Course Outline

Fall 2017

EARTH 444/BIOL 462
Applied Wetland Science

Course Instructor: Barry G. Warner
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Office hours: Tuesdays 9:30-12:30, and longer if several people show up. Additional office hours may be scheduled if necessary. Any other times by appointment or times you can catch me in my office which is most mornings. I will try to use Friday as my teaching preparation and research day and so may not always be in my office.

Meeting Times: 6:30-9:30 p.m. Tuesday, DC 1350

Prerequisites: One of BIOL 150/250, CIVE 153, EARTH 121, 153, ENVE 153, ENVS 200, GEOE 153) and (one of CHEM 120, 123, CHE 102) and (one of CIVE 224, ENVE 224, STAT 202) or consent of instructor. All are welcome to take this course. However, if you have background weaknesses, you are responsible for doing any necessary catch-up.

Required Text: There is no single textbook available that covers all the topics included in this course. However, if you would like to purchase one, I recommend the Mitsch and Gosselink (2015) book which is a good general reference. Below is a list of valuable references, some of which, are on Reserve in the Davis Library. Others are available in e-book format available via the Davis Library.

Lecture Notes: Text copies of power point presentations will be available on LEARN. Many of the photographs cannot be included in the files because of their huge electronic size and/or copyright. The instructor will have them online prior to class meetings.

Course structure: This course is delivered primary by lectures. Thus, regular attendance is critical. The lectures will cover key topics and issues. Students may from time to time be given

supplementary readings and references to look up in the library to complement lecture material. Background readings will be especially important for those whose background in certain areas may be weak.

In addition, students will learn together in small multi-disciplinary groups on a project. The project is designed to be practical that will require careful thought, planning, and research. It will also require organization, co-ordination and time-management as is necessary in professional collaborative efforts.

Learning Outcomes:

This course is designed to blend the theory of fundamentals of the science with applications to professional practice to address key and topical issues surrounding wetlands. Students should be able to do the following at the end of this course.

- Demonstrate a knowledge for wetland ecosystems as discreet ecosystems and know how to distinguish them from other terrestrial and aquatic ecosystems
- Identify and classify various kinds of wetlands in Canada, including natural, restored and created wetlands
- Have an ability to identify and characterize the complexity of processes responsible for wetland ecosystems, both as independent and interrelated processes
- Apply and replicate attributes of wetland ecosystems to restoration and creation applications
- Have the knowledge to apply wetlands technology to solve issues such as water quality improvement, habitat creation, and landscape enhancement
- Demonstrate knowledge about land-use provincial policy and the legislative and regulatory processes for wetland conservation in Ontario
- Have the ability to recognize and apply wetland conservation needs in Ontario and elsewhere in the world through agreements such as the International Convention on Wetlands (i.e. RAMSAR Convention)

Resources:

The following is a list of valuable references, some of which, are on Reserve in the Davis Library. Some are available in e-book format available via the Davis Library.

Anderson, J.T. and Davis, C.A. eds. 2013. Wetland techniques. 3 volumes. Springer, Dordrecht.

Batzer, D.R. and Sharitz, R.R. 2014. Ecology of freshwater and estuarine wetlands. 2nd edition. University of California Press, Berkeley.

DeLaune, R.D., Reddy, K.R., Richardson, C.J., and Megonigal, J.P. 2013. Methods in biogeochemistry of wetlands. Number 10, Book Series, Soil Science of America, Madison, WI.

Jorgensen, S.E. 2009. Applications in ecological engineering. Elsevier, Amsterdam.

Kadlec, R.H. and Wallace, S.D. 2008. Treatment wetlands. 2nd edition. CRC Press, Boca Raton, FL.

Keddy, P.A. 2010. Wetland ecology: Principles and conservation. 2nd edition. Cambridge University Press, NY.

Lee, H., Bakowsky, H., Riley, J., Bowles, J., Puddister, M., Uhlig, P., and McMurray, S. 1998. Ecological land classification for southern Ontario. First approximation and its application. SCSS Field Guide FG-02. Ministry of Natural Resources, North Bay. ON. Available for free download from: http://www.forestresearch.ca/images/stories/pdf/EVENTS/ELC/2012/Ecological%20Land%20Classification%20for%20Southern%20Ontario.pdf

Mitsch, W.J. and Gosselink, J.G. 2015. Wetlands. 5th edition. J. Wiley and Sons, NY

Mitsch, W.J. and Jorgensen, S.E. 2004. Ecological engineering and ecosystem restortation. J. Wiley and Sons, NY.

National Wetlands Working Group 1988. Wetlands of Canada. Polyscience Publishers Inc., Montreal. This publication is available for free download: http://nawcc.wetlandnetwork.ca/Wetlands%20of%20Canada.pdf

Reddy, K.R. and DeLaune, R.B. 2008. Biogeochemistry of wetlands. CRC Press, Boca Raton, FL.

Rydin, H. and Jeglum, J.K. 2006. The biology of peatlands. Oxford University Press, NY.

van der Valk, A.G. 2012. The biology of freshwater wetlands. 2nd edition. Oxford University Press, NY.

Vymazal, J. and Kröpfelová, L. 2008. Wastewater treatment in constructed wetlands with horizontal sub-surface flow. Springer, N.Y.

Warner, B.G. and Rubec, C.D.A. eds. 1997. The Canadian Wetland Classification System, 2nd edition. This publication is available for free download: http://nawcc.wetlandnetwork.ca/Wetland%20Classification%201997.pdf

General Topics:

Part A: The Science of Wetlands: Some of the Theory

What are wetlands?

Definitions: Scientific versus regulatory;

Classifications: Canadian Wetland Classification System and Ecological Land Classification System

Wetland geology, geomorphology and soils

Wetland hydrology and geochemistry

Wetland plants: Adaptations and development of plant communities

Part B: Applications of the Science and Professional Practice

Wetland Identification and delineation: Ontario Wetland Evaluation System

Wetland Restoration: Habitat wetlands, wetlands enhancement

Wetland Creation: Ecological engineering and wetlands for water treatment

Wetland functions and values: Wetland ecosystem services

Managing wetlands in Ontario and Canada

Wetland conservation: Local, regional, and international

Note: This is a general list of topics. The timing and/or order of possible lecture topics is not necessarily sequential and may change

Assessment:

Test #1 30% Test covers everything up until the date of the test. This test will take place during the regular lecture time.
Date: Tuesday, October 17, 2017

Test #2 30% Test emphasizes material covered since Test #1. Some knowledge of material covered prior to Test #1 may aid in your responses to the essay-type questions.
Date: Tuesday, November 28, 2017

Both Test #1 and #2 will require short answer and longer answer type responses to questions. Each of the questions will be worth from 2 points to 15 points each so judge your responses accordingly.

Group Project 40% **Due: 4 p.m., Tuesday, December 5, 2017**

There is no final examination.

Commitment Expectations:

- As with any course, time management is important. Students are encouraged to start working on projects as early in the term as possible so as to balance work load and manage end-of-term rush and deadlines.
- It is recommended that students attend all classes. Experience in previous years show that those who attend all classes most often do better than those students who miss lecture meetings.
- The instructor will endeavor to respond to all email messages within 24 hours. We are required to use the "uwaterloo" email address. The instructor cannot respond to questions such as: "What did I miss in the lecture I could not attend?" because the onus is on the student for filling in missed material. Please exercise proper email etiquette.
- On-line discussions with the instructor and/or with your peers on LEARN are encouraged as this can be another valuable way for everyone to learn together.

Academic Integrity:

- This course exercises all university policies concerning academic integrity.

- **Academic Integrity**: In order to maintain a culture of academic integrity, members of the University of Waterloo community are expected to promote honesty, trust, fairness, respect and responsibility. The Office of Academic Integrity provides relevant information for students, faculty and staff. Students are expected to know what constitutes academic integrity, to avoid committing academic offences, and to take responsibility for their actions. Completion of the Orientation to Academic Integrity Tutorial is encouraged and familiarity with Policy #71, (Student Discipline) is expected. Students who are unsure whether an action constitutes an offence, or need help in learning how to avoid offences (e.g., plagiarism, cheating) or understand 'rules' for group work/collaboration should seek guidance from their course instructor, academic advisor, or the Associate Dean of Science for Undergraduate Studies. For information on typical Policy 71 penalties, students should check *Guidelines for the Assessment of Penalties for the Faculty of Science*.
- **Grievance**: Students, who believe that a decision affecting some aspect of their university life has been unfair or unreasonable, may have grounds for initiating a grievance. Students should read Policy #70, Student Petitions and Grievances, Section 4. When in doubt, students must contact the departmental/school administrative assistant who will provide further assistance.
- **Appeals**: A decision or penalty imposed under Policy 33 (Ethical Behavior), grievances under Policy #70 (Student Petitions and Grievances) or Policy #71 (Student Discipline) may be appealed, if there is a ground. Petitions may not be appealed. Students who believe they have a ground for an appeal should refer to Policy #72 (Student Appeals).

Course Rules and Expectations:

- Learning Environment Interruptions:
  - If there should be service disruptions to LEARN, we shall follow university guidelines:

    https://uwaterloo.ca/secretariat-general-counsel/service-interruptions-online-learning-environment-guidelines

- Missed Tests:
  - Dates of course tests have been identified at the outset of the course. These dates cannot be changed.
  - Only those with valid Verification of Illness form will be considered as a legitimate reason for missing tests.

  - **Student travel plans are not considered acceptable grounds for granting an alternative examination time.**
- **Students with Disabilities:**
  - **AccessAbility Services, located in Needles Hall, Room 1401, collaborates with all academic departments to arrange appropriate accommodations for students with disabilities without compromising the academic integrity of the curriculum. If students require academic accommodations to lessen the impact of their disability, they should register with AccessAbility Services at the beginning of each academic term.**
- **Changes to Course Outline**
  - **The material provided in the course outline will not change from that provided at the outset of the course. The instructor may alter the order of topics and may vary based on the speed by which material is covered in class.**
  - **Course elements that will <u>not</u> change are the:**
    - **Grading scheme**
    - **Course elements related to evaluation**