Syllabus

WETLANDS ECOLOGY

BIOL 5870

Fall 2017

Instructor:

Dr. Valerie Brady

NRRI 788-2753 (M,W,F); MN Sea Grant 726-8714 (T,Th,F)

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Lectures: Tuesdays and Thursdays 3:30 pm to 4:45 pm; JISSB 202

Office hours: By appointment

Class website: www.d.umn.edu/~vbrady; password: wetlands101

Field Trips (required): Full day, each of two Saturdays (Sept. and Oct.). Rubber knee boots, warm clothing, and rain gear are mandatory; hip boots or waders are preferable. Bring a notepad and pencil/pen, lunch, snacks, and something to drink.

Course Credit: 3 credits

Grading:

Team project, incl. presentation and report	250 points
Mid-term exam	125
Final exam (Thur. Dec. 14, 2-4 pm)	125
Field trips write-ups (50 pts each)	100
Hydrology problem set	50
Biogeochemistry problem set	50
Class participation	50
Total	750 points

All assignments are due at the beginning of class on the due date. Assignments should be emailed as electronic versions. Please do not turn in PDF versions without prior OK from instructor.

Required Text:

One of the following editions of Wetlands by William J. Mitsch and James G. Gosselink. John Wiley & Sons. Preferred (current edition): Fifth (2015). Next best: fourth (2007). Acceptable: third (2000).

Other readings:

Keddy, P.A. 2010. Wetland Ecology: Principles and Conservation. Cambridge Studies in Ecology, Cambridge University Press, New York, NY, second edition.

Readings from Keddy and the primary literature are available on the class website.

Team Projects: Teams of 3-4 students will each act as if they are a group of expert consultants hired to develop a fact-finding report and presentation on a local, real-world problem involving wetlands. Each team will be given a different project centered around a local wetland issue. Teams will work to discover available information about each problem and the affected wetlands, will analyze the potential impact, and will develop recommendations that would improve the project from the perspective of reducing harm or improving wetlands or aquatic ecological condition. This effort will

require teams to search the web and published literature to find information and recommendations from similar events in other areas and determine the types of harm to the wetland or come up with restoration ideas and alternatives. Recommendations should include all potential ways to reduce the impact of a proposed project or increase the benefits and gains of a restoration project. Recommendations should also include mitigation and restoration recommendations. For projects whose primary focus is mitigation and restoration, recommendations should be made for monitoring and assessment of the success of the mitigation or restoration. Each recommendation should contain a brief assessment of the feasibility of doing it (i.e., cost, amount and difficulty of the effort involved, likelihood of acceptance by neighbors/community, likelihood of successfully accomplishing it).

Teams will present their findings in both presentation and written report format. Teams will have 30 minutes for their presentations with 5 minutes for questions and answers. All team members must take part in the presentation. Teams will be graded by how well their presentation describes the problem, their background research (data discovery, etc), and their findings and recommendations. Presentations will be graded by both the instructors and the audience. In addition, team members will grade each other on participation and effort. Thus the project grade will consist of the instructors' grade (50 points), team member grading (25 pts), and audience rating (25 pts). Total value: 100 points.

In addition, each team will produce a team-written report (maximum of 15 pages of text plus figures). Teams will have to collaborate on writing the sections, with each team member taking major responsibility for 1-2 sections, with the others contributing and editing. The report grade is in 3 parts: an outline and list of sources worth 25 pts (team grade), a report rough draft worth 25 pts (team grade), and the final report worth 100 pts (team and individual grades). The final report will be given a team grade (40 points content, 10 points writing ability) and each student will receive a grade on the sections that were their primary responsibility (40 points content, 10 points writing ability).

Date	**Topic & Readings**
8-28	What are wetlands? M&G (5^{th}): Ch. 2; Ch. 3:45-55, skim rest of chapter. (4^{th}) Ch. 2; Ch. 3:49-54, skim rest of chapter. (3^{rd}): Ch. 2; Ch. 3: 40-43, skim rest of chapter.
8-31	Hydrology: the driving factor M&G (5^{th}): Ch. 4: 111-119, 146-155. (4^{th}): Ch. 4:107-111, 146-159. (3^{rd}): Ch. 5:107-112, 145-153 Zedler, J.B., and S. Kercher. 2005. Wetland resources: Status, trends, ecosystem services, and restorability. Ann. Rev. Environ. Resour. 30:39-74. **Read pages 40-57.**
9-5	Hydrology: Water budget I M&G (5^{th}): Ch. 4: 119-134. (4^{th}): Ch. 4:111-134. (3^{rd}): Ch. 5: 119-133. Journal article: Euliss, N.H., Jr.; LaBaugh, J.W.; Fredrickson, L.H.; Mushet, D.M.; Laubhan, M.K.; Swanson, G.A.; Winter, T.C.; Rosenberry, D.O.; Nelson, R.D. 2004. The wetland continuum: A conceptual framework for interpreting biological studies. Wetlands 24(2):448-458. **Excel spreadsheet practice**

9-7 Hydrology: Hydroperiods & tides: Dr. Anett Trebitz
M&G (5th): Ch. 4: 115-119; 142-146. (4th): Ch. 4:111-118, 144-146. (3rd): Ch. 5:112-119, 143-144.
Journal article: Montalto, F.A. & T.S. Steenhuis. 2004. The link between hydrology and restoration of tidal marshes in the NY/NJ estuary. Wetlands 24(2): 414-45.

9-12 Hydrology: Water budget II
M&G (5th): Ch. 5:134-142. (4th): Ch. 5:135-146. (3rd): Ch. 5: 134-143.
Problem set I handout

9-14 Biogeochemistry: Soils I
M&G (5th): Ch. 5. (4th): Ch. 5: 163-176. (3rd): Ch. 6: 155-170.
All: Tiner chapters 4 and 10
Campbell, D.A., C.A. Cole, and R.P. Brooks. 2002. A comparison of created and natural wetlands in Pennsylvania, USA. Wetlands Ecology & Management 10(1):41-49.

9-17 **First field trip, Sunday: 8 am – 4 pm**

9-19 Biogeochemistry: Soils II (and C cycle)
M&G (5th): Ch. 6:179-204. (4th): Ch. 5:177-196. (3rd): Ch. 6:170-187
Form project teams; Project descriptions and assignments.

9-21 Biogeochemistry: Chemistry transformations I: N Dr. Rich Axler
Same readings (cont).
Waterontheweb.org Modules 2+3: Lectures 2, 4, 5, 6; Appendices - all 3
http://waterontheweb.org/curricula/ws/unit_01/U1mod2_3.html **Trip write-up due**

9-26 Biogeochemistry: Chemistry transformations II: P Dr. Rich Axler
Same readings (cont).
Journal article: Saunders, D, and J. Kalff. 2001. Nitrogen retention in wetlands, lakes and rivers. Hydrobiologia 443: 205-212. **Problem set I due**

9-28 BGC: Chemical transport and mass balance I (rev N, P, Fe, S cycles)
M&G (5th): Ch. 6:204-212. (4th): Ch. 5:196-206. (3rd): Ch. 6: 187-204.
Problem set II handout

9-30 **Second field trip, Saturday: 8 am – 6 pm**

10-3 Biotic adaptations: Plants Cynthia Hagley
M&G (5th): Ch. 7:215-227. (4th): Ch. 6: 207-222. (3rd): Ch. 7: 205-224.
Journal article: Bakker, C., P.M. van Bodegom, H.J.M. Nelissen, R. Aerts, and W.H.O. Ernst. 2007. Preference of wet dune species for waterlogged conditions can be explained by adaptations and specific recruitment requirements. Aq. Botany 86:37-45.

10-5 Biotic adaptations: Animals
M&G (5th): read scan of 4th. (4th): Ch. 6: 222-230. (3rd): Ch. 7: 224-230.

10-10 Ecosystem development, zonation, communities
M&G (5th): Ch. 7:227-251. (4th): Ch. 7:231-246. (3rd): Ch. 8: 231-246.

Keddy zonation reading (Ch. 10).
Journal article: Keough, J.R., T.A. Thompson, G.R. Guntenspergen, and D.A. Wilcox. 1999. Hydrogeomorphic factors and ecosystem responses in coastal wetlands of the Great Lakes. Wetlands 19(4):821-834. **Field trip write-up due**

10-12 Ecosystem ecology: Processes and productivity
M&G (5th): Ch. 4: 146-153. (4th): Ch. 8:247-258. (3rd): Ch. 8: 247-258.
Journal article: Junk, W. et al. 2006. The comparative biodiversity of seven globally important wetlands: a synthesis. Aquatic Sciences 68:400-414. **Problem set II due**

Writing assignment: Problem statement, preliminary findings and recommendations, and source bibliography.

10-17 **Mid-term exam**

10-19 Ecosystem ecology: Diversity and competition
Keddy diversity/competition reading (ch.5, ch. 9)

10-24 Ecosystem ecology: Herbivory and disturbance
Keddy herbivory/disturbance reading (ch. 4, ch. 6)

10-26 **Fall Break**

10-31 Peatlands, Minnesota's abundant wetlands Dr. John Pastor
Glaser, P.H., D.I. Siegel. E.A. Romanowicz, and Y.P. Shen. 1997. Regional linkages between raised bogs and the climate, groundwater, and landscape of north-western Minnesota. Ecology 85:3-16. **Writing assignment due**

11-2 Wetland protection
M&G (5th): Ch. 15. (4th): Ch. 14. (3rd): Ch. 18. Those with books other than 5th ed. should try to skim the 5th ed chapter after you read the chapter in your edition.
Esty, A. 2007. Banking on mitigation. Am. Scientist 95:122-123.
Journal article: Porej, D. and T.E. Hetherington. 2005. Designing wetlands for amphibians: the importance of predatory fish and shallow littoral zones in structuring amphibian communities. Wetlands Ecology and Management 13:445-455.

11-7 Wetland creation and restoration
M&G (5th): Ch. 18. (4th): Ch. 12. (3rd): Ch. 19. Those with books other than 5th ed. should try to skim the 5th ed chapter after you read the chapter in your edition.
Journal articles: Craft, C., P. Megonigal, S. Broom, R.J. Stevenson, R. Freese, J. Cornell, L. Zheng, J. Sacco. 2003. The pace of ecosystem development of constructed *Spartina alterniflora* marshes. Ecological Applications 13(5):1417-1432.
Zedler, J.B., and J.C. Calloway. 1999. Tracking wetland restoration: Do mitigation sites follow desired trajectories? Restoration Ecology 7(1):69-73.

11-9 Wetland management
M&G (5th): Ch. 14. (4th): Ch. 9. (3rd): Ch. 17. **Draft project reports due**

11-14 Treatment wetlands Dr. Richard Axler
M&G (5th): Ch. 19. (4th): Ch. 20. (3rd): Ch. 20. Those with books other than 5th ed. should try to skim the 5th ed chapter after you read the chapter in your edition.
Kadlec, R. & R, Knight. 1996. Treatment Wetlands. Ch. 3: Natural systems for treatment. CRC Press. Pp. 31-46.
Journal article: Axler, R., J. Henneck, and B. McCarthy. 2001. Residential subsurface flow treatment wetlands in northern Minnesota. Water Science and Technology, 44 (11-12): 345-352.

11-16 Invasive species in wetlands
Journal articles: Galatowitsch, S.M., N.O. Anderson, and P.D. Ascher. 1999. Invasiveness in wetland plants in temperate North America. Wetlands 19(4): 733-755.
Ervin,G., M. Smothers, C. Holly, C. Anderson, and J. Linville. 2006. Relative importance of wetland type versus anthropogenic activities in determining site invasibility. Biological Invasions 8:1425-1432

11-21 Wetlands and climate change Dr. Lucinda Johnson
M&G (5th): Ch. 17. (4th): Ch. 10; (3rd): pp. 634-637. Those with books other than 5th ed. should try to skim the 5th ed chapter after you read the chapter in your edition.
Journal article: Johnson, W.C., B.V. Millett, T. Gilmanov, R.A. Voldseth, G.R. Guntenspergen, and D.E. Naugle. 2005. Vulnerability of northern prairie wetlands to climate change. Bioscience 55(10):863-872.

11-23 **Thanksgiving Break**

11-28 Project work day

11-30 Project presentations

12-5 Project presentations

12-7 Land use planning and aquatic resources Jesse Schomberg
Journal article: Booth, DB, D. Hartley, and R. Jackson. 2002. Forest cover, impervious-surface area, and the mitigation of stormwater impacts. Journal of the American Water Resources Association 38(3):835-845. **Final project reports due**

12-14 WEDNESDAY: Final Exam, 2-4 pm, same room

The University of Minnesota is committed to the policy that all of its students shall have equal educational opportunities. Individuals who have any disability, either permanent or temporary, which might affect their ability to perform in this class are encouraged to inform the instructor at the start of the quarter. Adaptation of methods, materials or testing may be made as required to provide for equitable participation.

The University also expressly forbids discrimination on the basis of race, color, gender, sexual orientation, disability, veteran's status, ethnicity, religion, creed, national origin, or marital status. If you believe that your instructor has not upheld this policy, you are invited to bring it to the confidential attention of the Biology Department Head (211 Life Sciences, 726-7263) or the Associate Dean of the College of Science and Engineering (140 Engineering, 726-7585).