GEO 548: Stream Restoration

Course Information and Syllabus, Spring 2011

Schedule: T, 2:00-4:40pm
Location: 106 Wilkeson
Email: seanb@buffalo.edu
Instructor: Dr. Sean J. Bennett
Office: 126 Wilkeson Quad
Office Hours: Tues. 11:00 am to 12:00 pm; Thurs. 12:00 to 1:00 pm

Course Description: Stream restoration seeks to return an impaired or degraded river corridor ecosystem to a close approximation of its remaining natural potential, as defined by such indices as ecologic habitat, water quality, biodiversity, functionality, dynamic stability, etc. This course examines the scientific basis of stream restoration programs in the U.S. and worldwide through consideration of interdisciplinary theories and practices. Participants will actively discuss river processes, aquatic ecology, restoration needs and goals, restoration approaches, ecological economics, and the uncertainty and sustainability of restoration designs. Students will be exposed to a variety of stream restoration concepts through lectures, seminars, and independent projects.

Course Syllabus and Presenter Schedule

Date	No.	Topic	Presentation
1/18	1	Introduction & Stream Mechanics I	Lecture
1/25	2	Stream Mechanics II	Lecture
2/1	3	Stream Ecology and Habitat	Lecture
2/8	4	*Case Studies of Stream Ecology and Habitat*	*Student seminars*
2/15	5	The Need for Stream Restoration	Lecture
2/22	6	*Case Studies of Stream Systems in Need of Restoration*	*Student seminars*
3/1	7	Stream Restoration Approaches I	Lecture
3/8	8	*Case Studies of Stream Restoration Approaches I*	*Student seminars*
3/15		No Class	
3/22	9	Stream Restoration Approaches II	Lecture
3/29	10	*Case Studies of Stream Restoration Approaches II*	*Student seminars*
4/5	11	Shifting Paradigms of Stream Restoration	Lecture
4/12	12	*Case Studies of Shifting Paradigms*	*Student seminars*
4/19	13	*Final Project Presentations I*	*Student seminars*
4/26	14	*Final Project Presentations II*	*Student seminars*

Primary literature to be used per topic will include the following, supplemented by scientific publications to be provided later.

River Mechanics I & II

Bridge, J.S., *Rivers and Floodplains: Forms, Processes, and Sedimentary Record*, Blackwell Publishing, Oxford, 491 pp., 2003.

Knighton, D., *Fluvial Forms and Processes: A New Perspective*, Arnold, London, 383 pp., 1998.

River Ecology and Habitat

Allan, J.D., and M.M. Castillo, *Stream Ecology: Structure and Function of Running Waters*, 2nd ed., Springer, The Netherlands, 436 pp., 2008.

Dorava, J.M., D.R. Montgomery, B.B. Palcsak, and F.A. Fitzpatrick, eds., *Geomorphic Processes and Riverine Habitat*, Water Science and Application, Volume 4, 250 pp., 2001.

The Need for River Restoration

Brierley, G., and K. Fryirs, eds., *River Futures: An Integrative Scientific Approach to River Repair*, Island Press, 328 pp., 2008.

Restoration Ecology, Special Section: Restoring Rivers: A Synthesis of Findings From Project Records and Interviews, vol. 15(3), pp. 472-591, 2007.

Thorp, J., M. Thoms, and M. Delong, *The Riverine Ecosystem Synthesis: Toward Conceptual Cohesiveness in River Science*, Academic Press, Oxford, 232 pp., 2008.

Stream Restoration Approaches I & II

Brookes, A., and F.D. Shields, Jr., eds., *River Channel Restoration: Guiding Principles for Sustainable Projects*, John Wiley and Sons, Chichester, 23-74, 1996.

Daly, H., and J. Farley, *Ecological Economics: Principles and Applications*, Island Press, 488 pp., 2003.

Darby, S., and D. Sear, eds., *River Restoration: Managing the Uncertainty in Restoring Physical Habitat*, John Wiley & Sons, Chichester, 315 pp., 2008.

Doll, B.A., G.L. Grabow, K.R. Hall, J. Halley, W.A. Harman, G.D. Jennings, and D.E. Wise, *Stream Restoration: A Natural Channel Design Handbook*, North Carolina Stream Restoration Institute and North Carolina State University, 128 pp., 2003.

United States Department of Agriculture-Natural Resources Conservation Service, *Stream Restoration Design*, Part 654 National Engineering Handbook, 2007.

United States Environmental Protection Agency, *Ecological Restoration: A Tool To Manage Stream Quality*, EPA 841-F-95-007, http://www.epa.gov/owowwtr1/NPS/Ecology/exsum.html and http://www.epa.gov/owow/nps/Ecology/, 1995.

Watson, C.C., D.S. Biedenharn, and C.R. Thorne, *Stream Rehabilitation Version 1.0*, Cottonwood Research LLC, Fort Collins, Colorado, 201 pp., 2005.

Zeedyk, B., and V. Clothier, *Let the Water do the Work: Induced Meandering, an Evolving Method for Restoring Incised Channels*, The Quivira Coalition, Sante Fe, 239 pp., 2009.

Resources: Students are encouraged to purchase those books of close interest to their studies. All graphics and PowerPoint presentations shown in class, as well as pertinent papers, reports, and manuals, will be posted on UB*learns* in PDF format prior to lectures and seminars.

Student Assessment: Three (3) topical seminars, one (1) term project, and one (1) term project seminar per student.

Topical seminars presented by students will be based on a paper selected by them with assistance and approval from the instructor (see list of suggested journals). Note that only those papers published in 2009-10 are eligible to be presented. Students should email the instructor a PDF of the paper chosen, as these will be loaded to UB*learns* for the benefit of the class. Each seminar meeting will comprise up to six (6) student presentations, with up to 20 minutes allotted per presentation, which includes 5 minutes for discussion. All students shall present their seminars in PowerPoint, and a computer with projector will be available. In addition, each student presenter must prepare a 250-word abstract of the chosen paper, written in their own words. General guidelines for the seminar presentations are provided below. Late abstracts or email submissions will not be accepted (a "0" grade will be assigned).

The term project is a relatively long discussion (~12 pages long, 12-point font, and single-spaced in addition to figures, tables, and references) of a topic, focusing on its critical evaluation. It will include a brief literature review, identified gaps in current knowledge, stated hypotheses or objectives, and insight into new research opportunities. This paper must entail the collection of field or experimental data (actual, synthetic, or qualitative), the reduction and analysis of previously collected data, the testing of new hypotheses, and/or the formulation or application of conceptual or numerical models. Topics must be approved by the instructor. Each student shall present their project and results to the class as a seminar, with up to 25 minutes allotted per presentation, which includes 5 minutes for discussion. General guidelines for the projects are provided below. Late papers or email submissions will not be accepted (a "0" grade will be assigned). Example topics will be provided by the instructor throughout the semester.

Grades: Below is a table of all required work, deadlines, and the percentage points for student evaluations. Normal university grading procedures will be employed. An "Incomplete" grade will not be given to students who fail to submit work or submit work late.

Required Work	**Date Due**	**% of Total Grade**
Seminar Presentations (3)	TBA	10% each (30% total)
Seminar Abstract	Day of Seminar	2% each (6% total)
Term Project Seminar	TBA	15%
Term Project	By 4:30 pm on 5/6	40%
Class Participation	NA	9%

General Guidelines for Project:

- Papers should have an Abstract (250-word maximum), Introduction (with objectives of the paper), Methods (if applicable), Results, Conclusions, and References
- Papers will be assessed for content, accuracy, originality, presentation, organization, and overall quality of the writing
- Write concisely, similar in form to a journal paper
- Keep observations, measurements, and results separate from discussion and interpretations
- Use your own voice; plagiarism will not be tolerated
- All figures and tables require a caption
- Equations should be numbered sequentially in order of appearance, and all variables defined
- All material presented must be accurately and correctly cited
- Citations and references should follow the style and format of the American Geophysical Union

General Guidelines for Seminars:

- Students will present seminars standing in front of the class
- Students are allotted ~20 minutes per presentation, which includes 5 minutes for questions; do not exceed this limit (25 min. is allotted for the final project presentation)
- Format should be restricted to ~10 to 15 slides, and it should include a title and author(s) slide, background information, hypotheses or objectives of the paper, select procedures or methods used, select observations (plots, graphs, or mathematical formulations), discussion of the results, and concluding statements or summary
- Ensure all visual equipment is secured, in place, and working properly with the intended presentation
- Rehearsing the presentation is strongly recommended; "less" is generally "more"
- Speak to the audience and not the screen, use a relaxed, confident, and authoritative tone, make eye contact with the audience, and minimize physical gestures
- Listen to the questions carefully, and respond in a courteous, relaxed manner
- Respect should be shown to the presenter and the audience at all times
- Students will be evaluated on the clarity, style, and professionalism of their presentation, their command of the topic, the effectiveness of the visual aids, and their time management
- Attendance and participation by all students is mandatory

Suggested Journals for Papers

Advances in Water Resources
Annals of the Association of American Geographers
Aquatic Conservation: Marine and Freshwater Ecosystems
Bioscience
Earth Surface Processes and Landforms
Ecosystems
Ecohydrology
Ecological Engineering
Environmental Management
Environmental Science and Technology
Geomorphology
Ground Water
Hydrological Processes
Hydrobiologia
Journal of the American Water Resources Association
Journal of Applied Ecology
Journal of Environmental Engineering
Journal of Environmental Quality
Journal of Geophysical Research—Biogeosciences
Journal of Geophysical Research—Earth Surface
Journal of Hydraulic Engineering
Journal of Hydrology
Journal of Hydrologic Engineering
Restoration Ecology
River Research and Applications
Water, Air, & Soil Pollution
Water Resources Research