GE 312 River Restoration and Management

Lecture: T/Th 12 – 1:15 PM
Professor: Gabrielle David
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Office: Devlin 203A
Office hrs: Mon & Wed 2 – 3:30 PM
Tue 1:30 – 2:30 PM, or by appt
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Office: Devlin 311
Office hours: TBA

Course Description:
This course focuses on one of our most fundamental resources, rivers, and the science behind management and restoration. Rivers, floodplains, and wetlands transfer sediment, nutrients, and contaminants, while providing ecosystem services such as species habitat, clean water resources, hydroelectricity, transportation, and recreation. Subsequently, there are many stakeholders and goals for management and restoration projects. We will investigate qualitative, quantitative, and statistical methods used to understand the exciting complexity of river processes and applications of these methods to management plans. Furthermore, we will explore how restoration of river form is related to aquatic habitat restoration in the channel and surrounding wetlands.

Course Goals:
1. Gain the ability to develop a stream restoration project and be able to discuss how to implement and monitor the project
2. Describe stream and river behavior and response to alterations across different spatial and temporal scales using quantitative and qualitative models
3. Understand and be conversant in describing interactions between physical and ecological processes in streams and rivers
4. Improved speaking, writing, and critical thinking skills in the context of interdisciplinary water resources issues
5. Exposure to the primary scientific literature and current themes in river restoration research
### Tentative Class Schedule

*R&B refers to your main textbook for the course by Roni and Beechie (2013).

<table>
<thead>
<tr>
<th>Week</th>
<th>Day</th>
<th>Topic</th>
<th>Readings</th>
<th>Homework</th>
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<tr>
<td><strong>Part I: Watershed and Fluvial Processes</strong></td>
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<tr>
<td>1</td>
<td>Sept 3</td>
<td>Introduction</td>
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<td></td>
<td>Sept 5</td>
<td>History of stream and watershed restoration</td>
<td>*R&amp;B(Ch. 1)</td>
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<td>2</td>
<td>Sept 10</td>
<td>Watershed Processes I</td>
<td>R&amp;B (Ch. 2)</td>
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<td></td>
<td>Sept 12</td>
<td>No Class – BC Mass from noon to 1:15</td>
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<td>3</td>
<td>Sept 17</td>
<td>Watershed Processes II: article discussion</td>
<td>Poff et al., 1997 (Group A); Wondzell and King, 2003 (Group B); Dunne and Black, 1970 (Group C); Jones and Grant, 1996 (Group D)</td>
<td>Article Summary I Due</td>
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<td>Sept 19</td>
<td>Fluvial Processes I: hydraulics, river character and sediment transport</td>
<td>R&amp;B (Ch. 2)</td>
<td>Problem Set I Due</td>
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<td>River Restoration Field Trip I on <strong>Sunday, Sept 22</strong></td>
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<td>4</td>
<td>Sept 24</td>
<td>Fluvial Processes III: banks, channel evolution, and complex response</td>
<td>R&amp;B (Ch. 2)</td>
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<td>Sept 26</td>
<td>Process domains, the river continuum (and discontinuum), and historical range of variability</td>
<td>Vannote et al., 1980 (Group A); Montgomery, 1999 (Group B); Burchsted et al. 2010 (Group C); Rubin et al., 2012 (Group D)</td>
<td>Article Summary II Due</td>
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<td>5</td>
<td>Oct 1</td>
<td>Floodplains, Wetlands, and Ecology</td>
<td>R&amp;B (Ch. 2); Robinson et al., 2002</td>
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<td></td>
<td>Oct 3</td>
<td>Riparian vegetation, wood, and stream restoration</td>
<td>Montgomery et al., 2003</td>
<td>Problem Set II Due</td>
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<td>6</td>
<td>Oct 8</td>
<td>Floodplains, channel planform and change</td>
<td>R&amp;B Ch. 3</td>
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<td>Oct 10</td>
<td>Predicting river behavior: article discussion</td>
<td>Simon and Downs, 1995 (Group A); Watson et al., 2002 (Group B); Wohl, 2011 (Group C); Rinaldi et al., 2012 (Group D)</td>
<td>Article Summary III Due</td>
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<tr>
<td>Date</td>
<td>Activity</td>
<td>Resource</td>
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<td>Oct 15</td>
<td>Identifying restoration opportunities</td>
<td>R&amp;B (Ch. 3)</td>
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<td>Oct 17</td>
<td>Midterm Exam</td>
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### Part II: River Restoration Goals and Methods

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<th>Date</th>
<th>Activity</th>
<th>Resource</th>
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<tr>
<td>Oct 22</td>
<td>Human dimension of stream restoration</td>
<td>R&amp;B (Ch. 4)</td>
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<td>Oct 24</td>
<td>Human dimension of stream restoration – class discussion</td>
<td>Dufour and Piegay, 2009 (Group A); Richter et al., 1997 (Group B); Wohl, 2005 (Group C); Wohl, 2012 (Group D)</td>
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<td>Oct 29</td>
<td>TBA</td>
<td>TBA</td>
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<td>Oct 31</td>
<td>Restoration Techniques I</td>
<td>R&amp;B (Ch. 5); Seedang et al., 2008</td>
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<td>Nov  5</td>
<td>Restoration Techniques II</td>
<td>R&amp;B (Ch. 5); Shields et al., 2012</td>
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<td>Nov  7</td>
<td>Restoration Techniques III</td>
<td>R&amp;B (Ch. 5)</td>
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#### River Restoration Field Trip II on Saturday, Nov 9

- Prioritization and Design of Restoration Projects
- Development, design, and implementation of restoration projects I

#### Part III: River Restoration Design and Monitoring

- Development, design, and implementation of restoration projects II
- Group Discussions of Restoration Designs
- Monitoring of restoration projects

Nov 28 Thanksgiving – No Class!
14 Dec 3 Presentation of restoration project plans

14 Dec 5 Presentation of restoration project plans

15 Dec 10 Synthesis: Developing comprehensive restoration programs

R&B (Ch. 9)

Final Project Due

Final Exam Friday, December 20, 12:30 PM

Approach and Evaluation

This course heavily emphasizes group work and discussions. Stream restoration work is completed when an interdisciplinary team comes together to plan and implement the project. Therefore, learning to collaborate on these projects is a key life skill. You will learn the importance and benefits of group work through class discussions and through the final project which involves coming up with your own stream restoration plan for a local watershed.

Class participation and in-class assignments (10%): Class time will be split between lectures and hands-on activities.

2 Problem Sets (20%): You will be given the opportunity to apply the material discussed in lecture with 2 problem sets. The first problem set will emphasize watershed processes and the second will emphasize fluvial processes.

3 article summaries (15%): River restoration project plans balance scientific knowledge with both societal and political needs. To better understand restoration work it is essential that managers are able to read and comprehend scientific journal articles. Therefore, throughout the semester you will read and learn how to better discuss scientific research related to river restoration work. You will be required to write three 1-page article summaries and come prepared to discuss the articles in class.

River Restoration Group Project (30%): An essential part of restoration work is being to work successfully with an interdisciplinary group. Throughout the semester, you will work in groups of five and develop a proposal to restore a local river. The details related to this project will be handed out in the next couple of weeks.

Midterm (10%) and Final Exam (15%): There will be one midterm and one comprehensive final exam.

Readings

Main Textbook:

Readings for class lectures:


Readings for Group Discussions:


Course Reserves:

Academic Integrity
You are expected to be familiar with Boston College’s policy on academic integrity (http://www.bc.edu/offices/stserv/academic/integrity.html). Every author owns his/her own ideas, words, and research, therefore proper citation is essential. Plagiarism is a serious offense and will be dealt with according to the college guidelines. Plagiarism and cheating (for assignments, papers, quizzes, exams, or anything) are not acceptable. Please consult the college guidelines, or us, if you have questions.

Web Info
You will be able to access all the class material through the Blackboard page for the course. Any non-textbook readings will be posted on Blackboard under the “Assigned Readings” folder. You will find useful links, which will help with your final project here as well.

Please refrain from using portable-electronic devices, and from non-course related internet use, during classes, field trips, and office visits. These interfere with your and other students’ active participation in the course.

Late or Missed Assignments
Students are expected to turn assignments in on time. If this is not possible then it is your responsibility to contact me and let me know why the assignment will be late. Points will be deducted from late assignments and no assignment will be accepted three days after the due date.

Accommodations
**If you are a student with a documented disability seeking reasonable accommodations in this course, please contact Kathy Duggan, (617) 552-8093, dugganka@bc.edu, at the Connors Family Learning Center regarding learning disabilities and ADHD, or Paulette Durrett, (617) 552-3470, paulette.durrett@bc.edu, in the Disability Services Office regarding all other types of disabilities, including temporary disabilities. Advance notice and appropriate documentation are required for accommodations.**