Instructor Jim Perry  
Jperry@umn.edu  
Office Hrs Monday, 10:30-11:30, and Thursday 11:30-12:30 at Lori’s Café

This is the Grad Syllabus. Because we meet simultaneously with the undergrads part of the time, that syllabus is included below

Goals, structure and expectations
This is a graduate level water quality class. My goal is for you to experience and learn the content from the basic water quality class, and take that content deeper through reading and discussions. We will read and discuss a wide range of papers from the primary literature, usually two per week. You will lead the discussion on various weeks through the semester. Specifically, your responsibilities will be to:

- Read understand, and discuss the papers posted on Moodle
- Lead discussions about some of those papers, including locating and bringing in additional literature to advance our understanding
- Individually write a short, synthetic paper offering a synthesis of our topic for the semester (i.e., The intersection between Ecosystem Management (EM) approaches and Ecosystem Based Adaptation to Climate Change (EbA), as each is applied at the watershed scale.
- Review and comment on someone else’s paper, then revise your own after peer review
- Collectively present a 50-minute overview of that synthesis to the rest of the class (i.e., to the undergraduates)

I have selected a series of papers that we will use to begin that understanding. Each week, we will have a discussion leader who leads the session and will have two papers to discuss. The schedule for the semester is on Moodle, as are all assigned papers.
On the days you are to lead the discussion, start with the papers I have provided, and lead us. You can see from the 4061 structure the kinds of things I hope to see in leadership and synthesis. They include at least:

- Read the papers assigned for the day. Make notes that will allow you to lead an active and informative discussion.
- You may find it valuable to locate 1-3 other papers that complement the papers we are reading for the day. You are not required to find more; if you decide to, you might look at papers ours cite, and possibly ones that cite our papers (use Web of Science for that).
- On the day of the discussion, open with a brief overview of the questions posed, methods used if appropriate, major findings and conclusions of the papers of the day. You may decide it is best to consider the papers as two units of one package or as two discrete papers. As you prepare for class, as you lead the discussion and as you consider your synthesis paper, think about what it means to you to publish in the refereed literature. In that context,
  - Does this paper have clear hypotheses or questions? Are those presented and framed well in the context of recent and relevant literature?
  - Are the methods clearly presented? Do you feel they are appropriate for the questions the paper is trying to address?
  - Are the data presented in clear and meaningful ways? Are the figures necessary and sufficient?
  - Do you understand the data analyses? Are those analyses appropriate for the data and the questions posed? Were they performed correctly? Do you feel the assumptions of the statistical techniques have been met?
  - Are the interpretations clear and logical, based on the data and analyses? Has the literature been used correctly to synthesize and interpret the results?
  - Do you feel that the questions and/or hypotheses posed have been addressed adequately?
- What did we conclude about the papers? Are they meaningful contributions, defensible, and do they advance our knowledge?

**Writing**

This is a Writing Intensive class, although that does not hold much specificity for graduate students. As graduate students, your greatest benefit will come from refining and practicing your writing and editing skills. I do not believe it is a good investment of your time or mine to ask you to produce an extensive document; rather, a focused, intensive document will challenge you to think more deeply and write more concisely. That exercise will help you hone skills you will need in your graduate and professional careers. I also recognize that each of you has a unique perspective, a unique suite of interests and background experiences. Therefore, I’d like each of you to develop a concept paper that could be offered to a watershed manager, advising him/her on steps you feel would best prepare managers and citizens of the watershed for the climatic conditions predicted for 2050. That task is described in more depth in the **Writing Assignment**.

Your final paper should be ~5-10 pages long excluding references and figures (11 point Calibri, 1.15 spacing, 1” margins).
I also want to offer you the experience of performing and receiving a peer review, and receiving an editorial review. The time frame for the semester incorporates those goals and is posted on the Moodle site.

Presentations
I want the rest of the class to get some benefit from our discussions, and I feel that you benefit from a chance to synthesize material and present that material to others. We’ll do that twice.
- On December 11, I’d like the grad students to take the full class period, presenting to the rest of the class a synthesis of what we have been discussing through the semester. Talk to each other and seek common themes you have discovered. You know the undergraduate students are developing a watershed management plan, and are considering a future climate. Your goal here is to demonstrate and communicate that we have gone further by adding our explicit attention to EM and EbA.

Grad Grading

<table>
<thead>
<tr>
<th>Date</th>
<th>Points</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>45</td>
<td>Lead discussions through the semester</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>Participate in discussions through the semester</td>
<td></td>
</tr>
<tr>
<td>46</td>
<td>Moodle posts for case discussions</td>
<td></td>
</tr>
<tr>
<td>10/2</td>
<td>10</td>
<td>Paragraph describing the direction of your final paper (demonstrating that you’ve begun to think about it)</td>
</tr>
<tr>
<td>10/12</td>
<td>25</td>
<td>Exam taken in class</td>
</tr>
<tr>
<td>10/26</td>
<td>25</td>
<td>Outline of the final paper, ¾ page to full page</td>
</tr>
<tr>
<td>11/23</td>
<td>45</td>
<td>Exam taken in class</td>
</tr>
<tr>
<td>11/24</td>
<td>50</td>
<td>Full draft of final paper</td>
</tr>
<tr>
<td>11/30</td>
<td>15</td>
<td>Peer review of someone else’s draft</td>
</tr>
<tr>
<td>12/8</td>
<td></td>
<td>Post slides for final presentation</td>
</tr>
<tr>
<td>12/14</td>
<td>10</td>
<td>Present to the undergraduate class</td>
</tr>
<tr>
<td>12/22</td>
<td>75</td>
<td>Final draft of paper</td>
</tr>
</tbody>
</table>

Total of 371 points available

Syllabus for the combined grad and undergrad class

Introduction
Water in the proper quantity and quality is essential to all life. Water quality is a critical aspect of the overall management of water resources. Water quality is so central in the minds of Minnesotan’s that it played a significant role in passage of the Clean Water, Land and Legacy Amendment, a 2008 change to the State’s Constitution. Arguably, water is the most significant natural resource challenge facing Minnesotans today. Globally, more than 2.5 billion people have inadequate access to safe drinking water or sanitation. The political stability of areas such as the Middle East and parts of Africa is strongly influenced by water resource issues. As citizens of Minnesota and of the world, we are asked to vote on, comment on, and often pay for changes in water quality. Our failure to be involved often will result in increased health risk, increased economic cost and reduced quality of life. As such, we need to be aware of the costs and benefits (in the larger sense of both words) of changes in water quality.
An Overview of Global and Local Water Quality Issues
In this class, we discuss biophysical water quality in the context of society’s management concerns; we mix ecology and water resource science with policy and decision-making. I draw examples from many places in the world, many cultures and many economies because there are useful similarities and instructive differences among them. I provide an overview of water quality and its role in broader issues to help you become a better natural resource professional and a more informed citizen. Water quality is important in every natural resource field; this class provides you with depth that will be useful in your natural resources career.

Active, constructivist learning and diversity of views and interactions
I strongly believe in active and constructivist learning. That is, I believe that each of us brings a unique perspective and we each have something to offer to the discussion. As we approach an issue or a discussion, each of us learns from the interaction among us and constructs new learning from that interaction. Therefore, the class relies upon an open, highly participatory, interactive format, both in class and electronically. People from all backgrounds and orientations are explicitly welcomed. I especially seek a wide variety of views and styles of interaction. If there are any ways I can make your participation more effective or if you have any special needs, I will try to accommodate them; please let me know.

CLE Environmental theme
This class has been certified as meeting the Environment theme, by the university’s Council on Liberal Education. The class focuses on the interdependency of humans and their environment, stressing the ways humans alter landscapes and the positive and negative impacts that alteration has on water quality. The class discusses in many ways the regenerative aspects of the biosphere (i.e., the ways biotic and abiotic influences can remove or mitigate negative aspects of water quality). Finally, water quality management clearly is a function of both social and ecological influences. These issues are addressed throughout the class.

Discussion, Analysis and Synthesis
You will be expected to participate in discussions and presentations in order to improve your grasp of the material as well as to improve your communication abilities. You will be expected to develop and demonstrate an ability to think critically and to weigh alternatives. Performance evaluations in the class depend on critical analyses of issues and interpretations of scenarios, as well as text-based facts and concepts inherent to the field.

No text is required for the class; we will read a wide range of materials and all will be posted on the class Moodle site. To excel in the class, you will need to remain sufficiently familiar with the material posted on Moodle that you can discuss it intelligently and can refer to it as necessary. You will not be asked to memorize and repeat material; rather your goal should be to become conversant with concepts and approaches and become comfortable using the concepts in the literature as a reference for practical analyses, interpretation and decision making.

Student Learning Outcomes
The University has adopted seven Student Learning Objectives that apply to all students. This class specifically advances objectives 1 (i.e., identify, define and solve problems), 2 (i.e., locate and critically evaluate information) and 3 (i.e., master a body of knowledge and mode of inquiry).
• Outcome 1 is achieved through our content. Water is a critical natural resource. Water quality is a critical aspect of the overall management of water resources. Outcome 1 is assessed through our examination of conflicting issues in case studies, the analytical aspect of panel discussions, and the synthetic paper.

• We pursue Outcome 2, by examining the cultural and biophysical aspects of water quality. Water quality management clearly is a function of both social and ecological influences. These issues are addressed throughout the class. This outcome is assessed throughout the field of water quality and natural resources as we examine, discuss and write about case studies, read published papers and write and revise synthetic papers.

• To achieve Outcome 3, the class focuses on the interdependency of humans and their environment, stressing the ways humans alter landscapes and the positive and negative impacts that alteration has on water quality. This outcome is assessed through the literature review and analytical aspects of the synthetic paper, the examinations, and case study discussions.

Class Conduct
Water quality (by my definition) is an applied ecology approach to water resource decision making at the landscape scale. Water resources offer a range of benefits to human societies; we often express those benefits as “ecosystem services”. As we manage the landscape differently, we change the relationship between the land and water and therefore, change the ecosystem services society gains. Informed decision making means we think carefully about the balance between the benefits we derive from landscape management practices and the loss of ecosystem services we get from the water. We (should) always take an ecosystem and watershed approach to managing that relationship. Minnesota has developed a highly innovative visualization and analysis tool called the Watershed Health Assessment Framework (WHAF). We will use WHAF as a tool for understanding and writing about the future of Minnesota watersheds as climates change; that paper will represent your synthetic writing for the class.

The flow of the days and the weeks
In this class, we use a wide variety of strategies to capture your interest and optimize your learning. You will notice that there is a wide range of exercises. Consider each as a step that helps build your critical and analytical abilities and helps develop your decision-making and management skills. Although the days and weeks will vary somewhat as I learn more about your learning style, we will use the following pedagogical approaches often:

Lecture and Discourse
I will use Power Point and other visual aids to offer information, complementing that with recent literature and other sources. I will tie together the readings from the day and real life stories from my experience. This is our principal review of content. I will present materials; your responsibility will be to develop an understanding by reading the material and by engaging with the content. This content will serve as the basis for aspects of your writing for the class.

Case Discussion
I have selected case studies from the literature that will allow us to engage in and learn about water quality. A case study is really a story about some landscape in which there are people and water resources. There are impacts from the land to the water and resulting changes in ecosystem services as the land is managed differently; trade-offs are examined and decisions are made. That is
followed by another decision (i.e., accept the loss of ecosystem services or change practices). These are decision cases where you are assigned a role and asked to take that position for the purposes of the case discussion.

**Panel discussions**
I have selected papers from the recent literature that discuss some aspect of the issues we are discussing in class. Each of the papers addresses current issues in water quality management. We will use a panel discussion approach to those papers. Each person will serve at least once as moderator, once as proponent and once as opponent. On the days you are on a panel, you have three responsibilities:

- Read the paper(s) assigned for the day. Make notes that will allow you to serve as an active and informed participant in the discussion.
- On the day of the panel:
  - **Opening (several minutes)** I will provide an opening statement about the papers we are discussing, why I chose them, and terms that you will have found interesting, confusing or useful. This will set up the broader picture of the discussion.
  - **Moderator (2 minutes)** Provide an opening statement about the papers we are discussing. Summarize the principal So What that you see in the papers, what do you feel these papers bring to our discussion today and to our class?
  - **Proponent(s) (10 minutes)** You have 10 minutes to summarize how the research was completed and to convince the rest of the class that this work was well designed, well conducted, analyzed correctly, and interpreted correctly.
  - **Opponent(s) (10 minutes)** You have 10 minutes to offer an intelligent counterpoint. Think about and discuss other papers that might take a different approach to the questions posed here; question the research designs; question the analyses and interpretations. The role here is not to be critical of the paper per se, but rather to raise thoughtful questions.
  - **Moderator (5 minutes)** We all have read the papers, heard your introduction, and heard in-depth analyses of the papers. Open the rest of the discussion by offering two questions that will engage the class. As you listen to the proponent and opponent, come up with one more question, a third offering that occurs as a result of the early discussion. Lead the class in a discussion of those three questions.

**Meeting with the Instructor**
You are encouraged to initiate discussion and/or ask questions at any time. If you encounter difficulty with course material, please ask questions and see me for help. I will make time available during class and directly after class for questions on course material. I also will hold office hours at Lori’s on Mondays and Thursdays.

I react to e-mail questions very quickly and will check Moodle often to ensure you are not “held hostage” waiting for some answer. I am not available for unscheduled meetings and almost never answer the phone. I do not understand “the book of faces” or “snapping chats” or “instant grains” or “tweaker” or any form of asocial media. Do not expect me to go there.

**Student Requirements**

*Participation* Each student is required to participate in class, including Moodle postings, paper discussions, and case study discussions.
**Examinations** There are two examinations in the class. Each will be short essay and will require most of a full class period.

**Writing** This is a Writing Intensive class; it will help you learn more about writing and communicating, it will satisfy the University’s Writing Intensive requirements and it will help you learn to recognize good writing. You will have good support in your writing. We will have class periods devoted to your writing (i.e., days set aside for your writing when you do not have to be in the classroom). We also will have instructor- and peer-reviews of your drafts.

**Grad students do not write this paper** An analytical paper on Synthetic Approaches to Water Quality Management Each person will participate in a group that conducts research using the WHAF, and write two papers. One of those will characterize a watershed, using WHAF tools. The second will focus on two sub-watersheds and will offer strategies a watershed manager should implement and he/she considers climate change and attempts to prepare watershed management for 2050. Details about expectations and timing for the paper are described in detail in the paper instructions.

**Case positions**
We will use case studies as a way of engaging with the content this semester. Usually our cases are decision based, meaning someone has to make a decision among competing priorities. Each time we discuss a case, you will be asked to post a paragraph on Moodle describing your position and your analysis.

**Grading**
My core philosophy of grading is that students should be given the benefit of doubt whenever possible. I feel that students should have wide varieties of opportunities to excel, and I stress communication, expression and concepts more than details.

**Grad grading was discussed above** There will be **265 points in the semester**. People who earn at least 92% will receive an A, 86-91% a B, 75-85% a C, 65-74% a D. I may lower the grading scale to accommodate natural breaks in the curve.

- 35 points for **In-class participation**
- 160 points for **Writing**
  - 4 for your first reactions
  - 68 for the case study analyses, usually 4 points each
  - 88 for the watershed characterization papers (in steps)
- 70 points for **Exams**
  - 25 for the first exam
  - 45 for the second