DRAFT SYLLABUS
Global Scarcity in Freshwater Systems: Crisis and Solutions (online)
AS.420.676.81
Developer and Instructor: Glenn Patterson

Course Description: Robert Fulghum said “Water is everywhere and in all living things; we cannot be separated from water. No water, no life. Period.” We all depend on water for our very existence, yet access to clean freshwater is one of the most pressing global issues of the 21st century. About four in ten people on the earth live in areas with frequent water scarcity. According to the World Commission on Water, it is likely to rise to five in ten—half the world’s population—by the year 2025. And where freshwater is scarce for people, it is also scarce for aquatic ecosystems. According to National Geographic, more than 20 percent of the 10,000 known freshwater fish species have become extinct or imperiled in recent decades.

This graduate-level course explores the dual nature of water scarcity worldwide, including both natural and human causes, and what is being done to help people and ecosystems cope with scarcity. The course covers definitions of water scarcity, the geographic extent of the problem, and trends in factors that contribute to it. It also examines several types of actions that are being taken to deal constructively with water scarcity. These actions fall into the general categories of monitoring, supply enhancement, conservation, re-use, pollution control, lifestyle changes to lower our water footprint, and public policy changes. Many of these actions, especially those related to public policy, are incorporated into seven principles of sustainable water management detailed in the course textbook, “Chasing Water: A guide for moving from scarcity to sustainability”, by Brian Richter of the Nature Conservancy. Examination of the principles helps to end the course on a hopeful note by reminding us that humans collectively use only 5-10 percent of the water that falls as precipitation, and we have the capacity to greatly reduce the human suffering and environmental damage caused by poorly managed use of freshwater resources.

Instructor: Glenn Patterson, gpatter5@jhu.edu, 970-586-5196.

Course Goals:
--To understand the nature, causes, types, and geographic extent of water scarcity.
--To become familiar with technical and institutional strategies for coping with water scarcity.

Discipline: Environmental science and policy

Required Texts:


UNIVERSITY POLICIES

General: This course adheres to all University policies described in the academic catalog. A few to pay close attention to are noted below. JHU Ethics Statement: The strength of the university depends on
academic and personal integrity. In this course, you must be honest and truthful. Ethical violations include cheating on exams, plagiarism, reuse of assignments, improper use of the Internet and electronic devices, unauthorized collaboration, alteration of graded assignments, forgery and falsification, lying, facilitating academic dishonesty, and unfair competition. Report any violations you witness to the instructor.

Plagiarism: The strength of the university depends on academic and personal integrity. In this course, you must be honest and truthful. Ethical violations include cheating on exams, plagiarism, reuse of assignments prepared for other courses, improper use of the Internet and electronic devices, unauthorized collaboration, alteration of graded assignments, forgery and falsification, lying, facilitating academic dishonesty, and unfair competition. To avoid plagiarism in your writing, any time you copy more than 7 consecutive words written by someone else (for example, from a web site), you should enclose the copied material in quotes and provide a citation to the source. Report any violations you witness to the instructor. Read and adhere to JHU’s Notice on Plagiarism.

Policy on Level of Effort on this Course: As your instructor, I am committed to being a frequent and helpful presence during the course, logging in on average once every other day to participate in discussions and respond to email. I expect you to dedicate the same level of interest and effort you would give to a classroom course, and stay current with the schedule of lessons, averaging one per week.

Students with Disabilities: Johns Hopkins University is committed to providing reasonable and appropriate accommodations to students with disabilities. Students with documented disabilities should contact the coordinator listed on the Disability Accommodations page. Further information and a link to the Student Request for Accommodation form can also be found on the Disability Accommodations page.

Dropping the Course: You are responsible for understanding the university’s policies and procedures regarding withdrawing from courses found in the current catalog. You should be aware of the current deadlines according to the Academic Calendar.

Technical Assistance: You have a variety of methods to get help on Blackboard. Please consult the help listed in the ‘Technical Help’ link for important information. If you encounter technical difficulties in completing or submitting any online assessment, IMMEDIATELY contact the 24/7 Help Desk at 855-593-0086, use the live chat at the link provided on http://advanced.jhu.edu/academics/online-programs/support/ or submit a web ticket available on the same website. Please also let your instructor know immediately, via email, that you are experiencing technical issues.

Course Etiquette or “Netiquette”: This is a professional educational program and your communications are expected to be in accordance with normal professional standards. Please show respect for your audience, and use the writing skills you have been developing throughout your academic and
professional training. In email messages, please specify the course number in your subject line, and sign the message with your full name.

**Grading:** Grading will be based on 400 points, distributed as follows:

<table>
<thead>
<tr>
<th>Component</th>
<th>Component Score</th>
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<tr>
<td>- 5 quizzes, 25 points each</td>
<td>125</td>
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<tr>
<td>- 3 discussions, 25 points each</td>
<td>75</td>
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<tr>
<td>- 1 semester project (200 points), graded in 8 parts as follows:</td>
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<tr>
<td>--1. Topic selection (a water scarcity issue)</td>
<td>20</td>
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<td>--2. Classification as to type of scarcity and type of water resource</td>
<td>25</td>
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<td>--3. Problem description including quantitative data and trend information</td>
<td>50</td>
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<tr>
<td>--4. Potential application of “water toolbox” tools</td>
<td>30</td>
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<td>--5. Potential modifications to governance</td>
<td>20</td>
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<tr>
<td>--6. Potential application of the 7 principles for water sustainability</td>
<td>20</td>
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<tr>
<td>--7. Summary</td>
<td>20</td>
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<tr>
<td>--8. Bibliography</td>
<td>15</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>400</strong></td>
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Quizzes are open-book, with no set time limit, but you may take each quiz only once. The 3 roundtable discussions are an important part of the course, and you will be expected to participate by posting your well-thought-out response and by commenting on at least one other student’s post. The goal of the discussions is to let you share the insight you have gained about how science and public policy have come together to help solve watershed management problems. The problems do not have easy answers, and there is room for varying opinions in the discussions, as long as the opinions are supported.

The 8-part research and writing assignment is a semester-long project in which each part, graded separately, builds on the previous parts. You will select a water scarcity problem somewhere in the world, describe it in quantitative terms, and describe the potential application of tools to mitigate the problem. The product will be a scholarly paper that demonstrates your ability to analyze and solve technical and institutional aspects of water scarcity problems.

The grading scale is as follows:

- 98–100% (490-500 points) A+
- 93–97% (465-489 points) A
- 90–92% (450-464 points) A-
- 87–89% (435-449 points) B+
- 83–86% (415-434 points) B
- 80–82% (400-414 points) B-
COURSE CONTENT AND SCHEDULE

Week 1: The pain of water scarcity

Topics: Course intro and overview, examples of water scarcity, gender and water scarcity, water scarcity, water quality, and human health.

Readings: Richter, chapter 1; Pearce, chapter 3; articles on gender, water quality, and health.

Assignment: Discussion 1—Impacts of water scarcity.

Week 2: Physical water scarcity

Topics: Definition, extent, causes, examples of physical water scarcity.

Readings: Pearce, chapter 4; articles on physical water scarcity.

Assignment: R&W project step 1—Select a water scarcity problem somewhere in the world.

Week 3: Economic water scarcity

Topics: Definition, extent, causes, examples of economic water scarcity.

Readings: Articles on economic water scarcity.

Assignment: R&W project step 2—Classify it as physical, economic, or both. Also classify as surface water, groundwater, or both.

Week 4: Taking stock of our water budgets

Topics: Distribution of water in the world, hydrologic cycle, watershed and aquifer basics, consumptive and non-consumptive use.

Readings: Richter, chapter 2

Assignment: Quiz 1.

Week 5: Stealing from the future: groundwater mining

Topics: Groundwater overdrafts, examples and impacts, Ogallala Aquifer.

Readings: Richter, pp. 30-33; Pearce, chapters 5, 6, and 8; Articles on Ogallala Aquifer and GW mining.

Assignment: R&W project step 3—Describe the problem.
Week 6: Water toolbox: Finding more water
Topics: Desalination, rain and fog harvesting, storage, importation.
Readings: Richter, chapter 3, Pearce, chapters 24, 27, 28, 29
Assignment: Quiz 2

Week 7: Water toolbox: Using less water
Topics: Virtual water and the water footprint, re-use, watershed management, and water conservation.
Readings: Pearce, chapters 1, 25, 33
Assignment: R&W project step 4-- What tools from the water toolbox could be used to help solve the problem?

Week 8: Applying the toolbox: Colorado River Basin
Topics: Case history of applying techniques from the water toolbox to the Colorado River Basin.
Readings: Pearce, chapter 22; Articles on the Colorado River Basin
Assignment: Quiz 3

Week 9: How water governance leads to scarcity
Topics: Governance and ignoring needs of the poor, resource allocation in relation to wealth and power.
Readings: Richter, chapter 4
Assignment: R&W project, step 5--What aspects of governance need to be modified in order to mitigate this scarcity problem?

Week 10: Seven principles for sustainable water management
Topics: Richter’s 7 principles for effective water governance and adaptive management.
Readings: Richter, chapter 5
Assignment: R&W Project, step 6--Which of the 7 principles for water sustainability could be applied?

Week 11: Water for the people
Topics: Water as a human right vs water as a commodity, case history of Cochabamba, governing the commons.
Readings: Richter, chapter 6, pp. 97-100; Pearce, chapter 34; articles and video clips about Cochabamba, Bolivia water wars; articles from the UN on water as a human right; article about commodification of water.

Assignment: Discussion 2—How can we reconcile the concepts of water as a human right and water as a commodity for profit?

**Week 12: Case history on water sustainability in Texas**

Topics: Examining the sustainability scorecard for water management in Texas.

Readings: Richter, chapter 6, pp. 100-109; Pearce, pp. 1-17; articles on water in Texas.

Assignment: Quiz 4

**Week 13: Case history: Murray-Darling River Basin, Australia**

Topics: Examining the sustainability scorecard for water management in the Murray-Darling Basin of Australia.

Readings: Richter, chapter 7; articles on the Murray-Darling River Basin.

Assignment: Discussion 3—Has the Murray-Darling Basin Authority struck an appropriate balance among demands for water?

**Week 14: Chasing hope and water**

Topics: Reasons for optimism about the future of sustainable water management, examples of progress being made.

Readings: Richter, chapter 8.

Assignment: Quiz 5

**Week 15: Finish R&W Project**

Assignment: R&W Project, steps 7 and 8—Summary and Bibliography