**WATS 3700: Fundamentals of Watershed Science**  
*(Spring 2020)*

**Instructor: Dr. Soren Brothers**  
Office: BNR 269  
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**Teaching Assistant: Jessica Scholz**  
Office: JQL 222  
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Office hours: By appointment

**Lectures:** Monday, Wednesday, Friday 11:30 AM – 12:20 PM  
VSB 130

**Course Objectives:**

In order to understand the nature of our lakes, rivers, and reservoirs, we must first examine the watersheds which have created them. Watershed science encompasses an exciting, dynamic interaction between landscape geology, physics, chemistry, and biology. Understanding how these forces interact is an important first step towards managing our aquatic resources.

This course will introduce students to the fundamental components that comprise a watershed. We will examine the interplay between these components, with a particular focus on linking aquatic ecology to watershed characteristics. Finally, we will briefly examine the socio-political dimensions which come to play in this field, as watershed boundaries rarely align with political ones, potentially leading to conflict.

As good writing skills are essential to the success of an academic, this course is also designed to be a communications-intensive course. This means that a substantial portion of each student’s time will be spent on writing assignments, and a close collaboration with writing fellows and Science Writing Center tutors will be established to improve academic writing skills through practice.

**Primary Learning Outcomes:**

- Understand the relationships between climate and watershed processes.  
- Understand the types, characteristics, and distribution of inland waters.  
- Understand and communicate the relationships between aquatic ecology, biogeochemistry, and watershed processes  
- Understand and communicate anthropogenic effects on watersheds and potential water quality solutions
Assignments and Grading:

#1- Homework Assignments 10%
#2- Participation 10%
#3- Quizzes 10%
#3- Communication Assignments 20%
#4- Midterm Exam 10%
#5- Video Project 15%
#6- Final Exam 25%

Homework Assignments:

Throughout the semester a number of assignments (formative and summative assessments) will be assigned to familiarize you with some of the basic principles and methods used in watershed science. “Questions for Thought” (QFT) homework will be assigned for units focusing on aquatic ecology. For each QFT assignment, two questions must be chosen by the student (from the list provided at the end of each Dodds textbook chapter), and 2 to 4 sentences must be written and submitted as answers to each of the chosen questions. Many of these assignments will undergo peer review grading, and online submissions (via canvas) will be automatically and anonymously assigned to peers. Unless exercises are designated as group projects, students must submit their individual effort.

Participation:

Participation grades will be determined based on your completion of (and quality of) peer review grading, as well as your participation in class. Class participation will be determined by the teacher, including your attendance and response rates with iClickers.

Quizzes:

Quizzes will be used throughout the semester to gauge your progress on learning concepts introduced in the course. Each quiz will be announced in advance, and expectations will be made clear.

Communication Assignments:

As this is a communication intensive course, a major component of the final grade will come from the communication assignments. You will be asked to submit one short writing assignment (1-2 pages, double spaced), one medium-length (3-4 page, double spaced) writing assignment, and a policy brief. The short writing assignment (5% of total grade) will be a practice in writing an executive summary of a peer-reviewed journal article for a specific audience (academic/specialist, family members, etc.), and will be graded to focus heavily on grammar and appropriate writing style. The medium-length writing assignment (5% of total grade) will have students summarize and discuss two contradictory scholarly articles on a specific relevant topic, and will be graded more
rigorously on content as well as a greater focus on appropriate citations and grammar. For the policy brief (10% of total grade), students will be required to identify a watershed which is being faced with an issue (dam construction, invasive species, eutrophication, etc.), and write up a 4-5 page, highly accessible/readable report, addressed to a responsible government management agency, summarizing the main problems and identifying a solution.

**Midterm and Final Exams:**

Thirty-five percent of the course grade will rest on the midterm (10%) and final (25%) exams. These exams will be designed to test your knowledge and understanding of the reading materials provided to date. If you are an ESL student, please contact me to make arrangements for use of foreign language dictionaries and translators. You must have prior permission to use such a device.

**Video Project:**

Students will be assigned to groups of four, and will create an original 10-15 minute video. There will be some flexibility in the video topic and style; possible options could be a debate-show format, investigative report, or online science education video. Although there is flexibility in format and topic, each student of the group will be required to present/speak at least 3-4 minutes within the video, and all group members will receive the same grade for each video. You will be expected to follow a set of guidelines regarding content and format that will be provided to you. The goal of this assignment is to combine the various aspects of the course into a cohesive case study examining one particular community of the student’s choice, and how it interacts with its waters or watershed(s). The educational video should consider the important characteristics of the local watershed (whether geological and/or ecological), the impacts that the local community has had (or may in the future have) upon it, and discussions of management plans, including any recommendations.

**Writing Fellows Program:**

To help students improve their writing skills, this class will participate in the Writing Fellows (WF) Program. For the first two (short and medium) written communication assignments, you will submit a good first draft that will be evaluated by the WF, two weeks prior to the assignment due date (as per deadlines indicated on the schedule below, and as a printed-out hard copy unless organized otherwise with the WF). You will then meet in a conference with the WF to discuss possible improvements of your paper and suggestions for revision; you will submit the original draft (hard copy with WF’s comments) and the final version (online via Canvas) of your paper to the instructor for grading. Final papers will not be accepted without the first draft and WF comments. There are thus two due dates for each paper: first draft to the WF and first draft + final version to the instructor. Please note time and place of your conference and honor your appointment. Students that fail to show up for their appointments with the WF will be
marked down. Both first and final drafts must be submitted at the beginning of class on the specified date.

The four Writing Fellows for our class are:

**Sage Sutcliffe**
utahsuttie@gmail.com
(385) 222-1912

**Madi Tripp**
madimoliver@gmail.com
(435) 590-8650

**Holly Hudson**
hollyhudson@aggiemail.usu.edu
(406) 381-7150

**Christyna Gardner**
christynagardner@yahoo.com
(276) 521-3297

Students are also recommended to use language editing programs (such as Grammarly, freely available on the internet) as a tool to help improve their writing skills.

**Science Writing Center:**

In addition to the Writing Fellows (WF) Program, all class members will be required to meet for at least one one-on-one 30-minute session with a Science Writing Center tutor (https://writing.usu.edu/programs/sci-writing). These tutors will be able to assist students in polishing up assignments or reports prior to being handed in, or can offer additional advice on a returned writing assignment. For communication assignments (short or medium) which have received a grade below 60%, an additional 5% credit may be earned by discussing the writing assignment with the tutor.

**Required Materials:**

This course will incorporate readings from the primary literature, an open, online course (Water: Science and Society) developed by a previous instructor of this course in collaboration with faculty from Penn State (accessed online at https://www.e-education.psu.edu/earth111/), and one book: Freshwater Ecology, a general textbook introducing students to the science of inland waters (e-book link: https://libcat.lib.usu.edu/record=b3494608~S2). This textbook is additionally available through the Merrill-Cazier Library.

**Auto Access: Freshwater Ecology**

This course requires all-inclusive digital materials that are provided to you at a lower price than traditional printed materials. These materials are paid for through an “Auto Access Digital Materials” charge placed on your student account when you registered for the course. To access the materials, visit the Canvas course site. For more details, including dates, deadlines, visit [https://portal.verba.io/usu/login](https://portal.verba.io/usu/login). This page will also include information on how to opt-out of the digital materials if you choose to do so.

I will also be using Canvas to share assignments, readings, student grades, and any additional announcements. For the required video assignment, groups will be organized to ensure that at least one group member has access to a device for recording video and audio. For students or groups without access to video-editing software, free online software, such as Lightworks ([https://www.lwks.com/](https://www.lwks.com/)) is available for the preparation of their videos.

Finally, this class will regularly incorporate i-clickers in lectures, which students bring to class.

**Canvas:**

We will use Canvas regularly for sharing announcements, accessing readings, accessing and submitting assignments, and checking your grades. The messaging system in Canvas is inflexible and clunky, so do not use it to contact me. Email either the instructor or teaching assistant directly if you have questions or concerns.

**Course Policies:**

- Cell phones must be silent or turned off during class.
- All assignments are due at the beginning of class on the given due date.
- Arrangements for make-up exam will only be made as an emergency measure for justifiable reasons. A doctor’s note is required to reschedule a missed midterm exam.
- Late homework assignments receive an automatic grade of zero. Late reports will have a grading penalty of 10% per day late for up to four days.

**Departmental and University Policies:**

**Academic Freedom:**

Academic freedom is the right to teach, study, discuss, investigate, discover, create, and publish freely. Academic freedom protects the rights of faculty members in teaching and of students in learning. Freedom in research is fundamental to the advancement of truth. Faculty members are entitled to full freedom in teaching, research, and creative activities, subject to the limitations imposed by professional responsibility.
**Students with Disabilities:**

Accommodations are collaborative efforts between students, faculty and the Disability Resource Center (DRC). Students with accommodations approved through DRC are responsible for contacting me prior to or during the first week of the semester to discuss accommodations. Students who believe they are eligible for accommodations but who have not yet obtained approval through DRC should contact DRC immediately at 797-2444.

**Academic Dishonesty:**

All assignments and exams are to be completed individually, unless otherwise stated by the instructor. This course follows the University rules on civility and honesty. These can be found at http://www.usu.edu/policies/PDF/Acad-Integrity.pdf. The penalty for cheating, falsification, or plagiarism in this class will be assessed on a case-by-case basis, but by default will be a zero grade for the assignment/exam. In addition, the offense will be reported to the Office of Student Conduct for inclusion in the student’s permanent record. A useful guide for understanding and avoiding plagiarism, and required reading for all students prior to the commencement of this course, is available online here (http://ocw.usu.edu/English/introduction-to-writing-academic-prose/plagiarism.html). All online submissions to Canvas will be automatically screened for plagiarism by Turnitin (comparing writing samples to all other student papers, the internet database, and journals, periodicals, and publications). Students will not be notified of identified plagiarism in a writing sample until the assignment has been marked.

**Important Dates:**

- **Friday, January 24th:** Short writing assignment due (beginning of class)
- **Friday, February 21st:** Medium-length writing assignment due (beginning of class)
- **Friday, February 28th:** Midterm exam (in class)
- **Monday, March 30th:** Video assignment due (by beginning of class)
- **Friday, April 10th:** Policy brief due
- **Monday, April 27th:** Final Exam

WSS: Water, Science and Society online course modules:
https://www.e-education.psu.edu/earth111/

FE: Freshwater Ecology
FA: Formative Assessment
SA: Summative Assessment
QFT: Questions for Thought
WA: Writing Assignment
VA: Video Assignment
WF: Writing Fellow copy due (14 days prior to assignment due date)
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<thead>
<tr>
<th>Month</th>
<th>Dates</th>
<th>Topic</th>
<th>Readings</th>
<th>Assignments</th>
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<tbody>
<tr>
<td>January</td>
<td>6, 8, 10</td>
<td>Introduction to watersheds and the global distribution of water</td>
<td>WSS Module 1</td>
<td>Wed: WSS M1: FA 4</td>
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<td>Fri: WA#1 (WF)</td>
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<td>13, 15, 17</td>
<td>Tying it together: geology and climate</td>
<td>WSS Module 2</td>
<td>Fri: WSS M2: SA</td>
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<td>22, 24</td>
<td>Climate effects on watersheds</td>
<td>WSS Module 4, Fri: WSS M4: FA 2</td>
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<td>27, 29, 31</td>
<td>Water on the move: rivers</td>
<td>FE Ch 6 (Flowing Water) WSS Module 3</td>
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<td>Wed: FE: QFT Ch 6</td>
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<td>February</td>
<td>3, 5, 7</td>
<td>Lakes: types and distribution</td>
<td>FE Ch 7 (Lakes and Reservoirs)</td>
<td>Fri: WA#2 (WF)</td>
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<td>10, 12, 14</td>
<td>Impoundments: When a river becomes a lake</td>
<td>WSS Module 5</td>
<td>Wed: WSS M5: SA (dam debate)</td>
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<td>19, 21</td>
<td>Wetlands and groundwater</td>
<td>WSS Module 6, FE Ch 4 (Groundwater), 5 (Wetlands)</td>
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<td>24, 26, 28</td>
<td>Midterm review and exam #1</td>
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<td>Fri: WA#2 due</td>
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<td>March</td>
<td>2, 4, 6</td>
<td>SPRING BREAK</td>
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<td>9, 11, 13</td>
<td>The good, the bad, and the algae</td>
<td>FE Ch 18 (Eutrophication)</td>
<td>Wed: FE: QFT Ch 18</td>
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<td>16, 18, 20</td>
<td>Ecology of inland waters: Zooplankton to Fish</td>
<td>FE Ch 21 (Interspecific Interactions), 24 (Freshwater Ecosystems)</td>
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<td>23, 25, 27</td>
<td>Watershed biogeochemistry: Linking terrestrial and aquatic biomes.</td>
<td>FE Ch 13 (Carbon)</td>
<td>Fri: FE: QFT Ch 24</td>
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| April    | 30, 1, 3 | Water quality | WSS Module 7 | **Mon:** VA due  
**Fri:** WSS M7: FA2 |
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<td>6, 8, 10</td>
<td>Watershed management and restoration</td>
<td>WSS Module 10</td>
<td><strong>Fri:</strong> Policy brief due</td>
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<td>13, 15, 17</td>
<td>Watersheds in society and policy</td>
<td>WSS Module 8.2, Module 9</td>
<td><strong>Fri:</strong> WSS M1: SA (Water journal)</td>
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<td>20</td>
<td>Final exam + review</td>
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