

Watershed Management and Restoration-

FNR 6628

1 Overview

This course addresses science and policy of watershed management, focusing on 1) biophysical factors, 2) socioeconomic drivers, and 3) the legal/policy context.

- Offered in Fall semester, even years
- 100% online, asynchronous lectures, optional synchronous meetings
- <http://elearning.ufl.edu/>

Course Prerequisites: Basic water resources course or instructor permission

Instructor: Dr. Matthew Cohen (Professor), mjc@ufl.edu, 328 Newins-Ziegler Hall, (352) 846-3490.

- Please use the Canvas message/Inbox feature for fastest response.
- Office hours: anytime by email or phone; by appointment for office visits and video conference.

Teaching Assistant: Joshua Epstein (PhD candidate), jmepstein12@ufl.edu, 331 Newins-Ziegler Hall.

- Please use the Canvas message/Inbox feature for fastest response.
- Office hours: anytime by email or phone; by appointment for office visits and video conference.

Textbook(s) and/or readings: There is no required text for the course. Online readings will be provided for each learning topic.

2 Learning Outcomes

Students in this course will engage the topic from multiple disciplines with a focus on watersheds in Florida, but with examples drawn from around the world. There are 4 learning outcomes that form the core objectives of this class:

- Students will understand the multiple overlapping stressors that create the need for watershed management.
- Students will also understand the myriad constraints that limit options for watershed management, and be able to articulate where and how these have successfully been addressed.
- Students will demonstrate competence in synthesizing information on a single watershed by delivering as their final output, a document that describes the physical, biological, socio-economic and regulatory setting, and establishes future needs and opportunities for successful watershed management.
- Students will broaden their basis for understanding watershed management by reviewing and providing constructive criticism on other students' watershed reports, and by engaging actively in open-ended discussion sections.

3 Course Logistics

This course is entirely web-based and students are expected to access lectures, readings, and supporting materials as they become available each week. Course modules are divided into week long themes.

Learning modules consisting of lectures, readings, and discussion boards with optional live weekly video conferences. Lectures and readings will be posted on Wednesdays, with initial discussion posts due the following Tuesday by 2 pm. Optional live discussions via Zoom tool will be **Tuesdays from 4:30 to 5:30 pm** with recordings made available to students not present. Replies to discussions, which should incorporate content presented in the weekly Conference, are due Thursdays 11:59pm.

Project assignments are due for peer review on Thursday 11:59pm of the relevant week, and peer reviews should be completed by the following Tuesday at 11:59pm.

This course leans heavily on the primary literature and government reports. Relevant documents will be assigned on each topic area. Additional readings (2-3 per week) will be provided for additional context once specific focal watersheds are selected.

Technology Requirements:

- A computer or mobile device with high-speed internet connection.
- A headset and/or microphone and speakers; a web cam is suggested.
- Latest version of web browser. Canvas supports only the two most recent versions of any given browser. [What browser am I using?](#)
- Voicethread: <http://ufl.voicethread.com> (more instructions will be provided)

3.1 Assignments & Deliverables

Participation

Class participation will be evaluated according to engagement in formal online discussions and the peer review process. A rubric for constructive feedback will be provided.

Peer review grades are given on an all-or-nothing basis per assignment, so be sure you review/comment on your peers work; your peer-reviewing obligations will be allocated by the instructor and TA following the submission date for each assignment.

Lecture Quizzes

To ensure students are engaging the lecture materials, a short 5 question quiz will be delivered at the end of each lecture block/module.

Projects/Writing Assignments

The projects are intended to focus on a single watershed. Choose this watershed early (coordinate with the instructor). It may range from small (ca. 300 km²) to large (ca. 50,000 km²). It is recommended that massive watersheds (e.g., the Columbia or Amazon) be avoided due to the complexity of synthesizing the available information, the variety of issues that interact at that scale, and the scope legal and institutional participation. Small watersheds are fine, but the goal is to identify sites where interacting

priorities create conflict and, ultimately, the need for water management. Consider this decision carefully as you will be engaged in the same place the entire semester.

E-Poster: Biophysical Template. The first assignment will describe the biophysical template (climate, geology, biology) relevant to watershed management. What underlies the watershed? How is this important for understanding how to protect or manage that watershed? What characterizes the hydrology, and what are the kinds of ecosystems and organisms present in the watershed? What is the natural condition that would be there if not for human uses? Maps and pictures are essential.

- Posters will be created in the program of your choice (e.g., Powerpoint) and uploaded to Voicethread for sharing and submission. You will need to provide comments and feedback to FOUR other submissions for peer review participation grade.

Presentation: Stakeholder Engagement. The second project will focus on what people do within your watershed. What human activities are currently occurring and how significant are they? What are historical land uses and what are their consequences? What are the expected future trends and how is this trajectory expected to affect the natural system? What happens at the interface of human and natural systems in your watershed that create problems that management seeks to redress?

- Presentations will be created, converted to PDF, and uploaded to Voicethread where you will then narrate or use video commentary to present projects. Presentations should be **no longer than 15 minutes**. You will need to provide comments and feedback to FOUR other submissions for peer review participation grade.

Short Paper: Legal Brief. The third project will focus on legal and institutional attributes of the basin. Key questions when considering watershed management are: What institutions have jurisdiction, and over what aspect of the system? How are overlapping jurisdictions handled? What laws affect watershed management (e.g., are there wetlands, endangered species, navigable waters, national parks)? To what extent has litigation affected management responses, and what regulatory programs exist to redress those problems? Your task with this assignment is to summarize the major elements of one law (e.g., Clean Water Act, Florida Water Resources Act, Swampbusters Act) and one institution (e.g., Water Management District, Army Corps of Engineers, Farm Bureau, public stakeholder group) directly relevant to your watershed.

- This short paper (~2-3 pages) will be submitted in Canvas and you will be randomly assigned to peer review four submissions.

Synthesis Paper. The final paper should be a summative assessment of watershed management in your basin. Development of this paper should parallel the three other assignments because it should include sections on biophysical factors, socioeconomic drivers and constraints, and legal drivers and constraints. The goal is to synthesize the management needs, actions taken to date to meet those needs, the adequacy of those actions, and a vision for the future of the basin.

- This synthesis paper (~15 pages) will be submitted in Canvas by the initial due date. You will be randomly assigned to peer review four submissions by the peer review deadline.
- After peer review, students will revise and resubmit the assignment for instructor grading.

3.2 Grades & Grading Scale

Discussion Participation:	10%
Lecture Quizzes	10%
Peer reviews:	10% (2.5% per assignment)
Poster:	15%
Presentation:	15%
Short Paper:	15%
Synthesis Paper:	25%

Grading Scale (%)

A	90-100
B+	86-89
B	80-85
C+	76-79
C	70-75
D+	66-69
D	60-65
E	< 60

For information on current UF policies for assigning grade points, see <https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>

4 Course Content

Learning Modules

Week 1 (8/31): Conceptual Framework, Motivation for Management

Week 2 (9/7): Adaptive Management and Water Availability

Week 3 (9/14): The Water Budget: Precipitation and Streamflow

Week 4 (9/21): The Water Budget: Evapotranspiration and Groundwater

Week 5 (9/28): The Biophysical Template: Landform

Week 6 (10/5): The Biophysical Template: Biological Resources

Week 7 (10/12): The Socioeconomic Template: The Working Watershed

Week 8 (10/19): The Socioeconomic Template: Water Quality

Week 9 (10/26): The Socioeconomic Template: What is Restoration?

Week 10 (11/2): The Socioeconomic Template: Wetland Mitigation

Week 11 (11/9): Legal/Institutional: Waters of the United States

Week 12 (11/16): Legal/Institutional: Water Allocation

Week 13 (11/23): Thanksgiving – no lecture or discussion.

Week 14 (11/30): Legal/Institutional: Pollution Load Reduction

Week 15 (12/7): Legal/Institutional: Florida Water Law.

Deliverables

Choose your watershed.

*Posters due Thursday **

*Presentations due Thursday**

*Legal Brief due Thursday**

*Draft Paper due Wednesday**

Final Paper due Tuesday (12/15)

** Peer reviews for posters, presentations, legal briefs and draft synthesis papers will be due the following Tuesday.*

Readings: The following is a partial list of reading material you will be assigned during the semester:

- Abbott et al. 2019. Human domination of the global water cycle absent from depictions and perceptions. *Nature Geoscience* 12:533-540
- Allen, C.R., J.J. Fontaine, K.L. Pope and A.S. Garmestani. 2011 Adaptive management for a turbulent future. *Journal of Environmental Management* 92:1339-1345
- Arthington, A.H., S.E. Bunn, N.L. Poff and R.J. Naiman. 2006. The challenge of providing environmental flow rules to sustain river ecosystems. *Ecological Applications* 16:1311-1318
- Bednarek, A.T. 2001. Undamming Rivers: A Review of the Ecological Impacts of Dam Removal. *Environmental Management* 27:803-814
- Castle S.L. et al. 2014. Groundwater depletion during drought threatens future water security of the Colorado River Basin. *Geophysical Research Letters* 41: doi:10.1002/2014GL061055
- Christensen, N.L. and others. 1996. The Report of the Ecological Society of America on the Scientific Basis for Ecosystem Management. *Ecological Applications* 6:665-691
- Delfino, J.J., J.P. Heaney. 2004. Challenges to water resources sustainability in Florida. *Allocating Water: Economics and the Environment*, 9 pp
- Havens, K.E., and R.T. James. 2005. The Phosphorus Mass Balance of Lake Okeechobee, Florida: Implications for Eutrophication Management, *Lake and Reservoir Management*, 21:139-148
- Millennium Ecosystem Assessment. 2005. World Resources Institute, Washington DC, USA
- Neubauer, C.P. et al. 2008. Minimum flows and levels method of the St. Johns River Water Management District, Florida, USA. *Environmental Management* 42:1101-1114
- Obreza, T., and others. 2010. A Guide to EPA's Proposed Numeric Nutrient Water Quality Criteria for Florida. University of Florida EDIS Publication #SL316
- Palmer, M.A. 2008. Reforming watershed restoration: Science in need of application, applications in need of science. *Estuaries and Coasts* DOI 10.1007/s12237-008-9129-5
- Palmer, M.A. and A. Ruhi. 2019. Linkages between flow regime, biota, and ecosystem processes: Implications for river restoration. *Science* 365
- Poff, N.L. et al. 2003. River flows and water wars: emerging science for environmental flows. *Frontiers in Ecology and the Environment* 1:298-306
- Sullivan, S.M.P., M.C. Rains, A.D. Rodewald, W.W. Buzbee and A.D. Rosemond. 2020. Distorting science, putting water at risk. *Science* 369:766-768
- Reiss, K.C., E. Hernandez and M.T. Brown. 2007. An evaluation of the effectiveness of mitigation banking in Florida: Ecological success and compliance with permit criteria. Final Report to the US EPA, Region IV 162 pp
- Schindler, D.E. et al. 2003. Pacific salmon and the ecology of coastal ecosystems. *Frontiers in Ecology and the Environment* 1:31-37
- Sinha, E., A.M. Michalak and B. Balaji. 2017. Eutrophication will increase during the 21st century as a result of precipitation changes. *Science* 357:405-408
- Sun, G., P.V. Caldwell and S.G. McNulty. 2015. Modeling the potential role of forest thinning in maintaining water supplies under a changing climate across the conterminous US. *Hydrological Processes* 29:5016-5030
- Vitousek, P.M. and others. 1997. Human domination of the Earth's Ecosystems. *Science* 277:494-500
- Vorosmarty et al. 2010. Global threats to human water security and river biodiversity. *Nature* 467:555:561
- Wilkinson, B.H. 2005. Humans as geologic agents: a deep time perspective. *Geology* 33:161-164

5 Policies and Requirements

This syllabus represents current plans and objectives for this course. As the semester progresses, changes may need to be made to accommodate timing, logistics, or to enhance learning. Such changes, communicated clearly, are not unusual and should be expected.

5.1 Late Submissions & Make-up Requests

It is the responsibility of the student to access on-line lectures, readings, quizzes, and exams and to maintain satisfactory progress in the course.

Computer or other hardware failures, except failure of the UF e-Learning system, will not excuse students for missing assignments. Any late submissions due to technical issues **MUST** be accompanied by the ticket number received from the Helpdesk when the problem was reported to them. The ticket number will document the time and date of the problem. You **MUST** e-mail your instructor within 24 hours of the technical difficulty if you wish to request consideration.

For computer, software compatibility, or access problems call the HELP DESK phone number—352-392-HELP = 352- 392-4357 (option 2).

Requirements for class attendance and make-up exams, assignments and other work are consistent with university policies that can be found at:

<https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>

5.2 Communication Courtesy and Professionalism

Just as in any professional environment, meaningful and constructive dialogue is expected in this class and requires a degree of mutual respect, willingness to listen, and tolerance of opposing points of view.

Respect for individual differences and alternative viewpoints will be maintained in this class at all times. All members of the class are expected to follow rules of common courtesy, decency, and civility in all interactions. Failure to do so will not be tolerated and may result in loss of participation points and/or referral to the Dean of Students' Office.

5.3 Semester Evaluation Process

Student assessment of instruction is an important part of efforts to improve teaching and learning.

At approximately the mid-point of the semester, the School of Forest Resources & Conservation will request anonymous feedback on student satisfaction on various aspects of this course. These surveys will be sent out through Canvas and are not required, but encouraged. This is not the UF Faculty Evaluation!

At the end of the semester, students are expected to provide UF with feedback on the quality of instruction in this course using a standard set of university and college criteria (UF Faculty Evaluations). These evaluations are conducted online at <https://evaluations.ufl.edu>. Evaluations are typically open for students to complete during the last two or three weeks of the semester; students will be notified of the specific times when they are open. Summary results of these assessments are available to students at <https://evaluations.ufl.edu/results>.

5.4 Academic Honesty Policy

As a student at the University of Florida, you have committed yourself to uphold the Honor Code, which includes the following pledge: *"We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honesty and integrity."*

You are expected to exhibit behavior consistent with this commitment to the UF academic community, and on all work submitted for credit at the University of Florida, the following pledge is either required or implied: *"On my honor, I have neither given nor received unauthorized aid in doing this assignment."*

It is assumed that you will complete all work independently in each course unless the instructor provides explicit permission for you to collaborate on course tasks (e.g. assignments, papers, quizzes, exams). Furthermore, as part of your obligation to uphold the Honor Code, you should report any condition that facilitates academic misconduct or appropriate personnel. It is your individual responsibility to know and comply with all university policies and procedures regarding academic integrity and the Student Honor Code. Violations of the Honor Code at the University of Florida will not be tolerated.

Violations will be reported to the Dean of Students Office for consideration of disciplinary action. For more information regarding the Student Honor Code, please see:

<http://www.dso.ufl.edu/sccr/process/student-conduct-honor-code>.

5.5 Inclusive Learning Environment

This course embraces the University of Florida's Non-Discrimination Policy, which reads,

The University shall actively promote equal opportunity policies and practices conforming to laws against discrimination. The University is committed to non-discrimination with respect to race, creed, color, religion, age, disability, sex, sexual orientation, gender identity and expression, marital status, national origin, political opinions or affiliations, genetic information and veteran status as protected under the Vietnam Era Veterans' Readjustment Assistance Act.

If you have questions or concerns about your rights and responsibilities for inclusive learning environment, please see the instructor or refer to the Office of Multicultural & Diversity Affairs website:

<http://multicultural.ufl.edu>.

5.6 Services for Students with Disabilities:

The Disability Resource Center coordinates the needed accommodations of students with disabilities. This includes registering disabilities, recommending academic accommodations within the classroom, accessing special adaptive computer equipment, providing interpretation services and mediating faculty-student disability related issues. Students requesting classroom accommodation must first register with the Dean of Students Office. The Dean of Students Office will provide documentation to the student who must then provide this documentation to the Instructor when requesting accommodation. 0001 Reid Hall, 352-392-8565, www.dso.ufl.edu/drc/

5.7 Software Use

All faculty, staff and students of the university are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal

penalties for the individual violator. Because such violations are also against university policies and rules, disciplinary action will be taken as appropriate.

6 Getting Help

For issues with technical difficulties for e-learning in Canvas, please post your question to the Technical Help Discussion in your course, or contact the UF Help Desk at:

- Learning-support@ufl.edu | (352) 392-HELP - select option 2 | <http://elearning.ufl.edu>
- Library Help Desk support <http://cms.uflib.ufl.edu/ask>
- SFRC Academic Hub <https://ufl.instructure.com/courses/303721>

6.1 Student Life, Wellness, and Counseling Help

Students experiencing crises or personal problems that interfere with their general well-being are encouraged to utilize the university's counseling resources. The Counseling & Wellness Center provides confidential counseling services at no cost for currently enrolled students. Resources are available on campus for students having personal problems or lacking clear career or academic goals, which interfere with their academic performance.

- Counseling and Wellness resources <http://www.counseling.ufl.edu/cwc/>
- U Matter, We Care <http://www.umatter.ufl.edu/>
- Career Resource Center <http://www.crc.ufl.edu/>
- Other resources are available at <http://www.distance.ufl.edu/getting-help> for online students.

6.2 Student Complaint Process

The School of Forest Resources & Conservation cares about your experience and we will make every effort to address course concerns. We request that all of our online students complete a course satisfaction survey each semester, which is a time for you to voice your thoughts on how your course is being delivered.

If you have a more urgent concern, your first point of contact should be the SFRC Academic Coordinator or the Graduate/Undergraduate Coordinator for the program offering the course. You may also submit a complaint directly to UF administration:

- Students in online courses: <http://www.distance.ufl.edu/student-complaint-process>
- Students in face-to-face courses: <https://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/>