

**SWS 5248**

**FALL 2024**

# **WETLANDS and WATER QUALITY**

**Instructor**

Mark Clark

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**Office Hours**

Tuesday, Thursday 10:30-12:00  
or by appointment

**PREREQUISITES:** None

**PHYSICAL CLASSROOM LOCATION:** MCCD G001

**SYNCHRONOUS MEETING TIMES:** For on campus students and DE students that are interested: Lectures Tuesday 8:30-10:25am, Thursday 9:35-10:25 (classroom or virtual zoom). Chat Session –Thursday evenings 8:00-9:30 pm (virtual zoom).

Zoom meeting link for lectures <https://ufl.zoom.us/j/92244172376>

Zoom meeting link for Thursday chats. <https://ufl.zoom.us/j/98712007830>

**COURSE WEBSITE:** The course website can be accessed through E-Learning:

<http://elearning.ufl.edu>

**COURSE DESCRIPTION AND STATEMENT OF GENERAL EDUCATION PURPOSE:**

Wetland ecosystems play an integral role in the physical, chemical and biological processes that occur on earth. Plant and animal habitats found in wetlands are unique and play a critical part in the lifecycle of both commercially important species as well as many threatened and endangered organisms. Wetlands are also often a focal point of issues related to protection of environmental resources, environmental policy and property rights. This course introduces wetland ecosystems focusing first on the hydrologic drivers, biogeochemical processes, unique soil characteristics and the biological adaptations that allow organisms to survive in this environment. Next, the interaction of these processes to form unique types of wetland communities, how they change over time and the environmental factors that shape these communities are investigated. Lastly, the interaction of humans with wetlands is discussed including regulations used to protect wetlands and requirements for mitigating wetland loss as well as how wetlands are being integrated into the human landscape to help improve water quality and treat just about any type of stormwater or wastewater. The course will provide both the fundamental science behind our understanding of wetland processes and functions as well as a practical application of these concepts and how they influence all of us on a regular basis. Graduate students will also have additional focus on various approaches to evaluate wetland conditions as they relate to water quality and other stressors that can result in changes in structure and decreased wetland function.

**COURSE OBJECTIVES:**

- To familiarize students with the structure and function of wetlands.
- To make students aware of the role wetlands play at the watershed scale and in regulating global cycles.
- To familiarize students with ecological processes in wetlands related to succession, habitat and change in response to environmental forcing parameters.
- To acquaint the student with policy and regulatory issues related to wetlands.
- To acquaint the student with concepts of wetlands mitigation, restoration, and integration of constructed wetlands to address water quality and quantity issues in urban and agricultural landscapes.

**STUDENT LEARNING OBJECTIVES:**

- Understand the structure of wetlands including hydrology, biogeochemistry, soils and vegetation adaptations.
- Understand the function of wetlands and how they influence systems at the watershed and global scale.
- Comprehend the difference between wetland community types and what specific environmental forcing parameters influence those communities.
- Comprehend the wildlife found in wetlands and what influence they can have on creating and modifying wetlands.
- Evaluate federal and local policies intended to maintain and preserve wetland functions in the landscape.
- Comprehend and analyze the science and techniques being developed to act as indicators of water quality related impacts to wetlands.
- Understand the opportunities and techniques used to integrate constructed and treatment wetlands into human landscapes as a means to mitigate water quality impacts while synthesizing and applying all aspects of wetland structure and ecological processes learned during the course.

**COURSE FORMAT:** The course material is mainly conveyed through three 40-50-minute lectures per week. Prerecorded lectures are also made available asynchronously on the class website and released weekly. For on-campus registered students there are two required field trips that will occur during Tuesday class periods. For DE students, two equivalent “virtual tour” video recordings will be made available.

There is also a chat session held on a weekly basis to address questions and discuss current event topics pertinent to the subject matter being covered. Chat sessions will be held Thursday evenings from 8-9:30. Most chat sessions are not required; however, during the later part of the semester (Oct 31 and Nov 7, 14, 21) all students must attend. During this period students will discuss and respond to questions about their USEPA Wetland Module (Project).

**TEXTBOOK: (optional, not required)**

*Wetlands*. Mitsch and Gosselink. 3<sup>rd</sup>, 4<sup>th</sup> or 5<sup>th</sup> Edition. John Wiley & Sons, Inc.

**GRADING:** Overall grade will be determined based on a student's performance in all of the following categories:

Quizzes	20 %
Homework	20 %
Virtual Field Trips	10 %
Project	20 %
Exam #1 (Units 1-6)	15 %
Exam #2 (Units 7-11)	15 %

**Quizzes** - There will be an open notes quiz posted on Canvas almost every week covering lecture material from the previous week.

**Homework** - Homework grades will include three field assignments where students will be required to locate hydrologic indicators and wetland species in a local wetland as well as determine the classification of a local wetland using the online National Wetlands Inventory.

**Field Trips** - There will be two physical/virtual field trips to local wetlands. Participation in the trips will account for 8% of your final grade. Students will be responsible for viewing and then writing a brief summary about each trip to verify participation.

**Project** - The project will consist of reviewing one of USEPA's 13 Wetland Modules that were designed to assist states and tribes in developing indices that evaluate wetland condition as it relates to water quality and other stressors. Students will also incorporate at least three journal articles that update our current understanding of these indicators of wetland condition. Once the module is reviewed, the student will summarize the module in a PowerPoint presentation (or other suitable program) and record a narrative to go along with the slide presentation so that it can be distributed to other students in the class for review. The student will then lead a question-and-answer session of the module during the chat session. Project grades will be based 60% on student peer review and 40% on instructor review using a grading rubric.

USEPA Wetland Modules that will be reviewed consist of the following.

1. Introduction to Wetland Biological Assessment
2. Study Design for Monitoring Wetlands
3. Volunteers and Wetland Biomonitoring
4. Wetland Classification
5. Developing Metrics and Indexes of Biological Integrity for Wetlands
6. Biological Assessment Methods for Birds
7. Using Algae to Assess Environmental Conditions in Wetlands
8. Vegetation-Based Indicators of Wetland Nutrient Enrichment
9. Using Vegetation to Assess Environmental Condition in Wetlands
10. Biogeochemical Indicators
11. Using Amphibians in Bioassessment of Wetlands
12. Nutrient Load Estimation
13. Land Use Characterization for Nutrient and Sediment

USEPA Wetland Modules <https://19january2017snapshot.epa.gov/nutrient-policy-data/wetlands-modules.html>

**Exams** - Exam #1 will cover units 1-6 and Exam #2 will cover units 7-11.

### Use of Generative AI

U-M GPT, ChatGPT, and other similar technologies are advancing rapidly and there are many instances where they will be key tools in your schoolwork and career. For the purposes of this class, I am asking all students *not* use these technologies. I believe this is key for this learning environment because I want you to learn how to *critically engage with* the material presented and how to synthesize the material on your own. Artificial Intelligence cannot do this learning for you. Students who are confirmed to have used GenerativeAI or the like to complete their assignments will receive a grade of zero for that assignment.

**Final letter grade:** The final letter grade for the course will be based on current UF policies that can be found at <https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>. and are outline below.

Letter	Course Grade	Grade Point
A	94-100	4.0
A-	90-93.9	3.67
B+	87-89.9	3.33
B	84-86.9	3.0
B-	80-83.9	2.67
C+	77-79.9	2.33
C	74-76.9	2.0
C-	70-73.9	1.67
D+	67-69.9	1.33
D	64-66.9	1.0
D-	60-63.9	0.67
E	< 60.9	0
WF		0
I		0
NG		0
S/U		0

**Late assignments:** All assignments are due by midnight on the date requested. Assignments that are late will result in an initial 5% reduction in grade with an additional 5% deduction every two days the assignment is late.

### ONLINE COURSE EVALUATION PROCESS:

Student assessment of the instructor and the course will be available at the end of the semester. Students are expected to provide feedback on the quality of instruction in the course using a standard set of university and college criteria. These evaluations are conducted online at <https://evaluations.ufl.edu/evals/Default.aspx>. Evaluations are typically open for students to complete during the last two or three weeks of the semester. You will be notified of the specific times when they are open

### TENTATIVE COURSE SCHEDULE:

#### Course Overview and Expectations (Aug 22)

#### Unit 1 Introduction (Aug 27)

-Definition of wetland

- Soil
- Hydrology
- Vegetation
- Functions/Importance
  - Water Quality
  - Water Supply
  - Habitat
  - Food Web Connections
  - Flood Control
  - Fisheries
  - Education
  - Recreation
- Where do we find wetlands in the landscape?

### **Unit 2: Hydrology (Aug 29, Sep 3)**

- Hydrologic cycle and Wetland Water Budget
- Precipitation
  - Atmospheric moisture, Phase changes, Calculating aerial average precipitation.
- Evaporation and Transpiration
  - Pan evaporation, Energy budget method, Evapotranspiration, Interception Through fall
- Infiltration
  - Soil moisture, Infiltration methods
- Groundwater
  - General properties, Groundwater movement, Surface connectivity
- Water budget calculations
- Tides
- Rainfall runoff
  - Runoff processes: rational method, curve number approach, Hydrograph analysis, and Unit hydrograph theory
- Hydrologic indicators

### **Unit 3: Biogeochemistry (Sep 5, 10, 12, 17)**

- Upland vs. Wetland Soil Characteristics
- Reduction/Oxidation
- Microbial activity
- Oxygen availability
- Carbon Cycling
- Nitrogen Cycling
- Phosphorus Cycling

### **Unit 4 Hydric Soils (Sept 19)**

- Legal definition of Hydric soils
- Soil Orders/Morphology
- Hydric Soil Delineation
- Field Indicators

### **Field trip #1: Natural Area Teaching Laboratory (Sep 24)**

**Unit 5: Wetlands Vegetation (Sept 26, Oct 1)**

- Environmental Stressors
  - Inundation, anoxia, hypoxia, salts
- Biological Adaptations
  - Vascular Plants, Animals
- Vegetative Succession
  - Environmental forcing functions, Seed Banks, Landscape Patterns, Van der Valk's Environmental Sieve concept

**Unit 6: Integrated Wetland Systems and Communities (Oct 3, 8)**

- Ecosystem-Level Processes
- Hydrarch succession
- Environmental feedback loops and forcing functions
  - Roll of fire
  - Change in elevation due to sediment accumulation
  - Raised bogs
- Upland Wetland interface
- Nutrient distribution related vegetative structure

**Unit 7 Wetland Classification (Oct 10, 17)**

- Types of Communities and Environmental Forcing Functions
  - Northern and Sub-Tropical Peatlands
  - Pocosins
  - Forested Wetlands
  - Riparian Wetlands
  - Salt Marshes
  - Mangrove Forests
- Classification

**Exam #1 (Units 1-6) (available online Oct 18- Oct 22)**

**Unit 8: Wetland Wildlife (Oct 22, 24, 29)**

- Major adaptations
- Animal Architects
  - Modifying and creating wetlands
- Common Wetland Threats Today
  - Direct and indirect impacts
- Duck Nesting and Ecology and Management

**Unit 9: Anthropogenic Impacts on Wetlands (Oct 31, Nov 5)**

- Hydrologic impacts
- Water quality impacts
- Exotic species impacts

**Unit 10: Regulatory Issues and Policy (Nov 7, 12)**

- Laws
  - History, Dredge and fill, water quality, habitat protection
- Delineation
  - History, agency jurisdiction, limits of protection

- Mitigation
  - On site, mitigation banking, credits
- Water Quality
  - Narrative and Numeric Nutrient Standards

**Unit 11: Constructed and Treatment Wetlands - Concepts and Considerations (Nov 14, 19, 21)**

- Definitions and Justification of Restoration and Construction
  - Mitigation, Habitat enhancement, Water quality
- Types of Constructed systems
  - Restoration, Wastewater, Stormwater, Agricultural runoff, Mine drainage
- Location in Landscape
- Design Hydrology
  - Depth, Hydroperiod, Residence time, Drawdown cycle
- Basin Morphology
- Water Quality Inputs
  - Type of compounds, Sediments, BOD, loading rates
- Design options
  - Surface flow, gravel bed, submerged aquatic, floating aquatic, vertical flow, horizontal flow,
- Vegetation
  - Types, Exotics, Self-organization, Planting techniques
- Management Issues
  - Performance, Wildlife, Mosquitoes, Sediments
- Cost Justification

**Exam #2: Units 7-11 (available online Nov 29- Dec 2)**

**Field trip #2: Stormwater Ecological Enhancement Project (Dec 3)**

**UNIVERSITY POLICIES:**

**Academic Honesty:**

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 to 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:

<https://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/>

**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.

**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, <https://disability.ufl.edu/>

**Campus Helping Resources:**

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.

- University Counseling & Wellness Center, 3190 Radio Road, 352-392-1575, <https://counseling.ufl.edu/>  
Counseling Services  
Groups and Workshops  
Outreach and Consultation  
Self-Help Library  
Wellness Coaching
- *Career Resource Center*, First Floor JWRU, 392-1601, <https://career.ufl.edu/>

**If you have a complaint:**

Should you have any complaints with your experience in this course please visit <https://distance.ufl.edu/student-complaint-process/> to submit a complaint.



## **Campus Resources:**

### **Health and Wellness**

#### **U Matter, We Care:**

Your well-being is important to the University of Florida. The U Matter, We Care initiative is committed to creating a culture of care on our campus by encouraging members of our community to look out for one another and to reach out for help if a member of our community is in need. If you or a friend is in distress, please contact [umatter@ufl.edu](mailto:umatter@ufl.edu) so that the U Matter, We Care Team can reach out to the student in distress. A nighttime and weekend crisis counselor is available by phone at 352-392-1575. The U Matter, We Care Team can help connect students to the many other helping resources available including, but not limited to, Victim Advocates, Housing staff, and the Counseling and Wellness Center. Please remember that asking for help is a sign of strength. In case of emergency, call 9-1-1.

**Counseling and Wellness Center:** <https://counseling.ufl.edu> and 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.

#### **Sexual Discrimination, Harassment, Assault, or Violence**

If you or a friend has been subjected to sexual discrimination, sexual harassment, sexual assault, or violence contact the [Office of Title IX Compliance](#), located at Yon Hall Room 427, 1908 Stadium Road, (352) 273-1094, [title-ix@ufl.edu](mailto:title-ix@ufl.edu)

#### **Sexual Assault Recovery Services (SARS)**

Student Health Care Center, 392-1161.

**University Police Department** at 392-1111 (or 9-1-1 for emergencies), or <http://www.police.ufl.edu/>.

### **Academic Resources**

**E-learning technical support**, 352-392-4357 (select option 2) or e-mail to Learning-support@ufl.edu. <https://lss.at.ufl.edu/help.shtml>.

**Career Resource Center**, Reitz Union, 392-1601. Career assistance and counseling; <https://career.ufl.edu>.

**Library Support**, <http://cms.uflib.ufl.edu/ask>. Various ways to receive assistance with respect to using the libraries or finding resources.

**Teaching Center**, Broward Hall, 392-2010 or 392-6420. General study skills and tutoring. <https://teachingcenter.ufl.edu/>.

**Writing Studio, 302 Tigert Hall**, 846-1138. Help brainstorming, formatting, and writing papers. <https://writing.ufl.edu/writing-studio/>.

**Student Complaints Campus:** <https://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/>;<https://care.dso.ufl.edu>.

**On-Line Students Complaints:** <http://www.distance.ufl.edu/student-complaint-process>.