

**SWS 5248**

**FALL 2019**

# **WETLANDS and WATER QUALITY**

**Instructor**

Mark Clark

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**Office Hours**

Tuesday, Thursday 10:30-12:00

or by appointment

**PREREQUISITES:** None

**CLASSROOM LOCATION:** Little Hall 0237

**MEETING TIME:** Tuesday 2<sup>nd</sup> and 3<sup>rd</sup> period, Thursday 3<sup>rd</sup> period.  
Chat Session – Thursday's 8-9:30pm

**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 provides an introduction to 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 via three 40-50-minute lectures per week during the first two thirds of the course. Lectures are prerecorded and made available asynchronously on the Sakai website. A chat session will also be held on a weekly basis to address questions and discuss current event topics pertinent to the subject matter being covered. Chat sessions will also be the venue that graduate students will use to present their summary of a USEPA’s Wetland Module later in the semester. Chat sessions will be held Thursday evenings from 8-9:30 hosted on Adobe Connect. Chat sessions are not required (although recommended) except for the later part of the semester when student presenters must responds to class questions about their USEPA Wetland Module.

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

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

*USEPA Wetland Modules* <http://www2.epa.gov/nutrient-policy-data/wetlands-modules>

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

|                      |      |
|----------------------|------|
| Quizzes              | 12 % |
| Homework             | 15 % |
| Field Trips          | 8 %  |
| Participation        | 5%   |
| Project              | 20 % |
| Exam #1 (Units 1-6)  | 20 % |
| Exam #2 (Units 7-11) | 20 % |

**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 required field trips (for on campus students) to the Natural Area Teaching Laboratory on the University of Florida campus during the Tuesday double period. Participation in the trips will account for 8% of your final grade. DE students will have a virtual wetland tour that they will be responsible for viewing and writing a brief summary about to verify participation.

**Participation** – Participation will be graded based on random class attendance, participation in class and participation in online evening chat sessions.

**Project** –The project will consist of reviewing one of USEPA's 13 Wetland Modules that were design to assist states and tribes in developing indices that evaluate wetland condition as it relates to water quality and other stressors. 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 discussion of the module during the chat session. Presentation 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

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

**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.

| <u>Letter</u> | <u>Course Grade</u> | <u>Grade Point</u> |
|---------------|---------------------|--------------------|
| 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 20)**

**Unit 1 Introduction (Aug 20, 22) (note, no campus class on Thursday 8/22, listen to Unit 1, lecture 2 online)**

- 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 27, 29)**

- 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 3, 5, 10, 12)**

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

**Field Trip to Natural Area Teaching Laboratory Wetlands (Sep 17)**

**Unit 4 Hydric Soils (Sep 19)**

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

**Unit 5: Wetlands Vegetation (Sep 24, 26)**

- 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 1, 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 8, 10)**

- 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) (Oct 15) – Exam for DE students posted Oct 18-21**

**Unit 8: Wetland Wildlife (Oct 17, 22, 24)**

- 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 (Nov 29, 31)**

- Hydrologic impacts
- Water quality impacts
- Exotic species impacts

**Unit 10: Regulatory Issues and Policy (Nov 5, 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 12, 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

**Nov 19 – Trip to Campus Stormwater Ecological Enhancement Project (SEEP)**

**Nov 26 – no campus class, review and grade assigned community profile presentations**

**Nov 28 – No Class (Thanksgiving)**

**December 3 - Course Summary**

**Exam #2: Units 7-11 (available online posted Dec 6-9 or during final exam period Wednesday, December 11, 3:00-5:00)**

#### **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/process/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.