

Wetland Soils and Mitigation

CSES/ENSC 4854

I. Catalog Description

Scientific study of wetland soils as components of natural landscapes. Focus on wetland soil biogeochemistry, hydrology, geomorphology, hydric soil indicators, and classification. Soil and hydrologic factors important to wetland delineation and jurisdictional determination. Wetlands protection and regulation and their historical development. Detail on mitigation of wetland impacts with emphasis on restoration and creation. Use of constructed wetlands for acid mine drainage treatment. Optional 3-day field trip.

Pre: 3114+3124 or 3134 or 3304. (3H, 3C) I Odd

Course Number: CSES/ENSC 4854

ADP Title: Wetland Soils and Mitigation

II. LEARNING OBJECTIVES

Upon completion of this course, the students will be able to:

- Discuss legal and scientific wetland definitions, concepts, and regulations, particularly as they relate to hydric soils and wetland soil hydrology.
- Relate the chemical, physical, biogeochemical and morphological characteristics of wetland soils to their location, role and function in the landscape.
- Describe and classify wetland soils based upon use of Hydric Soil Indicators, *Soil Taxonomy*, and other appropriate techniques.
- Relate important principles of wetland creation, restoration, and mitigation to mitigation site design and success criteria.

III. JUSTIFICATION

The role of wetland soils in wetland function and jurisdictional issues and the mitigation of wetland impacts are major issues that our graduates will likely deal with in their careers. This course will offer advanced undergraduate level material in these topical areas, along with a detailed literature-based research assignment. There are currently no undergraduate level courses offered in this specific area (wetland soils/hydrogeology/mitigation) at Virginia Tech. However, two related courses (FIW 4534 – Ecology and Management of Wetland Systems; FOR 4374 – Forested Wetlands) are offered in the College of Natural Resources with approximately 15% mutual overlap, primarily in the area of wetland regulation and basic delineation. With approval of this course, undergraduates would have a significant and fully complementary cluster of coursework available to them in support of their future employment needs.

This course should be offered at the 4000 level due to the fact that it will require advanced knowledge of soils, geology, and basic landform relationships. The course handout and reading materials will also rely heavily on published literature and agency reports in addition to the textbook, requiring advanced undergraduate ability in literature synthesis and report preparation. Graduate level credit (as a 4000 level supporting course) is requested to allow entry-level graduate students to take this class as a supporting course.

IV. Prerequisites and Corequisites

Students must have a solid background in soil morphology, landscape relations, and regional parent materials and landscapes. Therefore, enrolling students must have successfully completed either CSES/ENSC 3114+3124 Soils and Lab **or** CSES/ENSC 3134 Soils in the Landscape **or** CSES/GEOG/GEOS 3304 Geomorphology, any of which will provide this critical background knowledge. Additionally, senior level (4000) is requested for this course, due to the rigorous scientific research and synthesis term paper requirement.

V. Texts and Special Teaching Aids

Richardson, J.L. and M.J. Vepraskas (eds.) 2001. Wetland soils: Genesis, hydrology, landscapes and classification. Lewis Publ., Boca Raton, FL.

Vepraskas, M. J. 1995. Redoximorphic Features for Identifying Aquic Conditions. NC Agric. Research Serv., Tech. Bull. 301, Raleigh.

Journal articles and agency reports will be used as supplemental readings and supplied to students.

VI. Syllabus

Lectures:

1. Introduction and overview – 7%
2. Wetland definitions and regulatory framework – 7%
3. Wetland soil biogeochemistry – 7%
4. Physical properties of wetlands soils – 7%
5. Wetland soil hydrology and water budgets – 7%
6. Wetland soil morphology – 7%
7. Redoximorphic features and hydric soil indicators – 7%
8. Wetland soil landscape relationships – 7%
9. Delineation of hydric soil in agricultural landscapes – 7%

10. Hydrogeomorphology and other geomorphic classification systems – 7%

11. Hydric soils and *Soil Taxonomy* – 6%

12. Mid-Atlantic and Southeastern wetlands and associated soils – 6%

13. Constructed wetlands for water treatment – 6%

14. Wetland mitigation principles – 6%

15. Restored and constructed mitigation wetlands – 6%

Evaluation: Grades will be based upon two mid-term exams, a final exam, and detailed scientific literature-based term paper.

VII. Old Syllabus -- NA