Spring 2025 Syllabus
EVHY 5559: Watershed Restoration

Instructor Details

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Course Information

M, W, F 2:00 – 2:50 p.m. Ridley Hall 237

* Class may be held in alternate locations for lab activities

Course Overview

Land use change due to urbanization and agricultural development has resulted in significant increases in streamflow quantity, and degradation of water quality. As a result, flood hazard has increased, and the environmental quality of aquatic ecosystems in streams, rivers and receiving freshwater bodies and the coastal ocean have significantly declined, with consequences for environmental and human health. The restoration of watersheds has been recognized as a societal mandate to reverse these trends, with significant growth in restoration efforts by government, private companies and non-governmental organizations (NGOs). The environmental restoration of watersheds requires a strong understanding of hydrologic, terrestrial and aquatic ecosystem processes within the context of human society, land use and infrastructure. This class will study how land use/land cover change and infrastructure alter the cycling of water, carbon and nutrients compared to natural ecosystems, and how principles derived from the study of undeveloped watersheds and ecosystems can be used to guide watershed restoration from inland to coastal systems.

A previous course in hydrology, geomorphology or water resources is recommended. Students are expected to enter the class conversant and comfortable with computational tools (e.g. spreadsheets, some familiarity with programming).

Reading: There is no required textbook for this course. Readings from journal articles and technical reports will be assigned periodically and posted on Canvas. However, books that may be a useful reference:

- G.M. Hornberger et al., *Elements of Physical Hydrology*, 2nd edition, Johns Hopkins Univ. Press, 2014).

- H.B. Fischer, E.J. List, R. C. Koh, J. Imberger, and N.H. Brooks, *Mixing in inland and coastal waters*, Wiley, 1979.
- Chapra, S. C. (2008). *Surface water-quality modeling* (Reissued). Long Grove, Ill: Waveland Press.
- Domenico, P. A., and F. W. Schwartz. 1998. Physical and Chemical Hydrogeology, 2nd ed. John Wiley and Sons, Inc., New York, NY.

Course structure and grading:
We will use examples in the Charlottesville area, and in intensively studied watersheds elsewhere in the region, including the Virginia Coast Reserve Long Term Ecological Research (LTER). Students will read original literature in this actively growing field, work with restoration case studies, and develop skills in the use of geospatial software, watershed models and field measurement of environmental processes pertinent to restoration.

The course will be structured in two parts. The first portion will emphasize theory and skill development. There will be a set of methods you will be learning split between lab and field analysis. The second portion of the class will simulate an environmental research or consulting firm, outlining and working on a set of watershed and ecosystem restoration projects. Undergraduate students will work on either individual or small groups topics, each of which will address a specific watershed restoration. Graduate students are encouraged to outline a project on their thesis topic or other area of interest.

Grading will be based on homework assignments (20%), midterm exam (20%), final exam (30%), and the term project (30%).