

Biocomplexity in Watersheds: A Tale of Two Courses

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Abstract: Two courses use local Puget Sound watersheds as an organizing theme. Environmental studies methods uses a small urban and agricultural watershed to model watershed planning. Students investigate complex human, biological, and physical interactions in a rapidly urbanizing watershed by collecting data from reports and the field. Geomorphology uses a large wilderness, agricultural, and urban watershed to teach students how to plan, conduct and report applied geomorphology studies. In the Pacific Northwest, most watershed studies include those economically, culturally, and spiritually important creatures--the Salmonids.

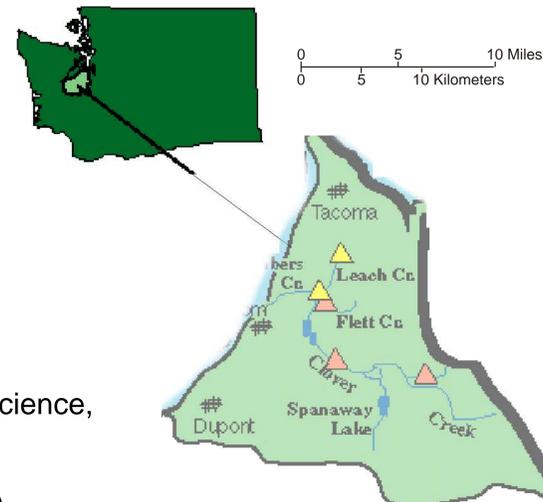
Environmental Studies Methods

Purpose of course: This course was designed to model a team approach to environmental planning and to prepare students to work on interdisciplinary projects (Whitman, 2001).

Structure:

Background

- Guest speakers and field trip introduce students to the watershed and local issues
- Students create watershed maps from USGS maps
- Students gather information and write background papers in pairs



EXPLANATION
 ▲ Realtime station
 ▲ Not a realtime station

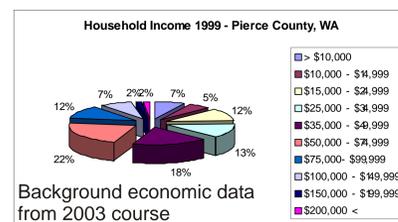
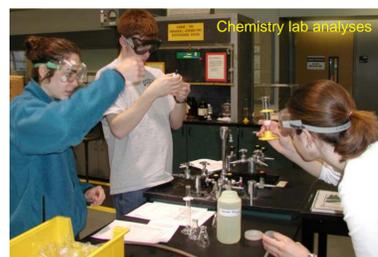
Socioeconomic phase

- Guest lecturer(s) from social sciences (political science, economics, history)
- Students gather data from available sources
- Students analyze and present (paper and poster) socioeconomic data in teams
- Students suggest socioeconomic indicators of watershed health



Science phase

- Guest lecturers from biology and chemistry
- Guest speakers who have expert knowledge about sustainable development
- Class gathers field data, performs lab analyses, and appropriate calculations
- Students analyze and present (paper and poster) science data in teams
- Students suggest scientific indicators of watershed health



Synthesis

- Students create an indicator study presented on the web And to the watershed experts
- Students present posters at PLU's Academic Festival

References and Texts:
 Mitchell M. K. & Stapp, W. B., 2000. Field Manual for Monitoring Water Quality, Kendall/Hunt Publishing, Dubuque, Iowa, 261pp.
 Murdoch, T and Cheo, M., 1996. Streamkeeper's Field Guide, Adopt-a-Stream Foundation, 296pp.
 White, R., 1995. The Organic Machine--The Remaking of the Columbia River, Hill & Wang, New York, 130pp.
 Whitman, J. M. 2001. The Environmental studies program at Pacific Lutheran University: Modeling cooperation between disciplines. In Koester, R. J. (Ed) Greening of the Campus IV: Moving to the Mainstream, Conference Proceedings, Ball State University, Muncie, IN, p 88-92.
 Watershed map from http://wa.water.usgs.gov/realtime/htmls/south_puget.html

Geomorphology

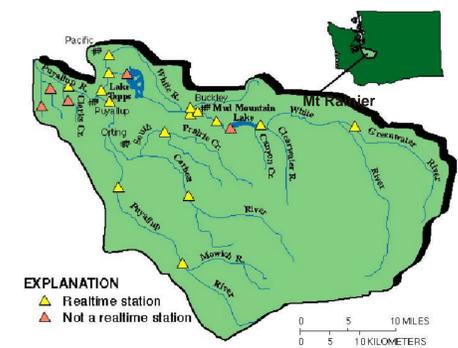
Purpose of course: This course was designed to emphasize activities that comprise a typical professional geomorphology position in consulting and government agencies. People in these professions frequently plan, oversee, and write reports on projects. In the Pacific Northwest the many of these professionals are involved in watershed analysis and planning, so in Fall 2002 projects were conducted in the Puyallup River basin

Current structure

- Lecture, discussion, and project based
- Approximately 10 papers from literature

Topical emphasis on

- Natural physical processes
- Interaction among biota and physical processes
- Effects of land use changes on processes
- Difficulties inherent in multiple land use



Results

- Students very familiar many aspects of one topic
- Some students expand class project into senior capstone project
- Students begin to learn how to read literature effectively
- Students learn a great deal about how (not?) to conduct a project
- Students' data analyses are not linked to theories
- Students often did not use the literature they read in their reports
- Students did not present reasoned arguments backed by data

Future plans:

- Incorporate effective research design teaching methodology (Simm and David, 2002)
- Incorporate data analyses of Puyallup River data into discussion of theories
 - Rainfall-runoff analyses
 - Flow frequency analyses
 - Channel cross-section analyses
 - Habitat
 - Flood conveyance
 - Planform analyses
 - Position through time/vegetation distribution
 - Radius to width calculation
- Incorporate peer/editorial review process into papers



References and Texts:
 Ritter, D. F., Kochel, R. C., & Miller, J. R., 2002. Process Geomorphology, McGraw-Hill, San Francisco, 560pp.
 Simm, D. J., & David, C. A., 2002. Effective teaching of research design in physical geography: a case study. Journal of Geography in Higher Education, 26(2): 169-180.
 Photos courtesy of Stephen Vaughn
 Watershed map from <http://wa.water.usgs.gov/realtime/htmls/puyallup.html>