

GEOGRAPHY 408: Watershed Analysis

Fall 2015

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Course Description: Systematic analysis of the fluvial dynamics of watersheds and the impact of humans on these dynamics. The course will emphasize the importance of geomorphological processes in watershed management. Class discussion and a class project will focus on a practical watershed assessment problem.

Readings: There is no text for the course. Assigned readings are listed below and will be distributed electronically via Compass.

Format: Two 75-minute lecture/discussion periods per week.

		Points	Percent
Grading:	Class Participation	20	17%
	Evaluation 1	25	22%
	Evaluation 2	25	22%
	Oral Presentations	20	17%
	Final Project	25	22%

Class Project: A major component of the course will be conducting analysis of a component of a watershed system. The purpose of the project is to contribute to and help guide ongoing watershed research aimed at informing management activities. The project will also provide you with the opportunity to apply the concepts covered in class and in the readings to a "real-world" problem. You will be responsible (with my help of course) for designing and executing the projects. The class will work in teams, but I expect each student to contribute substantively to the team effort. Your individual grade for the project will be based on: a) your contribution to a written report on the project, b) the quality of an oral presentation on your findings, and c) an evaluation of your performance by other members of the project team.

Schedule

Week 1 Aug. 24 & 26

Introductions, Purpose of Course, Critical Zone Research and the IML-CZO

Reading: NSF Proposal for a *Critical Zone Observatory in Intensively Managed Landscapes*

Week 2 Aug. 31 & Sept. 2

Past Class Projects, Overview of Ongoing Research in the IML-CZO

Reading: Class Report for 2013 class

Week 3 Sept 9

Watersheds: Scale, Hydrological, Geomorphological Characteristics

Reading: Ritter, D.F., Kochel, C. and Miller, J. 2006. *Introduction and Drainage basin-development, morphometry, and hydrology*. Chapters 1 and 5 in Process Geomorphology. Waveland Press.

Week 4 Sept. 14 and 16

Watersheds and Water Quality

Reading: David, M.B., Drinkwater, L.E. and McIsaac, G. 2010. Sources of nitrates in the Mississippi River basin, *Journal of Environmental Quality*, 39, 1657-1667.

Week 5 Sept. 21 and 23

Watersheds and Sediment Dynamics

Reading: Parsons, A. 2011. How useful are catchment sediment budgets? *Progress in Physical Geography*, 36, 60-71.

Week 6 Sept. 28 and Sept. 30

Human Impacts on River Systems: Watershed-scale Impacts

Reading: James, A.J. and Lecce, S. 2013. Impacts of land use and land cover change on fluvial systems. In: Shroder, J. (Editors in chief), Wohl, E. (Ed.), Treatise on Geomorphology. Academic Press, San Diego, CA, vol. 9, Fluvial Geomorphology, pp. 768–793

Week 7 Oct. 5 & 7

Human Impacts on River Systems: Channel-scale Impacts

Simon, A. and Rinaldi, M. 2006. Disturbance, stream incision, and channel evolution: The roles of excess transport capacity and boundary materials in controlling channel response. *Geomorphology*, 79, 361-383.

Week 8 Oct. 12 & 14

Geomorphology and Aquatic Ecology

Reading: Poole, G. 2010. Stream hydrogeomorphology as a physical science basis for advances in stream ecology. *Journal of the North American Benthological Society*, 29, 12-25.

Week 9 Oct. 19 and 21

Geomorphology, Riparian Ecology and LWD

Reading: Gurnell, A.M., 2013. Wood in fluvial systems. In: Shroder, J. (Editor in Chief), Wohl, E. (Ed.), Treatise on Geomorphology. Academic Press, San Diego, CA, vol. 9, Fluvial Geomorphology, pp. 163–188.

Week 10 Oct. 26 and 28

Impact of Dams and Dam Removal

Reading: Graf, W.L. 2006. Downstream hydrologic and geomorphic effects of large dams on American rivers. *Geomorphology*, 79, 336-360.

Week 11: Nov. 2 and 4

River Restoration: Natural Channel Design and Stream Mitigation

Reading: Natural Resources Conservation Service. 2007. Rosgen Geomorphic Channel Design. Part 654: Stream Restoration Design, National Engineering Handbook, USDA.

Week 12 Nov. 9 and 11

River Restoration: Process-based Approaches

Reading: Roni, P. and Beechie, T. 2013. Introduction to restoration: Key steps for designing effective programs and projects. IN Stream and Watershed Restoration, Wiley and Sons, pp. 18-29

Week 13 Nov. 16 & 18

Stream Naturalization

Reading: Rhoads, B.L., Wilson, D., Urban, M., and Herricks, E.E. 1999. Interaction between scientists and nonscientists in community-based watershed management: emergence of the concept of stream naturalization. *Environmental Management*, 24, 297-308.

Week 14 Nov. 30 & Dec. 2

In-class project meetings

Week 15 Dec. 7 & 9

Oral Project Presentations