

## UP 405, Watershed Ecology and Planning–Fall, 2017

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**Description**--This course uses the watershed as the basic organizing concept in environmental planning and management. The flow of water between points in a watershed connects land use activities at one point in a landscape to effects in others. Patterns of land use have cascading effects on both biological and physical systems downstream. This course analyzes how land use affects the ecology of aquatic systems as well as how rivers and streams place constraints on land use. We will cover hydrology and ecology of rivers and streams and analyze the effects of urbanization, agriculture, and channel modification on aquatic systems. We will also discuss strategies for restoring aquatic ecosystems. Lab exercises will help develop the skills for watershed analysis and modeling.

The course meets from 3:00-3:50 on Monday and 3:00-4:50 on Wednesday. The longer class meeting on Wednesdays will either be divided into a lecture and discussion or a laboratory exercise. Please let me know as soon as possible if you have a conflict that will prevent you from going on the field trip. There will also be 2 required local field trips during class period.

**Readings and Instructional Materials**--The text for the course is *Hydrology and the Management of Watersheds 4<sup>th</sup> ed.* by Brooks. This book is available free for UIUC students as an ebook through the University of Illinois library website or directly (if logged on through a University server) at <http://onlinelibrary.wiley.com/book/10.1002/9781118459751>. Students interested in purchasing a print copy can buy it through the library website link, Amazon or Wiley's website. We will also be using the US EPA *Handbook for Developing Watershed Plans to Restore and Protect our Waters*, 2008 (EPA 841- B-08-002). It is available on the Compass site and online at [www.epa.gov/polluted-runoff-nonpoint-source-pollution/handbook-developing-watershed-plans-restore-and-protect](http://www.epa.gov/polluted-runoff-nonpoint-source-pollution/handbook-developing-watershed-plans-restore-and-protect).

Readings in the texts will be supplemented by material placed on an Illinois Compass course page. You will also need to purchase the *Edwardsville* IL quad topographic map from the Illinois Geological Survey. They can be purchased from the Sales and Information Office (Room 122 Stephen Forbes Bldg., 1816 South Oak; open till noon; call ahead 244-2414) in the University of Illinois Research Park in Champaign. You will also need a ruler (inches and centimeters), pencils, and calculator.

**Requirements:** 1) 2 exams, midway through the course and at the end. There is no final exam during finals week. 2) **Completion of Lab and Homework exercises.** Throughout the semester we will have a number of lab exercises, which will build on each other, examining how changes in land use may affect watershed characteristics, non-point source pollution and runoff. Most lab exercises will have a homework assignment associated with it. These will be due throughout the semester. 3) **A watershed plan.** Working in small groups and using a small watershed in Champaign-Urbana, you will apply the skills developed in the labs and lectures to develop an abridged watershed plan, following the guidance of the EPA's *Handbook*. Grades will be based on a scale of A+>98>A>92>A->90>B+>88>B>82>B->80>C>70>D>60>F. Lab assignments and homeworks will count for 15% of the grade, the 1<sup>st</sup> exam will count for 25% of the grade, the 2<sup>nd</sup> exam for 30% and the Watershed Plan for 30%.

## Honor Code

The Illinois Student Code states: “It is the responsibility of the student to refrain from infractions of academic integrity, from conduct that may lead to suspicion of such infractions, and from conduct that aids others in such infractions.” Note that you are subject to the Honor Code, as well as procedures for addressing violations to the Code, regardless of whether you have read it and understand it. According to the Code, “ignorance is no excuse.” See

<http://www.provost.illinois.edu/academicintegrity/students.html>

To meet this standard in this course, note the following: in written work, all ideas (as well as data or other information) that are not your own must be cited. While this course does not require a standard citation style or formatting, we suggest you use either APA (American Psychological Association) or MLA (Modern Language Association) formats for in-text references and your reference sections. Please consult your TA or a university librarian if you have questions about appropriate reference formatting. Note that ideas that require citation may not have been published or written down anywhere. The consequence for violating these expectations may include receiving no credit for the assignment in question, and at the discretion of the instructor, may include automatic failure of the course.

The Department of Urban and Regional Planning (DURP) is committed to maintaining a learning environment that is rooted in the goals and responsibilities of professional planners. By enrolling in a class offered by the Department of Urban and Regional Planning, students agree to be responsible for maintaining an atmosphere of mutual respect in all DURP activities, including lectures, discussions, labs, projects, and extracurricular programs.

The Counseling Center is committed to providing a range of services intended to help students develop improved coping skills in order to address emotional, interpersonal, and academic concerns. The Counseling Center provides individual, couples, and group counseling. All of these services are paid for through the health services fee. The Counseling Center offers primarily short-term counseling, but they do also provide referrals to the community when students could benefit from longer term services. Go to the Counseling Center website:

<https://counselingcenter.illinois.edu/>.

Date	TOPIC	READINGS
August 28	Introduction	Brooks et al. Chapter 1
August 30	Precipitation <b>Boneyard Watershed Walk</b>	Brooks et al. Chapter 2,3
September 4	<b>LABOR DAY No Class</b>	
6	<b>LAB: Precipitation Probability Exercise</b>	Brooks et al. Chapter 3
11	Interception and Evapotranspiration	Brooks et al. Chapter 4
13	<b>LAB: Topographic Maps</b>	USGS US Topos User Guide
18	Infiltration	Brooks et al. Chapter 5
20	<b>LAB: Land Use &amp; Air Photo Interpretation</b>	
25	Groundwater	USGS (Compass), Brooks et al. Chapter 7
27	<b>LAB: Soil Surveys and Maps</b>	
October 2	Groundwater, cont.	
4	<b>Runoff</b>	Brooks et al. Chapter 5, cont.
9	Flowing Water Habitat	Allan Chapt. 5
11	Nutrient Cycles	Allan Chapt. 4,11
16	Disturbance and Variability	Poff 1997
18	<b>FIRST EXAM</b>	
23	Point Source Pollution and Introduction to EPA Watershed Planning Process	EPA 2006, Sierra Club 2007, Brooks et al. Chapter 11
25	<b>LAB: Runoff and Land use change</b>	Brooks et al. Chapter 6; L-THIA manual
30	Non-point Source Pollution	Carpenter 1998
November 1	<b>LAB: Non Point Source Pollution</b>	STEPL Manual, Brooks et al. Chapter 8
6	Monitoring Ecosystem Change	ILEPA 2007
8	Floods and Flood Control	Mount Chapter 14, Brooks et al. Chapter 6
13	River Channels	Brooks et al. Chapter 10
15	<b>LAB: River Channels Demonstration</b>	Meet in Stock Pavillion
18-26	<b>THANKSGIVING HOLIDAY–NO CLASS</b>	
27	Consumptive Use and Instream Flows	Kenny 2009
29	Video: Cadillac Desert	
December 4	Work on Watershed Plans	
6	Ecological Restoration Video: Kissimmee River Restoration	Ryder 2008, Whalen et al. 2003
		Mount, Chapter 16
11	Ecological Restoration (cont.)	Sparks 1998, Roni 2002
13	<b>SECOND EXAM</b>	

## READINGS (available on Illinois Compass)

- Allan, J.D. 2007. *Stream Ecology: Structure and function of running waters*. Chapman and Hall.
- Carpenter, S.R., N.F. Caraco, D.L. Correll, R.W. Howarth, A.N. Sharpley, and V.H. Smith. 1998. Nonpoint pollution of surface waters with phosphorus and nitrogen. *Ecological Applications* 8:559-568.
- Illinois Environmental Protection Agency. 2004. *Final Report. Total Maximum Daily Loads for the East Branch of the DuPage River, Illinois*.
- Illinois Environmental Protection Agency. 2007. *Illinois Water Monitoring Strategy, 2007-2012*. IEPA/BOW/07-005.
- Joan F. Kenny, Nancy L. Barber, Susan S. Hutson, Kristin S. Linsey, John K. Lovelace, and Molly A. Maupin. 2009. *Estimated Use of Water in the United States in 2005*. U.S. Geological Survey Circular 1344.
- Jeffrey Mount, 1995. *California Rivers and Streams: The Conflict Between Fluvial Process and Land Use*. University of California Press.
- Niezgoda, S.L. and P.A. Johnson. 2005. Improving the urban stream restoration effort: Identifying critical form and processes relationships. *Environmental Management* 35:579-592.
- Poff, N.L. et al. 1997. The natural flow regime: A paradigm for river conservation and restoration. *Bioscience* 47:769-784.
- P. Roni, T. J. Beechie, R. E. Bilby, F. E. Leonetti, M. M. Pollock, and G. R. Pess. 2002. A Review of Stream Restoration Techniques and a Hierarchical Strategy for Prioritizing Restoration in Pacific Northwest Watersheds. *North American Journal of Fisheries Management* 22:1-20.
- Ryder, D, et al. 2008. Vision generation: What do we seek to achieve in river rehabilitation. Pgs. 16-27 in Brierley, G.J. and K.A. Fryirs (eds.), *River Futures: An Integrative Scientific Approach to River Repair* (Washington: Island Press).
- Sierra Club. 2007. *Restoring DuPage County Rivers A Status Report on the Health of Salt Creek and the East and West Branches of the DuPage River*.
- Sparks, R.E., J.C. Nelson and Y. Yin. 1998. Naturalization of the Flood Regime in Regulated Rivers: The case of the upper Mississippi River. *Bioscience* 48:706-720.
- U.S. Environmental Protection Agency. 2006. *Laying the Foundation for TMDL Implementation: The DuPage River and Salt Creek (Illinois) Case Study*.
- Whalen, P.J., L.A. Toth, J.W. Koebel, and P.K. Strayer. 2003. Kissimmee River restoration: a case study. *Water Science and Technology* 45:55-62.