ENVIRONMENTAL HYDROLOGY
GEOG 375, Fall 2011
Dr. Trent Biggs
Lecture period: 3:30pm-4:45pm TTH
Email: tbiggs@mail.sdsu.edu

Office hours:
W 3-5 pm
Office: 317 Storm

Course description:

Where does freshwater occur on Earth? How does water flow interact with aquatic ecosystems? What hydrological processes maintain the quantity and quality of water? How do humans impact the hydrological cycle, and what are the implications of global climate change for water resources? Environmental hydrology is the study of the distribution and movement of water on Earth, including precipitation, runoff, groundwater, surface-atmosphere interactions, and human-environment relations. Students will become familiar with conceptual and quantitative models of hydrological processes and how water interacts with humans and ecosystems. A major emphasis is placed on the critical use of simple calculations and observations to test working hypotheses about water.

Learning Goals:

By the end of the course, students will be able to:

1) Describe and understand the hydrological cycle and its interactions with ecosystems at the global, regional, and local scales.
2) Make simple calculations describing the water balance of a watershed.
3) Illustrate how human activities affect hydrological processes, ecosystems, and water quality at local and global scales.

Activities and Grading:

Homework (5 assignments):	25%
Short reading responses:	10%
Mid-term examinations (2):	20%
Final presentation:	10%
Final paper:	25%
Revisions to final paper:	10%

Homework: There will be five homework assignments designed to familiarize the student with tools for hydrological analysis.

Examinations: There will be two mid-term examinations but no final examination. Exams are open book and open note (just like reality!).

Field trips: there will be at least two required field trips. Other field trips will be arranged on campus during lecture times. Times and dates TBA depending on student schedules.
** One field trip will have a mandatory $20 participation fee. **

Final paper: The paper is a comprehensive analysis of a problem of the student's choosing (10-12 pages, including figures and references). The paper will pose and address a question of interest to the student related to hydrology.

Final presentation: The presentation is an opportunity for students to share the results of their research during the semester. The presentations will be 10-12 minutes long.

Plagiarism and cheating: Copying from either printed material or another student's work without proper citation, for either term papers or homework assignments, will be considered plagiarism, and will result in a zero for the assignment. Any doubts about what constitutes plagiarism can be clarified through the instructor.

Late work: The grade of any work handed in late, including homework and papers, will be deducted 10% for each business day late. For example, if a homework is due on a Friday, any papers handed in Monday will have the final grade reduced by 10%, on Tuesday will be deducted 20%, etc. Excused late work is granted in only extraordinary circumstances of illness or emergencies.

Help for assignments: The professor is willing to assist with and explain assignments, up until 24 hours before the time the assignment is due. For example, if an assignment is due Friday at 5pm, the professor will answer emails or take office hours on the assignment until Thursday at 5pm. Any emails, phone calls or office visits after that time will not be answered.

TENTATIVE SCHEDULE AND READINGS

Wk	Date	Topic	Readings and assignments
1	Aug 30-Sept 1	Global water balance, watershed concepts	H p17-18 ** 1. Oki
2	Sept 6-8	Precipitation, interception	H Ch2 2. Global circulation 3. Dettinger
3	Sept 13-15	Evapotranspiration and soil moisture	H Ch 3; FW Ch 4 **HW #1 DUE Sept 16**
4	Sept 20-22	Human impacts on water balance	4. Vorosmarty 5. Barnett 6. Barsugli
5	Sept 27-29	Infiltration and overland flow	H p 69-78 **HW#2 DUE Sep 30**
	Oct 4-6	Review for midterm, Midterm #1	Midterm #1 Oct 6
6	Oct 11-13	Streamflow I: Measurement and mechanisms, Field trip	H 79-92 FW Ch 5
7	Oct 18-20	Field trip redux Streamflow and ecosystems	WFL Ch 1, 2, 4, 6 8. Riley **HW #3 DUE Oct 21**
8		Streamflow III: Floods	9. Jones
9	Oct 25-27	Groundwater	H Ch 5; FW Ch 2 10. Zektser
10	Nov 1-3	Water quality I: Point and non-point, nutrients	H Ch 10 11. Dwight CCW Ch 1, 3, 4; PW Ch 1,10,11
11	Nov 8-10	Water quality II: Nutrients	12. Alexander and Smith 13. Alexander et al. CCW Ch 5; PW Ch 3, 4 **HW #4 DUE Nov 11**
12	Nov 15-17	Water quality III: Emerging contaminants, pathogens	14. Loraine PW, Ch 5, 6 **MIDTERM #2 Nov 17**
13	Nov 23	Water quality IV: Groundwater	15. NRDC
14	Nov 29-Dec 1	Final presentations	**FINAL PAPER DUE DEC 2**
15	Dec 6-8	Final presentations	**HW 5 due Dec 9** **REVISIONS due Dec 14**

- H = Hydrology and the Management of Watersheds. 1997. 2nd edition. Brooks et al., Iowa State University Press.

** This text is available free online for SDSU students as an EBook. Visit library.sdsu.edu, search for "hydrology" under Ebooks.

- RFL = Rivers for Life. 2003. S Postel and B. Richter, Island Press.
- FW = Fresh Water. E. C. Pielou. 1998. University of Chicago Press.
- CCW = Clean Coastal Waters , 2000. National Research Council. National Academy of Sciences.

- PW = Poisoned Waters. Frontline special series.
http://www.pbs.org/wgbh/pages/frontline/poisonedwaters/view/

OTHER READINGS (Posted on Blackboard or Web resources):

1.Oki, T. and Kanae, S., (2006). Global Hydrological Cycles and World Water Resources. *Science*, 313(5790): 1068-1072.

2. Global Scale Circulation of the Atmosphere. Physical Geography Ebook. http://www.physicalgeography.net/fundamentals/7p.html

3. Dettinger, M.D., Ralph, F.M., Das, T., Neiman, P.J. and Cayan, D.R. (2011). Atmospheric Rivers, Floods and the Water Resources of California. *Water*, 3(2): 445-478.

4. Vörösmarty, C. J. & D. Sahagian (2000) Anthropogenic Disturbance of the Terrestrial Water Cycle. *BioScience,* 50**,** 753-765.

5. Barnett, T. P., and D. W. Pierce (2008), When will Lake Mead go dry?, *Water Resour. Res.*, *44*.

6. Barsugli, J. J., K. Nowak, B. Rajagopalan, J. R. Prairie & B. Harding (2009) Comment on``When will Lake Mead go dry?" by TP Barnett and DW Pierce. *Water Resources Research,* 45.

7. White, M.D. and Greer, K.A., (2006). The effects of watershed urbanization on the stream hydrology and riparian vegetation of Los Peñasquitos Creek, California. *Landscape and Urban Planning*, 74: 125-138.

8. Riley, S.P.D. et al., 2005. Effects of urbanization on the distribution and abundance of amphibians and invasive species in Southern California streams. Conservation Biology, 19(6): 1894-1907.

9. Jones, J.A. and Grant, G.E., (1996). Peak flow responses to clear-cutting and roads in small and large basins, western Cascades, Oregon. *Water Resources Research*, 32(4): 959-974.

10. Zektser, S., H. A. Loaiciga & J. T. Wolf (2005) Environmental impacts of groundwater overdraft: selected case studies in the southwestern United States. *Environmental Geology,* 47**,** 396-404.

11. Dwight, R. H., J. C. Semenza, D. B. Baker & B. H. Olson (2002) Association of Urban Runoff with Coastal Water Quality in Orange County, California. *Water Environment Research,* 74**,** 82-90.

12. Alexander, R.B. and Smith, R.A., 2006. Trends in the nutrient enrichment of U.S. rivers during the late 20th century and their relation to changes in probable stream trophic conditions. *Limnology and Oceanography*, 51: 639-654.

13. Alexander, R. B., R. A. Smith & G. E. Schwarz (2000) Effect of stream channel size on the delivery of nitrogen to the Gulf of Mexico. *Nature,* 403**,** 758-761.

14. Loraine, G. A. & M. E. Pettigrove (2005) Seasonal Variations in Concentrations of Pharmaceuticals and Personal Care Products in Drinking Water and Reclaimed Wastewater in Southern California. *Environmental Science & Technology,* 40**,** 687-695.

15. NRDC: California's contaminated groundwater. Executive summary; Ch 3 p 27-64