Course syllabus
Fall 2011

WATER RESOURCES
GEOG 574
Department of Geography

Instructor: Ryan Bart **Email:** rbart@rohan.sdsu.edu

Class Time: MWF 11:00-11:50am
Class Location: Storm 260
Office: Storm 306a
Office Hours: M 12:00-1:00, W 1:00-2:00 and by appointment

COURSE DESCRIPTION:
Water is vital to the functioning of both regional economies and ecosystems. Population growth, climate change, pollution, and persistent poverty all present challenges for the management of water resources. What are the major problems facing water resources in California and throughout the rest of the world? What are the consequences for human health, food production, and ecosystems? What should be the roles of different management strategies such as dams, groundwater development and conservation? This course will include multiple ways of viewing water as a resource, including hydrology, ecology, socioeconomics, health, and politics.

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

1. Define a water crisis, where they occur on Earth, and identify different discourses of water-human relationships.
2. Describe the major physical and sociopolitical processes regulating the distribution and management of water.
3. Critically assess statements about water resources problems.

Prerequisites: GEOG 370 (Environmental and Natural Resource Conservation) and GEOG 375 (Environmental Hydrology)

GRADING:
Class attendance/ participation (10%)
- All students are expected to be engaged during class and participate in class discussions.
- Unannounced quizzes on the assigned reading may be given throughout the semester. Scores from these quizzes will be incorporated into the class attendance/ participation portion of the grade.

Article presentations/discussions (15%)
- Each student will be responsible for leading two class discussions about a reading. Students will be evaluated on their preparation to lead the discussion. In some cases, two students will co-lead.
- The presentation/ discussion of each reading should address 1) the main question posed, 2) the methods used to answer that question, 3) the main answer to the question and 4) the student's response to the reading.

Responses to readings (10%)

- Good scientific literature often generates more questions than answers. What questions did you have about the week's readings? Each student will be responsible for posting a question on the Blackboard discussion board each week prior to the discussion of the papers. The questions are designed to prepare students for in-class discussions. Responses to other student's questions are also highly encouraged.
- Each week has more than one reading. The student chooses one reading for their response for the week.
- There are a total of 15 weeks of reading. *The student may miss three for a total of 12 responses in which they will be evaluated.*
- Responses are due by 9am the morning of the presentation
- NO LATE RESPONSES WILL BE ACCEPTED

Homework (40%)

- Homework is due at 11am (start of class) on the due date.
- Late homework will be deducted 10% per day overdue (including weekends).
- No homework will be accepted more than one week after the due date.

Research project (25%)

- Topic DUE OCTOBER 21 (3%)
- Project draft DUE NOVEMBER 18
- Peer review of another student's paper DUE NOVEMBER 30 (2%)
- Final DUE DECEMBER 14 (20%)
- Project presentations: FINAL WEEK OF CLASSES. **Note: Graduates Students Only**

The research project is designed for the student to go into greater depth on a topic of their choice. It is required that students meet with the instructor to discuss project ideas and to obtain feedback.
The paper must articulate a clear research question and address that question with evidence from a specific river basin and reference to scientific literature (minimum 10 sources).
Length: 12-15 pages, double spaced, including figures, tables, and references.

GRADING RUBRIC:

Grading will be the standard 93.0-100 A; 90.0-92.9 A-; 87.0-89.9 B+; 83.0-86.9 B; 80.0-82.9 B-; 77.0-79.9 C+; 73.0-76.9 C; 70.0-72.9 C-; 67.0-69.9 D+; 63.0-66.9 D; 60-62.9 D-; 0-59.9 F.

POLICIES:

- Students are expected to come to class **on time** and be prepared to participate.
- Cheating and/or plagiarism will in no way be tolerated and culpable students will be subject to a grade of **F**ail in the class and possible expulsion from the university.
- Please turn off your cell phones and no texting.
- Computer use is allowed on presentation days only **for referencing articles.** Absolutely no internet browsing/music listening/movie watching/game playing/file downloading/emailing/chatting/etc. Please mute computers prior to class.

COURSE OUTLINE (Subject to change)

WEEK	TOPIC	READINGS	ASSIGNMENTS
Week 1 Aug 29 – Sept 2	Introduction	Selby (2003)	
Week 2 Sept 7 – 9	The hydrologic cycle/ Water balance	Oki (2006)	
Week 3 Sept 14 – 16	Water issues in California and worldwide	Hanak (2009) Postel (2000)	
Week 4 Sept 19 – 23	Drinking water and health	HDR Report (2006) Smith (2000)	HW #1 due: Sept 23
Week 5 Sept 26 – 30	Urban and groundwater use in California	Gleick (2003a) Helperin (2001)	
Week 6 Oct 3 – 7	Agriculture/ Basin closure	Keller (1996) Falkenmark (2008)	
Week 7 Oct 10 – 14	Hard path: Dams	WCD Report (2001) Molle (2008)	HW #2 due: Oct 14
Week 8 Oct 17 – 21	Soft path: Water productivity, water harvesting, virtual water	Gleick (2003b) Kumar (2008) Allan (1998)	Project topic due: Oct 21
Week 9 Oct 24 – 28	California's water infrastructure	Null (2006) Lund (2008)	
Week 10 Oct 31 – Nov 4	Water allocation, water rights, and conflict I	Budds (2003) Dellapenna (2009)	HW #3 due: Nov 4
Week 11 Nov 7 – 9	Water allocation, water rights, and conflict II	Sunding (2000) Wolf (1998)	
Week 12 Nov 14 – 18	Ecosystems and water	Poff (1997) Arthington (2006)	Project draft due: Nov 18
Week 13 Nov 21 – 23	Climate change and snow	Vicuna (2007) Barnett (2005)	
Week 14 Nov 28 – Dec 2	Ecosystem management I	Jackson (2005) Woodworth (2006)	Peer review due: Nov 30 HW #4 due: Dec 2
Week 15 Dec 5 – 9	Ecosystem management II	Schmidt (1998) Cohen (2008)	Project presentations: Masters students
Final Period Dec 14, 10:30am			Research project paper due: Wed, Dec 14, 10:30am

READINGS:

Required:
All required readings will be provided via Blackboard.

Recommended books:
Pearce, F. (2006) *When the Rivers Run Dry: Water--the Defining Crisis of the 21st Century*, Beacon Press, Boston.
Carle, D. (2009) *Introduction to water in California*. California Natural History Guides No. 76, University of California Press, Berkeley, California.

Week 1: Introduction
Selby, J. (2003) Water, power and politics in the Middle East. I.B. Tauris, London, Chapter 1.

Recommended:
Pearce, Introduction & Ch 1

Week 2: The hydrological cycle
Oki, T., Kanae, S. (2006) Global Hydrological Cycles and World Water Resources. Science, 313(5790), 1068-1072.

Recommended:
Pearce, Ch. 3
Carle,Ch 1, Tapping into a planetary cycle

Week 3: Water issues in California and worldwide
Hanak, E., J. Lund, A. Dinar, B. Gray, R. Howitt, J. Mount, P. Moyle, and B. Thompson (2009) California Water Myths, Public Policy Institute of California, 1-28.
Postel, S. L. (2000) Entering an era of water scarcity: the challenges ahead, Ecological Applications, 10(4), 941–948.

Recommended:
Rijsberman, F.R. (2006) Water scarcity: Fact or fiction? Agricultural Water Management, 80, 5-22.
Pearce, Ch 28, 33

Week 4: Drinking water and health
Human Development Report (2006) Beyond Scarcity: Power, poverty and the global water crisis. p. 1-7; 27-44.
Smith, A., Lingas, E., Rahman, M. (2000) Contamination of drinking-water by arsenic in Bangladesh: a public health emergency. Bulletin of the World Health Organization, 78: 1093-1103.

Week 5: Urban water use and groundwater in California
Gleick et al. (2003a) Waste not, want not: The potential for urban water conservation in California. p. 1-35.
Helperin, A., Beckman, D., Inwood, D. (2001) California's contaminated groundwater. Executive summary; Ch 1. Hydrologic cycle p. 1-6; Ch 3. Assessment of 5 pollutants, p 27-64.

Week 6: Agriculture

Keller, A., Keller, J., Seckler, D. (1996) Integrated water resource systems: Theory and policy implications. Colombo, Sri Lanka: International Irrigation Management Institute.

Falkenmark, M., Molden, D. (2008) Wake Up to Realities of River Basin Closure. International Journal of Water Resources Development, 24(2): 201-215.

Recommended:

Pearce, Ch 4 & 26

Wallace, J.S., Batchelor, C.H. (1997) Managing water resources for crop production. Philosophical Transactions of Royal Society of London, series B, 352, 937-947.

Week 7: Hard paths: Dams

World Commission on Dams (2001) Executive Summary.

Molle, F.O. (2008) Why Enough Is Never Enough: The Societal Determinants of River Basin Closure. International Journal of Water Resources Development, 24(2): 217-226.

Recommended:

Pearce, Ch 15

Week 8: Soft path: Water productivity, water harvesting, virtual water

Gleick, P.H. (2003b) Global Freshwater Resources: Soft-Path Solutions for the 21st Century. Science, 302(5650): 1524-1528.

Kumar, M. D., A. Patel, R. Ravindranath, and O. P. Singh (2008) Chasing a mirage: Water harvesting and artificial recharge in naturally water-scarce regions, Economic and Political Weekly, 43(35), 61–71.

Allan, J.A. (1998) Virtual water: A strategic resource global solutions to regional deficits. Groundwater, 36(4), 545-546.

Week 9: California's water infrastructure

Null, S., Lund, J. (2006) Reassembling Hetch Hetchy: water supply without O'Shaughnessy Dam. Journal of the American Water Resources Association (JAWRA), 42(2), 395-408.

Lund et al. (2008) Comparing futures for the Sacramento-San Joaquin Delta. Summary & p 1-29.

Recommended:

Carle, Ch 2, California water landscape & Ch 3, The distribution system

Week 10: Water allocation, water rights, and conflict I

Budds, J., and G. McGranahan (2003), Are the debates on water privatization missing the point? Experiences from Africa, Asia and Latin America, Environment and Urbanization, 15(2), 87-113.

Dellapenna, J. W. (2009) United States: The allocation of surface waters, in: The Evolution of the Law and Politics of Water, Springer, pp. 189–204.

Recommended:

Dinar, A., Rosegrant, M., Meinzen-Dick, R. (1997) Water Allocation Mechanisms: Principles and Examples. World Bank Policy Research Working Paper No. 1779.

Week 11: Water allocation, water rights, and conflict II

Sunding, D. (2000) The price of water… Market-based strategies are needed to cope with scarcity. California Agriculture, 54(2), 56-63.

Wolf, A. (1998) Conflict and cooperation along international waterways. Water Policy 1:251-265.

Week 12: Ecosystems and water

Poff et al. (1997) The natural flow regime. Bioscience, 47, 769-784.

Arthington, A., S. Bunn, N. Poff, and R. Naiman (2006) The challenge of providing environmental flow rules to sustain river ecosystems, Ecological Applications, 16(4), 1311–1318.

Recommended:

Ricciardi, A., Rasmussen, J.B. (1999) Extinction Rates of North American Freshwater Fauna. Conservation Biology, 13(5): 1220-1222.

Pearce, Ch 9 & 10

Week 13: Climate change and snow

Vicuna, S., Dracup, J. (2007) The evolution of climate change impact studies on hydrology and water resources in California. Climatic Change, 82(3): 327-350.

Barnett, T.P., J.C. Adam, and D.P. Lettenmaier (2005) Potential impacts of a warming climate on water availability in snow-dominated regions. Nature 438:303-309.

Recommended:

Pearce, Ch 14 & 22

Week 14: Ecosystem management I

Jackson, R. B., E. G. Jobbágy, R. Avissar, S. B. Roy, D. J. Barrett, C. W. Cook, K. A. Farley, D. C. Le Maitre, B. A. McCarl, and B. C. Murray (2005), Trading water for carbon with biological carbon sequestration, Science, 310(5756), 1944-1947.

Woodworth, P. (2006) Working for Water in South Africa: Saving the world on a single budget? World Policy Journal, 23(2), 31-43.

Week 15: Ecosystem management II

Schmidt, J.C., Webb, R.H., Valdez, R.A., Marzolf, R., Stevens, L.E. (1998) Science and values in river restoration in the Grand Canyon. BioScience, 48(9), 735-747.

Cohen, M.J. (2008) Past and Future of the Salton Sea. In: World's Water 2008-2009: The Biennial Report of Freshwater Resources. Island Press, Washington, 127-138.