

Introduction to Fresh Water: Processes and Policy

***This is a **summer** ON LINE course. The class meets in an online classroom, and accesses course material via computer.*

The course runs from July 28 through August 29, 2014.

*There is an optional FIELD TRIP the weekend of August 15-17.** ***

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Office Hours: On-line and in person: Thursdays 10 am – noon Pacific Standard Time, and by appointment. Office: Engineering 2, Room 567, U.C. Santa Cruz. Online: via Adobe Connect. Emailing me (bhaddad@ucsc.edu), or through the course site, is a reliable way to initiate a communication.

Course Goals:

- Introduce key words and concepts related to fresh water processes and policies
- Review real-world challenges of fresh water management faced by cities, farming regions, and open-space managers.

Learning Outcomes:

By completing the activities, assignments, and assessments in this course, you will:

- Be able to do basic calculations related to water quantity, flow, and energy generation from hydropower;
- Have greater insight into how water policy is made and implemented;
- Be introduced to cost, financing, and rate-making challenges in the water sector;
- Have practice breaking a complex water problem into important parts, studying the parts, and then reconnecting the parts to better understand the entire problem; and
- Be knowledgeable about important water issues in California and beyond.

EVALUATIONS/GRADING: Students will be graded on the basis of (all times are Pacific Standard Time):

- On-line graded questions and problems are due by 4:00 pm Thursday afternoons each week. Together, on-line questions and problems represent 25% of total grade (although bonus points can earn you slightly more than that).
- One (1) online **midterm examination** on Monday, August 11, (25% of total grade). The exam begins at 12:30 pm if you take it at UCSC; otherwise you can choose a start-time between noon and 1:30 using an online proctor service called ProctorU.
- **Attendance and participation** (10% of total grade). Half of this total can be earned by attendance in **on-line meetings** on Fridays from 12:30 – 2:00 pm pst. (If you miss a session, you can watch a video of the meeting and submit notes on the video to earn the attendance credit.) The other half can be earned by **providing comments to the Discussion Forum**. The Discussion Forum is located on the left hand side of the

course site just above Week 1. The prompts are questions related to the materials covered that week. You can earn up to one point per week for your substantive participation in this forum, at total of 5% of your overall grade. *Substantive participation* means that your comments demonstrate that you have carefully thought about the prompt and the rest of the class's comments in light of the course materials. The opportunity to earn attendance and participation points closes at 4:00 p.m. on Thursday, August 28.

- One **Field Trip**, Friday August 15 - Sunday August 17, to Pajaro Valley, California. (10% of total grade). This field trip starts Friday afternoon and concludes Sunday afternoon. Students will be introduced to advanced water treatment technology and learn its role in protecting agricultural and environmental resources. Careers in the water sector will also be discussed. Details will be provided. We will attempt to minimize food and housing costs but some costs (including transportation) should be anticipated.
- One (1) online **final exam** on Friday, August 29, (30% of total grade), starting at 12:30 pm on campus at UCSC (location to be announced) or between noon and 2:30 pm using ProctorU.

All assignments are to be turned in by uploading answers or documents at the course site.

ATTENDING CLASS ON-LINE

Live on-line discussions will take place every week on Fridays and Wednesdays from 12:30 pm – 2:00 pm led by Professor Haddad. These sessions will preview the upcoming week's materials. Participation in the discussions is mandatory and up to 5% of your overall grade is available for attending the discussions. Recordings of these sessions will be posted on the course website.

Professor Haddad will also hold combined in person/on line office hours on Thursdays from 10:00 a.m. to noon PST, in room 567 of Engineering 2 at UCSC, and in our Adobe Connect virtual classroom. For online office hours, please make an appointment via email.

Taking Exams On Line: Two Options

You may either take your exams in a UCSC computer lab (midterm starting 12:30 pm, final starting 12:30 pm, location to be announced), or using the online proctoring service called ProctorU. To use this service:

- **By August 4**, please [create an account](#) on ProctorU's website.
- Schedule your appointment time for your exam. The first appointment slot is available at 11:30 AM and the last appointment slot is available at 1:30 PM. Appointment availability is on a first-come, first-served basis. You must reserve your appointment time at least three days in advance of the exam.
- For the midterm exam on Monday, August 11, you must schedule your appointment no later than Friday, August 8.

- For the final exam on Friday, August 29, you must schedule your appointment no later than Tuesday, August 26.
- At your scheduled exam appointment time, log into ProctorU's portal for the University of California Online Education.
- You will see a screen that lists three steps on the background of a chalkboard.
 - Step 1 directs you to "CLICK HERE". A download will start and you will need to click "Run" or "Open". If you are using Firefox as your browser, then you will need to double-click on the file within the Downloads menu.
 - For Step 2, you need to have your picture ID ready and a proctor will join you. If you are having trouble connecting, then click on "HELP ME".
 - For Step 3, the proctor will authenticate your identity by asking you to answer four multiple-choice questions.
- If you need assistance at any point in this process, call ProctorU at 205-870-8122.
- At the time of your exams, ProctorU will charge you a fee for their proctoring services payable by credit card.

Timing of Class and Deadlines

There are five kinds of deadlines.

1. Upload assignments on time. Each week's assignments are due by 4:00 pm on Thursday afternoon. Late assignments lose points.
2. Take the Midterm and Final during the time period in which they are offered.
3. Attend the field trip.
4. Upload comments to the Discussion Forum, which can be done up until 4:00 pm on Thursday August 28.
5. Upload your detailed notes on missed lectures, which can be turned in until 4:00 p.m., Thursday, August 28.

Student Feedback

I will ask you for feedback frequently on the experience of taking this class: what is working and what can be improved. I am also open to your unsolicited feedback. You can email or call me. And of course visit me in office hours. Thank you in advance for your assessments and suggestions both during and after the class!

To Launch the Course:

*By July 15
On Monday July 28*

*Order the course book and guides listed below!
View Professor Haddad's welcome video
View Navigating the online environment and technical resources.
Come to class at 12:30 pm pst in our Adobe Connect classroom!*

READING ASSIGNMENTS: The required texts that must be purchased include:

Carle, David. 2009. *Introduction to Water in California: Updated with a New Preface*. London England: University of California Press.

You can purchase David Carle's book on Amazon or other online book venues.

Layperson's Guide to Groundwater, Water Education Foundation, 2011

Layperson's Guide to Water Rights Law, Water Education Foundation, 2013

Layperson's Guide to the State Water Project, Water Education Foundation, 2013

You can purchase the Layperson's Guides at:

<http://www.watereducation.org/store/default.asp?parentid=3>

All other required readings are available in the online learning environment or via web link.

COURSE TOPICS, KEY DATES, AND READING ASSIGNMENTS

In addition to the course materials (essays, photos, videos, definitions, web links), there are regular reading assignments that clarify, add depth, and bring interesting perspectives to the main topics. Here are all the required and recommended reading assignments for the course:

Week 1 Online discussion: Monday, July 28;
 Voluntary online session: Wednesday, July 30;
 Homework due: Thursday, July 31

Section 1: Introduction

Water reliability

Akasake, Kiyoo. Spotlight: Water. Securing tomorrow's water. *OECD Observer*. No. 254 (March 2006): 11-27.

Vittor, J.L. 2010. Keeping the Well From Running Dry: The Future of US Water Infrastructure. *Journal AWWA*, 102:7 (July), pp. 30-32.

Public vs. private water

Sohail, M. and S. Cavill. (2010). *Public Private Partnerships*. Berkshire encyclopedia of sustainability. Volume 2, The business of sustainability. Great Barrington, Mass, Berkshire Publishing Group.

Recommended: Maxwell, S. 2010. Merger and Acquisition Activity Picks Up Again. *Water Utility Infrastructure Management* (Sept/Oct), pp. 22-23.

Section 2: Water and Open Space

Counting Water (no readings except the course notes and practice problems)

Hydrology and Geology

Carle, pp. 1-51.

Brickson, Betty, and Jeanne Duncan. 2011. *Layperson's Guide to Groundwater*. Sacramento: Water Education Foundation.

Aquatic Ecology

USEPA, 2000 "Principles for the Ecological Restoration of Aquatic Resources", EPA841-F-00-003. Office of Water (4501F), United States Environmental Protection Agency, Washington, D.C. 4 pp. Available at: <http://www.epa.gov/owow/restore/principles.html#1> .

Week 2

Online discussion: Friday August 1;
Voluntary online session: Wednesday, September 6;
Homework due Thursday, September 7

Continue Section 2: Water and Open Space

Freshwater endangered species

Carle, pp. 52-83, 135-46

NWFSC-66. *Updated Status of Federally Listed ESUs of West Coast Salmon and Steelhead*, June 2005. Read the brief Executive Summary on pp. xxxi-xxxii (in the PDF, these are pages 33-34). Then look over the table of contents in preparation for the homework assignment that will ask you to pull data and analyses out of this document.

Water-related diseases

"Malaria report shows rapid progress toward international targets", Dec. 14, 2010 news release from WHO.

World Health Organization. 2010. *World Malaria Report 2010*. Executive Summary and key points.

US Centers for Disease Control and Prevention Cholera website (see course notes for details of what to review)

US Centers for Disease Control and Prevention Dengue website (same as above)

Water Quality

Carle, pp. 157-9, 164-77

Water Quality: National Water Quality Inventory: Report to Congress, 2004 Reporting Cycle. Background, pp. 3-7; Findings, pp. 9-22.

Water Supply and Treatment Technologies

Schoeder, Dean, Serjeantson, Bill, and McKinney, Scott. 2008. "Enhance Operations with SCADA power," *Opflow* Vol. 34:3 (March) 14-19.

Water reuse and desalination

Duffy, Daniel. 2008. "The Ultimate Recycling Program," *Water Efficiency* Vol. 3, No. 4, pp. 24-29.

Recommended: Chalmers, R.B., Patel, M., and Cutler, D. 2010. Recycled Water: Consider a Drought-Proof Water Supply. *Opflow* 36:4 (April), pp. 14-17.

Week 3

Online discussion: Friday August 8;

Voluntary online session: Wednesday, August 13;

Homework due Thursday, August 14

The Midterm Exam takes place on Monday, August 11, location to be announced.

Continue Section 3: Water and Cities

Water Finance

Baird, G.M. 2010. Money Matters: The Labyrinth of Capital Planning and Budgeting for Water Infrastructure. *Journal AWWA* 102:7 (July), pp. 38-40.

Maxwell, S. 2010. Merger and Acquisition Activity Picks Up Again. *Water Utility Infrastructure Management* (Sept/Oct), pp. 22-23.

"Clear Water," *OECD Observer*, No. 280, July, 2010, p. 55.

Ratemaking

Mix, Andrew A. 1998. "Water Rates: Cost of Service vs. Reality," *Proceedings, Water Resources and the Urban Environment – 98*. American Society of Civil Engineers, Chicago, Il., pp. 621-626.

Recommended: Mayer, Peter, DeOreo, William, Chestnutt, Thomas, and Summers, Lyle. 2008. "Water budgets and rate structures: Innovative management tools," *Journal AWWA* Vol. 100, No. 5 (May), pp. 117-131.

Recommended: Hildebrand, M., Gaur, S., and Salt, K. 2009. Water conservation made legal: Water budgets and California law. *Journal AWWA* 101:4, (April), pp. 85-89.

Case Study: San Francisco and Los Angeles

Carle, pp. 110-126

Reisner, Marc. 1986. *Cadillac Desert*. New York: Viking, pp. 61-73, 93-101, on the capturing of Owens Valley water by Los Angeles. When you have completed this reading, watch the 3-part documentary with the same title.

Recommended: City and County of San Francisco, 1994. *Water and Power: A History of the Municipal Water Department and Hetch Hetchy System*.

Recommended: Transcript of Dec. 16, 1908 hearing on the proposed Hetch Hetchy Reservoir held before the Committee on Public Lands of the House of Representatives.

Developing Nation Cities

World Bank, 2010. *Water and Development: An Evaluation of World Bank Support 1997-2007*. Volume 1, Ch 5.

Week 4 Online discussion: Friday August 15;
Voluntary online session: Wednesday, August 20;
Homework due Thursday, August 21

Section 4: Water and Agriculture

Water Law

McCarthy, Elizabeth. 2013. *Layperson's Guide to Water Rights Law*, Sacramento: Water Education Foundation

Agricultural Water Technology

Carle, pp. 146-57, 160-4,181-191.

Pajaro Valley Water Management Agency, 2002. *Basin Management Plan, revised, 2002*. Ch. 3: Management Measures. (The Pajaro lies just southeast of Santa Cruz. It is a mainly agricultural area trying to reduce its overdrafting of groundwater and declining aquifers. This list of water management options gives insight into agricultural water conservation technologies.)

Water, culture and society

Think of a novel you have read in which water plays an important role, such as *Huckleberry Finn*. Look back at it and think about why water is so important to culture and society.

- **Field Trip: August 15-17 Watsonville Water Resources Center, WaterLab, and the Pajaro Valley.** We will learn about and operate advanced water reclamation and reuse technology, be introduced to the challenge of operating a regional water system in a distrustful political atmosphere. The weekend will include field trips, laboratory work, discussion with regional experts, and opportunities to get to know fellow students. Plan to travel by car Friday morning and return home Sunday afternoon. Details on directions, timing, and accommodations will be provided.

Dams and Hydropower

Carle, pp. 191-219

World Commission on Dams. 2000. *Dams and Development: The Report of the World Commission on Dams*. London: Earthscan, Executive Summary; Ch. 1: Water, Development, and Large Dams, pp. 8-25 (or 45-62/356); and Box 10.1 (p. 317 or 345/356). Recommended: Ch. 3: Ecosystems and Large Dams; Ch. 4: People and Large Dams: Social Performance, p. 97 (or 131/356).

International Energy Agency/OECD, 2010. *Renewable Energy Essentials: Hydropower*. Paris: Organization for Economic Cooperation and Development.

Recommended: World Bank, 2010. *Water and Development: An Evaluation of World Bank Support 1997-2007*. Volume 2, Appendix H: Dams and Hydropower, pp. 26-32.

Climate Change

California Department of Water Resources, 2007. "Climate Change in California Fact Sheet" and "Possible Impacts of Climate Change to California's Water Supply."

Recommended: Freas, Kathy, Bailey, Bob, Munévar, Armin, and Butler, Susan. 2008. "Incorporating climate change in water planning," *Journal AWWA*, 100:6 (June), pp. 92-99.

Links between water and energy

Glassman, D. , Wucker, M., Isaacman, T., and Champilou, C. 2011. "The Water-Energy Nexus: Adding Water to the Energy Agenda. World Policy Institute (March). Available at: www.worldpolicy.org/sites/default/files/policy_papers/THE WATER-ENERGY NEXUS_0.pdf.

Boulos, P., and Bros, C. 2010 Assessing the carbon footprint of water supply and distribution systems. *Journal AWWA* 102:11 (November), pp. 47-54.

Week 5 Online discussion: Friday August 22;
Voluntary online session: Wednesday, August 27;
Homework due Thursday, August 28

Continue Section 5: Water with Multiple Uses

Integrated Water Resources Management

Atassi, A., Pingatore, J, Harwick, J., and Opitz, E. 2009. Proactive Planning Preserves Resources for Future Generations. *Opflow* 35:12 (December), pp. 20-21.

Recommended: Ritchie, Ed. 2010. Total Resource Management. *Water Efficiency*. 5:5 Sept/Oct 2010. Pp. 30-37.

Vittor, J.L. 2010. Keeping the Well From Running Dry: The Future of US Water Infrastructure. *Journal AWWA*, 102:7 (July), pp. 30-32. (This was assigned in Week 1 but this is a good time to review it.)

California State Water Project

Carle, pp. 87-109

Totten, Glenn, 2013. *Layperson's Guide to the State Water Project*, Sacramento: Water Education Foundation.

Chinese Water Development

Wong, E. 2011. "Plan for China's Water Crisis Spurs Concern," *New York Times* (published June 1). Available at: <http://www.nytimes.com/2011/06/02/world/asia/02water.html?pagewanted=all>

McDonnell, Stephen. 2007. "China to Implement Controversial Water Plan," Australian Broadcasting Corp.

Oster, Shai. 2006. "China Water Plan Sows Discord," *Wall Street Journal* (October 20).

Varda, Nicholas. 2007. "Investing in Water: The World's Most Precious Resource." Available at <http://seekingalpha.com/article/31264-investing-in-water-the-world-s-most-precious-resource>.

US-Mexico water relations

International Boundary and Water Commission, 2011. Strategic Plan, FY2011-FY2016.

Concluding Discussion

Maxwell, S. 2010. A look at the challenges – and opportunities – in the world water market. *Journal AWWA* 122:5 (May): 104-116.

Final Exam Review Discussion: Wednesday August 27.

Due Thursday, August 28 no later than 4:00 pm:

All remaining discussion contributions

All remaining notes on missed lectures

"Save your grade" extra credit (up to 10% bonus assignment to be announced).

Final Exam: Friday August 29, 12:30-3:30 pm, location to be announced.