

SSCI 265Lg, The Water Planet

Syllabus

Units: 4

Term Day Time: Fall 2019, Tues and Thurs, 11 am-12:20 pm

Location: THH 102 (lectures), AHF 145A (labs)

Co-Instructor: John P. Wilson

Office: AHF B55F

Office Hours: Mondays, 3-4 pm and Fridays, 4-5 pm
Also available by appointment via email.

Contact Info: jpwilson@usc.edu, 213-740-1908,
<http://www.bluejeans.com/jpwilson>

Co-Instructor: Elisabeth J. Sedano

Office: AHF B57C

Office Hours: Mondays, 1-2 pm and Wednesdays, 1-2 pm
Also available by appointment via email.

Contact Info: sedano@usc.edu, 213-740-9582,
<http://www.bluejeans.com/sedano>

Lab Instructor: Leilei Duan

Office: AHF B57E

Office Hours: Wednesdays, 2:00-3:00 pm and Fridays, 9-10 am. Also available by appointment via email.

Contact Info: leileidu@usc.edu, 213-740-6532,

Lab Instructor: Kenan Li

Office: AHF 146

Office Hours: Monday, 2-4 pm

Also available by appointment via email.

Contact Info: kenanl@usc.edu, 213-740-5910

Library Help: Andy Rutkowski

Office: VKC 36B

Office Hours: Tuesdays 10 a.m. – 12 pm; Thursdays 4:30-5:30 pm Also available by appointment via email.

Contact Info: arutkows@usc.edu, 213-740-6390,
<http://bit.ly/andyhangout>

Course Description

This course entails a comprehensive investigation into the multi-faceted dimensions of water on Earth. Topics range from micro-scale concerns (e.g. water properties, form, and behavior) to regional-scale issues (e.g. water resource distribution, groundwater mining, and watershed dynamics) to global-scale processes such as the hydrologic cycle including atmospheric and oceanic circulation and climate change. Although there are many perspectives from which to approach the topic of water (e.g. economic, legal, political, institutional, and engineering perspectives), we will situate our investigation within a scientific framework with a particular focus on methodologies and the unique insights that science is able to reveal.

Attention will also be directed to the human (social science) dimensions of water supply and demand, and the implications for past and future societies. Water has specific societal significance because it is essential for sustaining life, directly and indirectly. Water is a necessary component of most agricultural and industrial processes, and it serves a central role in global and regional transportation networks. There are extensive technological dimensions to meeting the challenges of adequate water supply that are critical to human existence. We will examine these aspects through a series of case studies that simultaneously explore the water footprint of modern consumer societies and how various cultures and countries have been shaped by some of the world's largest and most iconic rivers as well as some other globally significant freshwater sources.

This course satisfies the requirements for General Education Category E (Physical Sciences). Courses in this category are intended to bring to bear the perspectives of several scientific disciplines on a theme, illustrating the relevant scientific principles, their technological applications, and the societal significance and consequences. The GE designation further requires that the course content give students the opportunity to think critically through focused inquiry into a particular area of knowledge. Scientific methodologies, analytical techniques, and digital scholarship will be stressed.

The overall goal of the GE Program is to provide necessary context for an informed citizenry, and therefore these courses emphasize a broad sweep of knowledge and require active intellectual engagement with scientific principles. In practice, this means that students will be introduced to many concepts and terminologies that may be new and unfamiliar. The focus, nevertheless, will be on applying basic principles to specific problems rather than simple description, memorization, and recapitulation.

Learning Objectives

Upon successful completion of this course, a student will be able to:

- Identify the special properties of water and the fundamental role water plays in the functioning of life on Earth;
- Explain the spatial and temporal character of water-related processes and how these help to shape the basic physical, environmental, and social aspects of the world's water supply;

- Describe the ways that human behavior affects water quality and the rates and patterns of the water cycle around the world;
- Identify the integration of economic, legal, and cultural factors with physical characteristics of water that together explain current water-related issues affecting human society;
- Use spatial data and maps to perform simple analyses of water-related processes; and
- Employ basic cartographic principles and integrate spatial datasets and other digital resources to communicate the results of water-related research.

Prerequisite(s): None

Co-Requisite(s): None

Required Readings and Supplementary Materials

Please acquire the text listed below. It is available at the USC Bookstore. All other supplementary readings listed in the syllabus are available online through USC Libraries or under the tab marked "Readings" on the course Blackboard.

The required textbook for this course is:

- Holden, J. (Ed.) 2013. *Water Resources: An Integrated Approach*. New York, NY: Routledge.

Supplementary readings for this course are:

- Anderson, J. 2003. The environmental benefits of water recycling and reuse. *Water Science & Technology: Water Supply* 3: 1-10.
- Anderson, M. G., & Burt, T. P. 1978. Role of topography in controlling throughflow generation. *Earth Surfaces Processes & Landforms* 3: 331-344.
- Arce-Nazario, J. 2018. The science and politics of water quality. In *Handbook of Critical Physical Geography* (eds. Lave R., C. Biermann, & S. N. Lane), 465-483. London: Palgrave.
- Cronon, W. 1992. A place for stories: Nature, history, and narrative. *Journal of American History* 78: 1347-1376.
- Dalhuisen, J. M., Groot, H. I. F., & Nijkamp, P. 2000. The economics of water: A survey of issues. *International Journal of Development Planning Literature* 15: 3-20.
- Falkenmark, M. 1986. Fresh water: Time for a modified approach. *Ambio* 15: 192-200.
- Hasler, A. D. 1947. Eutrophication of lakes by domestic drainage. *Ecology* 28: 383-395.
- Held, I. M., & Soden, B. J. 2006. Robust responses of the hydrological cycle to global warming. *Journal of Climate* 19: 5686-5699.
- Hoekstra, A. Y. 2012. The hidden water resource use behind meat and dairy. *Animal Frontiers* 2(2): 3-8.
- Hussey, K., & Pittock, J. 2012. The energy-water nexus: Managing the links between energy and water for a sustainable future. *Ecology & Society* 17(1): 31.

- Kolpin, D. W., Furlong, E. T., Meyer, M. T., Thurman, E. M., Zaugg, S. D., Barber, L. B., & Buxton, H. T. 2002. Pharmaceuticals, hormones, and other organic wastewater contaminants in US streams, 1999-2000: A national reconnaissance. *Environmental Science & Technology* 36: 1202-1211.
- Lave R., Doyle, M., Robertson, M. & Singh, J. 2018. Commodifying streams: A critical physical geography approach to stream mitigation banking in the USA. In *Handbook of Critical Physical Geography* (eds. Lave R., C. Biermann, and S. N. Lane), 443-464. London: Palgrave.
- McKenna, M. L., McAtee, S., Bryan, P. E., Jeun, R., Ward, T., Kraus, J., Bottazzi, M. E., Hotez, P. J., Flowers, C. C., Mejia, R. 2017. Human intestinal parasite burden and poor sanitation in rural Alabama. *The American Journal of Tropical Medicine & Hygiene* 97.5: 1623-1628.
- Milly, P. C. D., Betancourt, J., Falkenmark, M., Hirsch, R. M., Kundzewicz, Z. W., Lettenmaier, D. P., & Stouffer, R. J. (2008) Stationarity is dead: Whither water management? *Science* 319: 573-574
- Novotny, V. 2013. Water-energy nexus: Retrofitting urban areas to achieve zero pollution. *Building Research & Information* 41: 589-604.
- Schindler, D. W. 1974. Eutrophication and recovery in experimental lakes: Implications for lake management. *Science* 184: 897-899.
- Vörösmarty, C. J., Green, P., Salisbury, J., & Lammers, R. B. 2000. Global water resources: Vulnerability from climate change and population growth. *Science* 289: 284-288.

Description and Valuation of Assessments

This course includes a diversity of assessments that allow students to show their mastery of the material in a variety of ways. The different types of assessments are described below and their point value to final grades are listed in the following Grading Breakdown section.

Labs

A set of 12 lab sessions is spread across the semester. These laboratory experiences are designed to introduce the tools of scientific inquiry and give students practical experience in implementing these tools within the framework of the scientific method. Lab assignments are linked to the lectures and class discussions, but do not duplicate the lecture experience. Students must register for one laboratory session in addition to registering for the class itself. Most of the work for lab assignments will be completed during the 2-hour lab sessions.

Absences from lab sessions must be requested by sending an email to the laboratory co-instructor for your lab section at least one day prior to the lab. Excused absences from labs will be granted only for valid reasons; please notify us of the reason for your absence in your email.

The mapping software and geospatial data required for the lab assignments will be accessed using computing resources provided by the Spatial Sciences Institute.

Online Discussions

There will be three online discussions on Bb. The purpose of the online discussions is to build skills for close reading and critical thinking. In each discussion, every student will make one short post responding to a given prompt and then make at least two posts responding to other students. Your participation in the online discussions will be *individually graded* using the gradebook feature in Bb.

Article Summaries

Throughout the semester, students will produce three summaries of articles from peer-reviewed academic journals on one or more water-related issues.

Research Essay

There will be one research essay written in response to prompts from the instructors. This assignment will have detailed requirements with respect to required outside research and source citations.

Story Map

The final project in this course is a Story Map. A Story Map is an online platform that allows for the integration of digital maps with a variety of content such as graphs, text, photographs, video, and audio. The underlying data often depict the coupling of social and natural systems. These may be things like wetland areas, land cover, and census data, and may also include video feeds and live data such as temperature, precipitation, and streamflow. They often present scientific data and analysis, but they are mainly designed for the general public and do not require their users to have special knowledge or skills in geographic information software and services. In this course, you will create a Story Map that integrates data on natural and social systems around the presence (or absence), quality, and movement of water on or near the Earth's surface.

Final Exam and Other Policies

The final exam is closed book. This exam will cover content learned in course readings and during lecture and lab sessions.

No make-up opportunities will be offered for the final exam or labs, so mark the appropriate dates on your calendars! If you have a legitimate conflict, speak with one or another of the instructors as soon as possible. Also, note that there is **no credit for late assignments**.

Grading Breakdown

The table below shows the breakdown of the assessments and their weight in the final grade. The emphasis is on regularly completing a number of short assignments as well as solid performance on the final examination, policy essay, and Story map project.

Assessment	Number	Points Each	Total Points (% of Grade)
Online Discussions	3	2	6
Laboratory Reports	6	4	24
Article Summaries	3	4	12
Research Essay	1	12	12
Story Map Progress Reports	5	1	5
Final Project: Story Map	1	15	15
Final Exam (Closed book)	1	26	26
Totals	20	--	100

Schedule

Date	Topics	Readings	Deliverables/Due Dates
Module 1 Fundamental Properties and Key Concepts			
Week 1			
8/27	Introduction to Course		Labs Do Not Meet
8/29	Water Fundamentals, Part I	Holden, Ch. 1, pp. 1-5, 10-18 Vörösmarty, C.J., Green, P., Salisbury, J., & Lammers, R.B. 2000. Global water resources: Vulnerability from climate change and population growth. <i>Science</i> 289: 284-288	
Week 2*			
9/3 *Monday 9/2 is a university holiday	Water Fundamentals, Part II	Holden, Ch. 1, pp. 6-10	Monday Labs Do Not Meet (Labor Day) T, W, Th. Labs: Lab Report 1: Due 11:59 pm the day after your lab session
9/5	Global Water Cycle	Holden, Ch. 2, pp. 19-24 Cronon, W. 1992. A place for stories: Nature, history, and narrative.	

		<i>Journal of American History</i> 78: 1347-1376	
Module 2 Water and the Changing Climate			
Week 3			
9/10	Climate Variability	Holden, Ch. 2, pp. 24-39 Milly, P. C. D., Betancourt, J., Falkenmark, M., Hirsch, R. M., Kundzewicz, Z. W., Lettenmaier, D. P., & Stouffer, R. J. (2008) Stationarity is dead: Whither water management? <i>Science</i> 319: 573-574	Mon. Labs: Lab Report 1: Due Tues., 11:59 pm T, W, Th. Labs: Lab Report 2: Due 11:59 pm the day after your lab session
9/12	Climate Change	Holden, Ch. 2, pp. 40-44 Held, I.M., & Soden, B.J. 2006. Robust responses of the hydrological cycle to global warming. <i>Journal of Climate</i> 19: 5686-5699	
Week 4			
9/17	Screening of "Before the Flood"		Mon. Labs: Lab Report 2: Due Tues., 11:59 pm
9/19	Water-Energy Nexus	Hussey, K., & Pittock, J. 2012. The energy–water nexus: Managing the links between energy and water for a sustainable future. <i>Ecology & Society</i> 17(1): 31 Novotny, V. 2013. Water-energy nexus: Retrofitting urban areas to achieve zero pollution. <i>Building Research & Information</i> 41: 589-604	T, W, Th. Labs: Lab Report 3: Due 11:59 pm the day after your lab session Article Summary 1: Due Friday, 9/20, 11:59 pm
Module 3 Life in Aquatic Ecosystems			
Week 5			
9/24	Aquatic Ecosystems	Holden, Ch. 6, pp. 161-180	Mon. Labs: Lab Report 3: Due Tues., 11:59 pm
9/26	Human Modification and Management of Aquatic Ecosystems	Holden, Ch. 6, pp. 180-195 Schindler, D.W. 1974. Eutrophication and recovery in experimental lakes: Implications for lake management. <i>Science</i> 184: 897-899	T, W, Th. Labs: Lab Report 4: Due 11:59 pm the day after your lab session Online Discussion 1 Post: Due Friday, 9/20, 11:59 pm

Module 4 Water Flows and Stocks			
Week 6			
10/1	Hydrologic Pathways	Holden, Ch. 3, pp. 49-56 Anderson, M.G., & Burt, T.P. 1978. Role of topography in controlling throughflow generation. <i>Earth Surface Processes & Landforms</i> 3: 331-344	Online Discussion 1 Responses to Classmates' Posts: Due Monday, 9/23, 11:59 pm Mon. Labs: Lab Report 4: Due Tues., 11:59 pm T, W, Th. Labs: Lab Report 5: Due 11:59 pm the day after your lab session
10/3	River Flow	Holden, Ch. 3, pp. 57-68	
Week 7			
10/8	River Channel Dynamics	Holden, Ch. 3, pp. 68-76	Mon. Labs: Lab Report 5: Due Tues., 11:59 pm
10/10	Characteristics of Surface Waters	Holden, Ch. 4, pp. 79-93	T, W, Th. Labs: Story Map Progress Report 1: Due 11:59 pm the day after your lab session Article Summary 2: Due Friday, 10/11, 11:59 pm
Week 8*			
10/15 *Thursday 10/17 - Friday 10/18 is a university holiday	Water Use and Water Quality Deterioration	Holden, Ch. 4, p. 93-115 Hasler, A.D. 1947. Eutrophication of lakes by domestic drainage. <i>Ecology</i> 28: 383-395	Monday Labs Meet: Story Map Progress Report 1: Due Tues., 11:59 pm No T, W, Th. Labs or Th. Lecture (Due to Fall Recess) Online Discussion 2 Post: Due Wednesday, 10/16, 11:59 pm
Week 9			
10/22	Groundwater Flow Principles and Abstraction	Holden, Ch. 5, pp. 123-145	Online Discussion 2 Responses to Classmates' Posts: Due Monday, 10/21, 11:59 pm
10/24	Groundwater Chemistry and Pollution	Holden, Ch. 5, pp. 145-157	Story Map Progress Report 2: Due 11:59 pm

			the day after your lab session
Module 5 Water Management			
Week 10			
10/29	Water Demand Planning and Management	Holden, Ch. 7 Falkenmark, M. 1986. Fresh water: Time for a modified approach. <i>Ambio</i> 15: 192-200	Story Map Progress Report 3: Due 11:59 pm the day after your lab session
10/31	Screening of "Mulholland's Dream"		Article Summary 3: Due Friday, 11/1, 11:59 pm
Week 11			
11/5	Potable Water and Wastewater Treatment	Holden, Ch. 9 Anderson, J. 2003. The environmental benefits of water recycling and reuse. <i>Water Science & Technology: Water Supply</i> 3: 1-10 Arce-Nazario, J. 2018. "The science and politics of water quality" in Handbook of Critical Physical Geography (eds. Lave R., C. Biermann, and S.N. Lane), 465-483. London: Palgrave	Story Map Progress Report 4: Due 11:59 pm the day after your lab session Ungraded (but required) Research Essay Proposal: Due Friday, 11/8, 11:59 pm
11/7	Infectious Diseases and Chemical Contaminants	Holden, Ch. 8, pp. 223-249 McKenna, M. et al. 2017. Human intestinal parasite burden and poor sanitation in rural Alabama. <i>The American journal of tropical medicine and hygiene</i> 97.5: 1623-1628 Kolpin, D.W., et al. 2002. Pharmaceuticals, hormones, and other organic wastewater contaminants in US streams, 1999-2000: A national reconnaissance. <i>Environmental Science & Technology</i> 36: 1202-1211	
Week 12			
11/12	Physical Water Risk	Holden, Ch. 8, pp. 249-259	Story Map Progress Report 5: Due 11:59 pm the day after your lab session
11/14	Water Economics	Holden, Ch. 10 Dalhuisen, J.M., Groot, H.I.F., and Nijkamp, P. 2000. The economics of	

		<p>water: A survey of issues. <i>International Journal of Development Planning Literature</i> 15: 3-20</p> <p>Lave R., et al. 2018. "Commodifying streams: A critical physical geography approach to stream mitigation banking in the USA" in <i>Handbook of Critical Physical Geography</i> (eds. Lave R., C. Biermann, and S.N. Lane), 443-464. London: Palgrave</p>	
Week 13			
11/19	Screening of "Company Town"		Story Map Final Presentation (in lab session)
11/21	Water Rights, Law, and Governance	Holden, Ch. 11	
Module 6 Future Prospects			
Week 14*			
11/26 * 11/27-12/1 is a university holiday	Virtual Water and the Water Footprint Model	Hoekstra, A.Y. 2012. The hidden water resource use behind meat and dairy. <i>Animal Frontiers</i> , 2(2), 3-8	<p>No Labs or Thursday Lecture (Due to Thanksgiving Holiday)</p> <p>Online Discussion 3 Post: Due Tuesday, 11/26, 11:59 pm</p>
Week 15			
12/3	Water and Life Cycle Assessments of Consumer Products		<p>Online Discussion 3 Responses to Classmate's Posts: Due Monday, 12/2, 11:59 pm</p>
12/5	The Future of Water	Holden, Ch. 12	<p>Lab Report 6: Due 11:59 pm the day after your lab session</p> <p>Research Essay: Due Friday, 12/6, 11:59 pm</p> <p>No submissions accepted after 12/6/19</p>
Final Examination (Tuesday, December 17, 8-10 am; THH 102; Closed Book)			

Statement on Academic Conduct and Support Systems

Academic Conduct

Plagiarism – presenting someone else’s ideas as your own, either verbatim or recast in your own words – is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in *SCampus* in Part B, Section 11, “Behavior Violating University Standards” policy.usc.edu/scampus-part-b. Other forms of academic dishonesty are equally unacceptable. See additional information in *SCampus* and university policies on scientific misconduct, <http://policy.usc.edu/scientific-misconduct>.

Support Systems

Student Counseling Services (SCS) – (213) 740-7711 – 24/7 on call
engemannshc.usc.edu/counseling

Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention.

National Suicide Prevention Lifeline – 1 (800) 273-8255 – 24/7 on call
www.suicidepreventionlifeline.org

Provides free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week.

Relationship and Sexual Violence Prevention Services (RSVP) – (213) 740-4900 – 24/7 on call
engemannshc.usc.edu/rsvp

Free and confidential therapy services, workshops, and training for situations related to gender-based harm.

Office of Equity and Diversity (OED)/Title IX Compliance – (213) 740-5086
equity.usc.edu, titleix.usc.edu

Information about how to get help or help a survivor of harassment or discrimination, rights of protected classes, reporting options, and additional resources for students, faculty, staff, visitors, and applicants. The university prohibits discrimination or harassment based on the following protected characteristics: race, color, national origin, ancestry, religion, sex, gender, gender identity, gender expression, sexual orientation, age, physical disability, medical condition, mental disability, marital status, pregnancy, veteran status, genetic information, and any other characteristic which may be specified in applicable laws and governmental regulations.

Bias Assessment Response and Support – (213) 740-2421
studentaffairs.usc.edu/bias-assessment-response-support

Avenue to report incidents of bias, hate crimes, and microaggressions for appropriate investigation and response.

The Office of Disability Services and Programs – (213) 740-0776
dsp.usc.edu

Support and accommodations for students with disabilities. Services include assistance in providing readers/notetakers/interpreters, special accommodations for test taking needs, assistance with architectural barriers, assistive technology, and support for individual needs.

Student Support and Advocacy – (213) 821-4710

studentaffairs.usc.edu/ssa

Assists students and families in resolving complex personal, financial, and academic issues adversely affecting their success as a student.

Diversity at USC – (213) 740-2101

diversity.usc.edu

Information on events, programs and training, the Provost's Diversity and Inclusion Council, Diversity Liaisons for each academic school, chronology, participation, and various resources for students.

USC Emergency - UPC: (213) 740-4321, HSC: (323) 442-1000 – 24/7 on call

dps.usc.edu, emergency.usc.edu

Provides safety and other updates, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible.

USC Department of Public Safety – - UPC: (213) 740-6000, HSC: (323) 442-120 – 24/7 on call

dps.usc.edu

Non-emergency assistance or information.