

## **SSCI 265Lg, The Water Planet**

### *Syllabus*

**Units:** 4

**Term Day Time:** Spring 2021, Tues and Thu, 11 a.m. to 12:20 p.m.

**Location:** GFS 116

**Co-Instructor:** John P. Wilson

**Office:** AHF B55F

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

**Contact Info:** [jpwilson@usc.edu](mailto:jpwilson@usc.edu), 213-740-1908

**Co-Instructor:** Elisabeth J. Sedano

**Office:** AHF B57C

**Office Hours:** Mondays, 11 a.m.-12 p.m. and Wednesdays, 2-3 p.m. Also available by appointment via email.

**Contact Info:** [sedano@usc.edu](mailto:sedano@usc.edu)

**Lab Instructor:** TBD

**Library Help:** Andy Rutkowski

**Office:** VKC 36B

**Office Hours:** Thu 10 a.m.–12 p.m.

**Contact Info:** [arutkows@usc.edu](mailto:arutkows@usc.edu), see contact page on Blackboard for Zoom room

## **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

## **Class Conduct**

**Harassment, sexual misconduct, interpersonal violence, and stalking** are not tolerated by the university. All faculty and most staff are considered Responsible Employees by the university and must forward all information they receive about these types of situations to the Title IX Coordinator. The Title IX Coordinator is responsible for assisting students with supportive accommodations, including academic accommodations, as well as investigating these incidents if the reporting student wants an investigation. The Title IX office is also responsible for coordinating supportive measures for transgender and nonbinary students such as faculty notifications, and more. If you need supportive accommodations you may contact the Title IX Coordinator directly (titleix@usc.edu or 213-821-8298) without sharing any personal information with me. If you would like to speak with a confidential counselor, Relationship and Sexual Violence Prevention Services (RSVP) provides 24/7 confidential support for students (213-740-9355 (WELL); press 0 after hours).

## **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:

- 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.
- Clifton, C. F., Day, K. T., Luce, C. H., Grant, G. E., Safeeq, M., Halofsky, J. E., & Staab, B. P. 2018. Effects of climate change on hydrology and water resources in the Blue Mountains, Oregon, USA. *Climate Services* 10: 9-19.

- Cooley, H., Phurisamban, R., & Gleick, P. 2019. The cost of alternative urban water supply and efficiency options in California. *Environmental Research Communications* 1: 042001.
- Cronon, W. 1992. A place for stories: Nature, history, and narrative. *Journal of American History* 78: 1347-1376.
- Griffin, R. C. 2012. The origins and ideals of water resource economics in the United States. *Annual Review of Resource Economics* 4(1): 353-377.
- 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): 3.
- 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. *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.
- Sheil, D. 2018. Forests, atmospheric water and an uncertain future: the new biology of the global water cycle. *Forest Ecosystems*, 5: 19.
- Tickner, D, Parker, H., Moncrieff, C. R., Oates, N. E. M., Ludi, E., & Acreman, M. 2017. Managing rivers for multiple benefits: A coherent approach to research, policy and planning. *Frontiers in Environmental Sciences*, 5: 4.
- Vasco, D. W., Farr, T. G., Jeanne, P., Doughty, C., Nico, P. 2019. Satellite-based monitoring of groundwater depletion in California's Central Valley. *Scientific Reports*, 9: 16053.
- Walsh, C. J., Fletcher, T. D., & Burns, M. J. 2012. Urban stormwater runoff: A new class of environmental flow problem. *PLoS ONE* 7(9): e45814.

## 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. Six of the lab sessions are spent on short, stand-alone projects, and six are spent on the StoryMap assignment (see below). 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 *prior to the lab session you need to miss*. 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.

### ***StoryMap***

The final lab project is an ArcGIS StoryMap. A StoryMap 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 StoryMap 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, per the College policy on Final Exam Scheduling, speak with one 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 and StoryMap project.

| Assessment                | Number | Points Each | Total Points (% of Grade) |
|---------------------------|--------|-------------|---------------------------|
| Online Discussions        | 3      | 4           | 12                        |
| Laboratory Reports        | 6      | 5           | 30                        |
| Article Summaries         | 3      | 5           | 15                        |
| StoryMap Progress Reports | 5      | 1           | 5                         |
| Final Project: StoryMap   | 1      | 15          | 15                        |
| Final Exam (Closed book)  | 1      | 23          | 23                        |
| Totals                    | 19     | --          | 100                       |

## Schedule

| Date  | Topics                      | Readings   | Deliverables/Due Dates and Times (PT)  |
|---|-----------------------------|--|--|
| <b>Module 1   Fundamental Properties and Key Concepts</b> |                             |  |  |
| <b>Week 1</b>   |                             |  |  |
| 8/24  | Introduction to Course      |  | No labs  |
| 8/26  | Water Fundamentals, Part I  | Holden, Ch. 1, pp. 1-5, 10-18.<br>Cronon 1992. A place for stories: Nature, history, and narrative.<br><i>Journal of American History</i> 78: 1347-1376. |  |
| <b>Week 2</b>   |                             |  |  |
| 8/31  | Water Fundamentals, Part II | Holden, Ch. 1, pp. 6-10.   | Labs meet. Lab Report 1: Due 11:59 p.m. the day before your next lab session |
| 9/2   | Global Water Cycle          | Holden, Ch. 2, pp. 19-24.<br>Sheil 2018. Forests, atmospheric water and an uncertain future: the   |  |

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|--|---|--|--|
|  |   | new biology of the global water cycle. <i>Forest Ecosystems</i> 5: 19.   |  |
| <b>Module 2   Water Flows and Stocks</b>                         |   |  |  |
| <b>Week 3</b>  |   |  |  |
| 9/7<br>*9/6 is a university holiday                              | Hydrologic Pathways                         | Holden, Ch. 3, pp. 49-56.  | No labs (Due to holiday)<br>Article Summary 1: Due Friday, 9/10, 11:59 p.m.  |
| 9/9  | River Flow                                  | Holden, Ch. 3, pp. 57-68.  |  |
| <b>Week 4</b>  |   |  |  |
| 9/14   | River Channel Dynamics                      | Holden, Ch. 3, pp. 68-76.<br>Tickner et al. 2017. Managing rivers for multiple benefits: A coherent approach to research, policy and planning. <i>Frontiers in Environmental Sciences</i> 5: 4 | Labs meet. Lab Report 2: Due 11:59 p.m. the day before your next lab session   |
| 9/16   | Characteristics of Surface Waters           | Holden, Ch. 4, pp. 79-93.  |  |
| <b>Week 5</b>  |   |  |  |
| 9/21   | Water Use and Water Quality Deterioration   | Holden, Ch. 4, pp. 93-115.<br>Walsh et al. 2012. Urban stormwater runoff: A new class of environmental flow problem. <i>PLoS ONE</i> 7(9): e45814.   | Labs meet. Lab Report 3: Due 11:59 p.m. the day before your next lab session<br>Online Discussion 1 Post: Due Friday, 9/24, 11:59 p.m.                           |
| 9/23   | Groundwater Flow Principles and Abstraction | Holden, Ch. 5, pp. 123-145.  |  |
| <b>Week 6</b>  |   |  |  |
| 9/28   | Groundwater Chemistry and Pollution         | Holden, Ch. 5, pp. 145-157.<br>Vasco et al. 2019. Satellite-based monitoring of groundwater depletion in California's Central Valley. <i>Scientific Reports</i> 9: 16053.                      | Online Discussion 1 Responses to Classmates' Posts: Due Monday, 9/27, 11:59 p.m.<br>Labs meet. Lab Report 4: Due 11:59 p.m. the day before your next lab session |
| <b>Module 3   Climate Change and Changing Aquatic Ecosystems</b> |   |  |  |

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|---|---|---|---|
| 9/30  | Climate Variability                                     | Holden, Ch. 2, pp. 24-39.<br>Milly et al. 2008. Stationarity is dead: Whither water management? <i>Science</i> 319: 573-574.  |   |
| <b>Week 7</b>                                 |   |   |   |
| 10/5  | Screening of "Before the Flood"                         | Holden, Ch. 5, pp. 123-145.   | Labs meet. Lab Report 5: Due 11:59 p.m. the day before your next lab session<br>Article Summary 2: Due Friday, 10/8, 11:59 p.m.                       |
| 10/7  | Climate Change  | Holden, Ch. 2, pp. 40-44.<br>Clifton et al. 2018. Effects of climate change on hydrology and water resources in the Blue Mountains, Oregon, USA. <i>Climate Services</i> 10: 9-19.  |   |
| <b>Week 8*</b>                                |   |   |   |
| 10/12<br>*10/14-10/15 is a university holiday | Human Modification and Management of Aquatic Ecosystems | Holden, Ch. 6, pp. 180-195  | Labs meet. StoryMap Progress Report 1: Due 11:59 p.m. the day before your next lab session  |
| <b>Module 4   Water and Health</b>            |   |   |   |
| <b>Week 9</b>                                 |   |   |   |
| 10/19   | Infectious Diseases                                     | Holden, Ch. 8, pp. 223-239.<br>McKenna et al. 2017. Human intestinal parasite burden and poor sanitation in rural Alabama. <i>American journal of Tropical Medicine &amp; Hygiene</i> 97(5): 1623-1628.                                     | Labs meet. StoryMap Progress Report 2: Due 11:59 p.m. the day<br>Online Discussion 2 Post: Due Friday, 10/22, 11:59 p.m. before your next lab session |
| 10/21   | Chemical Contaminants                                   | Holden, Ch. 8, pp. 239-249.<br>Kolpin et al. 2002. Pharmaceuticals, hormones, and other organic wastewater contaminants in U.S. streams, 1999-2000: A national reconnaissance. <i>Environmental Science &amp; Technology</i> 36: 1202-1211. |   |
| <b>Week 10</b>                                |   |   |   |

|                                    |  |  |   |
|------------------------------------|--|--|---|
| 10/26                              | Physical Water Risk                    | Holden, Ch. 8, pp. 249-259.  | Online Discussion 2 Responses to Classmates' Posts: Due Monday, 10/25, 11:59 p.m.<br><br>Labs meet. StoryMap Progress Report 3: Due 11:59 p.m. the day before your next lab session<br><br>Article Summary 3: Due Friday, 10/29, 11:59 p.m. |
| <b>Module 5   Water Management</b> |  |  |   |
| 10/28                              | Screening of "Mulholland's Dream"      |  |   |
| <b>Week 11</b>                     |  |  |   |
| 11/2                               | Water Demand Planning and Management   | Holden, Ch. 7.<br><br>Cosgrove, W.J., & Loucks, D.P. 2015. Water management: Current and future challenges and research directions. <i>Water Resources Research</i> 51(6): 4823-4839.  | Labs meet. StoryMap Progress Report 4: Due 11:59 p.m. the day before your next lab session  |
| 11/4                               | The 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 &amp; Society</i> 17(1): 31.<br><br>Novotny, V. 2013. Water-energy nexus: Retrofitting urban areas to achieve zero pollution. <i>Building Research &amp; Information</i> 41: 589-604.Holden, Ch. 6. |   |
| <b>Week 12</b>                     |  |  |   |
| 11/9                               | Potable Water and Wastewater Treatment | Holden, Ch. 9.<br><br>Arce-Nazario 2018. The science and politics of water quality. In <i>Handbook of Critical Physical Geography</i> (eds. Lave et al.), 465-483. London: Palgrave.   | Labs meet. StoryMap Progress Report 5: Due 11:59 p.m. the day before your next lab session<br><br>Online Discussion 3 Post: Due Friday, 11/12, 11:59 p.m.   |
| 11/11                              | Water Economics                        | Holden, Ch. 10, pp. 293-314.<br><br>Griffin, R.C. 2015. The origins and ideals of water resource economics in the United States. <i>Annual Reviews of Resource Economics</i> 4:353-377.  |   |

|   |                                       |  |  |
|---|---------------------------------------|--|--|
|   |                                       | Cooley et al. 2019. The cost of alternative urban water supply and efficiency options in California. <i>Environmental Research Communications</i> 1: 042001. |  |
| <b>Week 13</b>  |                                       |  |  |
| 11/16   | Screening of “Company Town”           |  | Online Discussion 3 Responses to Classmate’s Posts: Due Monday, 11/15, 11:59 p.m.<br><br>Labs meet. StoryMap Final Presentation (in lab session) |
| 11/18   | Water Rights, Law, and Governance     | Holden, Ch. 11.  |  |
| <b>Week 14*</b>   |                                       |  |  |
| 11/23<br>*11/24-11/28 is a university holiday               | Virtual Water and the Water Footprint | Hoekstra, A.Y. 2012. The hidden water resource use behind meat and dairy. <i>Animal Frontiers</i> , 2(2), 3-8.   | No labs (Due to holiday)   |
| <b>Module 6   Future Prospects</b>                          |                                       |  |  |
| <b>Week 15</b>  |                                       |  |  |
| 11/30   | Water Models and Sustainability       | Holden, Ch. 12, pp. 333-345.   | Labs meet. Lab Report 6: Due the day after your lab session by 11:59 p.m.<br><br>No submissions accepted after 12/5.                             |
| 12/2  | The Future of Water                   |  |  |
| <b>Final Examination -- Tuesday, December 14, 8-10 a.m.</b> |                                       |  |  |

## 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” <https://policy.usc.edu/files/2020/07/SCampus-Part-B-1.pdf>. Other forms of academic dishonesty are equally unacceptable. See additional information in SCampus and university policies on scientific misconduct, [policy.usc.edu/scientific-misconduct](https://policy.usc.edu/scientific-misconduct).

**Support Systems:**

*Counseling and Mental Health - (213) 740-9355 – 24/7 on call*  
[studenthealth.usc.edu/counseling](http://studenthealth.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*  
[suicidepreventionlifeline.org](http://suicidepreventionlifeline.org)

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) 740-9355(WELL), press “0” after hours – 24/7 on call*  
[studenthealth.usc.edu/sexual-assault](http://studenthealth.usc.edu/sexual-assault)

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

*Office of Equity and Diversity (OED) - (213) 740-5086 | Title IX – (213) 821-8298*  
[equity.usc.edu](http://equity.usc.edu), [titleix.usc.edu](http://titleix.usc.edu)

Information about how to get help or help someone affected by harassment or discrimination, rights of protected classes, reporting options, and additional resources for students, faculty, staff, visitors, and applicants.

*Reporting Incidents of Bias or Harassment - (213) 740-5086 or (213) 821-8298*  
[usc-advocate.symplicity.com/care\\_report](http://usc-advocate.symplicity.com/care_report)

Avenue to report incidents of bias, hate crimes, and microaggressions to the Office of Equity and Diversity | Title IX for appropriate investigation, supportive measures, and response.

*The Office of Disability Services and Programs - (213) 740-0776*  
[dsp.usc.edu](http://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.

*USC Campus Support and Intervention - (213) 821-4710*  
[campussupport.usc.edu](http://campussupport.usc.edu)

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](http://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](https://dps.usc.edu), [emergency.usc.edu](https://emergency.usc.edu)

Emergency assistance and avenue to report a crime. Latest updates regarding safety, 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](https://dps.usc.edu)

Non-emergency assistance or information.