# Fall 2020 Course Syllabus

Thursdays 6-9 PM

**Instructors:**

**Julia Knisel**

MA Office of Coastal Zone Management
Coastal Shoreline and Floodplain Manager
julia.knisel@gmail.com

**Martin Pillsbury**
Metropolitan Area Planning Council
Environmental Planning Director
mkpillsbury@gmail.com

**Zoom classroom access:**

https://us02web.zoom.us/j/86587786016?pwd=cjRKUDJYR0lXb1lmRGRNWXpHODZYdz09
Meeting ID: 865 8778 6016
Passcode: 981916

**Moodle platform access:**

https://umass.thefishsite.com
Username: email address (*all lower case*)
Password: Aquaculture_101 (*you will need to create a new password*)

**Course description:**

This seminar course is designed to stimulate students' interests in the field of water resources from an environmentally sustainable perspective. Five water resource areas will be highlighted: (1) rivers and watersheds, (2) groundwater and aquifers, (3) estuaries, (4) coastal floodplains, and (5) marine resources. The focus will be on the resources themselves – their functions, values, and impacts from human uses – as well as policy issues and management techniques.

**Format:**

Within a resource-based context, policy issues and related management techniques will be presented and discussed. Each policy issue and management technique will be illustrated within a specific water resource area, but each can be applied to other resources.

| Resource Areas | Policy Issues | Management Techniques |
|---|---|---|
| Rivers and Watersheds | water scarcity | streamflow standards |
| Groundwater and Aquifers | drinking water | land use controls |
| Estuaries | coastal water quality; coastal habitats | stormwater management |
| Coastal Floodplains | storm damage prevention; flood control | regulations; living shoreline approaches |
| Marine Resources | saltwater intrusion; ocean acidification | ecosystem restoration; renewable energy |

Discussions of resource areas will include:

- Descriptions and connections
- Functions and values
- Human uses and impacts
- Policy issues
- Management techniques
- Case studies

**Learning outcomes:**

This course will give students an understanding of water resources management and protection as a public policy problem. Students will learn:

- How to define problems
- What data and technical expertise are needed
- How to understand the political and institutional context of water resources protection and management
- How to develop strategies and implement tools to achieve policy objectives

**Questions and issues to be addressed:**

- How to delineate resource area boundaries
- How to structure management techniques based on a scientific understanding of resource values and functions
    - How do natural ecosystems and water resources function?
    - How can human needs be met in an environmentally sustainable way?
    - How can conflicting natural and human needs (multiple uses) be accommodated?
- How to understand and respond to changing circumstances and needs

**Student responsibilities:**

Students will be expected to:

- Complete each week's **readings** prior to the class session
- **Participate** in class and Moodle platform discussions
- **Attend** a (remote) public forum
- Complete **three assignments**
- Be **creative**

**Assignments and Grading:**

Students are expected to complete all reading assignments before each class session, participate in discussions, and attend one (remote) public forum (e.g., local Conservation Commission meeting or federal agency webinar) (20%). Each student must also complete three assignments: assignment 1 (25%), class oral presentation (25%), and a final project

(30%). Each of these assignments should demonstrate an understanding of a water resources issue (rather than a recitation of facts), and an ability to communicate that information. Ideas should be carefully organized and concisely presented. *At the discretion of the professors, students will receive a three-point reduction per day on late assignments.*

For each credit hour, students are expected to spend a minimum of two hours on work outside of class each week. For this three-credit course, that is a minimum of six hours each week for the required reading, research and assignments. The grade scale is as follows:

| | |
|---|---|
| A | 92.0 – 100 |
| A- | 90.0 – 91.9 |
| B+ | 85.0 – 89.9 |
| B | 82.0 – 84.9 |
| B- | 80.0 – 81.9 |
| C+ | 75.0 – 79.9 |
| C | 72.0 – 74.9 |
| C- | 70.0 – 71.9 |
| D | 65.0 – 69.9 |
| F | < 65.0 |

Class Participation (20%)

Students are expected to come to class prepared to contribute to discussions of topics and materials, and actively engage in Zoom and Moodle discussions.

Students are also required to attend one (remote) public forum on a topic related to the course. Please be prepared to provide brief highlights during the following class. Here are options (*you will likely need to register in advance for online access*):

- *Local Conservation Commission Meetings*
  - **Boston Conservation Commission,** every other Wednesday at 6:00 PM
  - **Brookline Conservation-Commission,** 1st and 3rd Tuesdays at 7:00 PM
  - **Easton Conservation Commission,** every other Monday at 6:30 PM
  - **Hull Conservation Commission,** 2nd and 4th Tuesdays at 6:00 PM
  - **Norton Conservation Commission,** 2nd and 4th Mondays at 6:30 PM
  - **Quincy Conservation Commission**, 1st Wednesdays at 7:30 PM
  - **Raynham Conservation Commission,** 1st and 3rd Wednesdays at 5:30 PM
  - *Other communities…*
- *Federal Agency Webinars*
  - **OneNOAA Science Seminars**
  - **EPA Soak up the Rain Webinar**

Assignment 1 (25%) – due Oct. 8

For this assignment, students will select a resource area and ***current*** impact to research and analyze. Findings and a position on the issue should be provided to the instructors in a ***format other than a traditional academic term paper***. Students are encouraged to choose from the format options listed below ***or suggest one of your own***. The format options (below) span a range of different communication skills. Choose an option that interests you and will help you develop a skill for your academic and professional career.

**Format Options:**

- testimony for a public hearing (legislative, regulatory agency, or local government)
- issue or policy paper (white paper) from an advocacy group
- environmental impact statement for a development project
- press conference or press release from an agency or environmental group
- article for a planning, scientific, or legal journal
- newspaper or magazine article
- chapter for an engineering or natural science textbook
- agency or organization newsletter, fact sheet, or web content
- visual presentation (graphics or drawings)
- video presentation or documentary piece

**Length:** Written assignments should be no more than 10 double-spaced pages.

**Grading:**

- **Topic Focus (20 pts.)**: topic covered a current water resources issue; defined appropriately for the selected audience and product
- **Format (25 pts.)**: format effectively communicated your position on the issue
- **Depth of Discussion (25 pts.)**: included pertinent content
- **Cohesiveness (10 pts.)**: information from all sources related and tied together
- **Sources (10 pts.)**: included general background sources as well as specialized sources (e.g., peer-reviewed journal articles and government agency publications)
- **Citations (5 pts.)**: cited all source material (APA citation style preferred)
- **Spelling, grammar and page limit (5 pts.)**: no spelling and grammar mistakes; followed page limit (if applicable)

Class Presentation (25%) – due Nov. 5-19

Identify a ***case study*** topic (preferably on a different topic than your first assignment) and prepare an in-depth presentation to be given to the class. The case study should investigate a real-life example of water resource management and provide insight into decision-making and stakeholders involved. Presentation visual aids are highly encouraged; you may prepare slides, a poster, maps, and any other visuals appropriate for your topic. Class presentations

should be planned for **10-12 minutes**, followed by questions and class discussion. Presentation times will be assigned by the professors.

**Grading:**

- **Topic Focus (20 pts.)**: complex topic relevant to management and protection of water resources in a particular geographic location or by a group/organization across a region/industry
- **Format (25 pts.)**: presentation style effectively communicated management issues and tools to resolve the issues
- **Depth of Discussion (25 pts.)**: included pertinent background information and detailed content for the class to understand the issue and management or protection action(s)
- **Cohesiveness (10 pts.)**: information from all stakeholders and sources related and tied together
- **Citations (10 pts.)**: data sources and visual aids credited
- **Time (5 pts.)**: adhered to time limit of 10-12 minutes
- **Response to Questions (5 pts.)**: addressed questions from the class and professors

Final Project (30%) – due Dec. 10

The final project is a ***structured exercise*** that requires you to synthesize what you have learned throughout the semester and apply this knowledge to a particular issue of your choice. ***It is not a standard research paper. Please follow the guidelines below carefully.***

Drawing on knowledge gained from the readings, class discussions, and presentations, ***identify an unresolved problem or a gap in water resources policy, management, or science (e.g., increased extreme precipitation)*****,** then propose an approach to solve the problem or fill the gap***.*** The final project should follow this detailed format and include each of these sections (***label each section accordingly***):

**Part A: Description of problem or gap**

1. Statement of problem/gap
2. Description of context (what is and is not known about the problem/gap)
3. Description of value (why is it important to address the problem or fill the gap)

**Part B: Description of proposed management approach or scientific investigation**

1. Summary of the strategy
2. Describe the elements of the strategy in detail (incentives, financing and stakeholder roles)
3. Describe the implementation plan (actions and timeline)

**Length**: Final project should be no more than 10 double-spaced pages.

**Grading:**

- **Description of Problem/Gap (25 pts.)**: included required content (above)
- **Description of Management/Science (25 pts.)**: included required content (above)
- **Integration of Knowledge (25 pts.)**: applied concepts learned in the course; demonstrated original analysis and synthesis of ideas
- **Sources (10 pts.)**: included general background sources as well as specialized sources (e.g., peer-reviewed journal articles and government agency publications)
- **Format (5 pts.)**: followed required outline and included section headings (above)
- **Citations (5 pts.)**: cited all source material (APA citation style preferred)
- **Spelling, grammar and page limit (5 pts.)**: no spelling and grammar mistakes; followed page limit

**Topic Proposals*:*** A short proposal (1-2 paragraphs) describing the topic you selected for each ***assignment*** (described above) must be submitted to the instructor(s).

| **Summary of Important Dates** | |
|---|---|
| Sep. – Oct. | remote meeting or webinar participation |
| Sep. 24 | proposal for assignment 1 due |
| Oct. 8 | assignment 1 due |
| Oct. 15 | proposal for presentation due |
| Nov. 5, Nov. 12, Nov. 19 | class presentations |
| Nov. 12 | proposal for final project due |
| Nov. 26 | no class (Thanksgiving) |
| Dec. 10 | final project due |

**Policy on incomplete grades:**

Students are eligible to receive a grade of incomplete only if circumstances beyond the student's control prevent the student from completing required course work. To receive an Incomplete Grade, the instructor, student, Consortium Board Member at the student's home school (if the student is from a member school), and a Consortium staff member must all agree that such circumstances exist. Agreement is reached when all parties listed above have signed an **MSC Incomplete Grade Contract** (form available from the Marine Studies Consortium). The Contract must include a description of the circumstances surrounding the request for an incomplete grade, a list of all the work to be made up, and the time by which it will be completed. The student must submit the signed **Incomplete Grade Contract** to the instructor by the last class meeting.

If the student is unable to complete the required work within the time stipulated in the Incomplete Grade Contract, s/he will receive an F for the course or be required to retake the

course. In no case shall a student be granted more than six weeks beyond the end of the semester to complete the course work.

*The outline below may be subject to change and any changes will be announced in class.*

## INTRODUCTION

**Sep. 10 HYDROLOGIC CYCLE (Knisel & Pillsbury)**

- Course overview including purpose, readings, assignments, grading, and tools
- Student introductions
- Discussion: hydrologic cycle; drought; sustainable development and water

Reading

- Environmental Protection Agency, *Watershed Academy Training Module: Wetland Functions and Values*, https://cfpub.epa.gov/watertrain/moduleFrame.cfm?parent_object_id=262
- US Geological Survey, *Fundamentals of the Water Cycle*, https://www.usgs.gov/special-topic/water-science-school/science/fundamentals-water-cycle?qt-science_center_objects=0#qt-science_center_objects
- US Geological Survey, *A Comprehensive Study of the Water Cycle*, https://www.usgs.gov/special-topic/water-science-school/science/a-comprehensive-study-natural-water-cycle?qt-science_center_objects=0#qt-science_center_objects

## RIVERS & WATERSHEDS

**Sep. 17 RESOURCES & IMPACTS (Pillsbury)**

- Description, functions, and values of rivers and watersheds
- Human uses and impacts on water availability
- Video: *The Flooding River*

Readings

- MA Executive Office of Environmental Affairs, *Living Waters*, p. 6-24 and 40-43, https://ia802906.us.archive.org/0/items/livingwatersguid00mass/livingwatersguid00mass.pdf
- NE Interstate Water Pollution Control Commission, 2017, *Pollution from Everywhere*, https://neiwpcc.org/information-center/neiwpcc-reprint-series/pollution-from-everywhere
- Environment America, 2012, *When It Rains It Pours,* p. 6-27, https://environmentamerica.org/reports/ame/when-it-rains-it-pours
- Best, A., January 2019, *Hydraulic Empire*, Land Lines, p. 15-25, https://www.lincolninst.edu/sites/default/files/pubfiles/hyraulic-empire-lla190104.pdf
- Jenkins, M., January 2019, *Beyond Drought*, Land Lines, p. 27-37, https://www.lincolninst.edu/sites/default/files/pubfiles/beyond-drought-lla190105.pdf

**Sep. 24 POLICY & MANAGEMENT (Pillsbury)**

- Regulations: Massachusetts Interbasin Transfer Act & Water Management Act
- Planning & Policy: Sustainable Water Management Initiative
- Video: *Managing River Flows for Biodiversity* (The Nature Conservancy)
- Case study: Delaware River, Tocks Island Dam Project

Readings

- Moulton, C., April 2019, *Great Adaptations,* Land Lines, p. 27-40, https://www.lincolninst.edu/sites/default/files/pubfiles/great-adaptations-lla190405.pdf
- McCormack, K., January 2019, *Grow with the Flow*, Land Lines, p. 61-75, https://www.lincolninst.edu/sites/default/files/pubfiles/grow-with-the-flow-lla190106.pdf
- Postel, S., *Water – Adapting to a New Normal*, www.scribd.com/document/63678768/WATER-Adapting-to-a-New-Normal-by-Sandra-Postel
- EPA, *Growing Toward More Efficient Water Use*, www.epa.gov/smartgrowth/growing-toward-more-efficient-water-use
- EPA, March 2018, *Storm Smart Cities,* pages 3–9, https://www.epa.gov/sites/production/files/2018-04/documents/storm_smart_cities_508_final_document_3_26_18.pdf
- 2018, *Fourth National Climate Assessment*, Vol. II, Chapter 3, Water, https://nca2018.globalchange.gov/downloads/NCA4_Ch03_Water_Full.pdf

## ESTUARIES

**Oct. 1 RESOURCES & IMPACTS (Knisel)**

- Description, functions, and values of estuaries
- Human uses and impacts on water quality and habitat

Readings

- Restore America's Estuaries, Economics of Estuaries, https://estuaries.org/estuary-science/economics
- Boburg, S., and B. Reinhard, 2017, August 29, Houston's 'Wild West' Growth: How the city's development may have contributed to devastating flooding, *The Washington Post*, www.washingtonpost.com/graphics/2017/investigations/harvey-urban-planning/?utm_term=.8d4866132ec1
- National Oceanic and Atmospheric Administration, 2013, NOAA's State of the Coast – National Coastal Population Report, https://aamboceanservice.blob.core.windows.net/oceanservice-prod/facts/coastal-population-report.pdf

**Oct. 8 POLICY & MANAGEMENT (Knisel)**

- National Estuarine Research Reserves
- Coastal stormwater best management practices (BMPs)
- No Discharge Zones for boaters

Readings

- PEW Charitable Trusts, 2019, 5 Missions of National Estuarine Research Reserve System, https://www.pewtrusts.org/-/media/assets/2019/08/5_missions_fact_sheet_final.pdf
- Horsley Witten Group, Inc., 2015, *Assessment of Climate Change Impacts on Stormwater BMPs and Recommended BMP Design Considerations in Coastal Communities*, Section 4, p. 19-23, www.mass.gov/eea/agencies/czm/program-areas/coastal-water-quality/cpr/climate-change-stormwater-bmps.html
- MA Office of Coastal Zone Management, *No Discharge Zones*, www.mass.gov/service-details/no-discharge-zones-ndzs

## GROUNDWATER & AQUIFERS

**Oct. 15 RESOURCES & IMPACTS (Pillsbury)**

- Description, functions, and values of groundwater and aquifers
- Human uses and impacts on drinking water

Readings

- MA Audubon, Groundwater Flyers #1 & 2, *posted to Moodle*
- Horsley, Witten, Hegemann, Inc., Groundwater Hydrology, p. 1-1 to 1-12, 2-1 to 2-9, 3-1 to 3-29, *posted to Moodle*

**Oct. 22 POLICY & MANAGEMENT (Pillsbury)**

- Management technique: land use controls
- Case Study: North Suburban groundwater protection plan
- Video: *The Power to Protect*

Readings

- MA Audubon, Groundwater Flyers, #4, *posted to Moodle*
- Horsley, Witten, Hegemann, Inc, Ground Water Hydrology, Contamination, and Management, p. 3-34 to 3-51, *posted to Moodle*
- Witten, J., The Basics of Groundwater Protection, *posted to Moodle*

## MARINE RESOURCES

**Oct. 29 RESOURCES & IMPACTS (Knisel)**

- Description, functions, and values of marine resources
- Human uses and impacts on the freshwater-saltwater interface and ocean chemistry

Readings

- Northeast Regional Planning Body, 2016, *Northeast Ocean Plan*, c. 1, The New England Offshore Environment and the Need for Ocean Planning, p. 4-14, https://neoceanplanning.org/wp-content/uploads/2018/01/Northeast-Ocean-Plan-Chapter-1.pdf
- Northeast Coastal Acidification Network, *Overview of Acidification in the Northeast Region*, www.necan.org/sites/default/files/NECAN-Overview-of-Coastal-Acidification-in-the-Northeast-Region.pdf
- White, E. and D. Kaplan, 2017, Restore or retreat? Saltwater intrusion and water management in coastal wetlands, *Ecosystem Health and Sustainability* 3(1), https://esajournals.onlinelibrary.wiley.com/doi/full/10.1002/ehs2.1258

**POLICY & MANAGEMENT (Knisel)**

- Ecosystem restoration
- Marine spatial planning for renewable energy generation (tidal and wind)

Readings

- Executive Office of Energy and Environmental Affairs, 2015, *Massachusetts Ocean Management Plan*, c. 2, Management, www.mass.gov/eea/docs/eea/oceans/ocean-plan/2015-ocean-plan-v1-complete-low-res.pdf
- Northeast Ocean Data Portal, www.northeastoceandata.org

**Nov. 5 Presentations**

**Nov. 12 Presentations**

## COASTAL FLOODPLAINS

**Nov. 19 RESOURCES & IMPACTS (Knisel)**

- **Presentations**
- Description, functions, and values of coastal floodplains
- Human uses and impacts on flooding and erosion

Readings

- Climate Ready Boston, 2016, *Climate Change and Sea Level Rise Projections for Boston*, p. 1-20, www.boston.gov/sites/default/files/document-file-12-2016/brag_report_-_final.pdf
- Massachusetts Sea Level Rise and Coastal Flooding Viewer, www.mass.gov/service-details/massachusetts-sea-level-rise-and-coastal-flooding-viewer

**Nov. 26** ***NO CLASS (Thanksgiving)***

**Dec. 3** **POLICY & MANAGEMENT (Knisel)**

- National Flood Insurance Program floodplain management requirements
- Massachusetts Wetlands Protection Act and Land Subject to Coastal Storm Flowage
- Nature-based/living shorelines for storm damage prevention and flood control

Readings

- Pew Charitable Trusts, 2016, *Living Shorelines Provide Better Habitat and Erosion Protection Than Bulkheads: A Q&A with marine ecologist Rachel Gittman*, www.pewtrusts.org/en/research-and-analysis/q-and-a/2016/07/living-shorelines-provide-better-habitat-and-erosion-protection-than-bulkheads
- Woods Hole Group, 2017, *Living Shorelines in New England: State of the Practice*, www.conservationgateway.org/ConservationPractices/Marine/crr/Documents/Final_StateofthePractice_7.2017.pdf

## CONCLUSION / COURSE SYNTHESIS

**Dec. 10** **SUSTAINABLE COMMUNITIES (Knisel & Pillsbury)**

- Sustainable management of water resources under a changing climate
- Community and stakeholder engagement

Readings

- UN-Water, 2010, *Climate Change Adaptation: The Pivotal Role of Water,* Policy Brief, www.unwater.org/publications/climate-change-adaptation-pivotal-role-water
- Lincoln Institute of Land Policy, 2012, *Managing Risk and Uncertainty: Collaborative Approaches for Climate Change*, Land Lines, July 2012, pp. 16-21, www.lincolninst.edu/publications/articles/managing-risk-uncertainty
- Natural Resources Defense Council, 2011, *Thirsty for Answers: Preparing for the Water-Related Impacts of Climate Change in American Cities* (excerpts for Boston, Chicago, St. Louis, and Phoenix), www.nrdc.org/resources/thirsty-answers-preparing-water-related-impacts-climate-change-american-cities

- Trust for Public Land and National Association of Local Government Environmental Professionals (NALGEP), 2003, *Smart Growth for Clean Water*, www.tpl.org/smart-growth-clean-water