Marine Studies Consortium
WATER RESOURCES PLANNING & MANAGEMENT

Fall 2018 Course Syllabus
Thursdays 6:00-9:00 PM
Wheaton College, Mars Center for Science & Technology, Room 1141

Instructors:

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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

Discussion of each resource area will include:

- Description of the resource
- Functions and values of the resource
- Human uses and impacts
- Policy issues
- Management techniques
- Case study
- Connection to other resources areas

Guest speakers who have knowledge and experience through public agencies and non-profit advocacy organizations may join the discussion.

See marinestudiesconsortium.org for more information.

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:

- Boundary definitions: how to delineate resource areas such as watersheds.
- 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 (some copies will be provided and other resources are available online).
- **Participate** in class discussions and a field trip.
- **Attend** a local or regional meeting, workshop or symposium.
- Complete **three assignments** (written assignment, oral class presentation, and final project).
- Be **creative, network** and **have fun!**

Assignments and Grading:

Students are expected to complete all reading assignments before each class session, participate in discussion, attend a field trip, and attend one external meeting, workshop or other public forum (20%). Each student must also prepare a written assignment (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.

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, actively engage in class discussions, and participate in a field trip (below).

- **Waquoit Bay National Estuarine Research Reserve**, Oct. 20, 131 Waquoit Highway, Waquoit

  If severe weather develops, the field trip may be rescheduled to Oct. 21. In this case, an email will be sent to the class by noon on Oct. 19.

In addition, students are required to attend one local or regional meeting, workshop, symposium, conference, or other public forum on a topic related to the course. Please seek approval from instructor(s) prior to registering or attending an event and be prepared to provide brief highlights during the following class. For example, here are a variety of relevant events this fall:

Conservation Commission Meetings and Workshops

- **Dedham Conservation Commission**, Thu., Oct. 18 at 7:00 PM, Dedham Town Hall, 26 Bryant St., Dedham
- **Easton Conservation Commission,** generally every other Mon. (Sep. 17, Oct. 1, Oct. 15, Nov.5, Nov. 19) at 6:30 PM, Town Hall, Mary Connolly Meeting Room, 136 Elm St., Easton
- **Framingham Conservation Commission**, 1st and 3rd Wed. (Sep. 19, Oct. 3, Oct. 17, Nov. 7, Nov. 21) at 7:00 PM, 150 Concord St., Blumer Community Room, Framingham
- **Mansfield Conservation Commission,** one Mon. per month (Sep. 17, Oct. 15, Nov. 19), Mansfield Town Hall, 6 Park Row, Mansfield
- **Norton Conservation Commission,** generally 2nd and 4th Mon. (Sep. 10, Sep. 24, Oct. 22, Nov. 19) at 7:00 PM, Norton Municipal Center, 70 East Main St., Norton

- **Raynham Conservation Commission,** 1st and 3rd Wed. (Sep. 19, Oct. 3, Oct. 17, Nov. 7) at 5:30 PM, Raynham Town Hall, 558 South Main St., Raynham
- **Walpole Conservation Commission**, generally 2nd Wed. at 7:00 PM, Walpole Town Hall, Room 112
- **West Bridgewater Conservation Commission,** 1st and 3rd Tue. (Sep. 18, Oct. 2, Oct. 16, Nov. 6, Nov. 20) at 6:30 PM, West Bridgewater Town Hall, 65 N. Main St., West Bridgewater
- **Weston Conservation Commission,** 2nd and 4th Tue. (Sep. 25, Oct. 9, Oct. 23, Nov. 6, Nov. 20) at 7:30 PM, Weston Town Hall, 2nd Floor Building Dept. Conference Room, 11 Town House Rd., Weston
- **Massachusetts Association of Conservation Commissions (MACC) Fall Conference,** TBD
- **MACC Fundamentals of Wetlands Enforcement,** Sat., Dec. 1 from 9:00 AM to 11:30 AM, Ames Public Library, Queset House, 53 Main St., North Easton

  This fundamentals unit will include information on applicable laws, regulations and suggestions for developing a good enforcement case. Included in the training will be case studies and participatory scenarios.

  Contact: Lindsay Martucci at staff@maccweb.org or 617-489-3930 ($40 for students)

Other Regulatory and Planning Meetings

- **Massachusetts Marine Fisheries Advisory Commission Meetings,** Oct. 11 and Nov. 8 at 9:00 AM, DFW Field Headquarters, 1 Rabbit Hill Rd., Westborough

Cleanups and Other Events

- **Cleanup of Assabet, Sudbury and Concord Rivers,** Sat., Sep. 15 from 9:00 AM to noon, cleanup meeting locations along Assabet, Sudbury and Concord Rivers

  Contact: office@oars3rivers.org or 978-369-3956
- **Coastsweep – Coastal Cleanups,** various locations and dates through Nov.

  Sep. 15, Horseshoe Beach, Westport, Contact: eperry@bchs.com or 401-524-4738

  Sep. 15, Nelson Park and Beach, Plymouth, Contact: Carlos.Fragata@mass.gov or 508-946-2873

  Sep. 22, Westport Town Beach/East Beach, Westport, Contact: outreach@wrwa.com or 508-636-3016

  Sep. 29, Plymouth Beach, Plymouth, Contact: dmacado@yahoo.com or 508-612-0469

  Sep. 30, Fort Phoenix Town Beach, Fairhaven, Contact: bethesolutiontopollution@gmail.com

  Oct. 7, Nantasket Beach, Hull, Contact: loverealtysales@gmail.com or 617-834-5840

- **Cycle to the Source Cambridge Watershed Bike Tour,** TBD, Walter J. Sullivan Purification Facility, Cambridge
- **Massachusetts Ecosystem Climate Adaptation Network Conference,** Tue., Oct. 30, Framingham State University
- **Neponset River Cleanup,** Sat., Sep. 22 at 8:00 AM, Martini Shell parking lot, 1015 Truman Parkway, Hyde Park (Boston), Contact: Andres Ripley at ripley@neponset.org or 781-575-0354 x306
- Check **North & South Rivers Watershed Association Events**
- **The 1898 Portland Gale: The Storm that Changed the River's Mouth Walk,** Sat., Nov. 24 from 11:00 AM to 12:30 PM, Rexhame Beach, Marshfield

  Join Kezia Bacon, nature columnist, for a tour of the Rexhame Dunes, which prior to 1898 was the location of the mouth of the North & South Rivers. Kezia will explain how the storm known as the Portland Gale changed the course of the rivers.

Water Resources Webinars

- Check **OneNOAA Science Seminars**

Written Assignment (25%) – due Oct. 11

For this written assignment, students will select a resource area and ***current*** impact to research and analyze. Findings and a position on the issue should be presented 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)

Topic Proposal*:* A short proposal (1-2 paragraphs) describing the topics you selected for ***both the written assignment and class presentation*** (described below) must be submitted to the instructor(s) by **Sep. 20**.

Class Presentation (25%) – due Nov. 8 & Nov. 15

Identify a case study (preferably on a different topic than your first assignment) and prepare a presentation to be given to the class. 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 **20 minutes**, followed by questions and class discussion. Presentation times will be assigned in class on **Sep. 27**.

Grading:

- **Topic Focus (20 pts.)**: topic relevant to management and protection of water resources in a particular location or by a group across a region
- **Format (25 pts.)**: presentation style effectively communicated the case study
- **Depth of Discussion (25 pts.)**: included pertinent content for the class to understand the issue and management or protection action(s)
- **Cohesiveness (10 pts.)**: information from all sources related and tied together
- **Citations (5 pts.)**: credited sources on visual aids (where appropriate)
- **Time (5 pts.)**: adhered to time limit of 20 minutes
- **Response to Questions (10 pts.)**: addressed questions from the class

Final Project (30%) – due Dec. 6

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

Summary of Important Dates	
Sep. – Nov.	meeting/workshop participation
Sep. 20	proposal for written assignment and class presentation due
Sep. 27	presentation times assigned
Oct. 11	written assignment due
Oct. 18	no class (break for field trip and opportunity to attend public meeting)
Oct. 20	Waquoit Bay National Estuarine Research Reserve field trip
Oct. 21 (RAIN DATE)	Waquoit Bay National Estuarine Research Reserve field trip
Nov. 8, Nov. 15	class presentations
Nov. 22	no class (Thanksgiving)
Dec. 6	final project and class

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

September 6 HYDROLOGIC CYCLE (Knisel & Pillsbury)

- Course overview including purpose, readings, assignments, and grading
- Class introductions through brief interviews
- Discussion: hydrologic cycle; drought; sustainable development and water

Reading

- EPA *Watershed Academy Training Module: Wetland Functions and Values* online at https://cfpub.epa.gov/watertrain/moduleFrame.cfm?parent_object_id=262

COASTAL FLOODPLAINS

September 13 RESOURCES & IMPACTS (Knisel)

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

Readings

- Massachusetts Office of Coastal Zone Management, 2015, *Interpreting Federal Emergency Management Agency Flood Maps and Studies in the Coastal Zone*, p. 1-9, online at www.mass.gov/eea/docs/czm/stormsmart/interpreting-fema-flood-maps.pdf
- Climate Ready Boston, 2016, *Climate Change and Sea Level Rise Projections for Boston*, p. 1-20, online at climateready.boston.gov/findings
- Massachusetts Sea Level Rise and Coastal Flooding Viewer online at www.mass.gov/service-details/massachusetts-sea-level-rise-and-coastal-flooding-viewer

September 20 POLICY & MANAGEMENT (Knisel)

- National Flood Insurance Program floodplain management requirements
- Massachusetts Wetlands Protection Act and Land Subject to Coastal Storm Flowage
- Green infrastructure/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*, online at 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, online at www.conservationgateway.org/ConservationPractices/Marine/crr/Documents/Final_StateofthePractice_7.2017.pdf

RIVERS & WATERSHEDS

September 27 RESOURCES & IMPACTS (Pillsbury)

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

Readings

- Office of Technology Assessment, Water Supply: the Hydrologic Cycle
- Mass Audubon, Watershed Decisions, Chapter 1 (p. 1-9)
- Mass. Executive Office of Environmental Affairs, Living Waters
- NE Interstate Water Pollution Control Commission, *Pollution from Everywhere,* 2017
- Environment America, *When It Rains It Pours,* 2012

October 4 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

- Mass Audubon, Watershed Decisions, Chapter 4 (p. 61-75)
- Postel, Sandra, Water – Adapting to a New Normal
- Albert, Richard C., *In-Tocks-icated: The Tocks Island Dam Project*
- EPA, *Growing Towards More Efficient Water Use*

ESTUARIES

October 11 RESOURCES & IMPACTS (Knisel)

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

Readings

- Restore America's Estuaries, *The Economic Value of Coasts and Estuaries*, Executive Summary online at www.estuaries.org/images/stories/docs/policy-legislation/executive-summary-final.pdf
- 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*, online at www.washingtonpost.com/graphics/2017/investigations/harvey-urban-planning/?utm_term=.8d4866132ec1
- Beach, D., 2002, *Coastal Sprawl: The effects of urban design on aquatic ecosystems in the United States*, Sections I-III, p. 1-17, online at www.pewtrusts.org/en/research-and-analysis/reports/2002/04/08/coastal-sprawl-the-effects-of-urban-design-on-aquatic-ecosystems-in-the-united-states

October 18 ***NO CLASS (break for field trip and public meeting participation)***

October 20 ***WAQUOIT BAY NATIONAL ESTUARINE RESEARCH RESERVE FIELD TRIP (Knisel & Pillsbury)***

October 25 **POLICY & MANAGEMENT (Knisel)**

- Coastal stormwater best management practices (BMPs)
- No Discharge Zones for boaters

Readings

- 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, online at 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*, online at www.mass.gov/service-details/no-discharge-zones-ndzs

GROUNDWATER & AQUIFERS

November 1 **RESOURCES & IMPACTS (Pillsbury)**

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

Readings

- Mass. Audubon, Groundwater Flyers # 1 & 2
- Horsley, Witten, Hegemann, Inc., Groundwater Hydrology, pp. 1-1 to 1-12; 2-1 to 2-9; 3-1 to 3-29

November 8 **POLICY & MANAGEMENT (Pillsbury)**

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

Readings

- Mass. Audubon, Groundwater Flyers, # 4
- Horsley, Witten, Hegemann, Inc, Ground Water Hydrology, Contamination, and Management, pp. 3-34 to 3-51
- Witten, Jon, The Basics of Groundwater Protection

MARINE RESOURCES

November 15 RESOURCES & IMPACTS (Knisel)

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

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, online at http://neoceanplanning.org/wp-content/uploads/2016/10/Northeast-Ocean-Plan-Chapter-1.pdf
- Northeast Coastal Acidification Network, *Overview of Acidification in the Northeast Region*, online at 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), online at https://esajournals.onlinelibrary.wiley.com/doi/full/10.1002/ehs2.1258

November 22 *NO CLASS (Thanksgiving)*

November 29 POLICY & MANAGEMENT (Knisel)

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

Readings

- Ocean Renewable Power Company, 2015, Cobscook Bay Tidal Energy Project Environmental Monitoring Report, online at www.orpc.co/permitting_doc/2015-Environmental-Monitoring-Report.pdf
- Executive Office of Energy and Environmental Affairs, 2015, *Massachusetts Ocean Management Plan*, c. 2, Management, online at www.mass.gov/eea/docs/eea/oceans/ocean-plan/2015-ocean-plan-v1-complete-low-res.pdf

CONCLUSION / COURSE SYNTHESIS

December 6 SUSTAINABLE COMMUNITIES (Knisel & Pillsbury)

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

Readings

- UN-Water, *Climate Change Adaptation: The Pivotal Role of Water,* Policy Brief
- Lincoln Institute of Land Policy, *Managing Risk and Uncertainty: Collaborative Approaches for Climate Change*, Land Lines, pp. 16-21, July 2012
- Natural Resources Defense Council, *Thirsty for Answers: Preparing for the Wate-Related Impacts of Climate Change in American Cities* (excerpts for Boston, Chicago, St. Louis, and Phoenix)
- Trust for Public Land and National Association of Local Government Environmental Professionals (NALGEP), 2003, *Smart Growth for Clean Water*, online at www.tpl.org/smart-growth-clean-water

Introductory Student Interview

Name:

Academic or professional affiliation and major subject:

Home community, state, country, and watershed:

Why are you taking this course? What do you hope to get out of it? How does it fit with your academic interests and career goals? Have you taken any other Marine Studies Consortium classes?

Discipline of most interest (e.g., public policy, engineering, citizen advocacy, education, journalism, scientific research, technical, legal, business, or planning):

Water resource areas of most interest (e.g., aquifers, watersheds, rivers, coastal resources, or oceans):

Issues of most interest (e.g., non-point pollution, alternative wastewater treatment, marine mammals, pollution prevention, fisheries, of climate change):

Other comments, observations, or questions: