Marine Urban Ecology

I. Course Description:

Urban ecology is an emerging, interdisciplinary field that aims to understand how human and ecological processes can coexist in human-dominated systems. This course will focus on the modern-day ecological challenges of the greater Boston area, as a result of current or historical human-induced disturbance. Topics include the impact of toxic releases, invasive species, coastal and urban development, fishing and whaling, and politics on ecosystems such as the rocky intertidal, saltmarshes, local rivers (Charles, Mystic, and Neponset), the Boston Harbor, and Cape Cod. In the laboratory portion of the course, students will collaborate on original research projects investigating a single urban event and determining how to test the ecological ramifications thereof. Projects will be evaluated based on both a scholarship component and an experimental design component. The course will include fieldtrips and guest lectures by a number of local experts. This course is offered during Block 2 of the Fall 2011 Marine Semester.

II. Prerequisites: Admission to the Marine Semester.

III. Instructor:

Dr. Randi Rotjan
New England Aquarium
Office Hours: Individually arranged appointments;
Phone: 617-226-2139
E-mail: rrotjan@neaq.org

Teaching Fellow: Liz Burmester
Email: eburmest@bu.edu

IV. Grading

25% of your grade will be based on the quality of your research and a final oral research report, the topic of which will be determined in week 1 to enable a full 3.5 weeks of preparation. Discussion and collaboration among students is encouraged, but I will also be looking for signs of individual effort, scientific logic, and creativity. Hard work and enthusiastic participation will be well rewarded. There are many paper discussions; participation in those sessions will be worth 50% of your grade (both the amount and quality of participation will be taken into account). The remaining 25% of your grade will be based on small assignments given throughout the course, including the scavenger hunt presentations, short quizzes & assignments, etc.

V. Readings & Other Resources

- Background Readings for each day (Available as .pdf files on the course website):
  - *Selections from the primary & popular literature, listed below*
- ***Boston: A Topographical History*** by Walter Muir Whitehill and Lawrence W. Kennedy
- ***Urban Ecology*** by Marzluff, Shulenberger, Endlicher, Alberti, Bradley, Ryan, Simon, ZumBrunnen
- ***Urban Ecology: Patterns, Processes, and Applications*** by Niemela, Breuste, Guntenspergen, McIntyre, Elmqvist, and James
- ***Mapping Boston***, by Krieger, Cobb, and Leventhal

VI. Lecture & Research Schedule

Attendance at all lectures, paper discussions, collecting trips, and laboratory sessions is mandatory. Your final grade will be penalized 2.5% for each unexcused absence from a lecture or lab session.

WEEK 1: *Urban Ecology in Boston*

Monday, October 3

Readings

- ➔ Schochat et al. 2006 TREE
- ➔ Urban Ecology & the Marine Realm: TREE 2008
- ➔ Science 2011 – Update & projections on human population

AM: **Lecture 01.** Course layout, description, and expectations
Class Introductions: Why are we all here?
Lecture 02. What is urban ecology? / Water services in urban landscapes

PM: **Lecture 03.** The Ecology of Urban Ecology, part 1
Seminar Discussion: TREE 2008 paper
Brainstorming session for project topics (for final presentation)

Tuesday, October 4

Readings

- ➔ The Asphalt Jungle
- ➔ Evolution Right Under Our Noses
- ➔ Habitat analogues and reconciliation ecology in urban and industrial environment

AM: **Lecture 04.** The Ecology of Urban Ecology, cont'd

PM: Seminar Discussion: all readings
Determine dependent variables for independent projects – break out session
Preparation for RARGOM – what is it; key abstracts
How to attend a professional meeting
Preliminary project ideas, question, hypotheses, and materials needed due

Wednesday, October 5

Field trip: Attend RARGOM Annual Science Meeting in Portsmouth, NH (lunch included): The nexus between climate change and marine spatial planning ***[Confirmed]***

Lecture 05. KEYNOTE: ***Michael K. Orbach****, Professor of the Practice of Marine Affairs and Policy Nicholas School of Environment, Duke University, "The New Human Condition: The 'Total Ecology' of Marine Spatial Planning"*
Lecture 06. KEYNOTE: ***Robert S. Steneck****, Professor at the School of Marine Sciences, University of Maine, "Winds of Change: Marine Spatial Planning in an era of Rapidly Shifting Baselines"*
Questionsand/or summary on each talk due

Thursday, October 6

Readings

AM: RARGOM Discussion
Scavenger Hunt prep

PM: Scavenger Hunt! (lunch included)

Friday, October 7

Readings

- ➔ McMahon and Cuffney 2000 – Quantifying urban intensity in drainage basins for assessing stream ecological conditions (Project Prep)

AM: *Scavenger Hunt Presentations* & Discussion

PM: Seminar discussions on readings
Create weekend "to do list" for individual projects
Lecture 07. Marine Urban Ecology Globally & Locally

WEEK 2: *Marine Pollution in Urban Areas*

Monday, October 10

COLUMBUS DAY OBSERVED – NO CLASS

Tuesday, October 11

Readings

- ➔ Barton 2002 – Stress in Fishes
- ➔ Wikelsi and Cooke 2006– Conservation physiology
- ➔ Davis 2002 – Key principles for understanding fish bycatch discard mortality

AM: **Lecture 08.** *John Mandelman, New England Aquarium:* The stress physiology of fishes in urban oceans
Seminar Discussion: all readings

PM: Project Discussions: Creating data sheets, experimental design, statistical analysis plan
Preliminary experimental design & data sheets due
Project begins – ready, set, measure!

Wednesday, October 12

Readings

- ➔ Shapiro 2011 – Sustainable land design in urban runoff management
- ➔ Reifel et al 2009 – Impacts of stormwater runoff in the Southern California Bight
- ➔ Butler and Orians 2011 – Ecological Engineering Facilitation
- ➔ P. 1-32 EPA Green Infrastructure Case Studies: Municipal policies for managing stormwater with green infrastructure

AM: A morning at the movies: Reduce Runoff: slow it down, spread it out, soak it in
Lecture 09. *Colleen Butler, Tufts University*: Green Roofs and their relationship with water
Seminar Discussion: all readings
Discussion: solving problems in your town with green infrastructure

PM: Projects in the field – Nahant, Mystic River

Thursday, October 13

Readings

- ➔ Water Quality Tests
- ➔ Nacci et al 2009 – Evolution of tolerance to PCBs and susceptibility to a bacterial pathogen in Atlantic killifish from New Bedford Harbor
- ➔ A brief history of water in Boston

AM: **FREE – work on projects**

PM: Seminar Discussion: all readings
Projects – Field Trip Water quality analysis with *Nina Fischer*, New England Aquarium

Friday, October 14

Readings \

- ➔ http://www.savebuzzardsbay.org/page.aspx?pid=279
- ➔ http://www.savebuzzardsbay.org/page.aspx?pid=304
- ➔ http://epa.gov/nbh/data.html

Field trip (all day): Buzzards Bay Coalition, with Robert Hancock ***(bring wellies and waders!)***

Introduction, water sampling, lunch career discussion, visit 3 restoration sites, cleaning up the Bay discussion

WEEK 3: *Energy & Sewage*

Monday, October 17

Readings
- ➔ Rowe and Hutchings 2003 – Mating systems and the conservation of commercially exploited marine fish
- ➔ NOAA Essential Fish Habitat Report on the Atlantic Cod (1999)

AM: **Lecture 10.** *Dan Ullucci, Rhodes College:* The history of cod decline in New England *(with Jess Pesce)*
Seminar Discussion: all cod-related readings

PM: Projects (potential trips to the field – Nahant, Mystic River, etc).

Tuesday, October 18

Readings
- ➔ 1-page Seabrook fact sheet
- ➔ Saila et al 1997 – Equivalent adult estimates for losses of fish eggs, larvae, and juveniles at Seabrook Station
- ➔ Burger et al 2011: Information needs for siting new, and evaluating current, nuclear facilities: ecology, fate and transport, and human health

Field trip:
AM: 9:30 am Seabrook Station Science & Nature Visitors' Center
The Owascoag Salt Marsh Nature Trail

PM: Seminar discussion: all readings; visit local sites

Wednesday, October 19

Readings
- ➔ Toward a healthy harbor
- ➔ Ricca and Cooney 1998 – Coliphages and indicator bacteria in birds around Boston Harbor
- ➔ Ryan, Lachmayr et al 2001 – Developmental effects of PCBs on the hard clam *Mercenaria mercenaria*
- ➔ Lachmayr et al 2009 – Quantifying nonspecific TEM B-Lactamase genes in a wastewater stream

AM: **Lecture 11.** *Karen Lachmyer, Harvard University:* Microbes and water quality in Boston Harbor
Seminar Discussion: all readings

PM: PROJECTS – ***possible trip to Gloucester - TBD***

Thursday, October 20

Readings
- ➔ Siegener and Chen 2002 – Caffeine in Boston Harbor seawater
- ➔ Hunt and Slone 2010 – Long-term monitoring using resident and caged mussels in Boston Harbor yield similar spatial and temporal trends in chemical contamination
- ➔ Lee et al 2004 - Ciliate populations as bio-indicators at Deer Island Treatment Plant

Field trip:
AM: 9:30- Arrive Deer Island Sewage Treatment Plant

PM: Meet with *Polly Reeve and Margaret Coyle Nestler* - Judge Mazzone Memorial

Friday, October 21

AM: Free – work on projects

PM: Free – work on projects

WEEK 4: *Wrap-up*

Monday, October 24

➔ Pickett et al 2011 – Urban ecological systems – scientific foundations and a decade of progress

AM: **Lecture 12:** How to give an effective scientific presentation
Seminar discussion on Pickett et al 2011

PM: Free – work on projects

Tuesday, October 25

All day preparation for final presentations

Wednesday, October 26

Final presentations (combined with Coastal Biogeochemistry – Prof. Fulweiler)

VII. Academic Conduct

It is each student's responsibility to know and understand the provisions of the Academic Conduct Code in the College of Arts and Sciences. The Code is available online at http://www.cs.bu.edu/ugradprogram/conduct.html. Cases of suspected misconduct will be referred to the Dean of the College. If the Dean's office comes to the conclusion that cheating or plagiarism have occurred, a grade of zero will be awarded for the assignment in question.

October Calendar – MARINE URBAN ECOLOGY

◄ September	~ October 2011 ~					November ►
Sun	**Mon**	**Tue**	**Wed**	**Thu**	**Fri**	**Sat**
						1
2	**3** Class Begins AM: 9-11 Intro Lecture PM: Project Assignment 12-4 **BRB 115**	**4** AM: Lecture + seminar PM: Prep for RARGOM **BRB 115**	**5** **RARGOM** **OFFSITE**	**6** AM: RARGOM discussion & Scavenger Hunt prep – **BRB 115** PM – Scavenger Hunt **OFFSITE**	**7** AM: Scavenger Hunt presentations 9-11 PM: Lecture + Seminar 12-4 **BRB 115**	**8**
9	**10** **NO CLASS** (Columbus Day)	**11** AM 9-12 J. Mandelman (urban stress physiology) Lecture + seminar **LSEB 103, 9:00 - 12:00** PM: Projects **OFFSITE**	**12** AM: C. Butler (green roofs) Lecture + seminar **9-12 BRB113** PM: Projects **12-4 BRB115**	**13** AM 9-12: WORK ON PROJECTS **OFFSITE** PM: Buzzards Bay Seminar Water quality lab @ **NEAq (OFFSITE)**	**14** **Buzzards Bay field trip** **OFFSITE**	**15**
16	**17** AM: D. Ullucci & J. Pesce (Cod decline) Lecture + seminar **9-12 LSEB 103** PM: Projects **OFFSITE**	**18** **Seabrook field trip** **OFFSITE**	**19** AM: Projects **OFFSITE** PM: K. Lachmyer (microbes in Boston Harbor) Lecture + seminar **ROOM TBD**	**20** **Deer Island field trip;** + Mazzone Memorial **OFFSITE**	**21** Projects all day **BRB 115**	**22**
23	**24** AM: Lecture & Seminar PM: Projects **BRB 115 (except 11-12) & OFFSITE**	**25** Projects all day **LSEB 103, 9:00 – 4:00**	**26** **Final Project Talks** **BRB 113**	**27**	**28**	**29**
30	**31**	**Notes:** **Lecture = formal lecture by myself or a guest** **Seminar = paper discussion of readings assigned – come prepared!**				