

The **Piedmont Project** sustainability teacher training was very helpful for me in developing two activities aimed at increasing sustainability awareness on campus. I also appreciated discussing what sustainability *means* to different people, and offer my own slightly different perspective.

The first planned activity, not a formal curricular offering but intended as a complement to classroom activities, is a **documentary film festival intended to raise awareness of water scarcity challenges and the regional need for water conservation in Atlanta**. This series, pending funding, opens with a guest lecture from a USGS hydrologist to talk about how Atlanta is connected to the broader Southeast watershed, and how decisions made here to conserve or waste potable water have direct impacts on the saltwater intrusion affecting coastal communities further down-river (e.g., in Florida). Then, spread over Spring Semester, the film series would show five (three full length, two short) documentary films about water, including visits from the filmmakers where possible. It would close with a panel of water experts from Emory discussing major issues in water sustainability. I have identified a philanthropic funder who may be interested, and am applying for their support now (their RFA has a July 1 deadline). I benefited from the Piedmont Project here by seeing greater connections between arts and sustainability education than I had appreciated prior to hearing poetry, speaking with linguists etc. this session.

The second project, a hypothetical course offering I am developing with ideas from the Piedmont Project, is an **Oceans and Human Health elective course**, explaining how the fate of the oceans and the fate of humanity are intertwined. I had previously been working on this syllabus for over a year, but learned from math teachers participating in the Piedmont Project about what kinds of “baby steps” are needed in order for computer labs to be workable for students without a strong prior programming skill-set. Their pedagogical advice is reflected in the revised syllabus with ungraded Lab 0 introducing basics like “how to load in a file” and “basic computer commands”.

One aspect of the Piedmont Project which I appreciated was the discussion of alternative definitions of sustainability. Many of the definitions presented in class presented economic sustainability as comprising about 1/3 of the sustainability challenge. My class therefore devotes one reading to cost estimation (cost of poop at the beach in Orange County: week 3’s reading #1) but the rest of the class discusses the benefits and problems without using an explicitly economic framing. I feel public appreciation of sustainability has now reached a “critical mass” where people can often appreciate the inherent value of actions that make people and the planet healthier, without necessarily needing to quantify those benefits at every stage. My hope is that we will move to a future definition of “sustainability” where the economic benefits are a welcome *bonus*, an *afterthought*. This is not to dismiss the very real “triple bottom line” benefits of sustainable leadership, but I hope that we can begin to draw on broader ethical language (i.e., virtue ethics and deontological ethics) than utilitarianism to explain sustainability’s value for a broader range of people (including not-quantitatively-minded), and shift to less of a demand for quantification of hard-to-calculate benefits as a prerequisite for low-cost, beneficial actions.

OCEANS AND HUMAN HEALTH (3 credits)
Spring Semester 2017

Instructor: Matthew Gribble, Ph.D. (matt.gribble@emory.edu)

Room: Claudia Nance Rollins Building, Room TBD

Time: Tuesdays and Thursdays 11 AM-12:20 PM (may be shifted)

Office Hours: By appointment

Course Summary: This course provides an overview of several of the connections between the oceans and public health. It involves lectures, hands-on data analysis exercises (“labs”), and, pending concordance with student schedules with one day off-schedule, an optional Friday field trip to the Georgia Aquarium for a “Science on Tap” lecture (their program opens at 6 PM).

Course Prerequisites: EH 530 and EH 540, or consent of instructor

Course Objectives: By the end of this course, you should be able to:

- Identify several of the major chemical constituents of seafood, and their health implications
- Describe cultural dimensions of vulnerability (i.e., fishing and surfing communities)
- Implement and interpret statistical analysis of real-world coastal environmental health data including examples from psychosocial health, ecotoxicology, and risk assessment
- Synthesize and communicate in written form complex information on coastal and marine environmental health challenges, and prepare evidence-based recommendations.

Strengthening Public Health Competencies: By the end of this course, you should be better able to do the following:

- Describe environmental conditions, including biological, physical, and chemical factors, that affect the health of individuals, communities and populations
- Use analytic reasoning and quantitative methods to address questions in public health and population-based research
- Assess global forces that influence the health of diverse populations around the world.
- Describe major environmental risks to human health ranging from the local to the global scale
- Apply the principles of epidemiology to assess health effects of environmental exposures
- Communicate the key methods, findings and public health implications of research on a poster and verbally to an audience of public health professionals
- Critically evaluate the strengths and weaknesses of different study designs with respect to a given research question
- Utilize information technology tools and statistical programming packages in preparing scientific reports

- Conduct basic research using multivariable models
- Recognize potential ethical and legal issues in epidemiologic studies

Course Description: This course canvasses a broad sweep of topics in the Oceans and Human Health umbrella but is not comprehensive. There are a very large number of ways that the oceans and human health are interconnected.

Course Philosophy: This course is intended to hone your skills in public health data analysis and study design by applying those skills to an important, broad and fascinating theme in environmental health: the reciprocal importance of marine environmental conditions and human well being.

Grading:

Class Participation: 25%

Lab 1: Happiness at the Beach: 15%

Lab 2: Mercury and Seafood: 15%

Lab 3: Clean Water Act and Sediment Quality: 15%

Choice of Take-Home Final Exam or Research Write-Up and In-Class Presentation: 30%

Evaluation Framework:

Class participation will be evaluated based on regular attendance (expectation of arrival on time, with no more than two unexcused absences), asking thoughtful questions, contributing to a positive classroom environment, and participating in small group exercises in class. Note: In week 4, much of a class session will be in a journal club format, with groups reading and presenting a summary of a journal article.

Lab 0 is a preparatory, ungraded data analysis lab that will orient you to major features of the R programming language and prepare you to follow the instructions in the following graded labs. *Lab 1, Lab 2, and Lab 3* are data analysis exercises for which you will be provided the data and some but not all data analysis instructions. These will be graded based on completion and accuracy. Time will be devoted to work on these in class but you may also work on these from home computers, the data are not sensitive. Labs are due one week after assigned. No late labs will be accepted except in cases of medical or other emergency. Note: these lab datasets are not necessarily “real” data; they may have been modified for use in a teaching setting rather than being the complete research record. It is possible that interested students may be able to apply for access to the “real” data for a thesis or capstone project doing a related secondary data analysis; schedule an office hour visit to discuss with the instructor if intrigued by one of the labs.

OPTION 1: Final Exam. The final exam will be a take-home, open-book exam which you will have an up-to-three hour block to complete once you start (timed on Blackboard). It may be comprehensive of materials and concepts covered in class (perhaps including illustrative examples from outside of class slides, of ideas discussed in class) and may be challenging.

OPTION 2: Research Project. In lieu of the final exam, you may elect to complete a short research project as an independent endeavor from the class, based on an existing and accessible dataset. Students electing this option must consult with the instructor in the first week of class to identify a suitable project. Students electing this option are expected to summarize their project in writing in the form of a scientific manuscript (Introduction, Methods, Results, Discussion sections), and also to present in class a 10 minute oral presentation of their work. The grade for this will be weighted 2/3 written summary, 1/3 oral presentation.

Office Hours: There will be regularly scheduled office hours. However, the instructor is responsive to emails and is happy to schedule additional office hours with students for additional help as needed.

Course Readings: Readings for this course will be available as .pdfs from the Blackboard site. We will emphasize scientific literature on current topics over textbook readings. However, interested students are encouraged to consider the following textbook for additional coverage of Oceans and Human Health themes:

Oceans and Human Health: Implications for Society and Well-Being. 2014. Wiley-Blackwell, 318 pages. Eds. Robert E. Bowen, Michael H. Depledge, Cinnamon F. Carlane, Lora E. Fleming. ISBN: 978-1-119-94131-6.

Lab Objectives:

Psychology and the Ocean: Describe the potential benefits of coastal natural environments for positive psychology, and the potential harms of coastal environmental degradation (i.e. oil spills).

Lab 1: Happiness at the Beach

Seafood Safety: Follow mercury from industrial sources (i.e. coal), through ecological systems, into human exposure via contaminated fish. Discuss various epidemiological and toxicological insights into mercury's cardiovascular, immunological, and developmental neurological risks. Highlight some of the epidemiological issues that complicate mercury studies, including measurement issues (i.e., biomarker variability), dose modification (i.e., by selenium) and confounding (i.e., negative confounding of cardiovascular risks by fish oils).

Lab 2: Mercury and other common exposures in seafood

Clean Water Act Regulatory Frameworks: Explore nuances of the Clean Water Act using the California regulatory framework as a case study. Describe the sediment quality objectives framework, ongoing controversies, stakeholders and policy considerations. Consider strengths and weaknesses of the “three lines of evidence” approach and challenges in interpreting real-world regulatory testing data.

Lab 3: Southern California Coastal Quality: Sediment Quality Objectives Database data analysis

Last Day of Class: Student Presentations: Share information gained from term paper research with the class. If no students elect the “Research” option, pending permission from the Registrar, we will instead administer the final exam in class rather than as a take-home exam (and the length will be correspondingly shortened), or offer a guest lecture or alternative activity.

Class Schedule:

Week	Day	Topic
1	T	Introduction to Oceans and Human Health; Go over syllabus <i>Reading: The Blood Harvest (2014 journalistic article in the Atlantic).</i> http://www.theatlantic.com/technology/archive/2014/02/the-blood-harvest/284078/
	Th	Flow of toxic chemicals through the environment; Marine Sentinel Species Lab 0: Introduction to Using R <i>Reading: Fair et al 2009, Environmental Research</i>
2	T	Lecture: Harmful Algal Blooms with emphasis on the Florida Beach Cohorts <i>Reading: Fleming et al. 2011, Harmful Algae</i> <i>Reading: Gingold, Strickland and Hess 2014, Environmental Health Perspectives</i>
	Th	Lab 1: Positive Psychology and the Beach <i>Reading: Hipp and Ogunseitan 2011, Journal of Environmental Psychology</i>
3	T	Lecture: Poop at the Beach (and intro to Environmental Health Economics) <i>Reading: Given, Pendleton and Boehm 2006 Environmental Science & Technol.</i>
	Th	Lecture: Surfing and Beach Sport Injury Risks vs. The Blue Gym <i>Reading: Furness et al. 2015, American Journal of Sports Medicine</i> <i>Reading: Wheeler et al. 2012, Health and Place</i>
4	T	Lecture: Seafood Contaminants and Culturally Appropriate Research with Vulnerable Populations (Journal Club Student-Led Format) <i>Documentary: Utsuk: A Story of Fat</i> https://vimeo.com/125414095 <i>Group 1 Reading: Kirk et al. 2012, Environmental Research</i> <i>Group 2 Reading: Laird et al. 2013, Journal of Nutrition</i> <i>Group 3 Reading: Sheehan et al. 2014, Bulletin of the World Health Organization</i>
	Th	Lab 2: Mercury in Seafood <i>Reading: Gribble et al. 2015, Journal of the Marine Biological Assoc. of the UK</i>
5	T	Lecture: Whalers, Sport Fishermen and Sport-Fish Consumer Cohorts <i>Reading: Turyk et al. Environmental Research 2015</i> <i>Reading: Choi et al., Environmental Health Perspectives 2009</i>
	Th	Lecture: Plastic in the Ocean (Microbes and the Plastisphere; changes in fish) <i>Reading: Jambeck et al.2015, Science</i>
6	T	Lecture: Oil Spill Impacts – including Community Psychosocial Health <i>Reading: Palinkas 2012, Psychiatry</i>
	Th	Lab 3: Clean Water Act and Sediment Quality <i>Reading: Greenstein et al. 2013. Environmental Monitoring and Assessment</i>
7	T	Lecture: Sea Level Rise, Drinking Water and Climate Refugees <i>Reading: Ahlgren, Yamada and Wong 2014, Health and Human Rights</i>
	Th	Lecture: Climate Change and Changes in the Mercury Cycle <i>Reading: Sundseth et al. 2015, International Journal of Environmental Research and Public Health</i>

8	T	Lecture: <i>Vibrio</i> and climate change <i>Reading: Escobar et al. 2015, Acta Tropica</i>
	Th	Student research project presentations; any take-home final exams due.
	Bonus Friday	(Optional) Field Trip to Georgia Aquarium (try to catch one of the summer Science-on-Tap marine environmental science evening lectures)

Course Readings (full citations)

- Ahlgren I, Yamada S, Wong A. Rising oceans, climate change, food aid, and human rights in the Marshall Islands. *Health Hum Rights* 2014;16(1):69-80.
- Choi AL, Weihe P, Budtz-Jorgensen E, Jorgensen PJ, Salonen JT, Tuomainen TP, Murata K, Nielsen HP, Petersen MS, Askham J, Grandjean P. Methylmercury exposure and adverse cardiovascular effects in Faroese whaling men. *Environ Health Perspect* 2009;117(3):367-72.
- Escobar LE, Ryan SJ, Stewart-Ibarra AM, Finkelstein JL, King CA, Qiao H, Polhemus ME. A global map of suitability for coastal *Vibrio cholerae* under current and future climate conditions. *Acta Trop* 2015;149:202-11.
- Fair PA, Lee HB, Adams J, Darling C, Pacepavicius G, Alae M, Bossart GD, Henry N, Muir D. Occurrence of triclosan in plasma of wild Atlantic bottlenose dolphins (*Tursiops truncatus*) and in their environment. *Environ Pollut* 2009;157(8-9):2248-54.
- Fleming LE, Kirkpatrick B, Backer LC, Walsh CJ, Nierenberg K, Clark J, Reich A, Hollenbeck J, Benson J, Cheng YS, Naar J, Pierce R, Bourdelais AJ, Abraham WM, Kirkpatrick G, Zaias J, Wanner A, Mendes E, Shalat S, Hoagland P, Stephan W, Bean J, Watkins S, Clarke T, Byrne M, Baden DG. Review of Florida Red Tide and Human Health Effects. *Harmful Algae* 2011;10(2):224-233.
- Furness J, Hing W, Walsh J, Abbott A, Sheppard JM, Climstein M. Acute injuries in recreational and competitive surfers: incidence, severity, location, type, and mechanism. *Am J Sports Med* 2015;43(5):1246-54.
- Gingold DB, Strickland MJ, Hess JJ. Ciguatera fish poisoning and climate change: analysis of National Poison Center Data in the United States, 2001-2011. *Environ Health Perspect* 2014;122(6):580-6.
- Given S, Pendleton LH, Boehm AB. Regional public health cost estimates of contaminated coastal waters: a case study of gastroenteritis at southern California beaches. *Environ Sci Technol* 2006;40(16):4851-8.
- Greenstein D, Bay S, Jacobe M, Barton C, Sakamoto K, Young D, Ritter K, Schiff K. Regional assessment of marine and estuarine sediment toxicity in Southern California, USA. *Environ Monit Assess* 2013;185(2):2055-65.
- Hipp JA, Ogunseitan OA. Effect of environmental conditions on perceived psychological restorativeness of coastal parks. *Journal of Environmental Psychology* 2011;31(4):421-429.
- Jambeck JR, Geyer R, Wilcox C, Siegler TR, Perryman M, Andrady A, Narayan R, Law KL. Plastic waste inputs from land into the ocean. *Science* 2015;347(6223):768-771.
- Kirk JL, Lehnher I, Andersson M, Braune BM, Chan L, Dastoor AP, Durnford D, Gleason AL, Loseto LL, Steffen A, St Louis VL. Mercury in Arctic marine ecosystems: sources, pathways and exposure. *Environ Res* 2012;119:64-87.

13. Laird BD, Goncharov AB, Egeland GM, Chan HM. Dietary advice on Inuit traditional food use needs to balance benefits and risks of mercury, selenium, and n3 fatty acids. *J Nutr* 2013;143(6):923-30.
14. Palinkas LA. A conceptual framework for understanding the mental health impacts of oil spills: lessons from the Exxon Valdez oil spill. *Psychiatry* 2012;75(3):203-22.
15. Sheehan MC, Burke TA, Navas-Acien A, Breyse PN, McGready J, Fox MA. Global methylmercury exposure from seafood consumption and risk of developmental neurotoxicity: a systematic review. *Bull World Health Organ* 2014;92(4):254-269F.
16. Sundseth K, Pacyna JM, Banel A, Pacyna EG, Rautio A. Climate change impacts on environmental and human exposure to mercury in the Arctic. *Int J Environ Res Public Health* 2015;12(4):3579-99.
17. Turyk M, Fantuzzi G, Persky V, Freels S, Lambertino A, Pini M, Rhodes DH, Anderson HA. Persistent organic pollutants and biomarkers of diabetes risk in a cohort of Great Lakes sport caught fish consumers. *Environ Res* 2015;140:335-44.
18. Wheeler BW, White M, Stahl-Timmins W, Depledge MH. Does living by the coast improve health and wellbeing? *Health Place* 2012;18(5):1198-201.