From Shore to State House: Marine Debris Undergraduate Course Materials

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This packet shares materials you can use to teach a class on the topic of marine debris.

If you're teaching a version of this course on marine debris, I'd love to hear about it!
Please send me an email at kowens@hartford.edu

All materials were developed through support from the **NOAA Marine Debris Prevention through Education and Outreach Program**. The program supported the development and implementation of a course by Katharine Owens at the **University of Hartford, Connecticut** in 2016.
Dr. Owens' NOAA funded project introduced college students to the issues of marine debris, guided them in the process of collecting and tracing the life cycle of debris, and then challenged them to use this data to

Visit the project website at: https://ctmarinedebris.wordpress.com/

UNIVERSITY OF HARTFORD

Table of Contents

Notes on teaching the class

Written by Professor Katharine Owens (kowens@hartford.edu)

Background

This class took place in the spring semester of 2016. To take advantage of this unique opportunity, I combined two sections and created

beach cleanups and the policy report. We visited four beaches in three trips, for a total of no more than eight hours of fieldwork. In this time we picked up over 1600 individual pieces of marine debris.

Course readings

I selected four texts for my classes.

All students read:

- Weis, Judith (2014) *Marine Pollution: What Everyone Needs to Know*. Oxford: Oxford University Press.

Politics students selected one of:

- Freinkel, Susan (2011) *Plastic: A Toxic Love Story*. Boston: Houghton Mifflin Harcourt.
- Gleick, Peter (2011) *Bottled and Sold: The Story Behind our Obsession with Bottled Water*. Washington, DC: Island Press.

Honors students read:

- Bergmann, Melanie, Gutow, Lars, Klages, Michael (Eds)

Thoughts on each text

Weis provides a clear introduction not only to marine litter, but also to water pollution writ large. It is an immensely clear and readable text, appropriate for undergraduates of all levels.

I found the format of this book, posed as a series of questions with answers, distracting at first. It took a little while to get used to—but over

small groups and assigning sections to synthesize and share with the class (aka my Tweet it, Bump it, Haiku it, Draw it assignments).

Both Gleick and Freinkle are easy to read, thoughtful, and while written for non-academic audiences, are based on clear and compelling evidence. I will use both of these again as they provide exceptional context for the issue and tie in how and why plastics are such an integral part of human society. They make the issues brought up in the other textbooks (pollution, debris, consumption) real for students, by linking this scientific information to the real world. I believe they help students understand the greater impact of this resource use.

The Bergmann book is incredibly readable and well written for a collection of academic articles. Not all scholarly work is as clear and as unhampered by superfluous jargon as this edited volume (See what I did there? With the superfluous jargon?)
This book delves very deeply into research on marine debris. In some cases, the detailed chapters may provide more information than needed for an undergraduate college course. That said, it was a great source for my honors students, who are more capable of reading scholarly publications. If you are not assigning the entire book I found that the best chapters for an overview include Chapters 1 (A brief history of marine litter research), 2 (Global distribution, composition and abundance of marine litter), and 7 (Microplastics in the marine environment: sources, consequences, and solutions).

What I will do differently next time re: readings
To allow for the hybrid nature of this course and the varied reading assignments, I had students present a brief summary of each chapter in Gleick, Freinkle (for non-honors students), and Bergman (honors students) throughout the semester. The students were given a time limit and told to summarize and synthesize the material for the rest of the class, sharing their results in a powerpoint presentation. In retrospect, this was not the best use of class time, as few students kept to the time constraints. I believe this time would have been better spent on group discussions or

Getting out in the field

Check with local agencies (fish and wildlife, your state environmental

public lands. Though lands are public, you MUST have permission from land managers and most critically, you need to be certain your work does not disturb nesting wildlife. You must also coordinate field collections with tide tables to ensure maximum shoreline access.

Due to the timeline of this award, it made sense to teach my class in the Spring semester (i.e., January through May), which is not an ideal time to plan outdoor excursions in New England. Every one of our collection days was impacted by weather, and two of our trips had to be called off due to extreme weather. Most disappointingly, my students were unable to take a canoe trip to collect from a coastal island due to snowstorms and high winds.

The advantage of collecting in winter in Connecticut is that our work did not overlap with wildlife nesting seasons. In addition, being on the shore during the off-season meant few recreational beach goers in the area. If the faculty member can be open-minded and flexible, this type of course is possible even in winter in Connecticut.

We followed the protocols of the NOAA Shoreline Survey Field Guide. Use this guide to ensure your work is conducted in a replicable, scientific manner.

It is critical to, even when working with college students, take head counts at the beginning and end of each field exercise to ensure all participants return at the end of each field trip.

What I will do differently next time re: field work

I wanted as many students as possible, but 35 students were not needed to run an effective beach cleanup. In each case, a group of 15-20 students showed up on the day. This was a workable number that allowed

Undergraduate Seminar syllabus

POL390: Marine Debris: Policy and Action
AND HON 385: Marine Pollution
Dr. Owens Spring 2016

Why does this class have two names?
This class is special. We will be conducting research in real-time and sharing our results with senators and congressional representatives at the state level. This class will only be taught one time. Because of the special circumstances, we wanted this amazing opportunity to be open to as many students as possible. We are running two classes in one: an Honors course and an upper-level politics course. The two classes will meet together and work together on ALL aspects of the project. In some cases, the two groups have different reading assignments—but the submitted assignments will be the same for both classes.

OVERVIEW
COURSE DESCRIPTION
Marine debris is the term for the accumulation of plastics, derelict fishing gear, trash, and storm wreckage in global waterways. Marine debris is a global problem that not only impacts the environment but also wildlife, human health, and the economy. While an omnipresent effect of the modern convenience- and plastics-based society, researchers believe marine debris is at its core a problem that can be solved. Experts believe that only by focusing on the sources of marine debris and by taking local context into account will we realize appropriate solutions at multiple scales. This course puts the issue of marine debris into context by providing an overview of marine pollution, focusing on the policies (from local to global) addressing water resources. This service-learning course provides an opportunity for students to collect data for a semester-long research project on Connecticut marine debris. We will engage **students in beach cleanups, guiding them in the process of cataloging debris and describing alternatives to the found debris items (through the creation of a course website, see the proof of concept below) and finally challenging them to use this data to contextualize policy alternatives to present to state legislators.**

SERVICE LEARNING is a form of experiential education that couples community service with reflection.
Required course activities include at minimum two weekend day trips to Connecticut beaches for debris collection.

REQUIRED READINGS

Weis, Judith (2014) *Marine Pollution: What Everyone Needs to Know*. Oxford: Oxford University Press.

POL 390 students should ALSO SELECT ONE OF:

Freinkel, Susan (2011) *Plastic: A Toxic Love Story*. Boston: Houghton Mifflin Harcourt.

Gleick, Peter (2011) *Bottled and Sold: The Story Behind our Obsession with Bottled Water*. Washington, DC: Island Press.

HON 385 should also purchase:

Bergmann, Melanie, Gutow, Lars, Klages, Michael (Eds) (2015) *Marine Anthropogenic Litter.* Dordrecht, Netherlands: Springer.

*Weekly readings are due at the beginning of the class/week listed.

LEARNING OUTCOMES: What will you gain from this course?

- Experience collecting, cataloging, and describing marine debris on Connecticut beaches.
- Broad knowledge about marine pollution and how marine debris fits into the challenges posed to global water sources
- Deep knowledge about marine debris.
- Understanding of water policy, including the regulations, actors, agencies, and institutions involved.
- An appreciation for the impact citizens can make on critical environmental challenges
- Skill development in compiling data and research into a report for policy makers

EVALUATIONS

GRADED ASSIGNMENTS

Participation	50
Reflective essays (2 @ 25 points each)	50
Tumblr posts	200
Draft section of Policy Report	50
Final section of Policy Report	50
Reading Presentation	60
Reading Discussion Lead	40
TOTAL	500

PARTICIPATION

To do well in this course you must come to class prepared to discuss all of the readings assigned for a given day and take part in class. Participation means contributing to the class discussion in a meaningful way. You must also attend at least TWO of our beach cleanup days to pass the course.

REFLECTIVE JOURNALS (solo work)
You will be assigned 2 reflective essays (400-800 words) throughout the semester, worth 25 points each, on the topic of our beach cleanups.

TUMBLR POSTS (completed in pairs)
Together, we will create a TUMBLR site that catalogs the marine debris we find, discusses what steps consumers could take to avoid putting similar materials in the system, and links to applicable research about the impact of marine debris (for example, providing information and data about ingestion and entanglement, choking and starving wildlife, non-native species transport, toxicity and degradation).

Each student will be responsible for several Tumblr posts, the final number determined by the results of debris collection.

The posts will follow a pre-set format (see attached example) and you will collaborate with your classmates to infuse your posts with the readings from the semester.

TUMBLR entry content
Identification
What is it?
Potential source of the item:
Location(s) found:
Date(s) found:
How many times we found the item:
What proportion of our collected material (by weight) was made up of this item?
What proportion of our collected material (by number) was made up of this item?
Associated Risks, for…(based on peer sources)
Human health
Wildlife
Air and Water
Reducing this item in the environment…
Are there alternatives to this item?

Can the item be re-used?
Can the item be recycled, up-cycled, or down-cycled?

THE POLICY REPORT and PRESENTATION (completed as a group)

This semester, we will get to collect data and then present our information to the Connecticut General Assembly (the state legislature). This is an incredible opportunity! We will provide them with a neutral policy report on the issue of marine debris, focusing on the debris we find in Connecticut.

We are not trying to influence politicians in favor of any one policy or position, but instead provide them with information about the issue globally and in our state.

The paper we create for and present to the General Assembly Environment Committee will include research on marine debris. This paper will elaborate on the issue and describe policies used around the world to address this complex problem. It will also seek to contextualize the issue for Connecticut lawmakers by shedding light on the types of debris found on Connecticut beaches.

We will work in small groups to draft, edit, and finalize this paper, create a presentation, and select a handful of students to present our results to the committee. We will all travel to the legislature to watch the presentation.

READING PRESENTATION

During one class period this semester, you will be responsible for making a presentation on a reading. What does this mean?

- You read the assignment.
- You synthesize the reading into a presentation in the Pecha Kucha 20 x 20 style. I will demonstrate this presentation format in class. Learn more about Pecha Kucha here http://www.pechakucha.org/
- You make your presentation to the class and engage in a discussion with them about your reading.

READING DISCUSSION LEAD

During one class period this semester, you will be responsible for supporting the student making the presentation. What does this mean?

- You read the assignment.
- You submit 4 questions by email **to Dr. O by midnight the night before** this class meets. Think about what might stimulate conversation and thoughtfulness among your colleagues.
- You come to class with your questions. You pose your questions to the group. As the presenter proceeds with the discussion, you provide your own perspective on the issue and your take on the reading.

POLICIES

ACADEMIC HONESTY

Plagiarism and/or cheating will not be tolerated. Plagiarism is defined as the presentation of someone else's ideas or language as your own. Cheating is defined as giving or receiving unauthorized assistance on any graded assignment.

For clarification please see the University's guidelines: http://admission.hartford.edu/parttime/Orientation/p35_honesty.html

If caught plagiarizing in my course you fail the assignment and be reported to the Academic Dean's office. If plagiarism takes place a second time, you will fail the course.

LEARNING ACCOMODATIONS

If you require accommodations due to a documented disability or other special need you should discuss this with the appropriate campus administrators (for example, Learning PLUS[1] or Health and Wellness with Student Affairs) so that they can provide information to me about accommodations. All information will remain confidential.

SCHEDULE

Week	HON reading	POL reading	Everyone reads
Wednesday 1/20	N/a: intro to course		
Monday 1/25	Bergman Ch1: A brief history of marine litter research		Weis Ch1. Introduction to the Marine Environment and Pollution
Wednesday 1/27	Bergman Ch 2: Global distribution, composition and abundance of marine litter	Gleick Ch 1	
Monday 2/1	Bergman Ch 3: persistence of plastic litter in the oceans	Freinkel Introduction, Ch 1	Weis Ch2. Nutrients
Wednesday 2/3	Bergman Ch 4: deleterious effects of litter on marine life	Gleick Ch 2	

Monday 2/8	Bergman Ch 5: the complex mixture, fate, and toxicity of chemicals associated with plastic debris in the marine environment	Gleick Ch 3	
Wednesday 2/10	Bergman Ch 6: Marine litter as habitat and dispersal vector	Freinkel Ch 2	
Monday 2/15	Bergman Ch 7: Microplastics in the marine environment: sources, consequences, and solutions	Freinkel Ch 3	Weis Ch3. Marine Debris
Monday 2/22	Bergman Ch 8: methodology used for the detection and identification of microplastics—a critical appraisal	Gleick Ch 4-5	Weis Ch4. Oil and related chemicals
Wednesday 2/24	Bergman Ch 9: sources and pathways of microplastics to habitats	Freinkel Ch 4	
Monday 2/29	Bergman Ch 10: microplastics in the marine environment : distribution, interactions, and effects	Gleick Ch 6-7	Weis Ch5. Metals
Wednesday 3/2	Bergman Ch 11: modeling the role of microplastics in bioaccumulation of organic chemicals to marine aquatic organisms.	Freinkel Ch 5	
Monday 3/7	Stemming the Tide report by the Ocean Conservancy	Freinkel Ch 6	Weis Ch6. Pesticides and Industrial Organic Chemicals
Monday 3/21	Bergman Ch 12: nanoplastics in the aquatic	Gleick Ch 8-9	Weis Ch7. Emerging Concerns

	environment.		
Wednesday 3/23	Bergman Ch 13: Micro- and nano-plastics and human health	Freinkel Ch 7	
Monday 3/28	Bergman Ch 14: the economics of marine litter	Freinkel Ch 8 and epilogue	Weis Ch8. Bioaccumulation and Biomagnification
Wednesday 3/30	Bergman Ch 15: regulation and management of marine litter	Gleick Ch 10	
Monday 4/4		Gleick Ch 11-12	Weis Ch9. Climate Change and Ocean Acidification
Monday 4/4	Weis Ch9. Climate Change and Ocean Acidification Weighing, cataloging, counting, and categorizing debris		
Monday 4/11	Bergman Ch 16: The contribution of citizen scientists to the monitoring of marine litter		
Wednesday 4/13	Weighing, cataloging, counting, and categorizing debris		
Monday 4/18	Writing Tumblrs in class		
Wednesday 4/20	Weis Ch10. Biological Pollution Writing Tumblrs in class		
Monday 4/25	Writing Tumblrs in class		
Wednesday 4/27	Weis Ch11. Regulating and Reducing Pollution Writing policy report in class		
Monday	Preparation for presentation to legislature		

5/2	Writing policy report in class
Wednesday 5/4	Preparation for presentation to legislature Writing policy report in class

Presentation to the legislature will occur outside of regularly scheduled class time due to legislator schedules

In class activities

For this iteration of the course, I had an individual student present Pecha Kucha on each reading to the whole group and then another student led a discussion on the reading for the class.

Tweet it, Bump it, Haiku it, Draw it

For all Weis readings I do an activity I call Tweet it, Bump it, Haiku it, Draw it. I give pairs of students a portion of the assigned reading (Weis is particularly good for this, as it's already divided up into manageable chunks) when we arrive in class and ask them to synthesize and summarize it into one of a number of forms.

Tweet it: Setting a 140-character limit per tweet, the students have to synthesize and summarize the work into 1-3 tweets. #creative and #funny #hashtags are #encouraged

Bump it: The students use words and images to create a bumper sticker

Haiku it: Students have to summarize the work in haiku form, 17 total syllables in three lines, following the structure: 5 syllables, 7 syllables, 5 syllables

Draw it: Students use large paper and colored sharpies to draw an image that

Examples of student work can be found at https://ctmarinedebris.wordpress.com/tweet-it-bump-it-haiku-it-draw-it/

Discussion GUIDE
Bottled and Sold by Peter Gleick

Authored by University of Hartford students in the classes: POL390: Marine Debris Policy and Action and HON385: Marine Pollution, Spring 2016

Chapter One

1. For dry areas such as Phoenix and Las Vegas, or areas in a drought, is there a better solution for drinking water than bottle water?
2. Do people drinking bottled water instead of tap water seem to gain peace of mind from it? Why?
3. What stigmas or fears do people typically have regarding drinking tap water?
4. The chapter states that the International Bottled Water Association calls soda companies, not tap water, their competitor. Do you think people feel safer drinking tap water or Coca Cola?
5. What were your attitudes regarding drinking water before this chapter? After reading this chapter, what do you think about it? Have your ideas changed? Why?

Chapter Two

1. Since private water bottle companies have taken advantage of people's fear of tap water, what do you think are some effective ways to assure citizens that tap water is just as safe as bottled water?
2. When considering the way people think and feel about their tap water, how can we take into account issues like the recent poor water quality in Flint, Michigan?
3. Gleick writes that even in the 21st century "tap water isn't as safe as it should be." Do you believe that our laws are in need of reform? How could they be reformed?
4. What are your thoughts about the conflict over advertising between Fiji water and Cleveland tap water? How could consumers be sure that one is safer than the other?
5. Does your family knows the source of their drinking water? Would it make a difference if they knew? How could they look up the source and quality of their drinking water?
6. Is tap water safe?

Chapter Three

1. Whose job do you think it should be to regulate the bottled water industry?
2. Gleick details stories of the lax regulation on potentially contaminated water. Should companies that knowingly sell contaminated bottle water to the public be held responsible? If so, how?
3. What do you think should be done to push the United States away from

4. Would you be more inclined to drink tap water now knowing some of the flaws of the regulatory system for bottled water?

Chapters Four and Five

1. Do you think it's better for bottled water to be sourced from municipal water or from groundwater?
2. Should the affects of commercial water plants be tested to see if they are altering the local water supply?
3. If the public knew that their bottled water was sourced from the tap, do you think they would be more inclined to just drink real tap water instead?
4. Do you think you can taste the difference between tap water and bottled water?

Chapter Six

1. The main reason people purchase bottled water is because they claim to not like tap water, yet it has been proven that not many people can tell the difference, so why do you suppose that is?
2. What makes bottled water so appealing as opposed to tap water?
3. We know water can be processed and filtered in dozens of different ways and that this process alters the water's natural mineral content and the taste. Early corporations capitalized on these differences because the concentrations of minerals made water with unique tastes. Is it important

Chapter Seven

1. After the Korean War aluminum became fairly popular and soon the aluminum can was developed, and became a popular and convenient method for preserving drinks and other items. As consumers, do you consciously purchase a drink that is canned or bottled? If you choose the aluminum can, is it because of convenience or something else.
2. There are many forms of plastics used for drink and food packaging purposes including polycarbonate, the plastic found in large water bottles and home coolers. However under certain conditions (such as cleaning polycarbonate containers with harsh materials or water that has been left in a poly carbonate container) it has been reported that some polycarbonate containers release bisphenol A as known as BPA, which could be a potentially serious health hazard. Should we ban poly carbonate chemicals in our plastics and replace the chemical polyethylene terephthalate also known as PET a plastic that is resistant to heat, mineral

Chapter Eight

1. In chapter eight Gleick spoke about the history of companies misleading consumers about their products in order for the company to make profit

and how the government tries to protect the consumer from these lies, but is not always successful. Gleick seems to blame these shortcomings on the lack of resources and personal that the government has to operate with, but is the answer to this problem more government like Gleick suggest or is the answer to educate the consumer?
2. If the government should have more power and resource to confront these companies that mislead consumers, what actions should the government take to close loopholes that were spoken about in this chapter and should they take legal action against theses companies?

Chapter Nine

1. In chapter nine Gleick spoke about religions role in the use of water and water bottles. Should religions take a stance on the use of water bottles by their clergy and laity?
2. Is it ethical for water bottles companies to sell blessed water to consumers for consumption and make profit off the items?
3. Should celebrities endorse companies that profit off of the sale of water for religious purposes?

Chapter Ten

1. We are seeing a return in water fountains to deter people from buying bottled water. New water fountain models can filter and chill water. Do you think the public will use these higher standard fountains?
2. While bottled water companies launch campaigns to promote drinking bottled water, colleges are becoming more involved with anti bottled water efforts. Would students at your University care about this issue? Why or why not? Could a water bottle ban realistically happen at your University or school?
3. The Connecticut General Assembly found that CT spends $500,000 annually on bottled water. To lower that number states attempt to discourage consumption. Does increasing tax on bottled water help to control this problem? Why or why not?
4. Does your location impact how involved you should be with this issue (rural, suburbs, city)? Or should everyone pay attention to this status of

Discussion GUIDE
Plastic: A Toxic Love Story by Susan Freinkel

Authored by University of Hartford students in the classes: POL390: Marine Debris Policy and Action and HON385: Marine Pollution, Spring 2016

Chapter One

1. Think about the 8 objects chosen by Freinkel to encompass the topic of plastic in her book (Comb, Chair, Frisbee, IV bag, Disposable Light, Grocery Bag, Soda Bottle, Credit Card). Are any of these objects more present in your life than others? For instance if you smoke or used to smoke, how many plastic lighters do you think you've purchased? How many times a week do you go grocery shopping? How many times in a year? Do you use plastic or re-usable bags? If plastic, how many bags do you think that equals?
2. If plastic, in a sense, was meant to replace natural products like ivory and turtle shell, then why are hawksbill sea turtles still critically endangered? Is it just that they are still recovering? Why are elephants still killed for their tusks? Has our affinity for "natural" products not really diminished? Did it ever go away? Or does it go along with what Freinkel discussed, about how things are made more valuable when we can't or shouldn't have them?
3. When describing "The Gift of the Magi," Freinkel explains how Della first defined her world "by what she lacks rather than what she has" (18). Then at the end of the story, both Della and her husband define themselves "by what they give up-what they don't have-rather than by what they hope to consume. Compare these quotes to this phrase from 1953's *House Beautiful*: "You will have a greater chance to be yourself than any people in history of civilization" (19). What does this mean for the person who can afford everything and anything? Not necessarily because they are rich, but because of a better economy, better production, cheaper products, etc. that came about with the invention of plastic? Does this quote imply that you cannot or are not yourself without consumerism? If so, what does that make the "you" alone, with nothing? Are you incomplete?
4. Do you think the phrase from *House Beautiful* has completely replaced the

   powerful or widespread for us to fight, or has it become powerful because

Chapter Two

1. Freinkel writes, "instead of feeling fulfilled, we now often feel choked by an empty abundance." What do you think she means by this statement?

2. Do you see monobloc chairs as disposable? If yes, is that ethical?
3. With the invention and further innovation of single mold plastic furniture, do you think any other materials will be able to replace plastic in the near future?
4. Would you spend $400 on a plastic chair?
5. In the long term, what is worse for the environment: plastic chairs, wood chairs or metal chairs?

Chapter Three

1. 60% of all plastic or 8 million tons that enters that the oceans is from 5 countries. China, Thailand, Vietnam, Philippines and Indonesia. This is due in part to the large amounts of production these countries provide for the western European and American markets (and also rapidly growing manufacturing sectors without comparably growing infrastructure). Who should carry the burden of his pollution?
2. Would you pay more for a plastic product in return for stiffer regulations?
3. What might a stronger regulation look like in terms of plastics manufacturing? Imagine you take this policy to Capitol Hill to try to get it passed into law. Make a chart of the stakeholders that might be in support of and against such a bill.
4. Do you believe Frisbees could be made with a material other than plastic?
5. Is it ethical for American corporations to demand Chinese manufactures to produce cheap plastic toys if it's at the expense of migrant factory workers?

Chapter Four

1. Does the inherent risk of exposure to phthalate from vinyl medical bags especially in newborns cause enough concern to find a safer material for medical supplies like IV bags?
2. The *Modern Plastics* article "Why Doctors are using more plastic" in 1951 stated "any substance that comes in contact with human tissue…must be chemically inert and non-toxic." Given the continuous health studies since why has this warning been continuously broken and ignored in medical supply production?
3. After reading chapter four do you have a deeper worry about the harmful effects of plastics chemically in our lives?
4. What should the burden of proof be for banning a toxic chemical– the American model of proof before safety or the European model of safety before proof?

Chapter five

1. Freinkel talks about a lighter that made its way to her from Hong Kong.

lasts for years. What other common objects do we use like this without even thinking of where they are going?
2. Freinkel describes the mentality in the 1950's being one that reused essentially to the point of not being able to reuse anymore. People used quality objects that stood the test of time and took pride in their purchases. Is there anyway we can change the mentality back to this?
3. A vast variety of things are being put into the ocean, but some things are commonly showing up like lighters, cigarette butts, bottle caps, plastic spoons, food packages, plastic bags, etc. What do you think the better route is to handle the oceans pollution; should politicians focus on laws about these specific products, or worry about pollution as a whole?
4. What are some potential policies lawmakers could put in place to restrict the most commonly found items of marine debris? (e.g., easier breakdown of products, making things reusable/refillable like bags or lighters, etc.)
5. Since matter (as pollution) never truly vanishes, the garbage ends up in the ocean and collects in the gyres. Should we focus on the patches themselves? The sources or places where pollution enters the ocean? Or points along the major ocean currents?

Chapter six

1. Do you agree with Murray's (executive director of Californians against waste) Zero Waste concept? It encourages people to "reduce consumption while pushing industries to extend lifespan on things we use by designing and producing products that can readily be reused, repaired and recycled"? Why or why not?
2. Are paper bags a good alternative while we come up with a solution? Would you, family and friends be willing to do that? (Remember it's not as durable or waterproof, and still uses resources).
3. In your opinion, who is to blame? The consumer or the company? Some combination?
4. What can we do as consumers to share this knowledge in our communities? Signs? Adding a fee for the use of disposable bags? Prohibiting plastic? Providing cloth options?

Chapter seven

1. Would you, if given the chance, go back to the days when all drink bottles were made of glass, keeping in mind how fragile glass bottles could be? (Think baby bottles, etc.)
2. Do you believe that we could ever implement a two-way system again? (Full bottles are delivered, and the empty ones are taken away by the same delivery person)
3. Which do you feel would help reduce the amount of recycled plastic more: eliminating most of the unnecessary packaging, or creating a simpler but

4. If the USA where adopt a more wide spread bottle bill and other EPR laws, would you be willing to potentially pay a good deal more for most existing products (due to all the plastic packaging)?

Chapter eight and epilogue

1. In the chapter Freinkel quotes Mark Rossi when he said, “Plastics aren’t created equal”. This refers to the fact that some plastics aren’t as harmful as others and vice versa. Would you be willing to completely stop using a certain product (credit cards, gift cards) if you knew it would mean the eradication of that type of plastic (PVC)?
2. The chapter also talks about using PLA, a relatively new biopolymer, for everyday products. The problem is that when it is used for chip bags they become “too loud” and when it is used for water bottles it becomes deformed in the face of mildly high temperatures. When it is used for soda bottles it cannot withstand the amount of CO2 from the soda so the bottle becomes deformed as well. Would you be willing to change your lifestyle (i.e. don’t leave bottles in the car on a hot day, ignore the loud sound of a

   environmentally-friendly plastic?
3. How effective do you think bioplastics are in regards to fighting climate change?
4. In this chapter Freinkel talks about her “biodegradable” Discover Card. Upon further investigation she finds out that the key to being biodegradable is that the whole product is completely biodegraded at the end of the process but in reality her credit card is only 13% biodegradable. Should there be punishment for false advertising? If yes, what kinds of discipline will keep other companies from false advertising in the future?
5. PLA, while being a biopolymer, cannot be recycled and if it is it would contaminate that batch of recycling. How important is it that the public pays more attention to this issue when considering the commonality of

6. Can you imagine a world without plastic? How possible is it really? Why? What are our options?

Discussion GUIDE for Marine Anthropogenic Litter, Edited by Melanie Bergmann, Lars Gutow, and Michael Klages

Authored by University of Hartford students in the classes: POL390: Marine Debris Policy and Action and HON385: Marine Pollution, Spring 2016

Chapter One

1. What do you believe are the biggest problems resulting from marine litter?
2. Is the issue of marine litter worthy of being addressed by international treaties or policies?
3. Do you think it's possible to find a solution that still allows for use of plastics by society?
4. Can you imagine a solution to the issue of marine litter? What with this

Chapter Two

1. Plastic constitutes the majority of all marine litter around the world. Do you think this is because plastic is the material we use most in our everyday lives? Or do you think other litter such as paper, wood, food waste, etc., enters the ocean as frequently but biodegrades and therefore does not accumulate in the ocean as much as plastic?
2. What changes to distribution, composition, and abundance of marine debris can we expect with climate change and global warming?
3. In addition to question 2, do you think collecting data on the global distribution, composition, and abundance of marine litter will become increasingly difficult if climate change and global warming continue to impact the oceans?
4. Scraping sediments on the sea floor and beach sediments can disturb or even be destructive to the resident fauna. Do you think this is a reasonable risk in order to better assess marine debris?
5. What are the primary influencers of accumulation rates?

Chapter Three

1. Why is it important to understand the different types of plastics identified and the degradation process of those plastics?
2. Why do Photo-Oxidation and different marine conditions hinder plastics

3. What are some of the errors attributed to buoyancy and sampling conditions?

4. What do many plastic samples collected from beaches and water look like and why?
5. In this chapter we learn that it is not true that more plastics are thrown away than other items, but instead that plastics are persistent in the environment. Is it possible to find a solution when littering is a way of life for many people?

Chapter Four

1. The article discusses the concern of “plastic soup” as tiny particles of plastics, which cannot be seen, but are being digested by multiple animals in the food chain, however, there is no explanation regarding the amount of “plastic soup” nor the actual effects. Is this a proven issue- or is the author referring to more general effects of consuming plastic?
2. The article discusses the dolphins and other animals which become entangled in “ghost fishing” gear, yet does not comment on the even greater number of animals killed through overfishing, especially considering the dolphin-tuna debate from a few years ago. Do we really find stray nets to be a large enough debris issue? Perhaps regulations in fishing would resolve the matter much more appropriately.
3. When discussing the color of ingested plastics, do we believe that color-blindness comes into play?
4. When plastics are ingested purposefully- in lieu of food- is this due to a flaw in judgment, or is there a lack of food in the environment causing the need for a last resort?
5. Why do you think they emphasize the food chain?
6. The authors mention that hundreds of thousands of fish are known to perish in active fishing gear. This is called bycatch, and these fish are simply thrown overboard as waste. Knowing this, do you think the fishing industry can be sustainable?

Chapter Five

1. The reading talks about how certain types of plastics release chemicals once in the ocean and begin to go through photo-degradation, while others act as a “sink” and absorb chemicals. Do you think it could possibly be a good idea to purposely use large pieces of plastic known to absorb chemicals in order to clean up certain chemicals from bodies of water?
2. The book talks about how some chemicals used while manufacturing plastics contain carcinogenic and other very toxic chemicals that when used in studies have proven to cause endocrine disruption, thyroid problems, and developmental disorders in certain animals. If this is the case do you think there could be a connection between people developing cancer or other disorders and the amount of seafood they consume?
3. Considering what we now know about how chemicals are affecting marine

Or do you think if enough is proven about the consumption of seafood, there will be regulations one day about what we should or should not eat?

4. Do you think it is feasible to create regulations where some plastics are produced while others are banned because certain chemicals stay with the product long after production? Or would that create conflict when trying to come up with substitutions for certain products?

Chapter Six

1. How might we prevent rafting species from attaching to plastic debris?
2. If certain types of plastics such as Styrofoam reduce the ability for organisms to colonize due to low stability, should a certain type of plastic be preferred as far as the prevention of invasive species?
3. Would creating nets out of material that would break down in a shorter span cause less colonization due to the smaller amount of space?
4. Would a method of serialization of plastic items allow for more accurate age reports of marine debris?
5. The text suggests that a microfilm forms first on a surface which then allows for macro-algae and other species to attach. Could the altering of plastics to not allow a viable surface for this film to form lead to a decrease in the attachments of other species?

Chapter Seven

1. Do you think the amount of microplastics will increase in the environment, despite efforts already being made to stop new debris from entering the ocean?
2. The book discusses how there have been laboratory studies in which they tested organism's outcomes or life expectancy when exposed to microplastics. How do you think the animals are being affected or what do you think in these laboratory studies are coming across or finding in the organisms once they are exposed? What are your thoughts on this?
3. Do you think there is something the government can do to change the way we produce, use, and dispose of plastics items?
4. The author talks about how there has been some evidence of a possibility of a sink in the deep sea filled with micro plastics. The author notes, however, that there isn't much evidence to support it. Why do you think that might be?

Chapter Eight

1. Prevention vs. analysis: the author sets up the premise that we ought to focus much more on prevention. What are your thoughts?
2. Are more chemicals the answer? Note how some of the solutions used to help separate the chemicals are sodium and zinc based, naturally occurring chemicals.
3. Whose job is it to clean up the beaches? Use philosophical and political

4. The plastic pyrolysis process is pricey and uses energy. Is this all worth it? Should we heed the book's warning and just stick to prevention methods?

Chapter Nine

1. With the population constantly increasing, the marine debris is going to get worse, so do you think the government should or ever will set modifications to redesign products so they contain less hazardous substances so if they were to be out in the environment they wouldn't be as damaging as they are now?
2. The ultimate goal is to reduce pathways that lead into the sewers and waterways. Will the government ever control what companies are allowed to manufacture and sell?
3. Do you think if we knew the place, person, or company who is letting these toxic things in the environment people would stop using them and consider other products?
4. There is little research about the pathways, but people can assume it comes out of our houses and factories and into the sewers and storm water. Do you think with more research about pathways, that we can put an end to it leading into the ocean?

Chapter Ten

1. Do you think people would cut down on plastics if they knew how much it affects marine mammals, biota, and potentially humans?
2. Who should be responsible for doing more research on microplastics and how they affect marine environments in certain areas?
3. Is plastic worth it even if it will ultimately accumulate in coastal and marine environments and potentially harm biota and humans?
4. Should countries with more concentrated areas of microplastics be held more responsible for the proper handling of microplastics even if they aren't the main contributors for the large accumulations?
5. In later years, do you think macroplastics or microplastics will pose a larger threat?
6. Would you rather have plastics that break down fast or plastics that are durable and don't break down as fast?

Chapter Eleven

1. A plastic additive may leach from a heavily contaminated plastic particle, but clean the organism from its body burden of legacy POPs at the same time. Do you agree that there is a positive AND negative trade off of micro-plastic ingestion?
2. How do you feel and/or do you agree with the term, "clean plastic" versus regular plastic/ plastic particles when all plastic in the ocean releases

3. Should the study of plastic ingestion be focused on whether or not it may clean an organism or that plastic ingestion can cause physical stress, which can then affect ingestion rates?
4. Is plastic ingestion more important that getting rid of the spread of POPs or are they both equally a problem because of how they are both causing harm?

Chapter Twelve

1. Nano-plastics pose a serious and difficult threat, yet the majority of the public neither knows of the threat nor believes it is that harmful. It is not a threat one can see physically such as debris on a beach or floating on the ocean. What possible means are there to make the public aware of nano-plastics, something that is still not fully understood and is invisible to the human eye?
2. Different studies have different definitions of nano-plastic, and such studies have various methods and conclusions. Some areas also have not been fully explored. Should there be one agency to take charge in order to set a standard of definitions and goals, and if so, who should be in charge of that agency?
3. Would it be more ideal to have a plastic that is far more durable in order to prevent the break down into smaller pieces and then eventually nano-plastics?
4. The hazards of nano-plastics will continue on as long as plastics exist. Even if the United States manages to dramatically cut down on the consumption of plastics, there are still around seven billion other people on the planet, and dozens of countries that rely on plastics for economic growth. Plastic production is expected to continue to rise, yet the impacts of nano-plastic currently in the oceans are becoming more evident. Is it possible to convince nations to deviate from the production and use of plastics, or are plastics the only realistic solution for the future in regards of consumers and economics, and, if possible, what is an alternative?

Chapter Thirteen

1. The chapter states that, despite comprising 19.8% of European plastic demand, code 7 plastics, or plastics categorized as “Other”, comprise 0% of recycled plastics. Can we reasonably expect to meaningfully reduce plastic waste when such a high proportion of plastics aren’t being recycled at all?
2. According to the study presented in this chapter, no reliable means of detecting and measuring nanoplastics in the environment and animals exists. Knowing this, what steps, if any, can be taken to reduce the spread of nanoplastics across environments and species?
3. The chapter mentions both that we do not know the full extent to which

tissues, and that we are exploring the potential for micro- and nanoplastics as a means for delivering medication. Would you, personally, be willing to use these medications if they were made available to the public?

4. To what extent, if any, should the government be involved in regulating the use of micro and nanoplastics in medicinal applications?

Chapter Fourteen

1. Studies have assayed the loss in economic activity due to the presence of marine debris. However, the studies have neglected ecological impacts and mainly focused on regulation services, health effects due to the debris, and loss of revenue from tourism and fishing. What do you think the studies on the cost of marine debris should focus on?
2. Marinas and ship owners spend annually about €39,000 per marina, €2.4

   operations done in order to remove debris from clogged boat jets and remove nets and ropes from propellers. Most clean ups are not done regularly because they are expensive but would it be more efficient to clean up more frequently to prevent expensive rescue operations, or do you think it would not make a difference overall?
3. As fisheries lose their traps, it leads to increased marine debris. This is an increase in service cost, as well as a decrease in revenue due to ghost fishing. Should we implement stricter regulations and policies to control fisheries?
4. Landfill taxes, product taxes and charges, infrastructure charges and deposit refund schemes have been implemented to regulate waste. Which one do you think is the hardest to implement, and which is the most effective?
5. In Europe, there are countries that tax waste to landfills. This led to a decrease in waste from 63%-33%. The tax money goes to waste management and environmental initiative. This is called the EU landfill Directive. It aims to encourage the prevention, recycling and recovery of landfill waste. Do you think this is possible to implement such a policy in the U.S. along with regulations of proximity to water bodies and design features to prevent water soil contamination? Why or why not?
6. An indirect fee leads to the cost of delivering solid garbage waste to port reception facilities being included in the fee paid by all ships visiting the

   getting money for waste removal is better than being direct?

Social Media Guide

Written by Rob Sechtman, University of Hartford ’17

One of the goals of this project (and your own marine debris class) is to spread awareness of issues surrounding marine debris, including its sources and potential preventative measures and solutions. Apart from traditionally taught classroom instruction and periodic public beach cleanups, social media can be used as a means to expand the scope of the audience reached by your educational efforts.

Three social media platforms you may choose to use to spread information about your own project are Tumblr, a tumble-blogging website, Twitter, a micro-blogging website, and Instagram, a photo-sharing website. Each platform has different areas in which they excel, and are suited for their own unique form of information sharing. Here we detail how they compare to each other, which may allow you to decide which best suits your own educational goals.

Each platform also uses a common organizational tool in the form of a tagging system, in which content is tagged by the user uploading it or sharing it so that it can be found easily among content with similar subject matter, or introduced to other users with similar interests. This tool should be taken advantage of on all three platforms as a means of widening the scope of the potential audience. Using #hashtags for #tagging will allow your content to be found by anyone with an interest in the topic. It expands the scope of your reach well beyond traditional channels. It may also allow you to be found by websites or pages that gather and re-post information on a given theme, which in turn will put your content in front of an ever-widening audience. Here we describe each of the three social media types (Tumblr, Twitter, and Instagram).

Tumblr is a popular tumble-blogging platform. Unlike normal blogs, which are usually long-form and more formal or journalistic in style, tumble-blogging typically favors shorter-form, mixed-media presentations that focus less on commentary and more on the subject matter of what is being shared. For example, while a food critic or freelance writer may use traditional blogging platforms, such as WordPress or Blogger, to publish and share articles or projects with their audience, a visual artist, such as a painter or photographer, may prefer to use a tumblr blog to present their work in a more easily digestible format in a mostly-public forum that is easy to access. The phrase “mostly-public” is used here because Tumblr gives users the option to make individual posts or entire blogs private from both specific

other users and the entire public user base of the website. However, because of the nature of our project as well as your likely use of Tumblr in this context, the blog and posts will be entirely public.
For the purposes of this project, the Tumblr account that will be created and published should be used primarily as a means of sharing information about important aspects of the project in the form of mostly-visual posts (photos, videos, graphs, etc.) with some brief analysis, as well as any potential essays or articles written for the project. This is because, while it is not primarily based in academia, Tumblr provides the broadest set of mediums to work with, allowing for mixed-media media content as well as longer-form posts that more closely mirror those found on more traditional blogging platforms. It should be noted, however, that Tumblr's user base does tend to favor easier-to-digest, mixed or visual media posts, meaning that longer-form, essay-style posts may garner less traction. An example of a potential post for this Tumblr blog would be a picture of debris found during a beach cleanup, with a brief explanation and analysis provided in the caption. We are using Tumblr as the form for sharing our student research where students examine and describe the harm caused by different items as well as about how consumers can choose alternatives to the items we found.
As for the scope of the potential audience reached by this, audiences, measured by "followers", for Tumblr blogs can come from literally anywhere in the world. However, because of the highly-localized nature of our project (Connecticut and Southern New England), a majority of potential followers will likely come from the Northeast region of the United States, and will likely be sourced almost exclusively from academic, scientific, and environmental communities on Tumblr. While this means that the potential follower count for the blog may not be large relative to other Tumblr users (some of the more popular blogs can garner hundreds of thousands of followers), it will likely be near the audience size for similarly-themed blogs.
Twitter is a micro-blogging website that focuses on sharing short, compact messages of no more than 140 characters, called "tweets", as well as some less-prominent photo- and video-sharing aspects. Micro-blogging and tumble-blogging are similar in that they both favor short-form posts, but differ in scope. Twitter is used primarily to send tweets, which can be read by everyone, or just those who can view your profile and posts. Twitter also tends to be more personal in nature than Tumblr;

Twitter accounts for celebrities tend to focus less on the fame and work of the celebrity, but instead focus more on the personal lives and thoughts of the celebrities themselves.

For the purposes of this project, you may choose to create a Twitter account to spread awareness of and promote events, such as beach cleanups, as well as spreading information in the form of short-form, factual tweets, such as statistical information about marine debris on the Atlantic coast. The Twitter account created for the project should also be used to share posts and information from, as well as promote, the Tumblr and Instagram accounts that will be created for the project. Both Tumblr and Instagram allow for the direct sharing of content to a Twitter account associated with the profile being used, so using the same information for and connecting these accounts is advisable. This will be helpful in spreading awareness of the project's Tumblr and Instagram content to those who are either unaware of the presence on these other platforms or who do not participate in using these other platforms, potentially expanding their respective audiences.

Instagram is a micro-blogging platform that focuses almost entirely on hosting and sharing images and videos, although captions do not necessarily have restrictions on length. As with Tumblr and Twitter, users upload content (an image or video file in this case), and other users may interact with it in the form of "Liking" or sharing (called "Reposting" in the case of Instagram). As with Tumblr, groups with similar interests tend to follow and interact with each other, often forming small communities. As such, the audience for the Instagram profile, as with the Tumblr account, will likely come primarily from scientific, academic, and environmentalist circles.

For the purposes of this project, an Instagram account would serve a similar function to that of the Tumblr account, only with a strict focus on visual media content. This means that images of beach cleanup efforts and the items found during these efforts will likely be the primary form of content posted. Because of the long possible caption length given for each post, analysis and descriptions should be provided when necessary or sensible, as with the Tumblr posts. In fact, images and videos posted to the Instagram profile can, and should, be shared to the Tumblr blog, as well as the Twitter profile. Not only does this increase audience and spread awareness, it also allows for additional commentary and analysis or description to be added to these posts on

the other platforms. Because marine debris lends itself to visual representation, Instagram can be an excellent tool that allows you to build an audience for your work. You don't have to find turtles choking on plastic bags to have a persuasive Instagram post on marine litter. Simply showing people the ordinary objects that appear frequently on shorelines will allow you to tell a compelling story about the impact of marine debris

Policy Brief Example

Talking Trash: Marine Debris in Connecticut

Katharine A. Owens and the students of the POL390 and HON390 Spring 2016 Marine Debris Course at the University of Hartford

Marine debris

Marine debris is not a new problem, but our reliance on disposable and single-use plastic items means that the debris in global waterways is accumulating at an astonishing rate. While in the 1950s only about 5 million tons of plastic were produced each year, now we produce over 280 million tons annually, most to create single-use items that are not in use within twelve months (Thompson et al, 2009). Plastics production uses 8% of global oil resources each year, what many would consider a misuse of this critically important resource (Thompson, 2015). About 20 million tons of plastic reach the ocean annually– the five oceanic gyres contain approximately 100 million tons of marine debris (U.S. EPA, 2011; Vannela, 2012). Our project sought to understand this global problem in the Connecticut context.

Why is marine debris a problem?

Plastics do not break down quickly. Plastics comprise about 10% of discarded rubbish but a higher proportion of marine debris. Plastics are estimated to take from hundreds to thousands of years to break down, but this may vary widely depending on circumstances (exposure to wind, air, sunlight, etc.). The size of plastic pieces is decreasing each year while the number of pieces found in oceans is increasing (Barnes et al, 2009).

Plastic debris impacts wildlife. The amount of entanglement (animals choking on plastic) and ingestion (animals eating plastic) has increased dramatically in wildlife species since 1997 from impacting 267 to 557 species globally. 100% of turtle species are now affected, as well as 66% of marine mammal species (or 81 species), and 50% of seabirds (203 species). There are also increases for fish and invertebrates groups, which were previously overlooked (Kühn et al, 2015).

Plastic debris can worsen issues of invasive species. Marine debris can serve as rafts for all manner of creatures, which use the material to travel to new ecosystems. 387 taxa (including microorganisms, seaweed, and invertebrates) have been recorded rafting or floating on litter in all major global oceans. Invasive species in the United States cost an estimated $120 billion in annual damages (Kiessling, 2015; USFWS, 2012).

Plastic debris creates a toxic soup in our oceans. Marine debris produces a toxic cocktail including the chemicals from plastics manufacturing and those it absorbs from marine environments. Plastic marine debris is both a physical and a chemical

hazard, as animals ingest plastic pieces laden with chemicals. These chemicals are transported through these animals to various environments, impacting more than the species originally in contact with the product. The influx of decomposing plastics and the subsequent leaching of toxic chemicals poses a danger to water quality, wildlife, and human health (Barnes et al, 2009, Engler, 2012, Rochman, 2015).

Marine debris negatively influences industries including tourism and recreation, shipping and yachting, fisheries, aquaculture, and agriculture

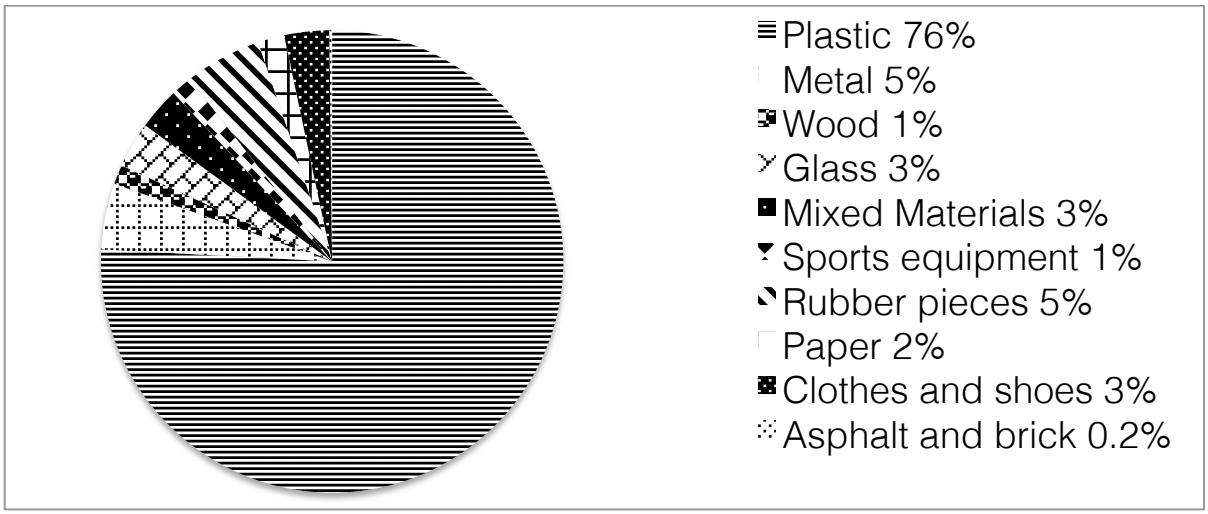
- A study of 31 California beaches found that "reducing marine debris by 50 percent at beaches in Orange County could generate $67 million in benefits to Orange County residents over a 3 month period (Leggett et al, 2014).
- Removing marine litter costs United Kingdom ports and harbors the equivalent of 2.7 million dollars per year (Newman et al, 2015).
- A 1990 study demonstrated that on the American east coast, 45% of commercial fishers dealt with caught propellers, 30% suffered from fouled gear, and 40% experienced cooling systems inhibited by debris (Wallace, 1990).
- Marine litter is estimated to cost finfish and shellfish producers of Scotland the equivalent of $176,000 per year (Newman et al, 2015).
- A recent study of oysters exposed to polystyrene microparticles (Styrofoam) showed this "interfere[d] with energy uptake and allocation, reproduction, and offspring performance" (Sussarellu et al, 2015, p. 1).
- In some coastal areas, debris can be carried by wind onto farmland, damaging property and putting livestock at risk (Newman et al, 2015).

Our project

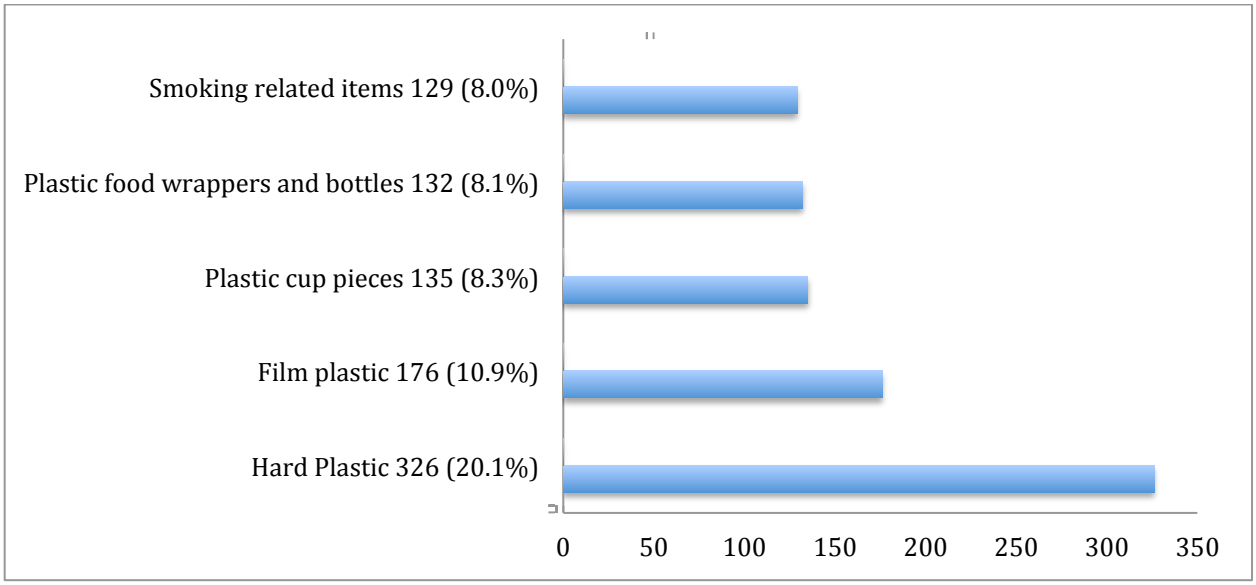
A group of thirty-five undergraduate students collected marine debris from three areas in Connecticut in the spring of 2016 including Bluff Point State Park and Coastal Reserve (February 6), Hammonasset Beach (February 7), and Meig's Point, Hammonasset (February 7 and April 2).

What we found

We spent fewer than 8 hours collecting and found over 1600 individual pieces (42 pounds) of debris of which 76% was plastic.



The five most frequently found types of items



What does this tell us?

The global problem of marine debris is an issue in Connecticut. The pattern of marine debris being composed of a high proportion of plastic debris holds true in our state, which results in risks to health, wildlife, water resources, and the economy.

What policies have other communities adopted to address marine debris?

- Bottle bills (updated in CT in 2009) significantly impact recycling rates of glass, aluminum, and plastic drink bottles and cans.
- Plastic bag bans reduce the number of these single use items in communities[1]

[1] A list of communities across the country with bag bans can be found here: http://www.cawrecycles.org/list-of-national-bans . Additional information on bag bans can be found here http://plasticbaglaws.org/legislation/state-laws/

- Plastic bag fees charge users for taking plastic bags at retail outlets, for example D.C.'s Anacostia River Clean up and Protection Act of 2009[2]
- Micro bead legislation passed nationally as the Microbead-Free Waters Act of 2015[3]
- Polystyrene food container bans for example the Sustainable DC Omnibus Amendment Act of 2014[4]

What economic instruments might address marine debris?

In The Economics of Marine Litter, Newman et al (2015) found that a range of economic instruments can counteract the effects of marine litter, including:

- incentivizing industries to use less packaging
- targeting waste accumulation (i.e., charging for landfill use)
- aiming policies at specific types of waste, such as plastic bags
- targeting in-ocean sources of waste, such as that related to shipping
- reducing litter that leads to ghost fishing
- paying for litter collection
- charging for litter according to how toxic it is
- discouraging polluting behavior (p. 388)

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At the University of Hartford, we're thankful to College of Arts and Sciences Dean Katherine Black and Honors program director Don Jones for supporting this project in multiple ways, and to Pam Masi, Office Coordinator for Politics, Economics, and International Studies for helping us iron out many details.

If you're teaching a version of this course on marine debris, I'd love to hear about it!
Please send me an email at kowens@hartford.edu

Visit the project website at: https://ctmarinedebris.wordpress.com/

On the project website you can find the following pages:

Learn about Marine Debris provides information about peer-reviewed literature, as well as links to videos and news stories on the web that can bring you up to speed on the issue.

The **Course Materials** page includes everything you need to teach the class: a social media guide, notes on teaching the class, syllabus for the class as a policy-focused undergraduate seminar (which you can use or alter as suits your purposes), a description of active teaching methods I use, and reading guides for the texts.

In **Project Results** you can see the policy brief we presented to state legislators and a brief description of what we found during collections in the spring of 2016. You can also follow the link to Dr. Owens' ResearchGate page, which details the study about the class– where she measures student knowledge, attitudes and behaviors to better understand the impact of this course.

Finally, the **Class Tumblr** shows how Dr. Owens' students analyzed and catalogued the debris we found in 2016.