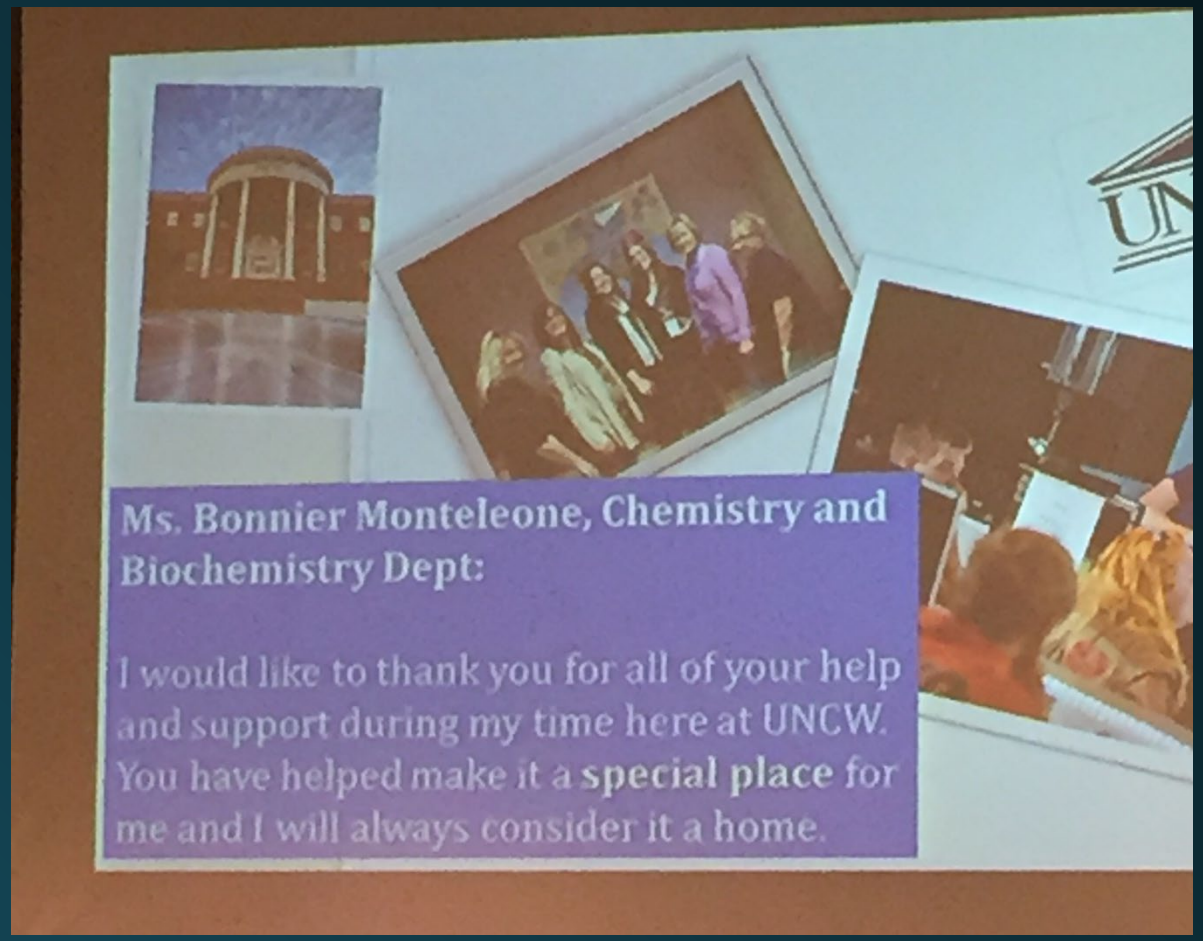
Plastic Ocean Project Then and Now

Bonnie Monteleone, Founder
Plastic Ocean Project, Inc.
CEO, +Nature

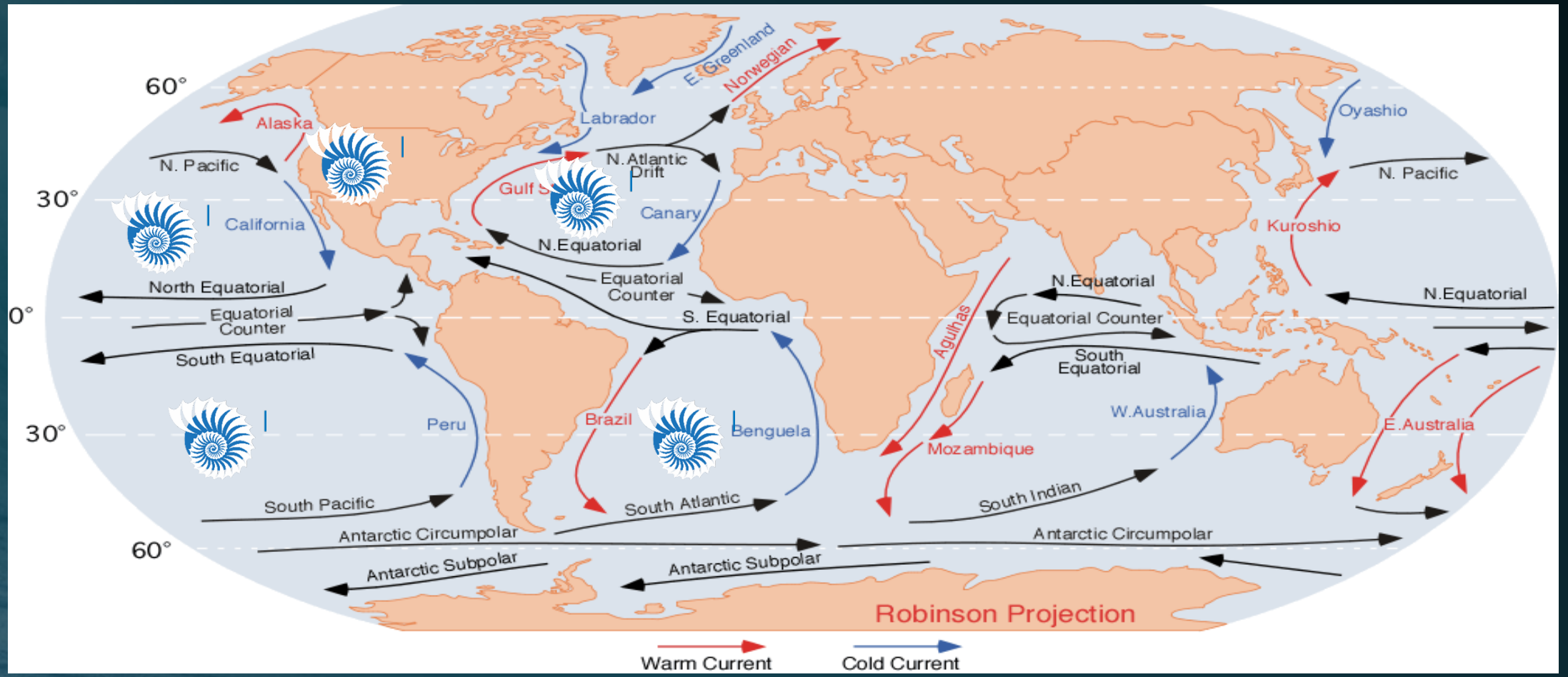
Career Path – Not a straight line

- Restaurant Owner

- UNCW Chemistry Office Admin



PLASTIC OCEAN PROJECT



Education thru Research, Outreach thru Art, and Solutions thru Collaboration

The moment when I knew . . .

Some findings from fieldwork as a master student

Plastic doesn't break down
breaks up

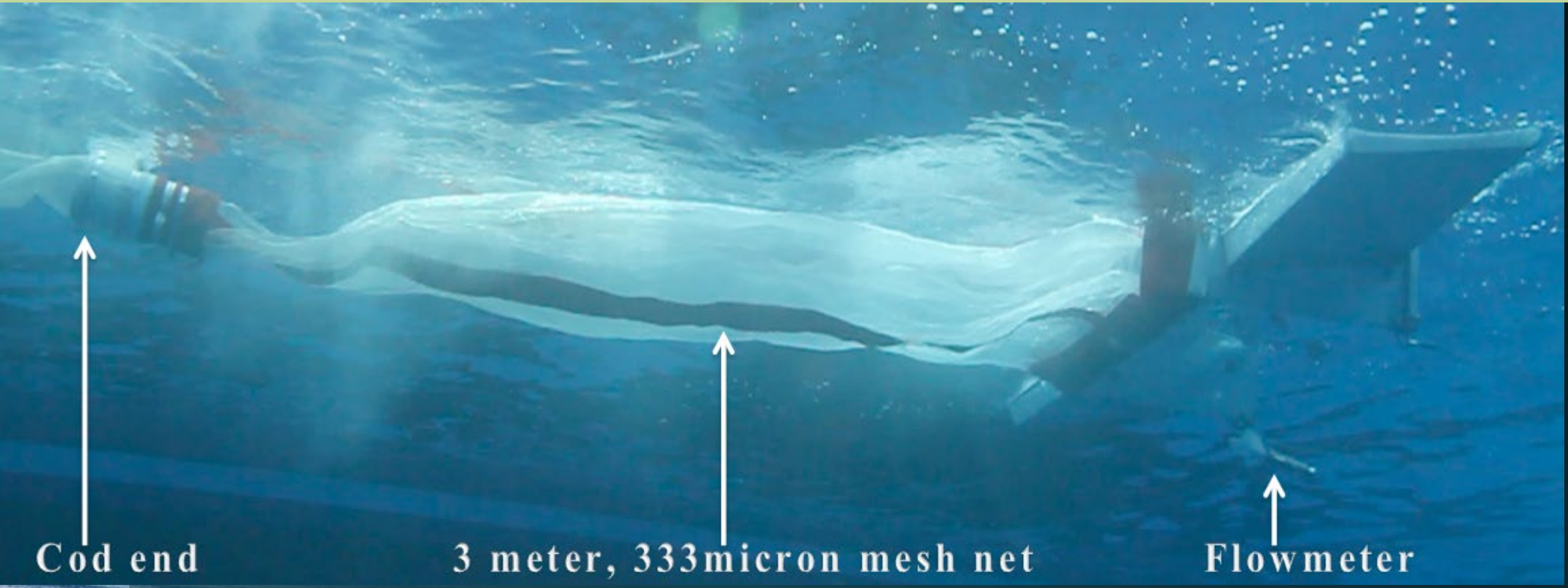
Like a plastic soup

Collected samples using a manta trawl

- 1 meter X .5 meter
- 330 micron net
- 2-3 knots
- Varied time from

15 minutes to 1 hr

Underwater look at the trawl



Plastic has become a big small problem

2. Plague animal nurseries

3. Invasive species transporter

N. Pacific Subtropical Gyre

- Transport invasive species causing bio-mixing

4. ENTANGLE AND/TRAP MARINE LIFE

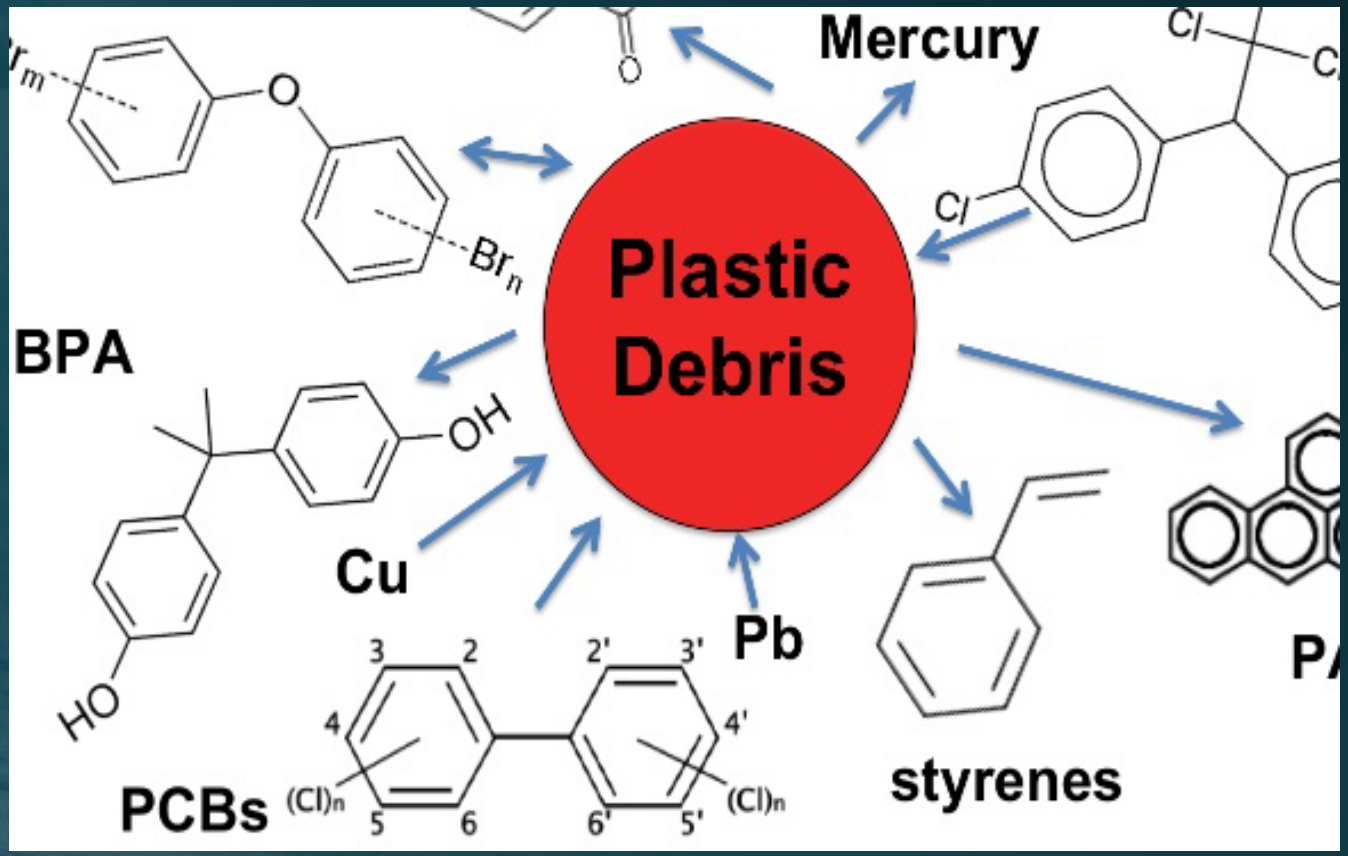
Entanglement

5. Navigational hazard for marine life and people

Almost impossible to remove without an a-frame

Ghost Nets From Below

6. Adsorb and leach chemicals



7. Consumption of plastic

35% of the 670 fish collected from N. Pacific Ocean contained plastics in stomach content. Boerger et. al. 2010

7. Biomimicry creates prey confusion

3b

Bite marks in Bermuda

3c

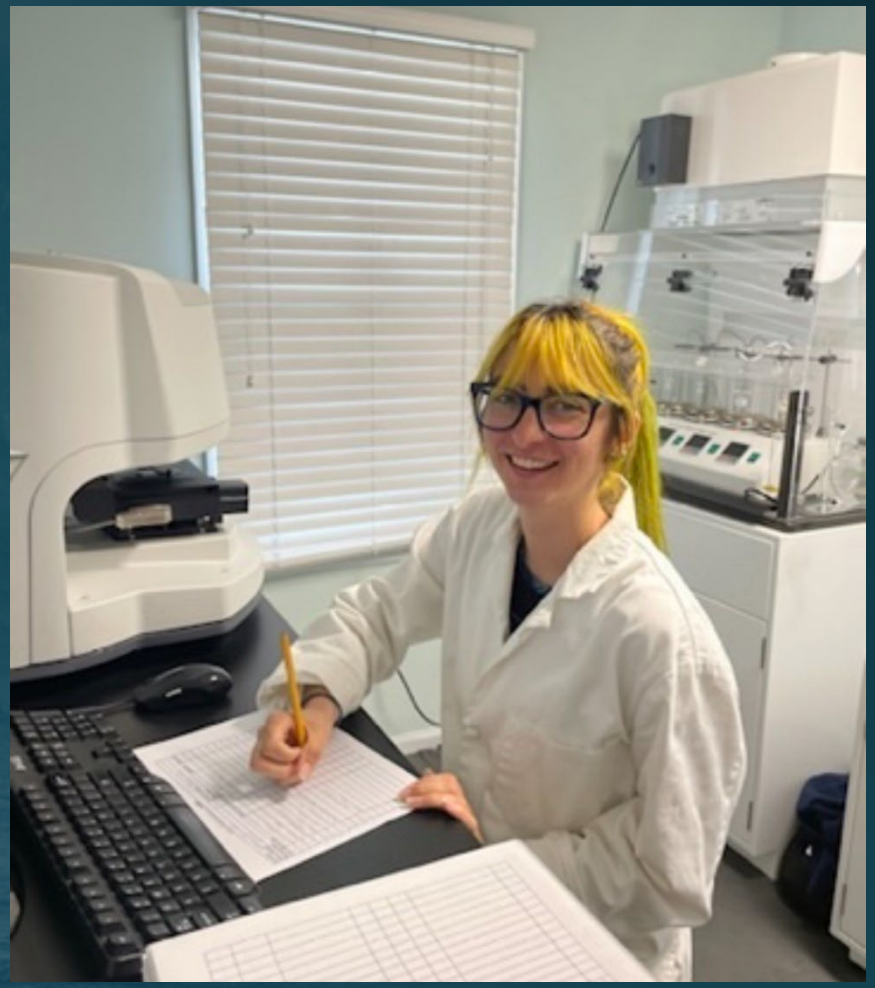
Bottles parts found in Hawaii

8. Benthos Interference

Defended in 2011 and began Plastic Ocean Project 2012

Created a POP research facility formally at UNCW MARBIONC Lab

Education through Research
Fourier Transform Infrared Spectroscopy (uFTIR) and Lab Director Kayla West



A River of Plastics

North Carolina Neuse River Basin

Rivers supply the majority of plastics that reach our coastal waters. Wildlife and aquatic animals can ingest plastic debris or become entangled. Litter on streets, sidewalks, and ditches washes through storm drains into our waterways when it rains. Plastic litter breaks down into smaller and smaller components — **microplastics** — which accumulate in fish, crabs, and oysters. Preventing and removing litter helps keep plastic out of our rivers, sounds, and food.

Microplastics

- Small particles less than 5 millimeters
- Pervasive in our streams, rivers, estuaries and the ocean

Most common microplastic types found in the Neuse River Basin:

Polyethylenes (PE) Plastic bags, films, containers	2, 4	30%
Polypropylenes (PP) Fabrics, bottle caps, carpet, food containers	5	18%
Polystyrenes (PS) Styrofoam packaging and food containers, plastic ware	6	15%
Resins Paints, adhesives, sealants	4	7.5%
Polyethylene terephthalate (PET) Bottles, containers, polyester fabrics	1	6.5%
Other Plastics Electronics, car parts, toys, etc.	3, 7	23%

Findings are based on a 2020-2021 study that NC Sea Grant led. For more information: *go.ncsu.edu/plastics*.

Macroplastics

- Plastic particles larger than 5 millimeters

Approximately 92% of the litter that washes into the creeks that drain into the Neuse River is plastic.

- 2% Plastic Lids & Caps
- 2% Plastic Cups
- 3% Balls & Toys
- 4% Plastic Food Wrappers
- 3% Aluminum Cans
- 5% Plastic Bags
- 8% Other Trash
- 6% Hard Plastic Pieces
- 10% Plastic Beverage Bottles
- 5% Plastic Film
- 10% Cigarette Butts & Cigar Tips
- 45% Styrofoam

Why did I go to the trouble of explaining all of this?

Plastic Pollution Creates Career Opportunities:

- Research
- Education
- Government Positions and Policy
- Non-profit
- Artistic Expression
- Material Science and A New Economic Paradigm

Research

The effects on marine life and the effects on us

- An estimated 1 million sea birds and 300 million marine animals die each year from plastic interaction
- Marine plastics adsorb manmade toxic chemicals and work their way up the food web
- Filter feeders like oysters ingest plastic particles, when we eat them we eat the whole animal

- The **American Academy of Pediatrics** is calling for stronger federal **food** and **plastic** safety requirements, linking several plastics to:

Obesity
Diabetes
Behavior Disorders
Cancers
Reproductive Issues

Contents of whale gut after necropsy –UNCW "North Carolina is one of the highest stranding sites on the East Coast." *Bill McLellan*

POLICY

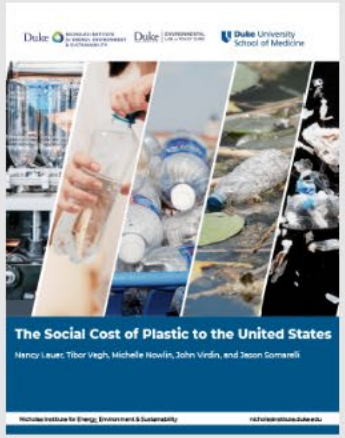
Working with Duke Environmental Law and Policy Clinic on bag ordinance

POLICY

Plastic's Hidden Price Tag: U.S. Faces Up to $1.1 Trillion in Annual Social Costs, Duke Scholars Estimate

The report's authors cite the need for further research to fully account for costs associated with plastic's life cycle.

Plastic is everywhere in daily life in the United States, from synthetic fabrics to toys to disposable utensils, straws and bags. While plastic is cheap for the average consumer, its impacts cost Americans $436 billion to $1.1 trillion per year—and that's likely an underestimate, according to a **new report from Duke University scholars**.



DOWNLOAD THE REPORT

The report, written by experts at Duke University's **Environmental Law and Policy Clinic**, **Nicholas Institute for Energy, Environment & Sustainability** and **School of Medicine**, provides the most comprehensive analysis to date of the social cost of plastic.

"The prices that consumers pay for plastic products don't tell the whole story of their costs," said lead author **Nancy Lauer**, staff scientist at the Duke Environmental Law and Policy Clinic. "Fossil fuel subsidies keep plastics relatively inexpensive in the United States. But as our report reveals, the true economic, environmental and health costs to society are far greater."

The authors derived their estimate from 13 existing studies documenting plastic's harms and costs across its life cycle—from fossil fuel extraction and production to use, disposal and

Local Policy - Determined the success of Smoke-free Wrightsville Beach

Wrightsville Beach Smoking Ban Preliminary Results

Sara Melick, Bonnie Monteleone, and Brooks Avery, PhD.
University of North Carolina Wilmington Department of Chemistry and Biochemistry

Abstract and Introduction

Cigarette filters are consistently the number one manmade debris discarded in the environment[1] and have negative consequences, especially on beaches. A 2006 laboratory study found that cigarette filters were acutely toxic to cladocerans, a freshwater organism, as well as marine bacteria (microtox) and the main cause of toxicity was attributed to nicotine and ethyl phenol in the leachates from cigarette filters.[2] There are documented cases of small children hospitalized from ingesting cigarette filters and cigarette filters found in dissected birds and fish.[3] Furthermore, these filters are composed of cellulose acetate, a form of plastic, and can persist in the environment indefinitely.[4]

A study was conducted by UNCW undergraduate students to look at the amounts of manmade debris found on Wrightsville Beach, NC, a smoke-free beach. Over the course of 4 years, 45 undergraduate students gained field research experience collecting over 300 samples partially focusing on discarded cigarette filters and were able to determine significant outcomes due the smoking ban and make recommendations for better debris management.

Marine life are known to ingested cigarette filters

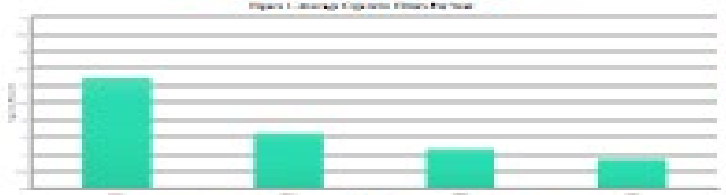
Methods

Each student was assigned 10 accesses to collect from per week for 3 months. They collected 1 to 3 samples each visit in sets of 2 either from the wrack line or the berm. The sample sites were randomly selected with the caveat that 1 would visually have a high concentrations of manmade debris and the other would have little to no evidence of manmade debris. This was to normalize each collection site to avoid only highly concentrated samples being collected. Sample sites were measured out a meter squared removing the top 5 cm of sand and debris. The samples were dried at 20°c., weighed, and sorted in the lab, separating the natural debris from the manmade debris, and then each weighed. The manmade debris was sorted by type: paper, glass, metal, cigarette filters, and plastic. The plastics were sorted again by preproduction pellet, film, filament, fragment, or foam. The data was then recorded on a master spreadsheet along with date, location, time, weather conditions, tide, coordinates, and quantities by number and by weight for each sample set.

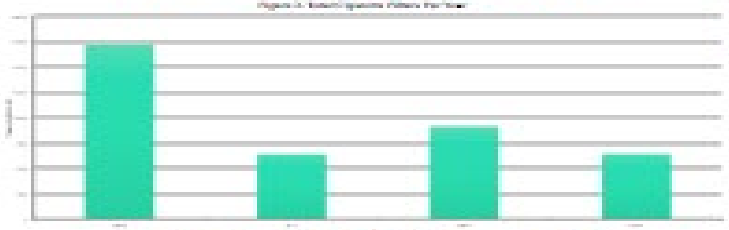
Results and Discussion

Three questions were formulated from the data that the study was able to answer. By year the number of cigarette filters went down (Fig.1) and were able to back these finding with another concurrent study on the same beach (fig 2). The findings also highlighted the pier accesses as having the highest concentration. (Fig.3)

How did the number of cigarette filters change during the study?



How does this data compare with other studies that have been conducted?



How is this data distributed among the different accesses?

Recommendations

- Monitor and keep up with signage at all of the accesses, especially those at and adjacent to the piers. This will help with better awareness of the ban.
- Have larger cigarette filter receptacles put in, especially in high traffic areas.
- Enlist groups to "Adopt a Pier." They would be responsible for cleaning up the area not only for cigarette filters, but also for picking up other debris.
- Enlist beach ambassadors by having local nonprofits collaborate with the town of WB to give unpaid internship positions. It would engage the local community regarding litter and give intern opportunities to students who can increase awareness regarding the ban and why it is important.

Conclusion

While cigarette filters continue to be the number one item found on this beach, the smoking ban has been effective in reducing the amount. The data also revealed the piers are the hot spot areas where more education and signage could significantly reduce discarded cigarette filters. Without the data collected through UNCW, along with Wrightsville Beach Keep it Clean, it would be difficult to recognize the ban was working.

References

1. 30 Year Anniversary International Coastal Cleanup Annual Report 2015. http://www.oceanconservancy.org/our-work/marine-debris/2016-data-release/2015-data-release-1.pdf
2. Micevska, T.; Warne, M.; Pablo, F.; Patra, R. Variation in, and causes of, toxicity of cigarette butts to a cladoceran and microtox. Arch. Environ. Contam. Toxicol. 2006, 50, 205-212.
3. Tobacco Free Kids. Special Reports: Justice Department Civil Lawsuit (updated 17 November 2006). http://www.tobaccofreekids.org/reports/daj/ (accessed November 8, 2008).
4. Clean Virginia Waterways. Are Cigarette butts bio-degradable? http://www.longwood.edu/CLEANVA/cigbuttbiodegradable.htm (accessed December 15, 2006).

Acknowledgements

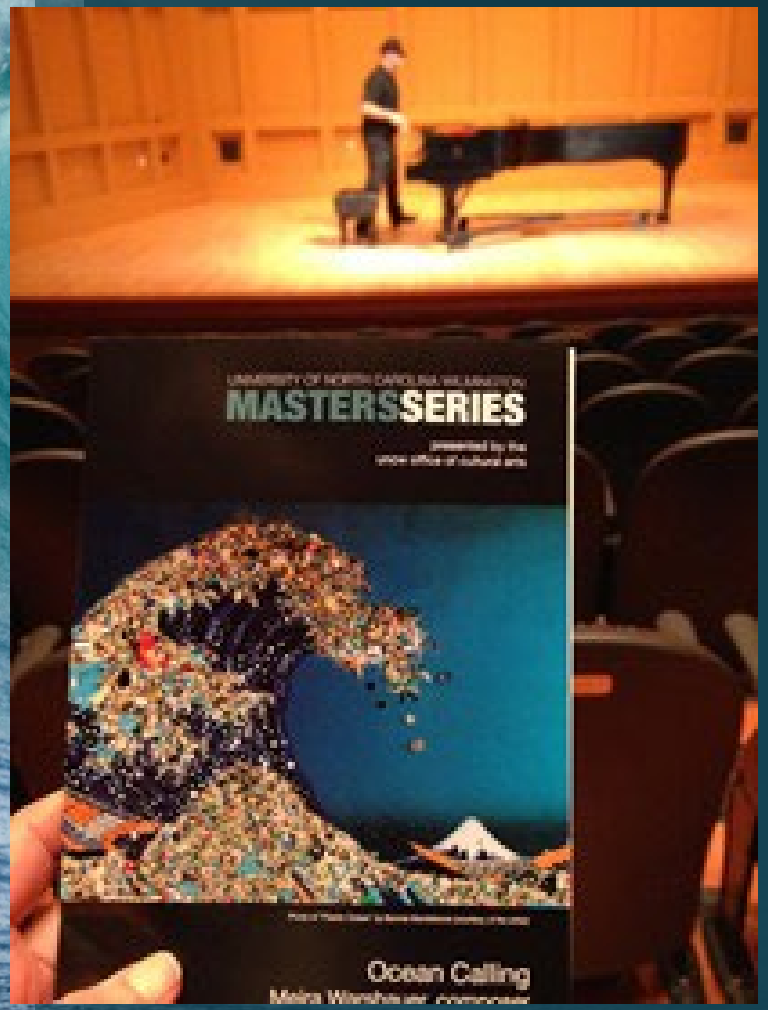
Ethan Lawson – UNCW Chemistry Undergraduate
Ginger Taylor – Wrightsville Beach Keep It Clean
UNCW's Experiencing Transformative Education through Applied Learning (ETEAL)

Outreach through Artist Expression

Award Winning Artwork

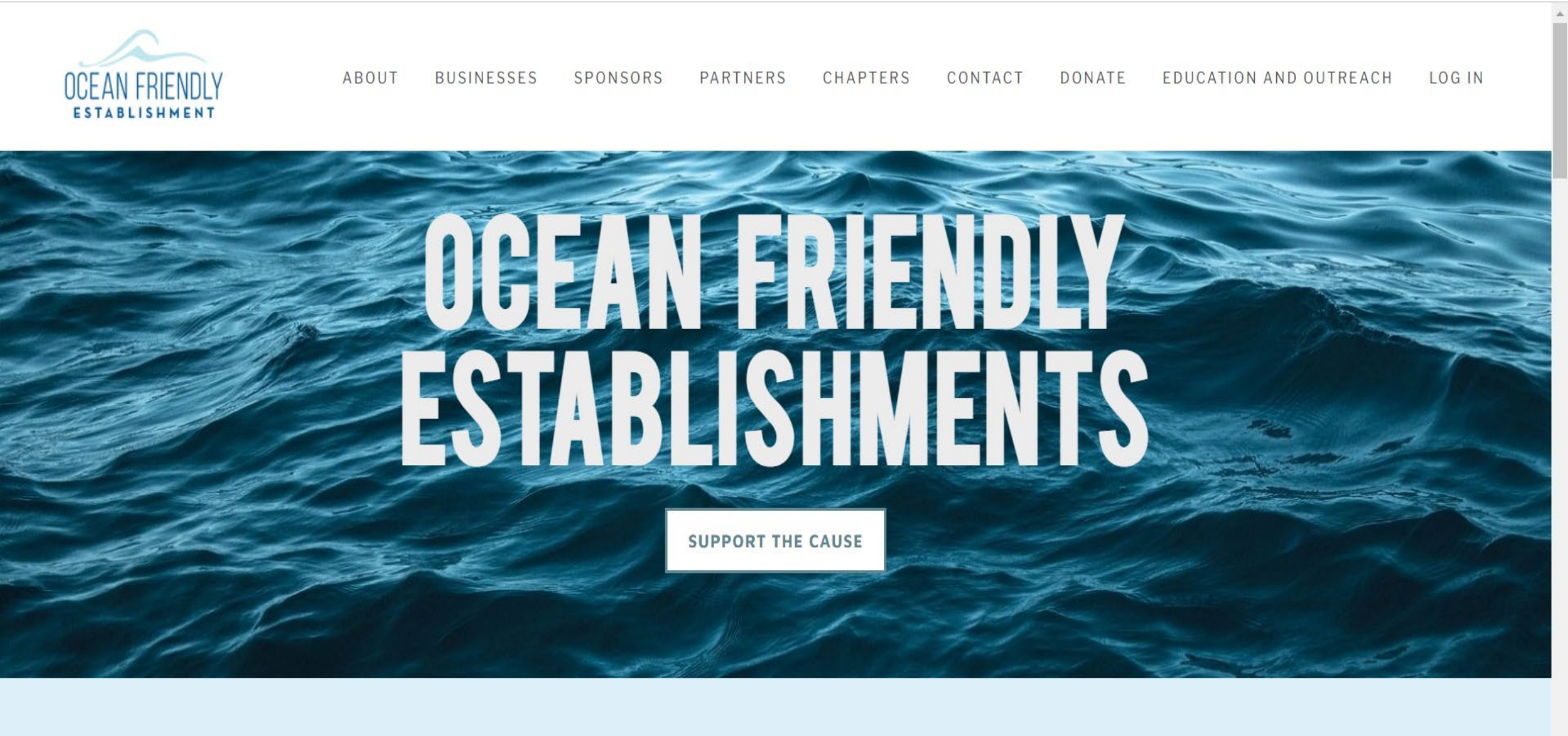
Documentary Film, “If the ocean could talk” Award winning “356” and A Plastic Ocean

Composer Meira Warshauser utilizing our art for her composition, “Ocean Calling”

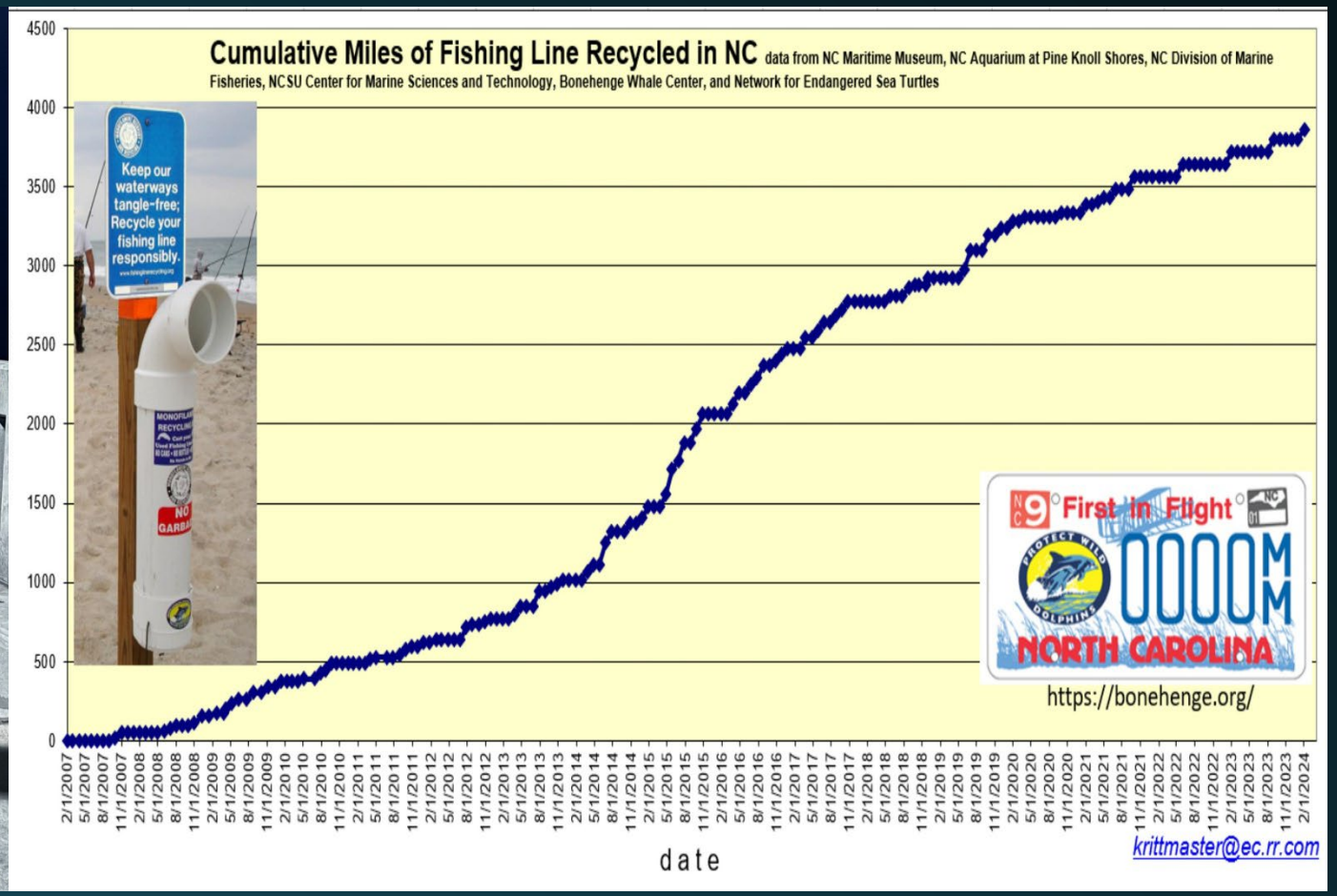


Solutions through Collaboration

Solutions through Collabor-ocean



POP's Lines4Life with Bonehenge NC and volunteers across the state



Trees4Trash – with NHC Landfill

For every 25 lbs. of trash we plant a tree.

We planted over 6,000 trees since 2019 and counting!

We now have cameras at Fran's Forest

coyote, deer, rabbits, and racoon

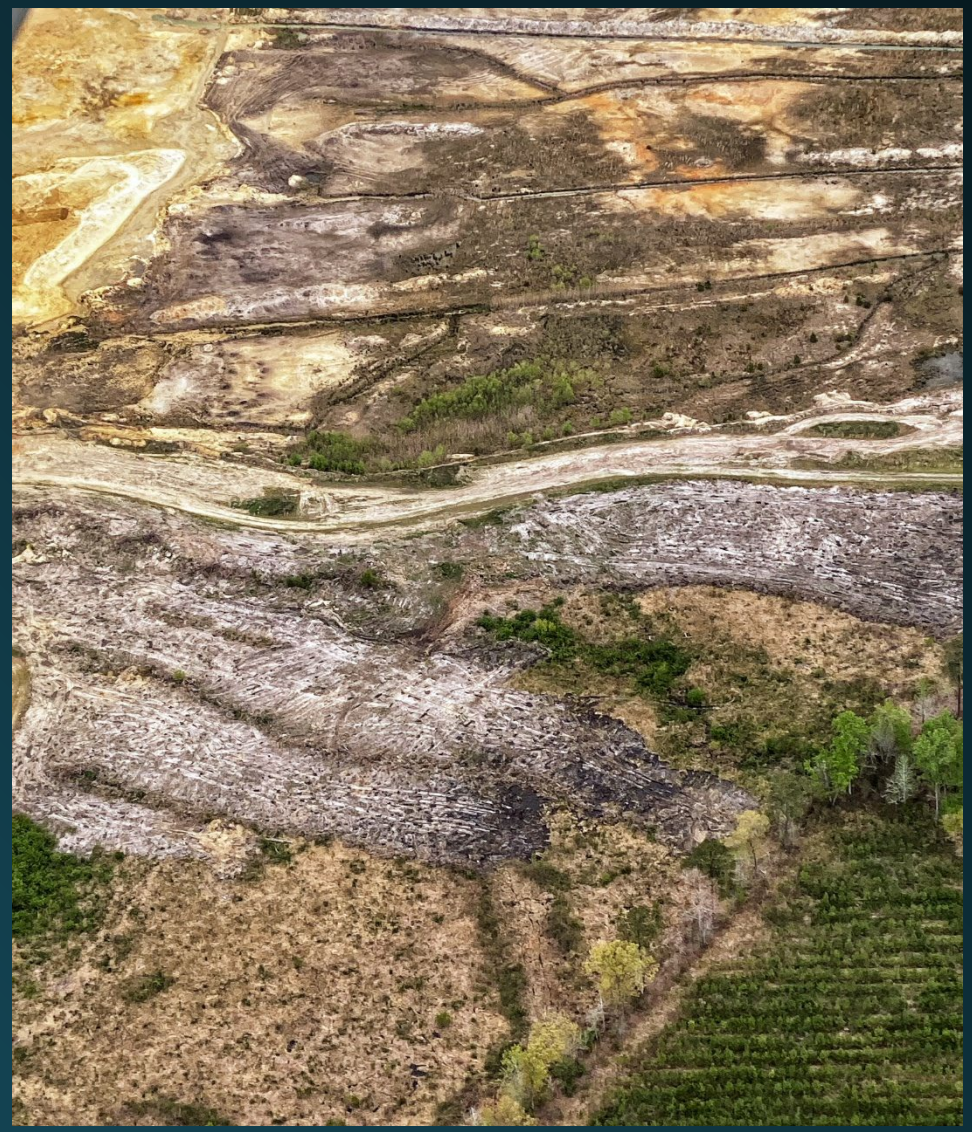
+NATURE ECONOMIC MODEL

THREE CRITICAL ELEMENTS FOR ACTION:

1. Valuing Keystone Species and Ecosystems
2. Rapidly Building Out Circular Economies
3. Designing a + Nature Market

A keystone species is one on which other species in an ecosystem largely depend, such that if it were removed the ecosystem would be radically altered.

Concerned about the deforestation here? So are we.



- It’s a great time to be alive
- No time in history has individual actions have the greatest impact
- Challenging times require more creative thinking
- We need all skillsets: scientists, engineers, artists, activists, writers, storytellers, and legislators to solve these problems -creating jobs through saving the planet

Thank you St. James!

Looking for volunteer opportunities?

Want to mentor?

Join us at our *For the Ocean Gala*

Want to financially support?

Join us!

To learn more:
www.plasticoceanproject.org and
www.plusnature.org