



# FROM SHORE TO SHOES

BEACH RUNNERS FROM COASTAL WASTE



# My Project

The design and fabrication of a beach running shoe made from local (North Carolina) coastal waste.



# Why beach runners?

Beach running is a popular sports and exercise activity. For runners whose main events are not on the sand, beach running can be a valuable form of cross training or general exercise. Training on sand can increase strength and speed on trails, pavement, or the track. Sand absorbs shock, so running on sand can minimize bodily strain. Additionally, running on the beach's uneven terrain activates different stabilizing muscles. The combined extra effort and muscle engagement result in more calories burned compared to running on flat surfaces.<sup>1</sup>

Running barefoot on sand is dangerous, because sharp objects can be present and injuries to the ankle, foot, and achilles can occur without the support of a shoe. To maximize the benefits of beach running, though, shoes need to meet certain criteria. Beach running shoes need to allow for a full range of motion and for the foot to respond to the uneven terrain, as well as keeping sand out and boasting quick-drying capabilities. Despite the need for beach running technology, there is a lack of products that are optimized for performance beach running.



<sup>1</sup> LeFave, Samantha. "How Running on the Beach Can Boost Your Performance" Runner's World. June 1, 2018. <https://www.runnersworld.com/training/a20967432/running-on-the-beach-benefits/>.

# Manufacturing Waste

The fashion industry is the second largest polluter in the world, and shoes are responsible for one-fifth of the environmental impact. More than 20 billion pairs of shoes are manufactured each year with 30 pounds of carbon dioxide emitted per shoe, equaling 600 billion pounds of carbon dioxide emissions each year.<sup>2</sup> Researchers at MIT's Materials Systems Laboratory conducted a life-cycle assessment of a typical running shoe and divided the shoes' life-cycle into five stages: materials, manufacturing, usage, transportation and end-of-life.<sup>3</sup> They found that the manufacturing stage contributed most to the product's carbon footprint due, in large part, to the creation of synthetic materials, or "virgin materials." In addition to the carbon emissions that result from the creation of synthetic materials, the World Wildlife Fund found that this process can produce even more waste than usable material.<sup>4</sup> Using recycled materials, rather than virgin materials, in the production of running shoes will reduce the amount of carbon emissions and net waste that result from the manufacturing phase of a shoe.



<sup>2</sup> Cernansky, Rachel. "The brands working to make footwear more sustainable" Vogue Business. January 14, 2020.  
<https://www.voguebusiness.com/sustainability/brands-working-to-make-footwear-more-sustainable-rothys-allbirds-everlane-reformation-gucci>.

<sup>3</sup> Chu, Jennifer. "Footwear's [carbon] footprint" MIT. May 22, 2013.  
<http://news.mit.edu/2013/footwear-carbon-footprint-0522>.

<sup>4</sup> Palmer, Brian. "Many sneakers are not eco-friendly, but you can reduce their environmental impact" The Washington Post. August 6, 2012.  
<https://www.washingtonpost.com/national/health-science/many-sneakers-are-not-eco-friendly-but-you-can-reduce-their-environmental-impact/2012/08/06>.



# Coastal Waste

The ever-increasing presence of coastal waste is widely destructive. By 2050, there could be more plastic than fish in the ocean.<sup>5</sup> The accumulation of waste causes sweeping devastation, both environmental and economic, affecting both humans and animals.

Plastic pollution kills more than 100,000 marine creatures every year by entanglement or ingestion.<sup>6</sup> If these animals survive ingesting plastic, toxic pollutants are transferred up the food chain and ingested by humans.

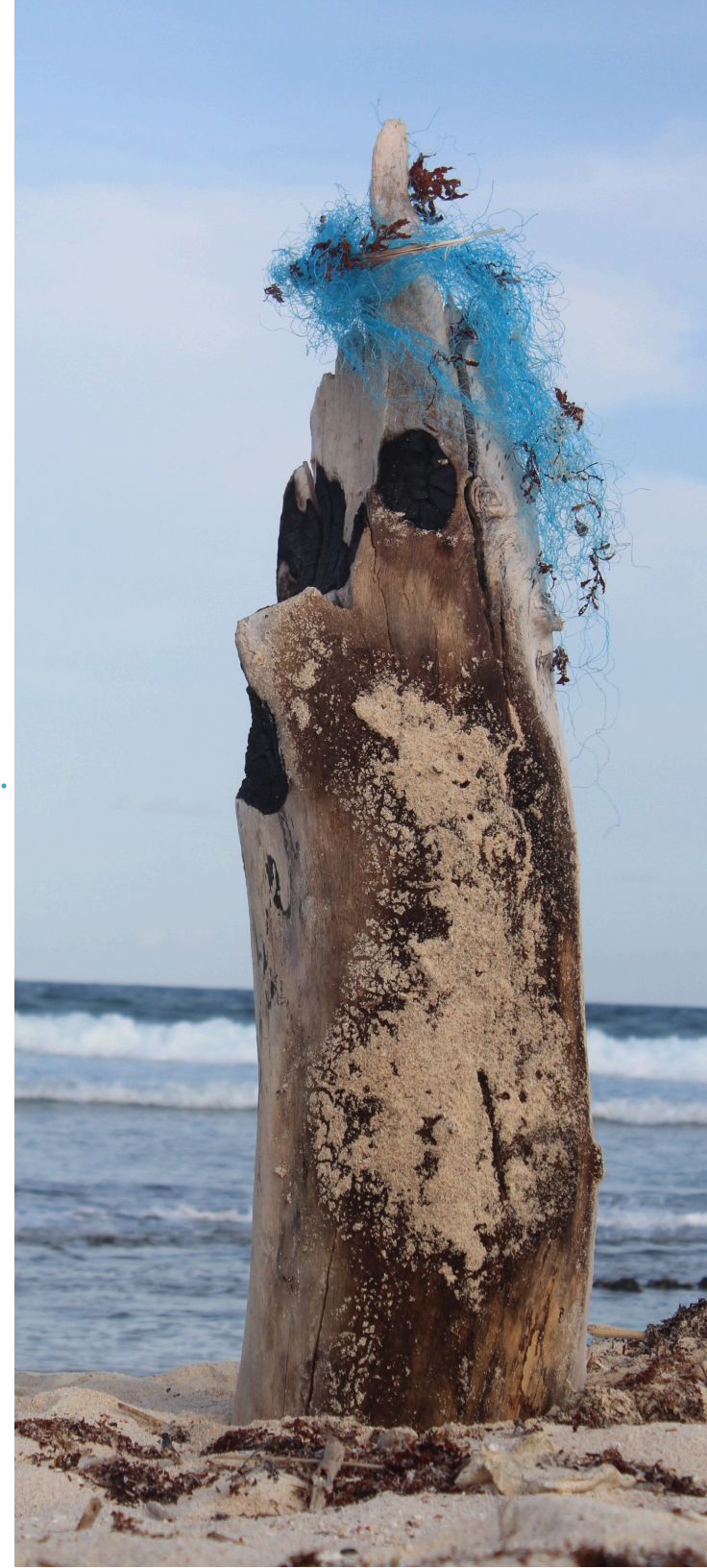
There are other ways in which humans are affected by coastal waste. Beaches polluted with broken glass and sharp metals can harm beachgoers, but excessive debris can also harm the community's economy if visitation decreases. With 80% of all tourism taking place in coastal areas, it is imperative that beaches are safe for visitors.<sup>7</sup>

My beach running shoe will be made from the readily available source of coastal waste. The creation of this shoe will decrease waste not only in coastal areas, but in the manufacturing process of shoes. My shoes will inspire runners to visit beaches, keep them clean, and appreciate coastal regions.

<sup>5</sup> "Plastic in Our Oceans Is Killing Marine Mammals" WWF. October 11, 2018.  
<https://www.wwf.org.au/news/blogs/plastic-in-our-oceans-is-killing-marine-mammals>.

<sup>6</sup> Ibid.

<sup>7</sup> Gunter, Michel. "Marine Problems: Tourism & Coastal Development" WWF.  
[3wwf.panda.org/our\\_work/oceans/problems/tourism/](https://www.wwf.org.au/our_work/oceans/problems/tourism/).



# STEP 1:

## Ideation



My project starts with developing ideas for the optimal beach running shoe. This phase will include ideation sessions with my advisor and consumer surveys. These surveys will gauge interest in shoes made from recycled materials and in shoes made for running on uneven terrain based on metrics such as geographic location, age, activity level, etc.



## STEP 2: On-site Research



I will conduct research in the areas of marine waste, materials processing, and current innovative, sustainable design practices. Available materials will be assessed by visits to the North Carolina coast and collaborations with beach cleanup organizations.

After my research into available materials is completed, relevant visits to processing sites will be determined by my advisor and myself. Research on materials processing will include visiting individuals and companies that process waste into usable materials, or those that are sustainably creating products with innovative materials, especially those in the sport technology sector.

## STEP 3:

### Digital Design & Prototyping



My in-depth research will propel me into a digital prototyping phase. In this phase, I will draw on consumer demands and current design solutions to create a prototype using SolidWorks, a 3D modeling software. Following, I will have the design 3D printed as a model to-scale. During this preliminary prototyping phase, I will create a techpack to accompany my design, which will indicate each material and processing technique that will be used in the final construction of the shoe.



## STEP 4:

### Fabrication & Physical Modeling



After prototyping, I will begin processing materials and constructing my shoe. The first step in this process is to gather materials from the North Carolina coast and from beach cleanup organizations. Next, I will begin to process the materials and create a physical model of my shoe. The final fabrication phase will be dependent on my findings throughout my project, but I will rely upon the insights of my advisor and the resources in the Materials Lab at the NC State School of Design to create my beach running shoe.

# "From Shore To Shoes" Timeline



June 1 - June 29

## IDEATION

- Create and deliver consumer surveys
- Remote ideation sessions with advisor
- Synthesize data
- Create a detailed plan for travel and site visits



## ON-SITE RESEARCH

- Visit beaches and collaborate with beach cleanups to determine readily available materials
- Travel to London to meet with advisor
- Visit relevant processing sites, design studios, and factories

June 29 - August 10



August 10 - October 5

## DIGITAL DESIGN & PROTOTYPING

- Synthesize all of my research to this point
- Create a digital prototype of my shoe based on my findings
- Create a 3D printed model to scale
- Create a techpack to indicate materials and processing techniques that will be used in fabrication



## FABRICATION & PHYSICAL MODELING

- Gather materials from the NC Coast
- Use the resources in the Design Materials Lab to construct a physical model of my shoe
- Collaborate remotely with my advisor to complete my project

October 5 - November 16



# My Advisor: Solene Roure

A French design consultant based in London. She specializes in footwear and accessory creation and has over 15 years of experience working with some of the world's leading sports and fashion brands.

Passionate about when sport technology meets fashion, creating product that allows consumers to balance a healthy, joyful lifestyle and responsible design processes, Solene will be an invaluable asset to this project.

"Sustainability is a big word, with a big meaning and not just a marketing tool. We have to challenge every aspect of our industry, and share the knowledge so that we limit the impact on our planet."





# Genevieve Gholizadeh

Throughout my professional and educational experiences, I have gained skills in research, general design, and shoe-making that will contribute to the success of my project. As a graduate student in Industrial Design at NC State University, my coursework has taught me skills in research through projects that require product, materials, and consumer research prior to ideation. I have also gained skills in digital prototyping, including 3D modeling softwares such as SolidWorks, and physical fabrication in my university's Materials Lab. Here, I've learned to use manufacturing tools such as saws, drills, welding apparatuses, laser cutters, and 3D printers. I am also confident in my ability to successfully craft a shoe. My first experience in shoe-making was a 1-day intensive SneakerKit shoe class, and I sharpened my skills during an apprenticeship with a local shoe cobbler. During a 3-week shoe factory tour in Thailand and Vietnam, I learned about materials and manufacturing. My most formative experience was a 3-day sneaker class with shoemaker Yuji Okura, during which I hand-made a shoe from start to finish.

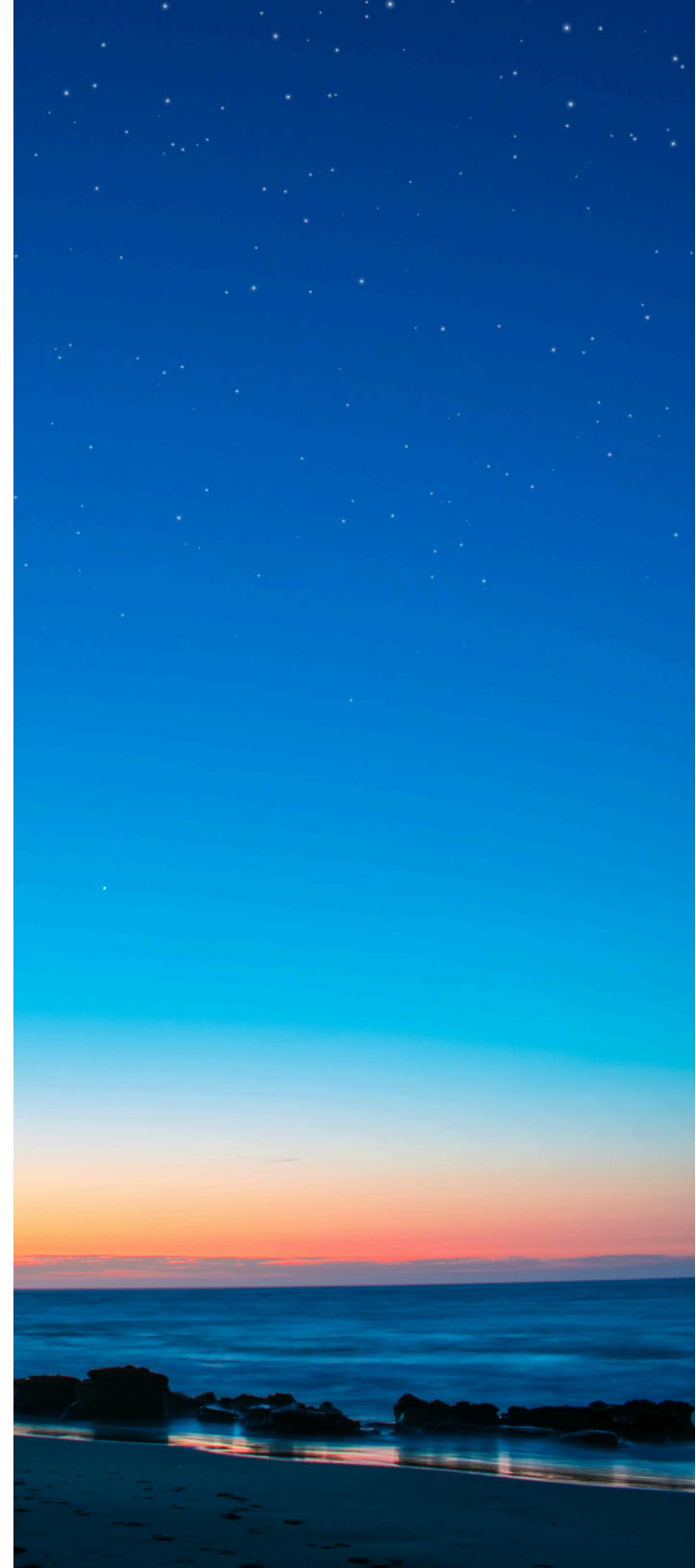


# Stepping Forward

Although some market leaders have launched sustainability-focused initiatives and incorporated more recycled materials, a bigger commitment must be made to sustainable change. If the supply and demand in sportswear industries continue at their current rate, by the year 2050, we will need 3x as many natural resources compared to the year 2000.<sup>8</sup> My project will present an example of a future-forward, sustainability-focused performance footwear product, and will represent some of the changes that are needed in the industry.

Throughout my project, I will develop relationships with like-minded industry professionals, build upon my existing skills in design, and enhance my understanding of performance footwear. I hope to transform these relationships into future collaborations and collective initiatives to create ethical sports technology products, and potentially launch my own footwear brand. Receiving the 2020 WIST Fellowship would allow me to build the knowledge, relationships, and skills to begin my career in the sports technology industry.

<sup>8</sup> Chitty, Tom. "We're on track to triple our use of natural resources by 2050" CNBC. September 11, 2017. <https://www.cnbc.com/2017/09/11/were-on-track-to-triple-our-use-of-natural-resources-by-2050.html>.







# THANK YOU!

FOR CONSIDERING MY PROPOSAL,  
"FROM SHORE TO SHOES: BEACH RUNNERS FROM COASTAL WASTE"