

LML Marine Debris Data Visualization

June 9, 2022

Sponsor Team

Robin Dunkin
Juliana Limon
Maia Smith

Development Team

Kaitlyn Liao
Vinh Le
Noah Cantwell

Bridget Chew
Zachary Miller
Spencer Fulgham



What is LML?

UCSC Long Marine Lab contributes to the scientific research of marine animal conservation by collecting data from living or dead stranded mammals, as well as the health of local beaches.

Survey Slugs

- Undergrad program
- collect stranded marine mammal carcasses
- record marine debris

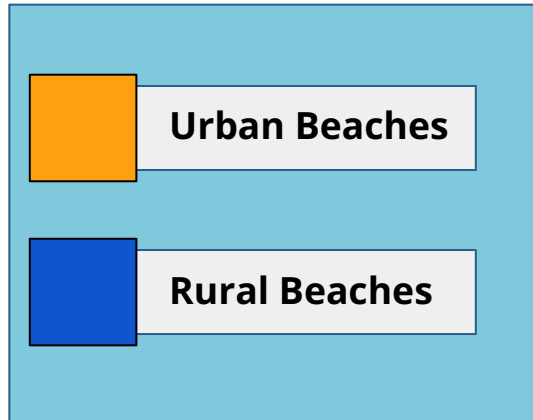
Do You 'Sea' the Problem?

Santa Cruz has a growing marine debris problem. To monitor and investigate patterns in marine debris, the UCSC Long Marine Labs Survey Slug program has collected 2,446 lbs of trash on Santa Cruz and Monterey beaches across three years.



Where does the trash comes from?

North to South (along coastline):

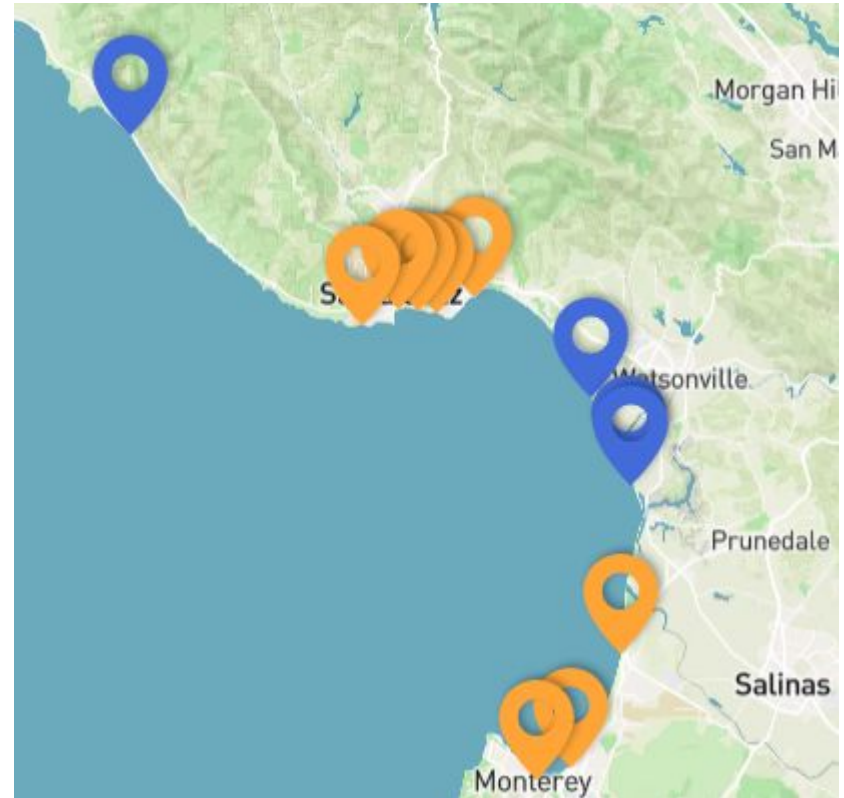


Waddell

Natural Bridges
Main Beach
Seabright
Live Oak
Capitola

Sunset
N. Zmudowski
S. Zmudowski

Marina
Seaside
Del Monte



Where does the data go?

What does LML do with all this collected data?

- Well, that's actually the issue.
- Aside from use in department research, this data is not publicly accessible.

	A	B	C	D	E	F	G	H
1	Beach	Urban vs. Rural	Date	Season	Total Fragments	Total Plastic Pro	Total Food Wrap	Total Styrofoam
2	Seabright	U	1/7/19	Winter	1	0	0	0
3	Del Monte	U	1/13/19	Winter	3	1	0	0
4	Marina	U	1/13/19	Winter	1	0	0	1
5	Natural Bridges	U	1/13/19	Winter	0	1	2	0
6	S. Zmudowski	R	1/13/19	Winter	13	0	0	1
7	Seaside	U	1/13/19	Winter	1	1	0	0
8	Sunset	R	1/13/19	Winter	50	3	0	23
9	Waddell	R	1/13/19	Winter	0	0	0	0
10	Capitola	U	1/17/19	Winter	0	0	0	2
11	Live Oak	U	1/18/19	Winter	68	5	0	109
12	N. Zmudowski	R	1/28/19	Winter	7	0	0	23
13	Waddell	R	2/9/19	Winter	4	1	0	0
14	Capitola	U	2/10/19	Winter	2	0	0	0
15	Live Oak	U	2/10/19	Winter	32	1	0	55
16	Marina	U	2/10/19	Winter	1	0	1	5
17	N. Zmudowski	R	2/10/19	Winter	0	5	0	2
18	Natural Bridges	U	2/10/19	Winter	8	0	0	1
19	S. Zmudowski	R	2/10/19	Winter	0	0	0	0
20	Seabright	U	2/10/19	Winter	2	0	1	0
21	Seaside	U	2/10/19	Winter	1	0	0	0
22	Sunset	R	2/10/19	Winter	76	0	0	20
23	Del Monte	U	3/2/19	Winter	4	1	0	3
24	Capitola	U	3/3/19	Winter	1	0	0	0
25	Live Oak	U	3/3/19	Winter	0	0	0	0
26	Main Beach	U	3/3/19	Winter	8	0	0	0
27	Marina	U	3/3/19	Winter	1	1	0	4
28	Seabright	U	3/3/19	Winter	5	0	0	3
29	Natural Bridges	U	3/10/19	Winter	2	0	0	0
30	Waddell	R	3/10/19	Winter	1	0	0	2
31	Seaside	U	3/11/19	Winter	30	7	0	18
32	Sunset	R	3/23/19	Winter	1	0	0	1
33	S. Zmudowski	R	4/6/19	Spring	0	2	0	7
34	Live Oak	U	4/7/19	Spring	1	0	0	4
35	Capitola	U	4/14/19	Spring	1	1	0	0

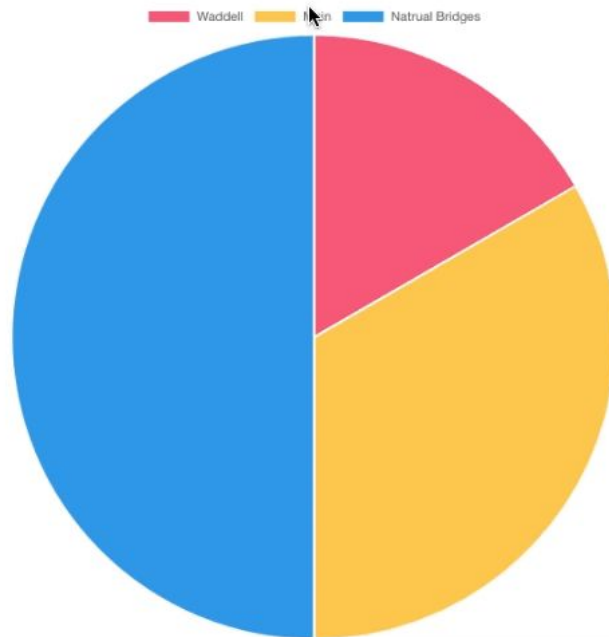
How are we going to help LML?

Numbers on an Excel spreadsheet to...

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33	S. Zmudowski	R	4/6/19	Spring	0	2	0	7
34	Live Oak	U	4/7/19	Spring	1	0	0	4
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Graphs on an accessible website



Our Simple Goal

Develop a website which displays LML's marine debris data in a way that is accessible to to the communities of Santa Cruz and Monterey.

Objectives of Our Website

1. **Visual appeal**

A layout aesthetically similar to the pre-existing Marine Mammal Stranding Map Website, with key functional and topical differences

2. **Data Upload**

Let admins upload **marine debris data** to website

3. **Data Visualization**

Visualize debris data of different beaches through graphs and pictures

4. **Locate Beaches**

Display pins to locate and select beaches in which data was collected from

5. **Security**

Manage admin users and who has access to uploading data

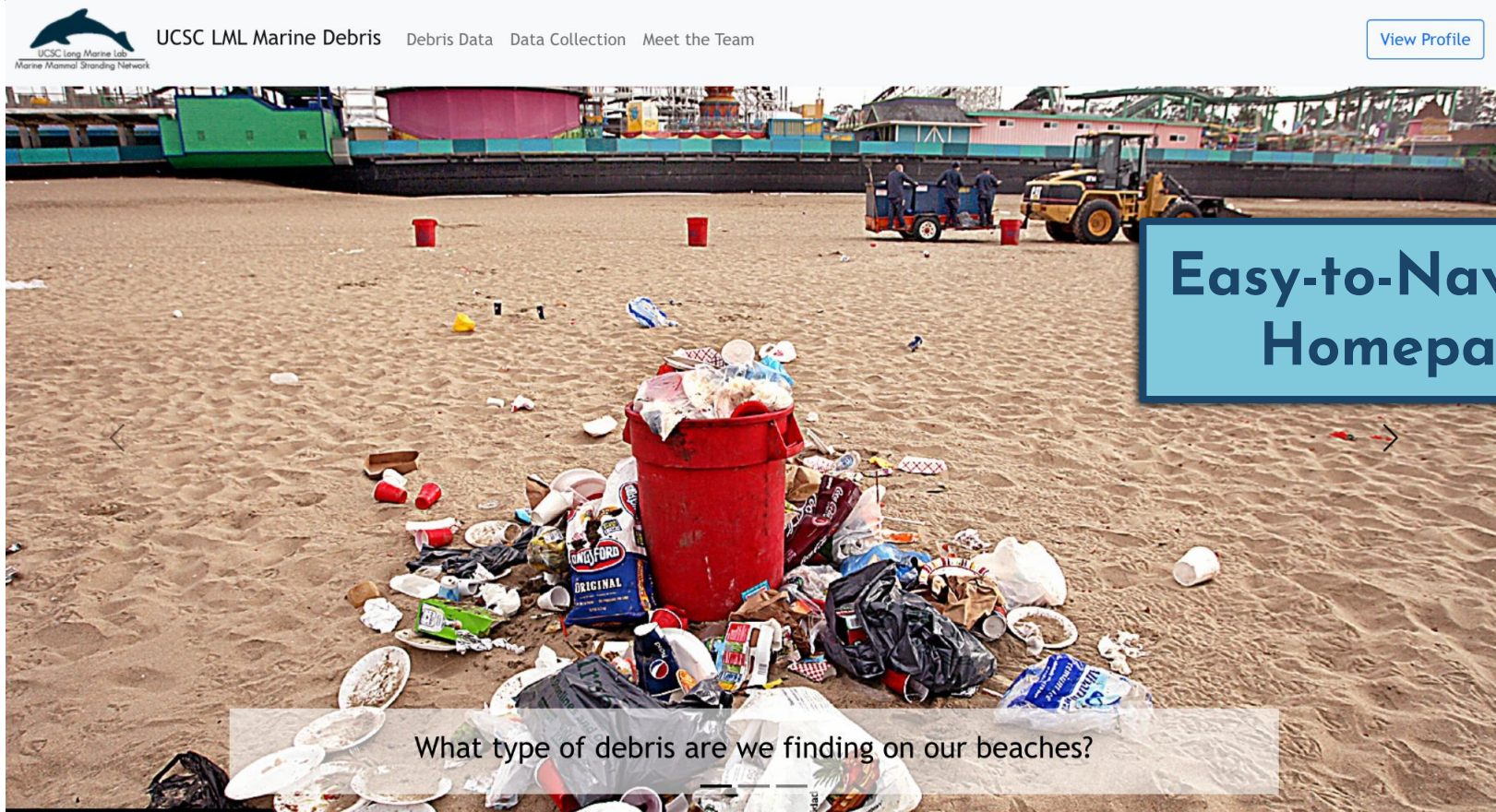
Approaching the Product

1. Set up the **groundwork** and **foundational** codebase
2. **Parse the debris data** files into our database
3. Complete all the **static (informational)** pages
4. Implementing the **data visualization** and **map tools**
5. Complete the **dynamic (interactive)** pages
6. **Host!**
7. Creating **admin profiles** and login abilities
8. Add **security** to admin profiles
9. Final touches and **wrap-up**
10. Handing off the **keys** to the LML Marine Department



Results

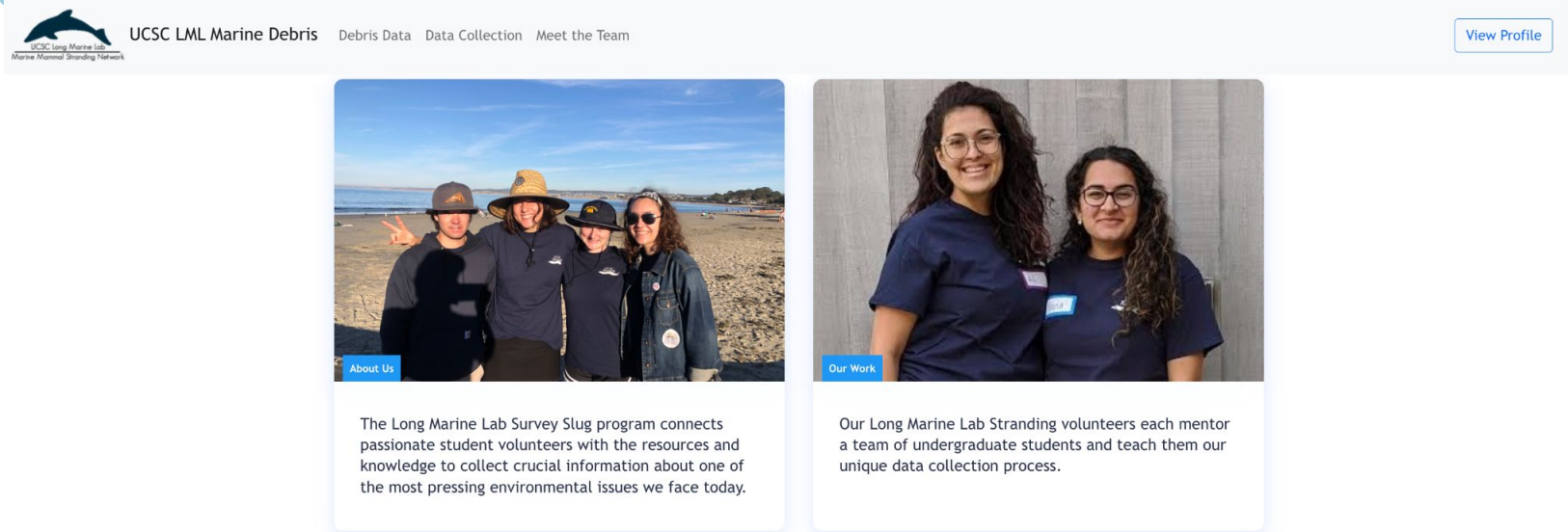
Results: Visiting the Website



Easy-to-Navigate
Homepage

What type of debris are we finding on our beaches?

Results: Visiting the Website



**Easy-to-Navigate
Homepage**

UCSC LML Marine Debris

(831) 459-2883
115 McAllister Way
Santa Cruz, CA 95060

Visit Us!

[Visit the official LML website!](#)
[Visit our Marine Stranding website!](#)

Results: An Interactive Map



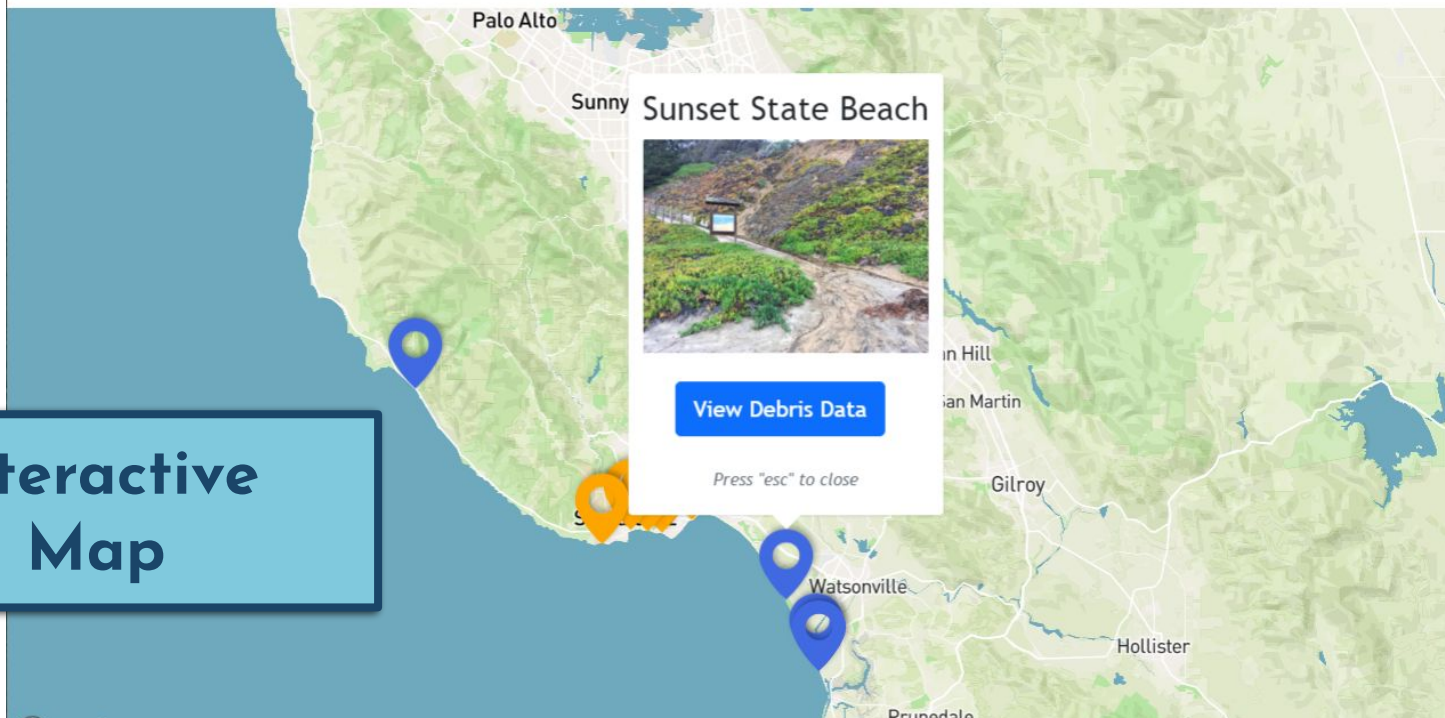
UCSC LML Marine Debris

[Debris Data](#)

[Data Collection](#)

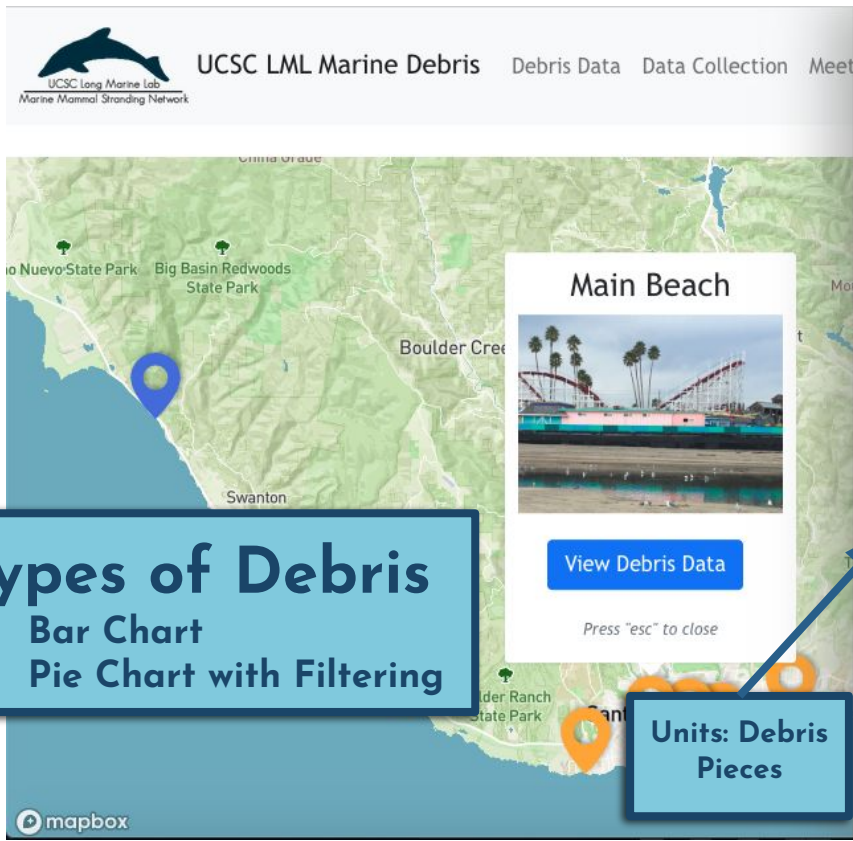
[Meet the Team](#)

[View Profile](#)



**Interactive
Map**

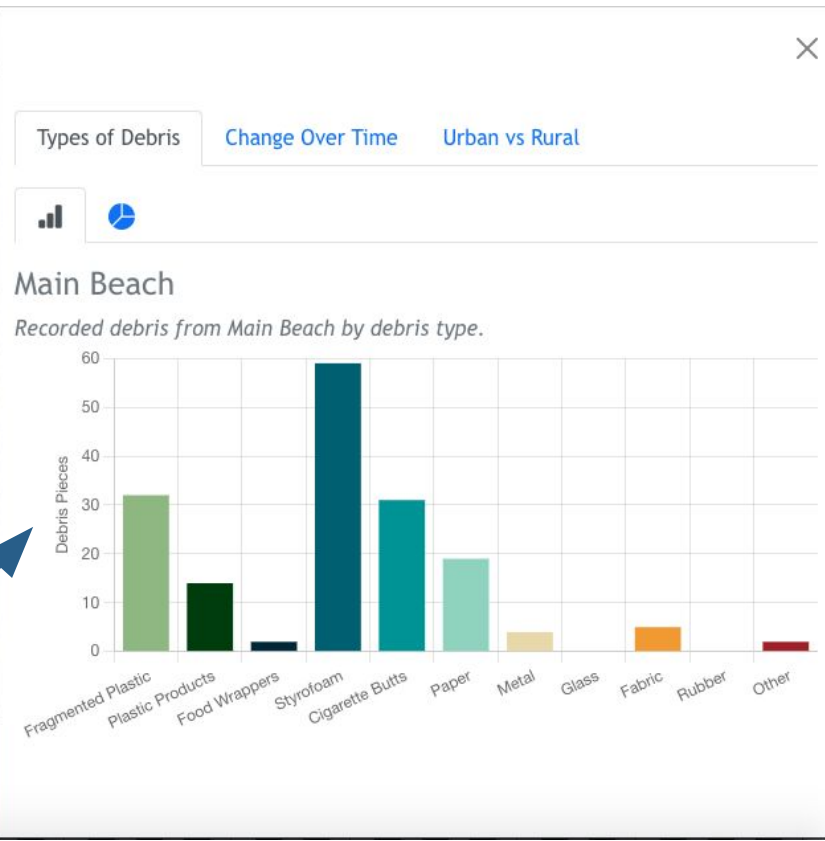
Results: Accessible Debris Data



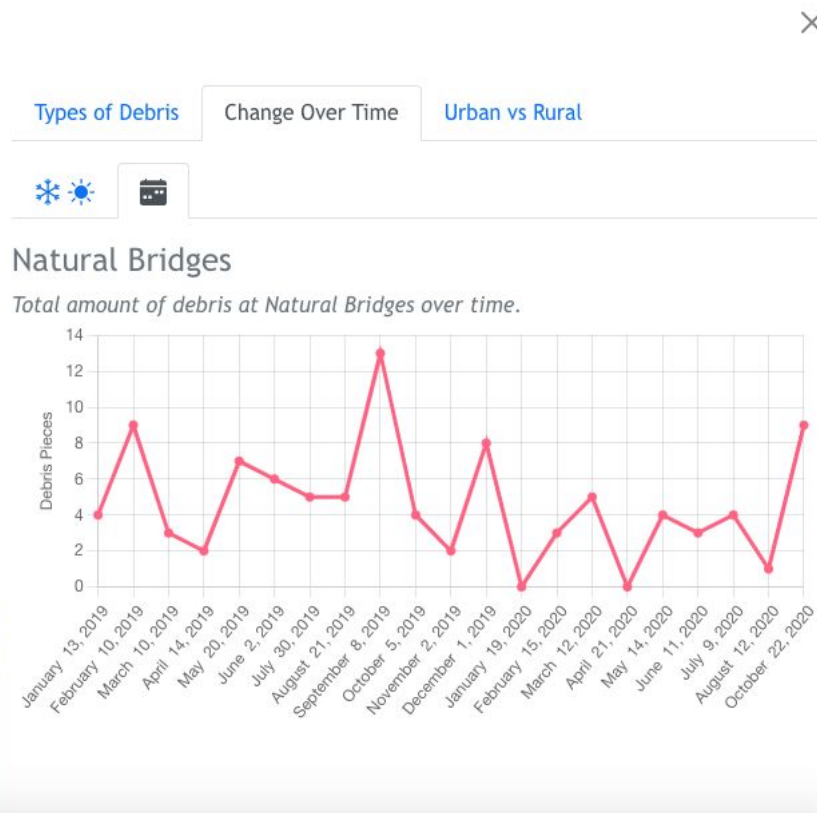
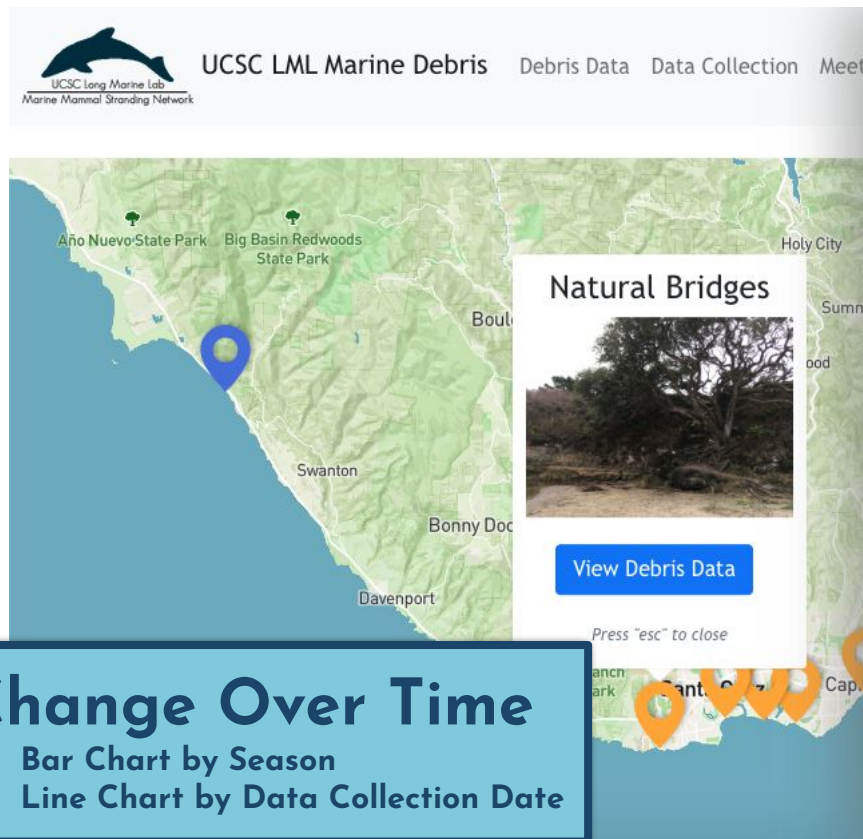
Types of Debris

- Bar Chart
- Pie Chart with Filtering

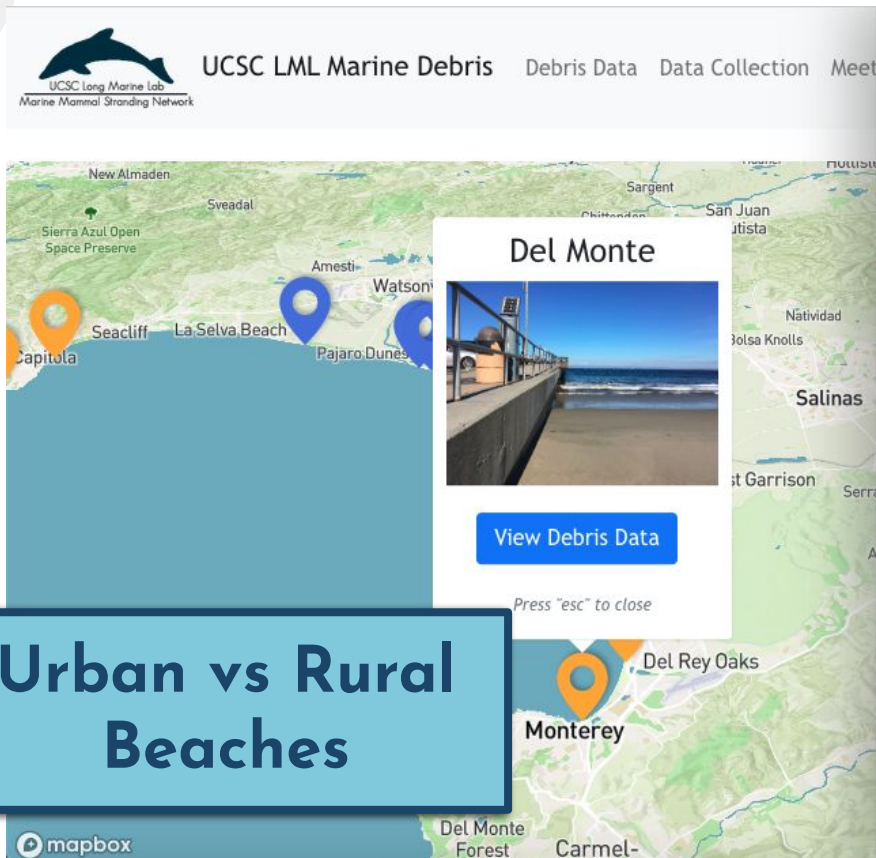
Units: Debris
Pieces



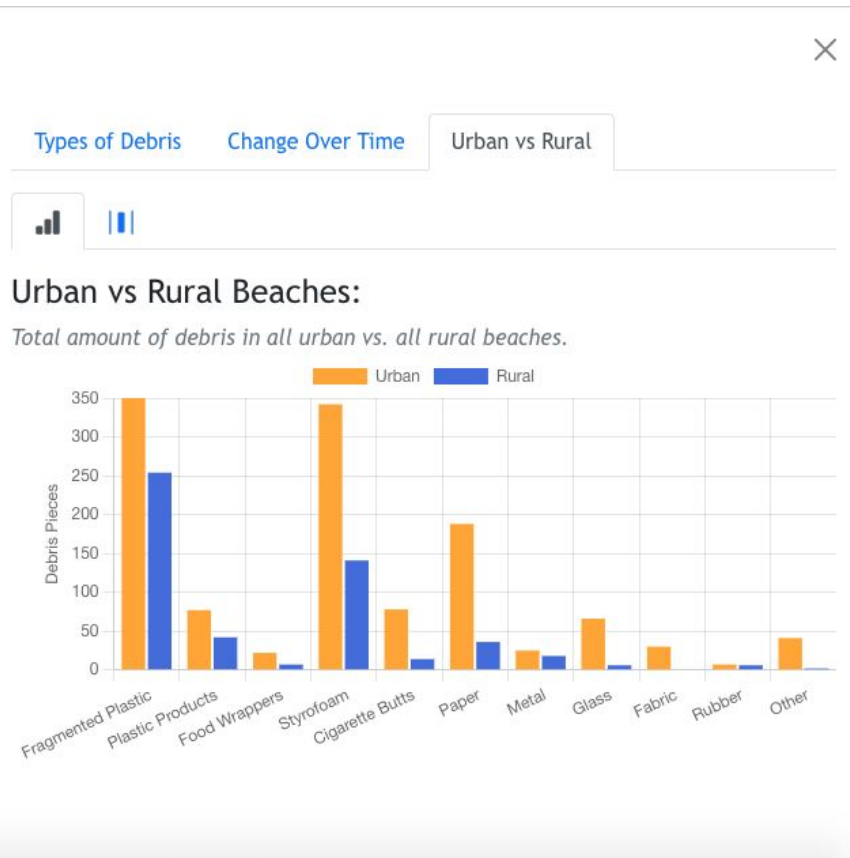
Results: Accessible Debris Data



Results: Accessible Debris Data



Urban vs Rural Beaches



Results: Informative Pages



UCSC LML Marine Debris

Debris Data

Data Collection

Meet the Team

[View Profile](#)

Marine Debris Collection Methodology

How is data collected?

The way that our team collects this Marine Debris data is relatively simple. First, volunteers will lay out a 100 meter transect across the beach, horizontal to the shoreline. Next, volunteers will place a 2 meter by 2 meter quadrat at 3 distances along the 100 meter transect. These distances are randomly generated numbers between 1-100 and change each month to prevent any biases. At each of the three distances, two quadrats are sampled (6 quadrats in total). One on the high tide line, and the other one 5 meters above the high tide line for each number. During each sampling, volunteers will examine the quadrat and collect debris laying on top of the sand, then record their findings on the Stranding Network Marine Debris Data Sheet. Additionally, volunteers will then rake their fingers into the sand approximately 2 cm deep and survey for buried debris. These will also be collected and recorded on the Stranding Network Marine Debris Data Sheet in the proper size region.

Methodology for Data Collection



Results: Informative Pages



UCSC LML Marine Debris

Debris Data

Data Collection

Meet the Team

[View Profile](#)

Meet the LML Team

From the UCSC Long Marine Lab.

Robin Dunkin

Dr. Robin Dunkin is the Marine Mammal Stranding Operations manager for The Long Marine Lab Stranding Network and has worked in this role since 2005. Robin completed her Ph.D. in the lab of Dr. Terrie Williams in 2012 but first began learning about marine mammal stranding response while completing her master's degree in the lab of Dr. Ann Pabst and Bill McLellan at the University of North Carolina Wilmington in 2001. As an undergraduate at U.C. Santa Cruz, Robin volunteered as a docent at Long Marine Lab and worked for the Marine Mammal Physiology Project as an animal trainer from 1998 to 2001. Robin is responsible for the day to day operations of the stranding network and works with the stranding coordinator and the director to coordinate stranding response for Santa Cruz County.



Juliana Limon

Juliana Limon is a Stranding Technician for the Long Marine Lab Stranding Network. She is a recent graduate with a major in Marine Biology at UCSC. She began volunteering for the Long Marine Lab stranding network shortly after she transferred to UCSC in 2019 and got hired as a Stranding Technician in 2021. During her time as an



Maia Smith

Maia Smith is a Stranding Technician for the Long Marine Lab Stranding Network. She is a recent graduate with a major in Marine Biology at UCSC. She began volunteering for the Long Marine Lab stranding network in 2017 as a first year and got hired as a Stranding Technician in 2021. During her time as an undergrad, she



Meeting the
LML team!

Results: Informative Pages

Meet the Software Team

We are a team of five computer science students at UCSC.

Kaitlyn Liao

Product Owner and Software Engineer, Computer Science student at UCSC



Zachary Miller

Developer and Software Engineer, Computer Science student at UCSC



Noah Cantwell

Developer and Software Engineer, Computer Science student at UCSC



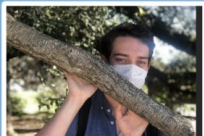
Bridget Chew

Developer and Software Engineer, Computer Science student at UCSC



Spencer Fulgham

Developer and Software Engineer, Computer Science student at UCSC




Vinh Le

Developer and Software Engineer, Computer Science student at UCSC



Meeting the
Dev. Team!


Results: Life as an Admin (1)



UCSC LML Marine Debris

Debris Data Data Collection Meet the Team

[View Profile](#)



dev team


- [Upload CSV File](#)
- [Manage Users](#)
- [Admin FAQ](#)
- [Logout](#)

Update Marine Debris Data

Please select a .csv file to upload data from

[Choose File](#) No file chosen

Most Recent Uploaded Data:

	Uploaded on May 28th 2022, 2:27 pm by bchew1 LML_test_reduced.csv
---	---

**Easy Data
Upload Platform**

Results: Life as an Admin (2)



UCSC LML Marine Debris

[Debris Data](#)

[Data Collection](#)

[Meet the Team](#)

Login



Robin Dunkin

[Upload CSV File](#)

[Manage Users](#)

[Manage Account](#)

Members

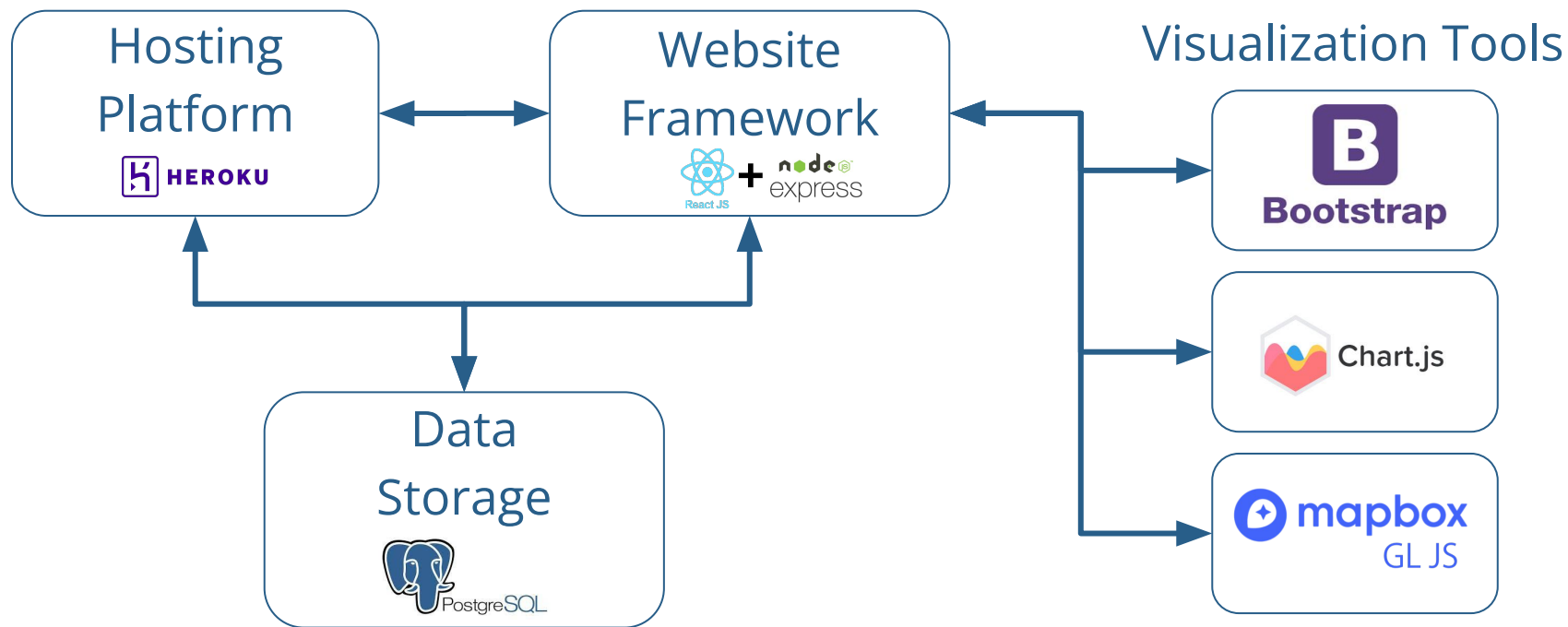
Search for Names

Name	User-ID	Super?	Delete
Spencer Fulgham	srfulgha	★	
Kaitlyn Liao	bobattack11	☆	

Add User

Easy Admin
Management

Architecture



Knowledge Challenges

Some of our challenges came in the form of...

- Meeting a sponsor's **needs** and **requests**
- Using a disciplined software development process over a **long period**
- **Turnover** in team members

Technical Challenges

Many challenges were due to technical issues...

- Attempting to host under the **ucsc.edu domain name**
- Developing the map and graphs to be **interactive** and **intuitive**
- Using a **React.js** framework for the first time
- Learning how to communicate with an **SQL database**



Conclusion

Display collected marine debris data in an accessible and interactive form.

1. Intuitive graphs with clear information.
2. Interactive map to contextualize the collected data.
3. Informational pages to teach beyond just the graphs.
4. Hosted online.

Create a positive way to update data and a friendly admin experience.

5. System to update debris data used on-site via spreadsheet upload.
6. Encrypted admin information.
7. Varying levels of admin privileges to maintain order in an ever-changing team.
8. Able to “pass of the keys” fully to LML without further developer aid needed.

What Next?

1. **Share** the website with your **friends**, **neighbors**, and **tourists** to keep the community aware of their impact on **our local beaches**.
2. **Support** the UCSC LML Marine Department so their **Survey Slugs Program** can continue doing amazing work and updating the data often.
3. Keep your local beaches **clean** and **loved**! Our goal is to **bring awareness** to our community through this website, and to **protect** the marine environment.

Acknowledgements

We would like to thank...

Our sponsors and research team from the UCSC Long Marine Lab, **Professor Robin Dunkin, Juliana Limon,** and **Maia Smith.**

Our Instructor, **Richard Jullig**

Our TA, **Aiden Smith**



Thanks for Listening!