7TH ANNUAL TEXAS PLASTIC POLLUTION SYMPOSIUM

THE HOUSTON ZOO

- APRIL 3, 2025 -

www.TexasPlasticPollutionSymposium.com

Oral Presentations

Presentation Title and Author(s) — Page

* Indicates presenter
§ Indicates student presentation

Concurrent Sessions held in the Classroom

* Indicates presenter
§ Indicates student presentation


CHASING THE TIDE
370 miles | 15 passes | 7 islands | 21 days
A Six-Part Documentary Series About One
Couple's Trek Across the Barrier Islands of Texas
Rev. 9/15/24


TEXAS
PARKS &
WILDLIFE
FOUNDATION

GULF
TRUST

MISSION

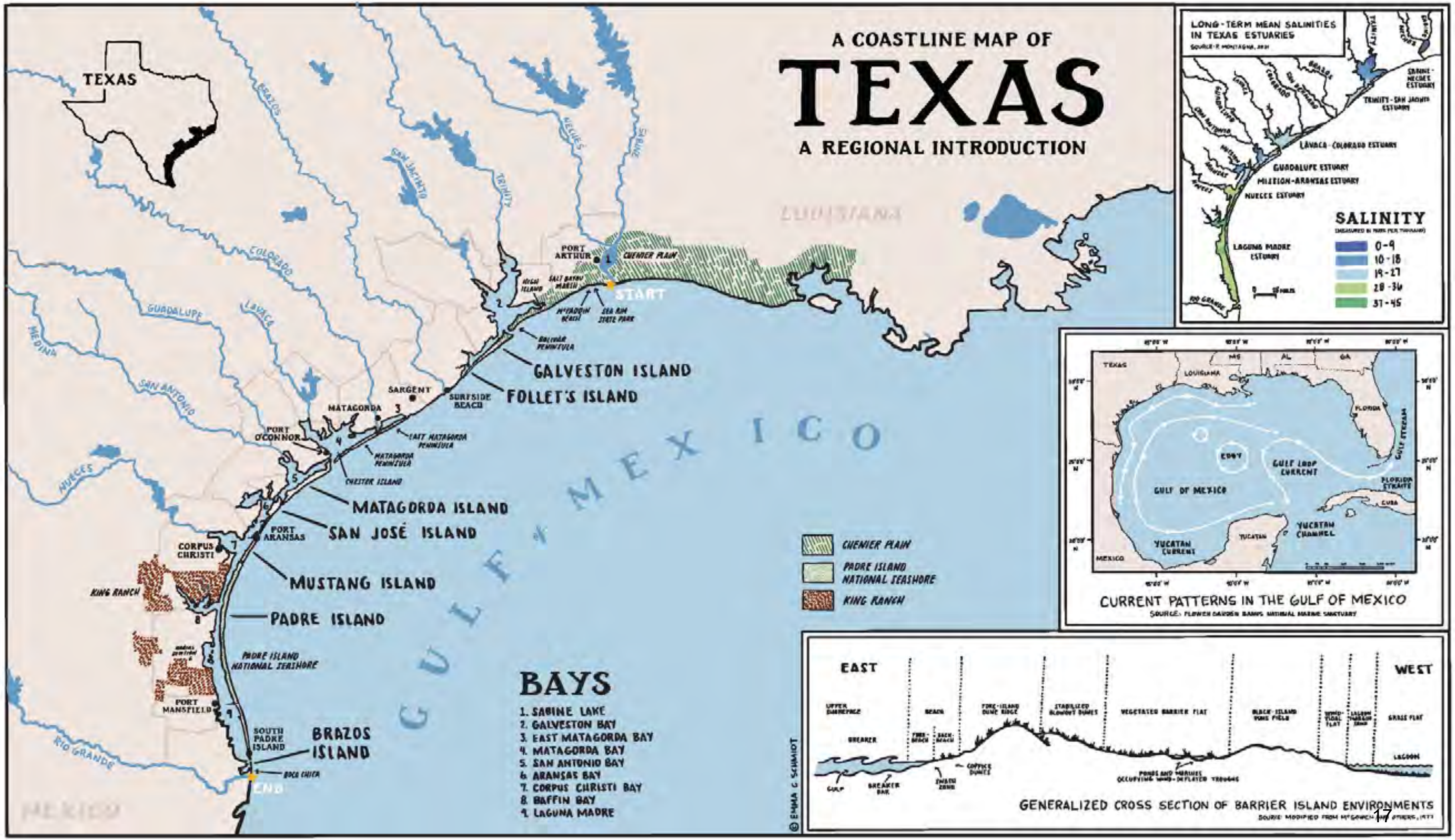
Unite and amplify Harte Research Institute at Texas A&M University-Corpus Christi’s work and our partners’ voices to advance Texas’ legacy of balancing economic growth with natural resource conservation.

CHASING THE TIDE

ONE COUPLE'S 370-MILE TREK ACROSS THE BARRIER ISLANDS OF TEXAS

BY JAY KLEBERG WITH CHRISSY KLEBERG

GREENLEAF
BOOK GROUP PRESS



A COASTLINE MAP OF
TEXAS
A REGIONAL INTRODUCTION
TEXAS
LOUISIANA
MEXICO
GULF of MEXICO
BRAZOS
SAN JACINTO
TRINITY
NECHES
SABINE
COLORADO
LAVACA
GUADALUPE
MEDINA
SAN ANTONIO
NUECES
RIO GRANDE
PORT ARTHUR
CHENIER PLAIN
START
HIGH ISLAND
SALT BAYOU MARSH
MCFADDIN BEACH
SEA RIM STATE PARK
BOLIVAR PENINSULA
GALVESTON ISLAND
FOLLET'S ISLAND
SURFSIDE BEACH
SARGENT
MATAGORDA
EAST MATAGORDA PENINSULA
MATAGORDA PENINSULA
PORT O'CONNOR
CHESTER ISLAND
MATAGORDA ISLAND
SAN JOSÉ ISLAND
PORT ARANSAS
CORPUS CHRISTI
MUSTANG ISLAND
KING RANCH
PADRE ISLAND
PADRE ISLAND NATIONAL SEASHORE
PORT MANSFIELD
SOUTH PADRE ISLAND
BRAZOS ISLAND
BOCA CHICA
END
CHENIER PLAIN
PADRE ISLAND NATIONAL SEASHORE
KING RANCH
BAYS
1. SABINE LAKE
2. GALVESTON BAY
3. EAST MATAGORDA BAY
4. MATAGORDA BAY
5. SAN ANTONIO BAY
6. ARANSAS BAY
7. CORPUS CHRISTI BAY
8. BAFFIN BAY
9. LAGUNA MADRE
© EMMA C SCHMIDT
LONG-TERM MEAN SALINITIES IN TEXAS ESTUARIES
SABINE-NECHES ESTUARY
TRINITY-SAN JACINTO ESTUARY
LAVACA-COLORADO ESTUARY
GUADALUPE ESTUARY
MISSION-ARANSAS ESTUARY
NUECES ESTUARY
LAGUNA MADRE ESTUARY
RIO GRANDE
SALINITY
0-9
10-18
19-27
28-36
37-45
TEXAS
LOUISIANA
MS
AL
GA
FLORIDA
GULF STREAM
EDDY
GULF LOOP CURRENT
FLORIDA STRAITS
GULF OF MEXICO
CUBA
YUCATAN CHANNEL
YUCATAN
YUCATAN CURRENT
MEXICO
CURRENT PATTERNS IN THE GULF OF MEXICO
EAST
WEST
UPPER SHOREFACE
BREAKER
BEACH
FORE-BEACH
BACK-BEACH
FORE-ISLAND DUNE RIDGE
STABILIZED BLOWOUT DUNES
VEGETATED BARRIER FLAT
BLACK-ISLAND DUNE FIELD
GRASS FLAT
LAGOON
GULF
BREAKER BAR
SWASH ZONE
COPPICE DUNES
PONDS AND MARSHES OCCUPYING WIND-DEFLATED TROUGHS
GENERALIZED CROSS SECTION OF BARRIER ISLAND ENVIRONMENTS







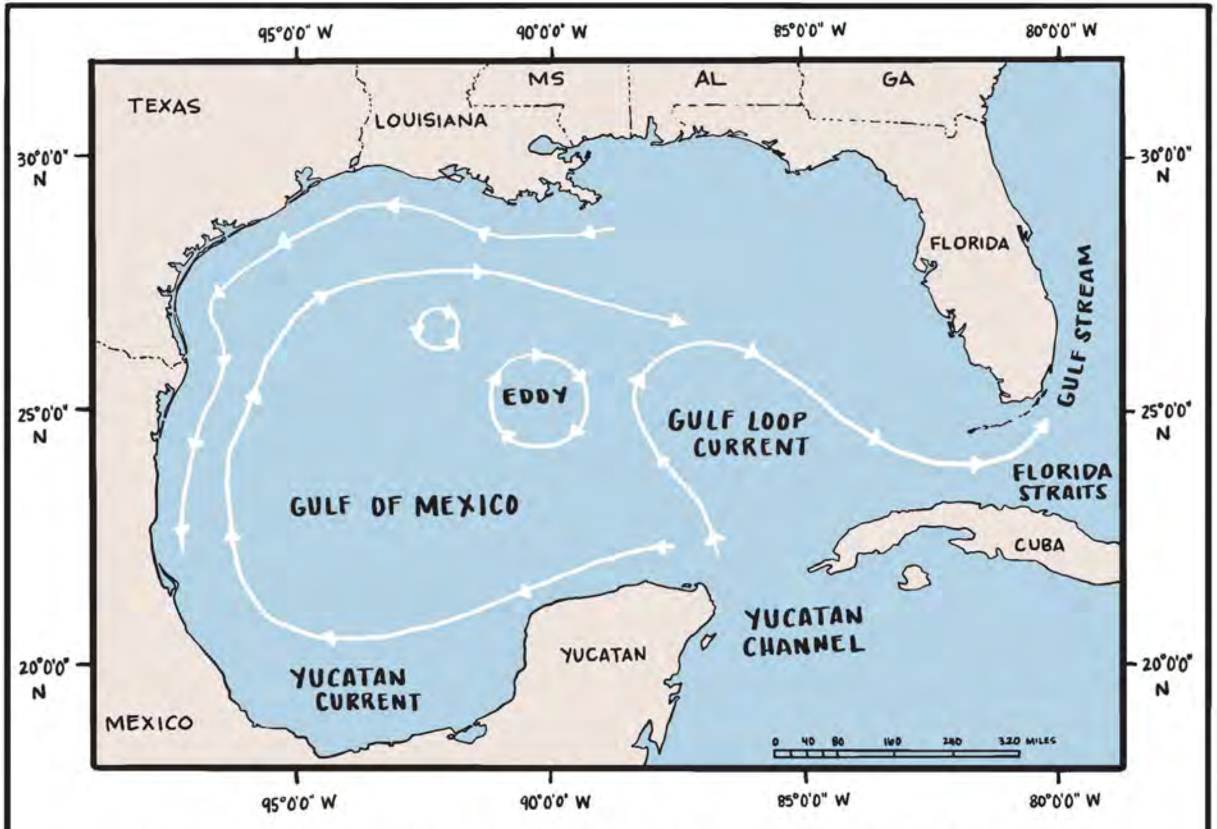
WARNING
4-WHEEL DRIVE
HIGH-CLEARANCE VEHICLES ONLY.
TOWING SERVICES ARE VERY EXPENSIVE!


WARNING
UNAUTHORIZED USE OF
PROSECUTED
PRIVATE PROPERTY
NO TRESPASSING

Mark Felix/AFP via Getty Images


KUIU

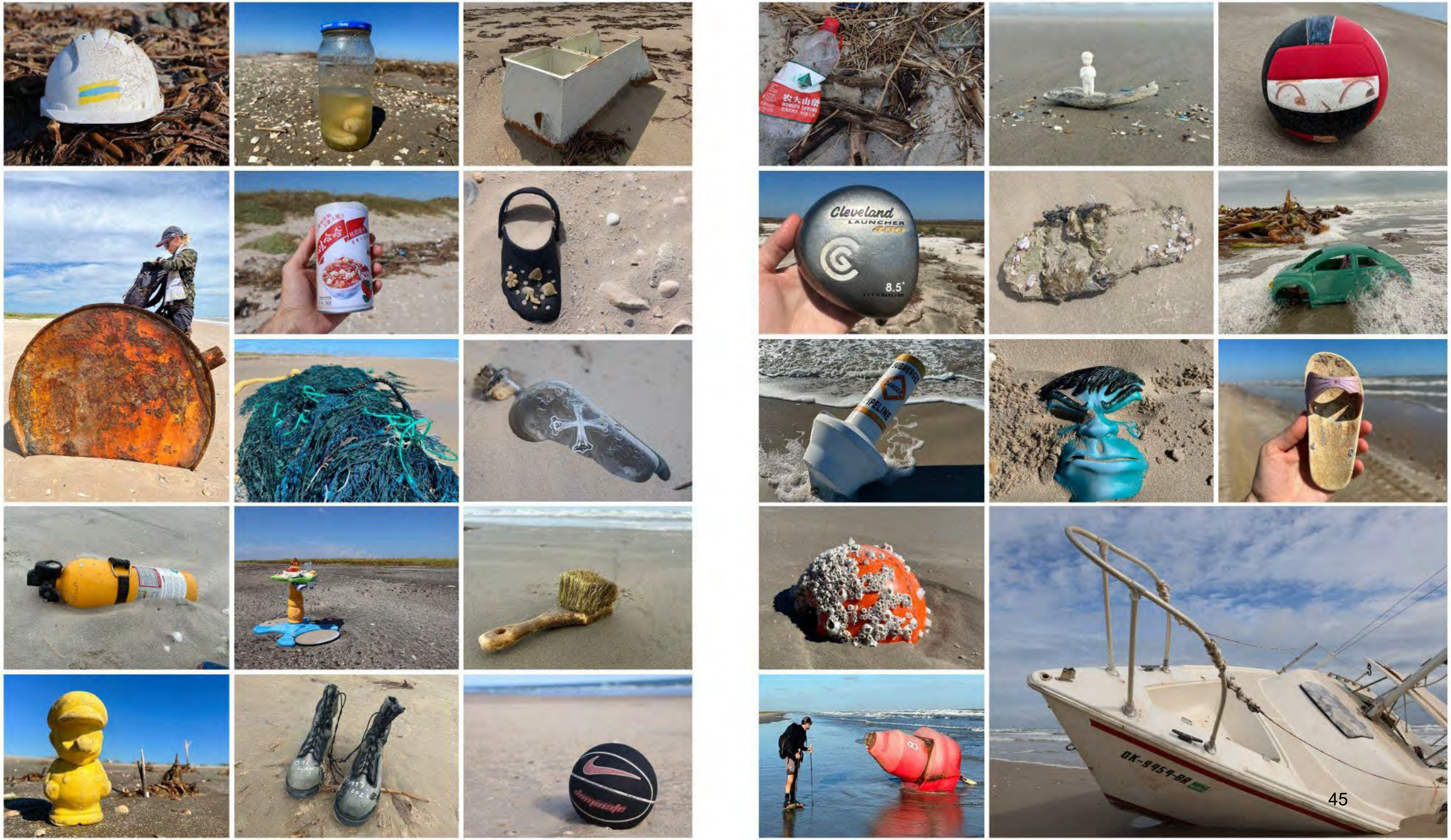
MAJOR TEXAS RIVERS & RIVER BASINS



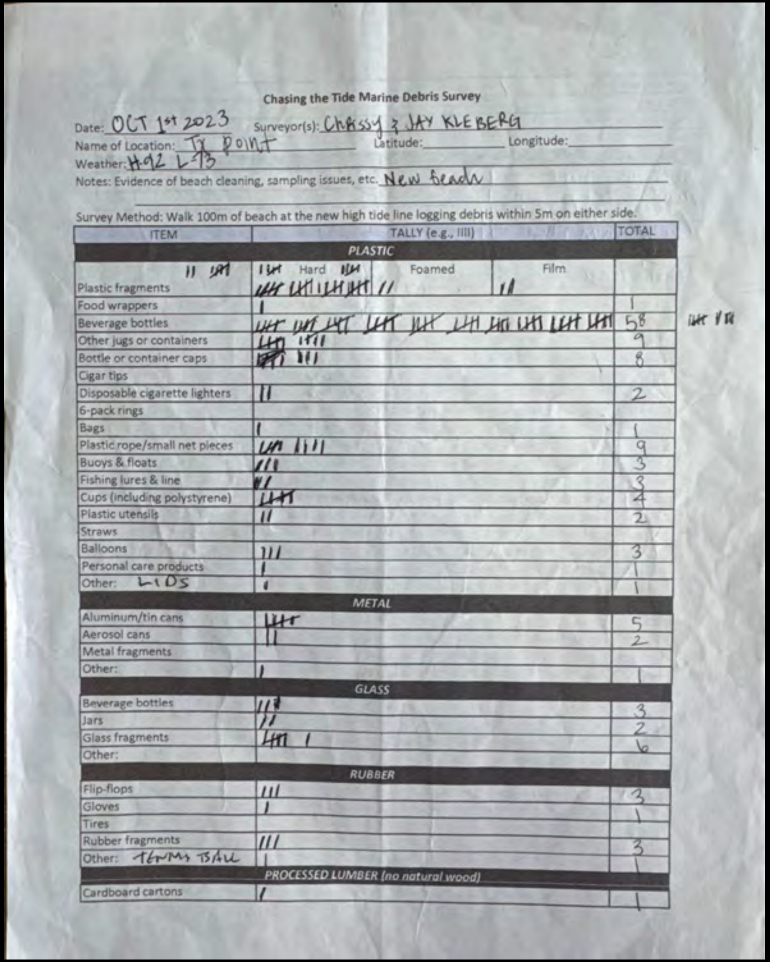
CURRENT PATTERNS IN THE GULF OF MEXICO

SOURCE: FLOWER GARDEN BANKS NATIONAL MARINE SANCTUARY


SUBURBAN


农夫山泉
Cleveland
LAUNCHER 400
8.5°
DK-9454-BR


conditioner
peaches 'n clean
all hair types



Chasing the Tide Marine Debris Survey

Date: OCT 1st 2023 Surveyor(s): CHRISSY & JAY KLEBERG
Name of Location: TX Point Latitude: Longitude:
Weather: H92 L73
Notes: Evidence of beach cleaning, sampling issues, etc. New beach

Survey Method: Walk 100m of beach at the new high tide line logging debris within 5m on either side.

ITEM	TALLY (e.g., IIII)	TOTAL
PLASTIC		
Plastic fragments	Hard / Foamed / Film	
Food wrappers		1
Beverage bottles		58
Other jugs or containers		9
Bottle or container caps		8
Cigar tips		
Disposable cigarette lighters		2
6-pack rings		
Bags		1
Plastic rope/small net pieces		9
Buoys & floats		3
Fishing lures & line		3
Cups (including polystyrene)		4
Plastic utensils		2
Straws		
Balloons		3
Personal care products		1
Other: LIDS		1
METAL		
Aluminum/tin cans		5
Aerosol cans		2
Metal fragments		
Other:		1
GLASS		
Beverage bottles		3
Jars		2
Glass fragments		6
Other:		
RUBBER		
Flip-flops		3
Gloves		1
Tires		
Rubber fragments		3
Other: TENNIS BALL		1
PROCESSED LUMBER (no natural wood)		
Cardboard cartons		1

14 surveys over 320 miles

High Tide Conditions

87% plastic

Top 5 overall:

31% hard plastic fragments

25% plastic bottles

9% polystyrene

9% plastic bottle caps

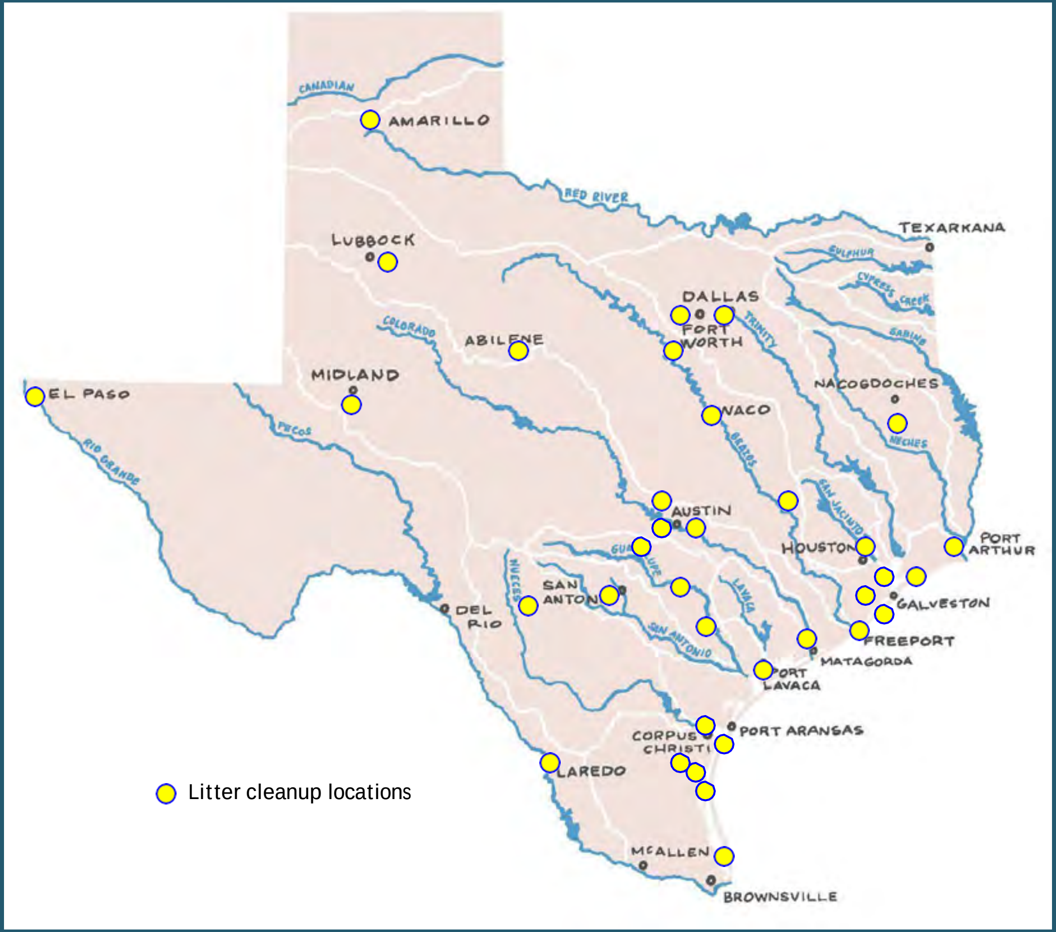
4% plastic film


Cleveland
LAUNCHER
400
8.5°
TITANIUM


dominate

THE CAMPAIGN

- March through May 2025
- 40+ cleanups in every Texas watershed
- Recruit 2,000 volunteers
- Prevent 800 tons of trash from reaching the Gulf
- Collect 16,000 plastic bottles
- Promote H-E-B and Keep Texas Beautiful “Keep Texas Waterways Clean” grant program for cleanup support
- Amplify the work of existing cleanup programs
- Collect data through the Texas Litter Database
- Create and provide access to learning resources for K-8 students



CAMPAIGN GOALS

- **Connect** Texans with their waterways and the Gulf of Mexico
- **Reduce** individual and corporate use of single-use plastics and polystyrene foam
- **Prevent** trash from reaching our waterways and ocean
- **Recycle** properly and push for more recyclable materials

TRASH FREE Gulf

www.trashfreegulf.com

Get involved in cleaning up our waterways and ocean by volunteering for a cleanup. Search for a location by entering in the city. You can also use the map to find a cleanup. Most cleanups are occurring in May 2025.

Enter city to search

STEWARDS OF THE WILD – ABILENE CHAPTER

For more information click the button below.

View More Details

KEEP AUSTIN BEAUTIFUL

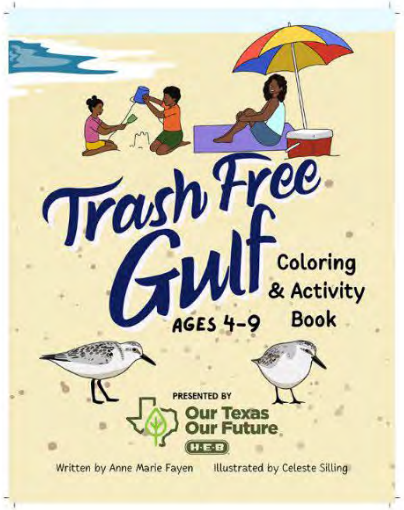
For more information click the button below.

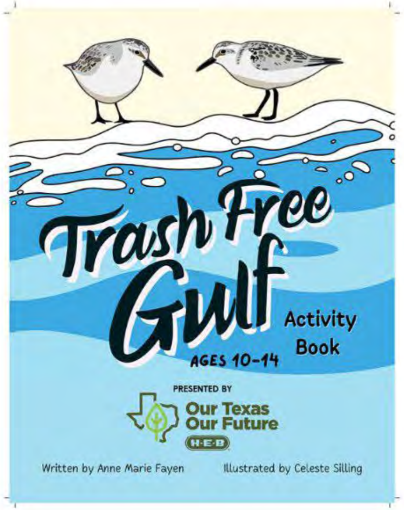
View More Details

CLEAN UP THE COLORADO WITH ALL WATER GUIDES

For more information click the button below.

View More Details


Trash Free Gulf
Coloring & Activity Book
AGES 4-9
PRESENTED BY
Our Texas Our Future
H-E-B
Written by Anne Marie Fayen
Illustrated by Celeste Silling


Trash Free Gulf
Activity Book
AGES 10-14
PRESENTED BY
Our Texas Our Future
H-E-B
Written by Anne Marie Fayen
Illustrated by Celeste Silling


Un golfo sin basura
Libro de colorear y actividades
EDADES 4-9
PRESENTADO POR
Our Texas Our Future
H-E-B
Escrito por Anne Marie Fayen
Illustrado por Celeste Silling


Un golfo sin basura
Libro de actividades
EDADES 10-14
PRESENTADO POR
Our Texas Our Future
H-E-B
Escrito por Anne Marie Fayen
Illustrado por Celeste Silling

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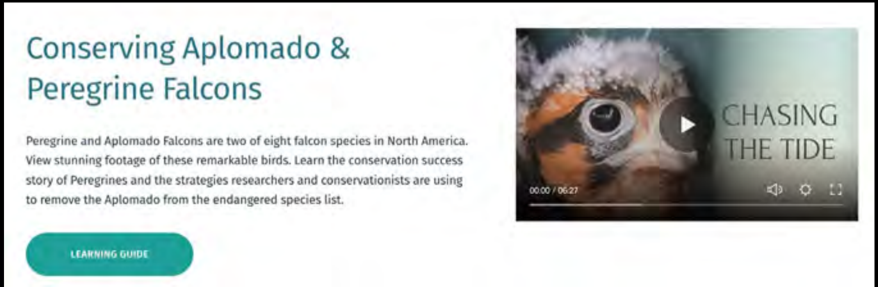
LEARNING RESOURCES

6 Videos Available for FREE at chasingthetideseries.comlearn

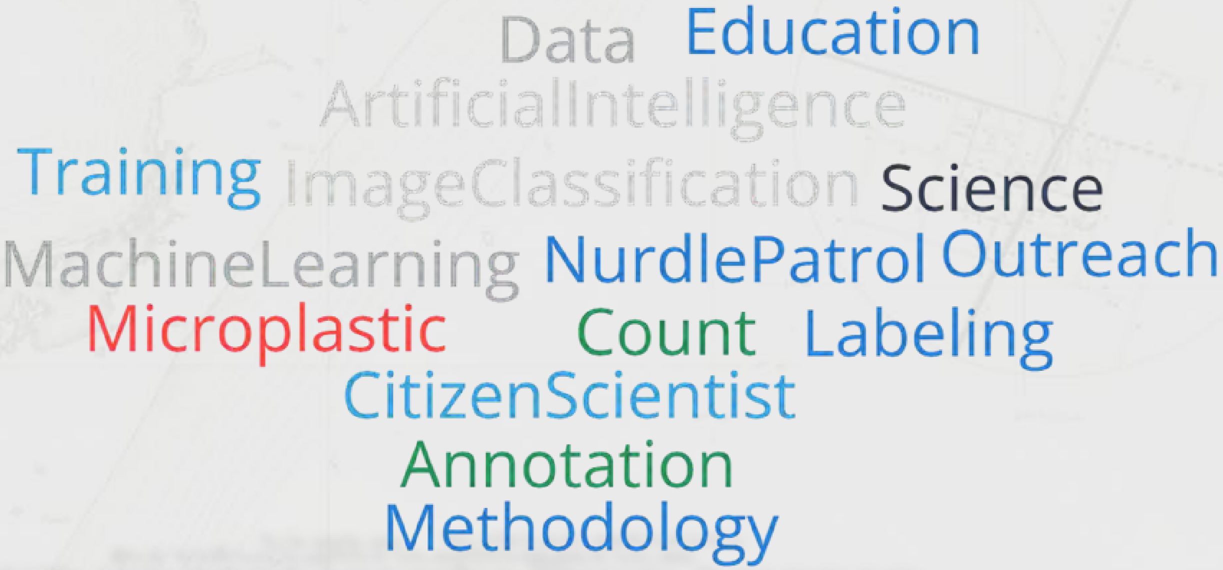
1. Conserving Aplomado & Peregrine Falcons
2. The Remarkable Rediscovery of Red Wolf DNA in the Wild
3. The Life Cycle of the World’s Most Critically Endangered Sea Turtle: Kemp’s Ridley
4. The Texas Coast: A Critical Environment for Migratory Birds
5. Oysters: A Vital Component of Coastal Ecosystems
6. Marine Debris: Explore the Issue of Trash Along the Texas Coast



www.TrashFreeGulf.com

www.ChasingTheTideSeries.com

Nurdle Count



April 3rd, 2025

Seneca Holland, Son Nguyen, Khoi Nguyen

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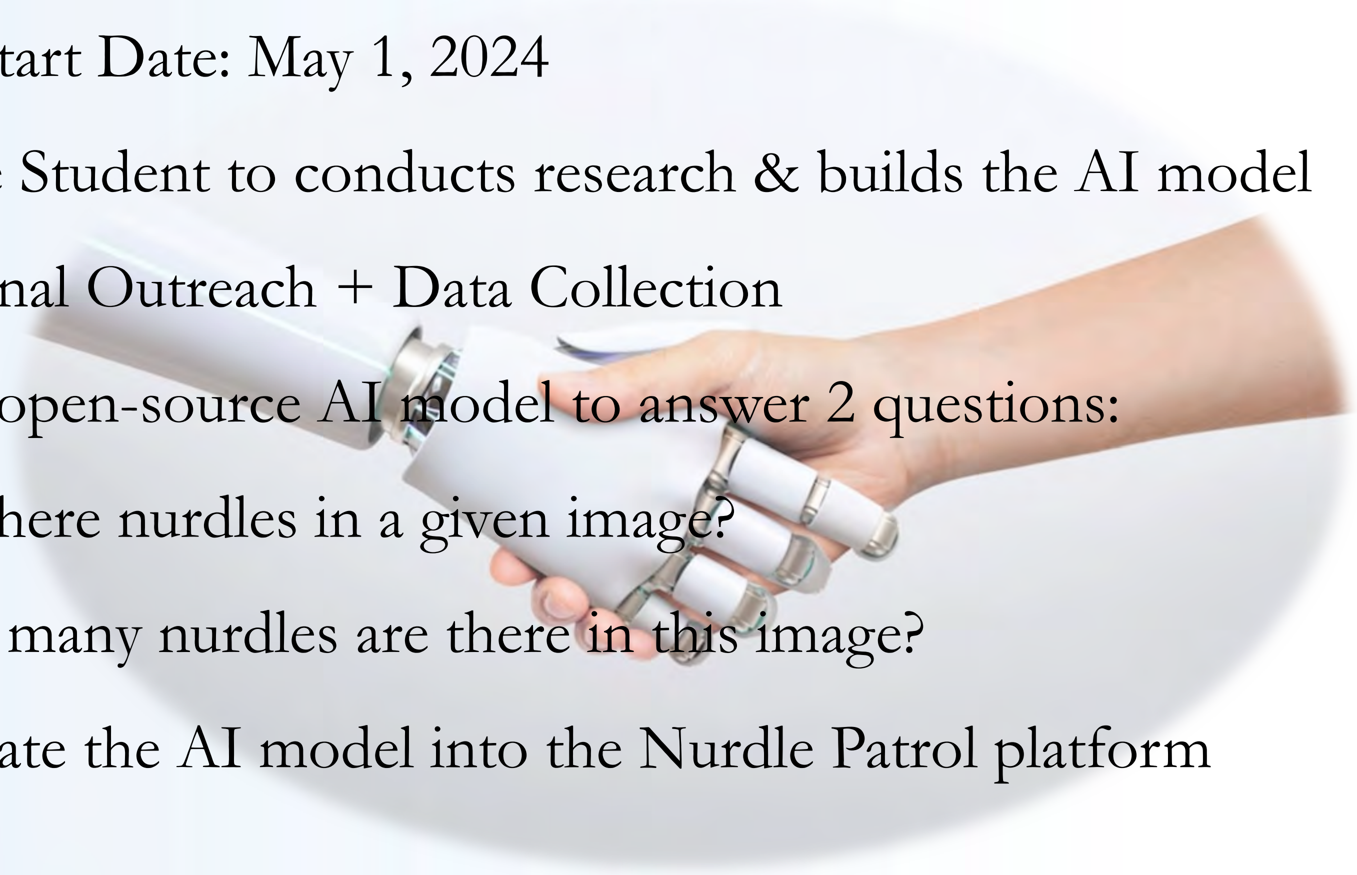
How It Started



- 2-year project funded by Matagorda Bay Mitigation Trust (MBMT)
- Project Start Date: May 1, 2024
- Graduate Student to conducts research & builds the AI model
- Educational Outreach + Data Collection
- Build an open-source AI model to answer 2 questions:
  - Are there nurdles in a given image?
  - How many nurdles are there in this image?
- Incorporate the AI model into the Nurdle Patrol platform

How It's Going

Students at Flour Bluff Intermediate and Kaffie Middle School in Corpus Christi area creating nurdles data for the data collection phase

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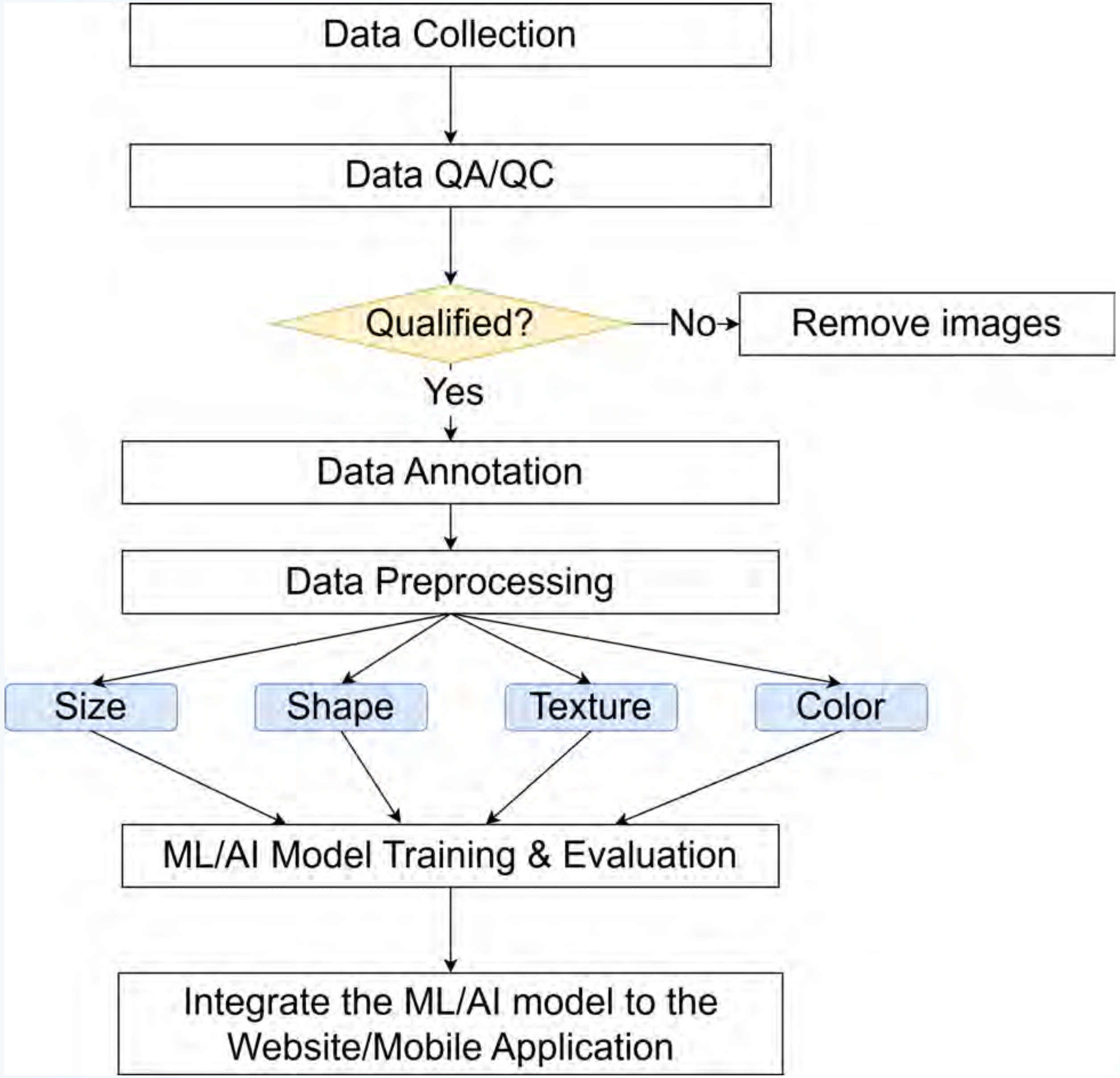
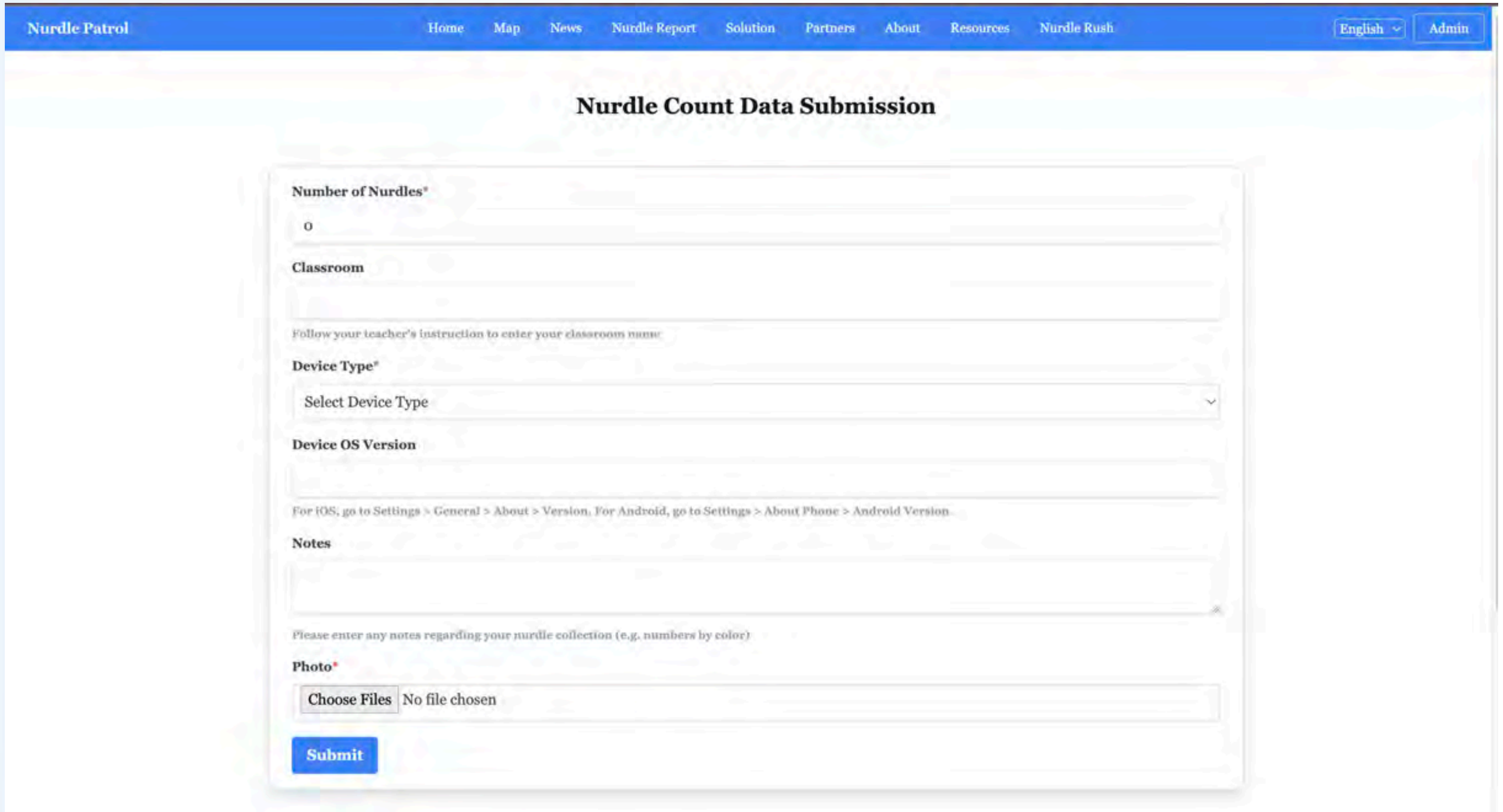
Building the AI Model

Workflow


Data Collection
Data QA/QC
Qualified?
No
Remove images
Yes
Data Annotation
Data Preprocessing
Size
Shape
Texture
Color
ML/AI Model Training & Evaluation
Integrate the ML/AI model to the Website/Mobile Application

STEP 1: Data Collection

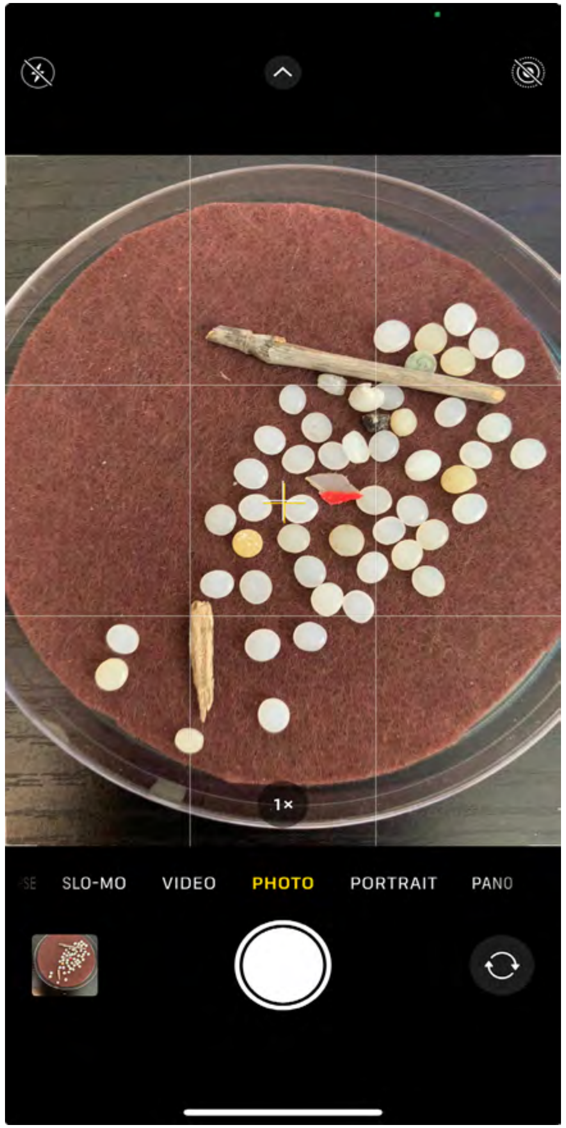
- Submit Nurdle images for training on the Nurdle Patrol
- Leverage educational outreach to gain data



Data submission web interface

STEP 1: Data Collection (cont.)

- Qualified images must align with the standards stated in the SOP, including:
    - Camera to be around 8 inch above the surface where nurdles are placed;
    - Image captured in vertical angle.



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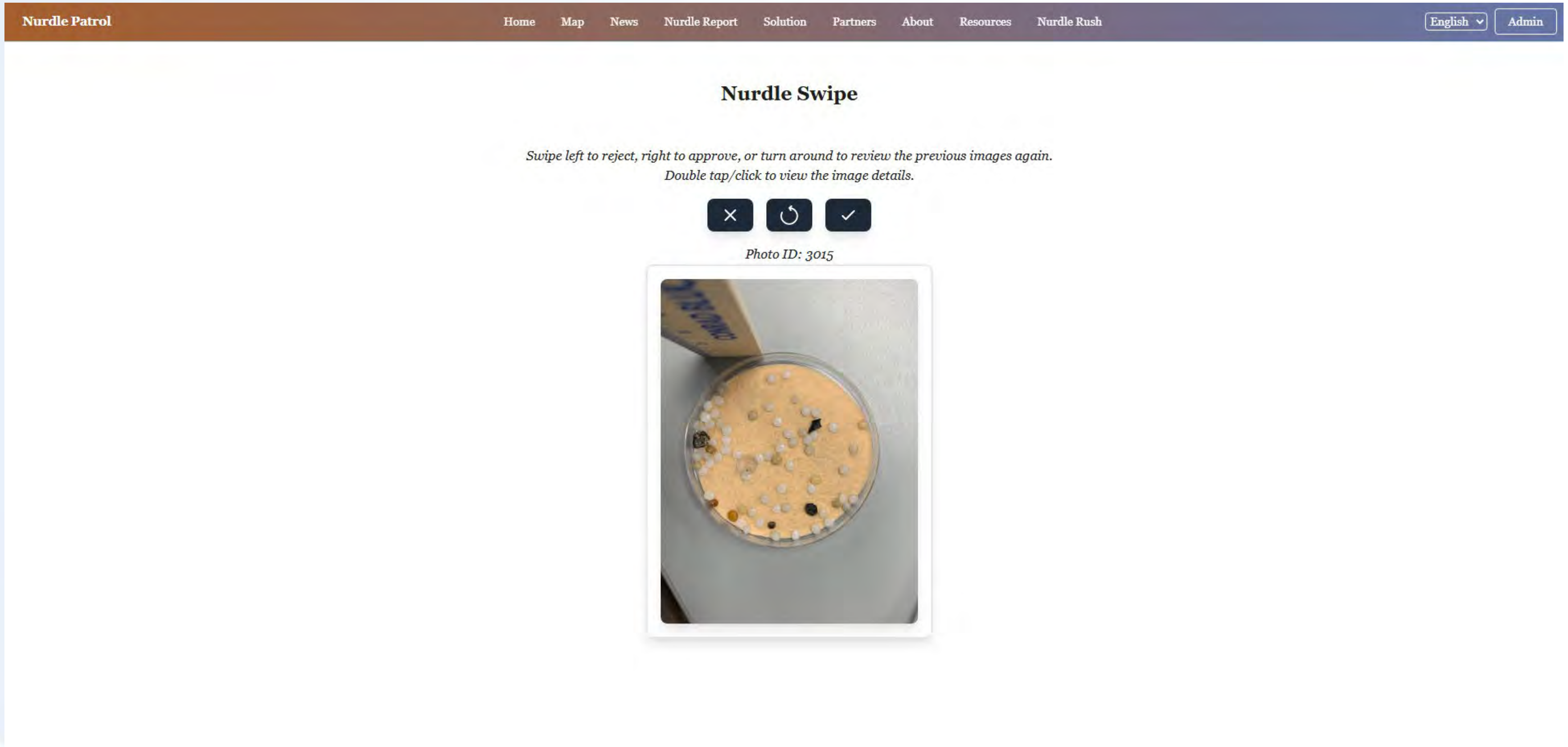
STEP 2: Data QA/QC

- Nurdle Swipe – Simple yes/no validation interface.
- Verify if the images are appropriate for training the data.



Nurdle Swipe web interface

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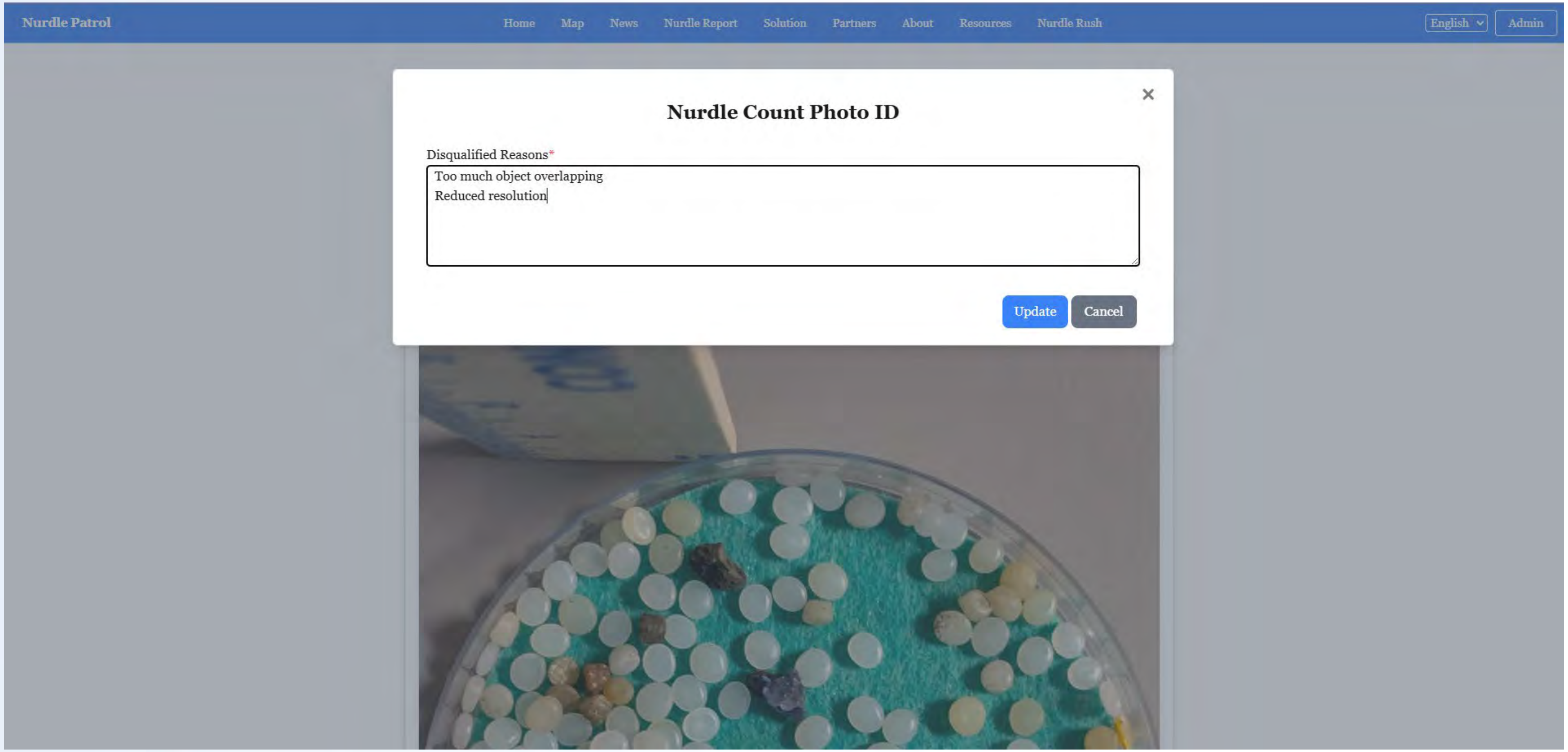
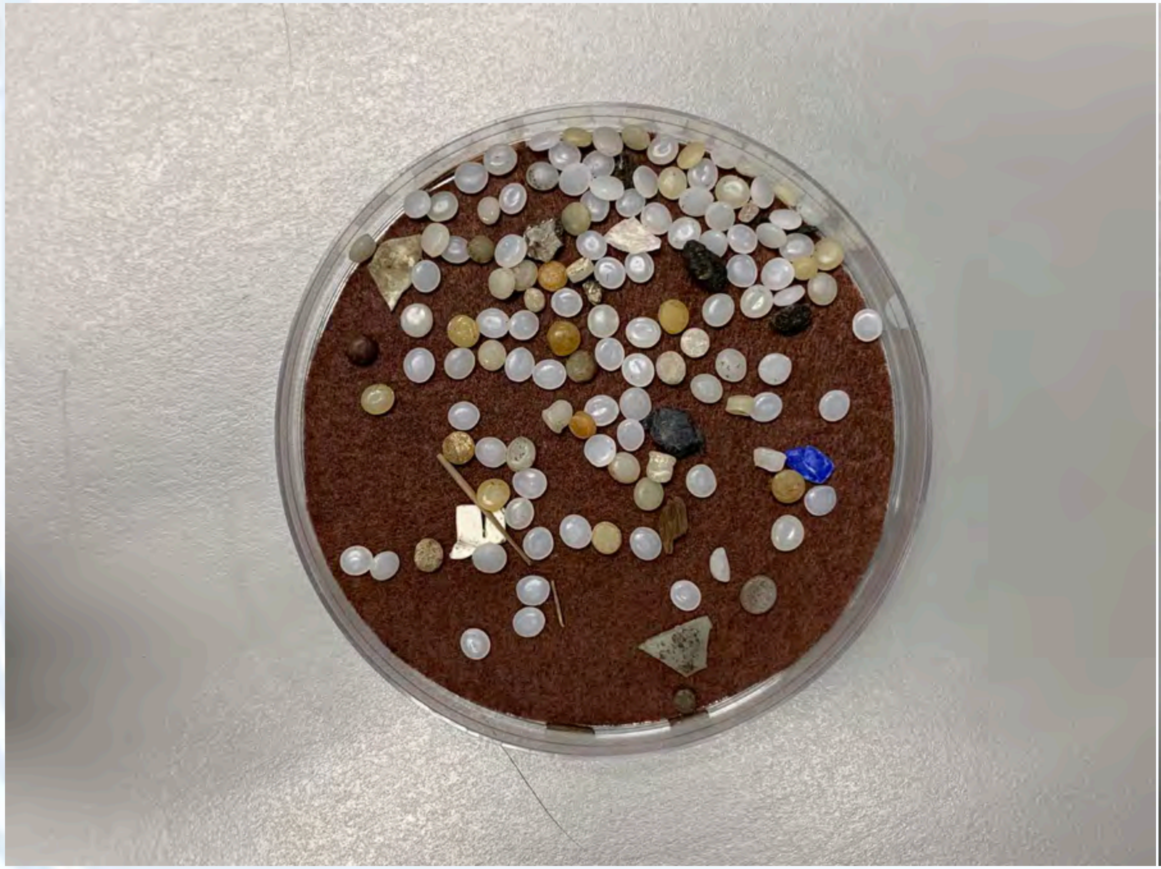
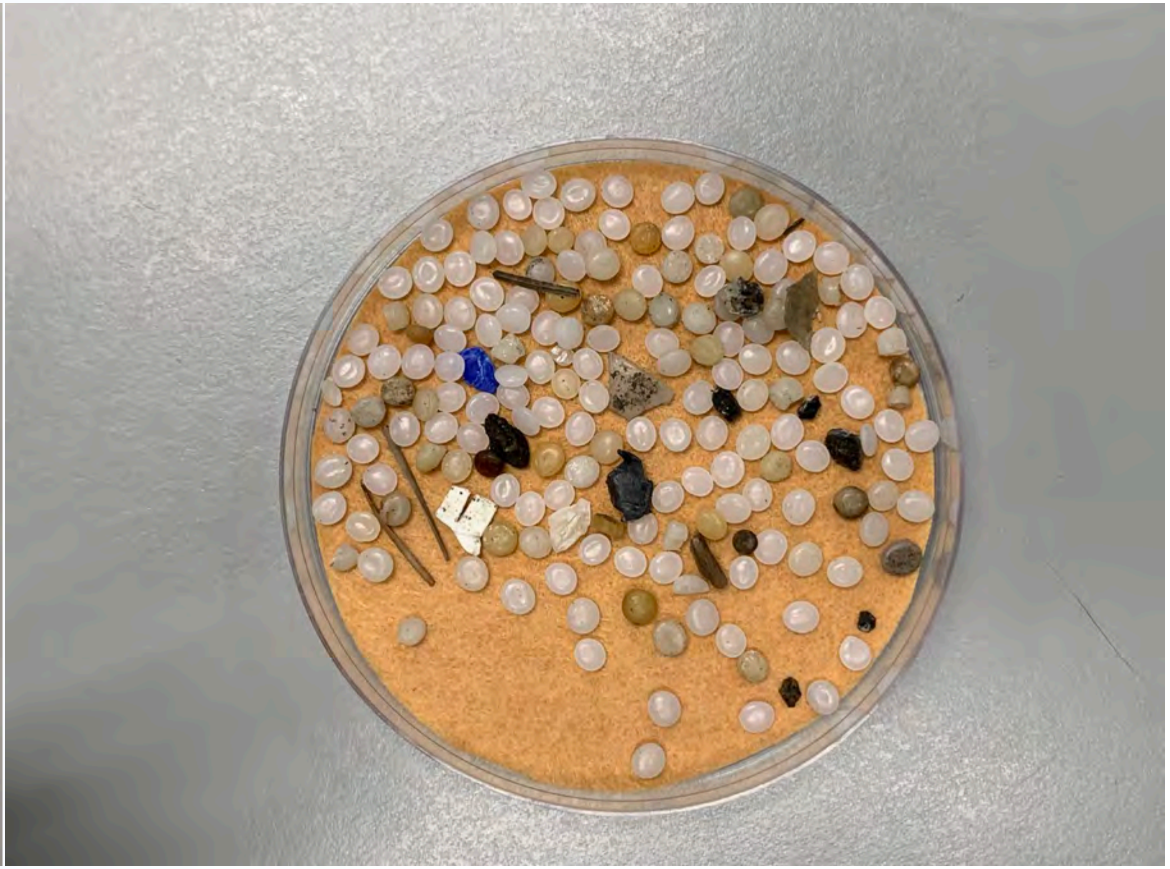
STEP 2: Data QA/QC (cont.)



Reviewer must add reasons when disqualifying an image

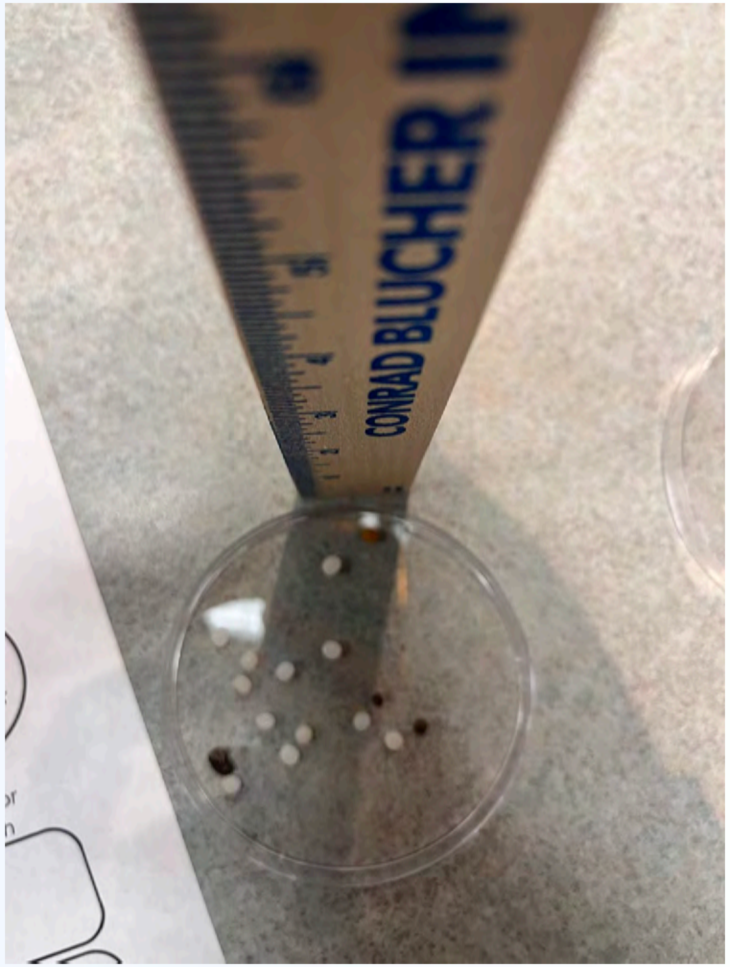
STEP 2: Data QA/QC (cont.)





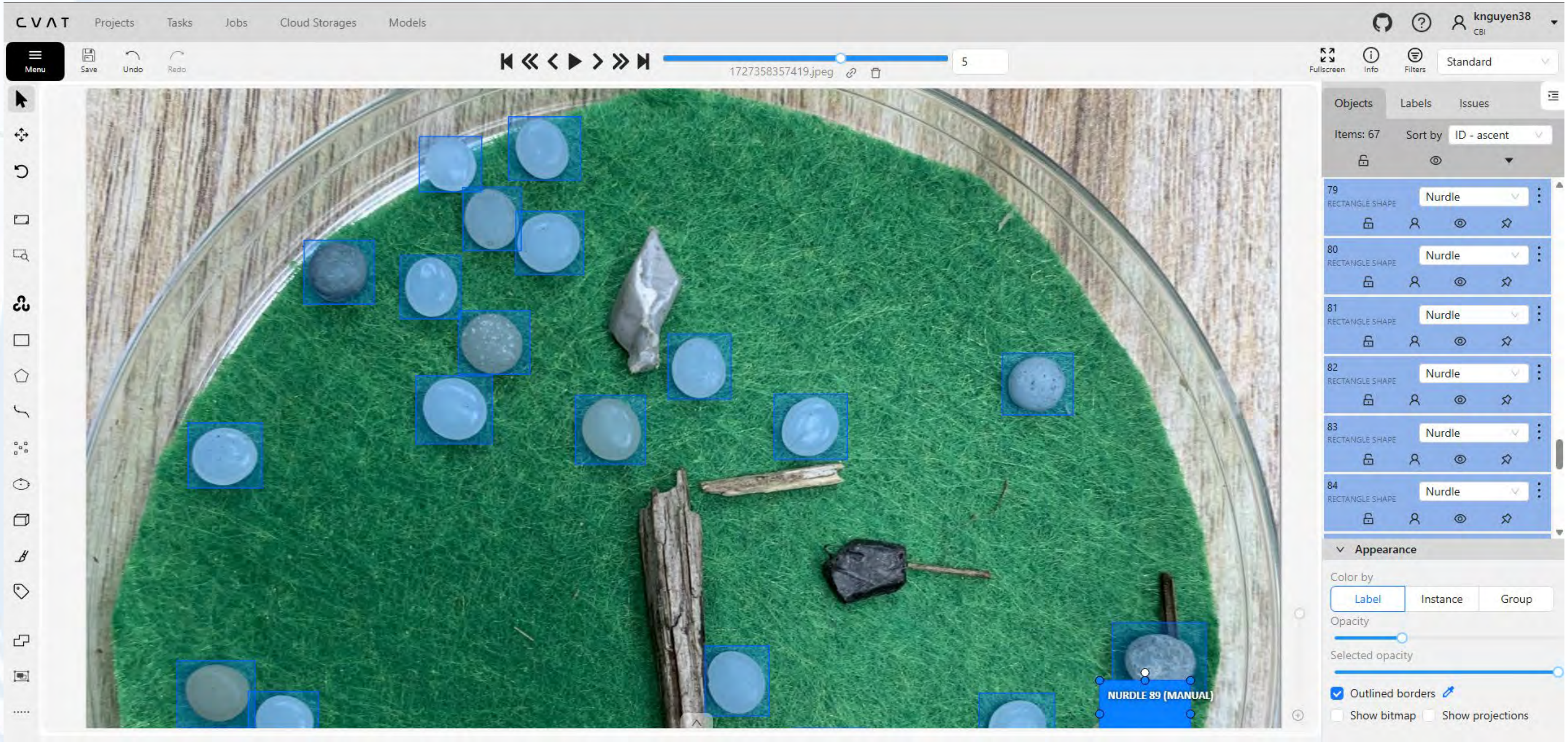
Examples of good images

STEP 2: Data QA/QC (cont.)



Examples of bad images

STEP 3: Data Annotation



Annotating nurdles on Computer Vision Annotation Tool (CVAT)

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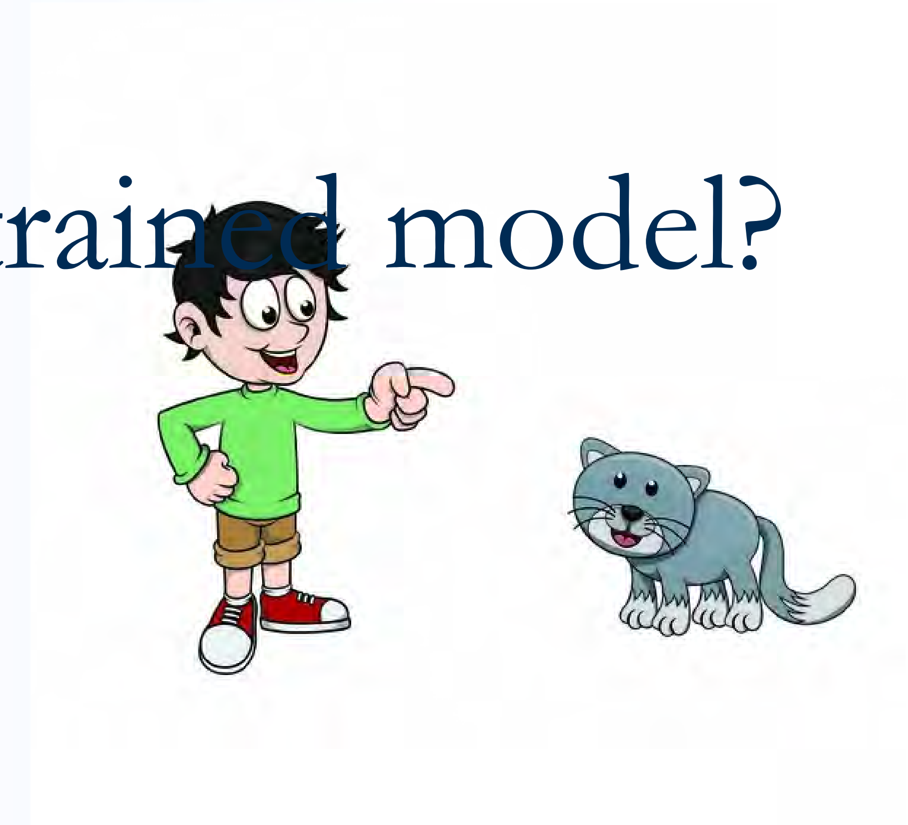
STEP 4: Data Preprocessing

Data Augmentation

STEP 5a: Model Training

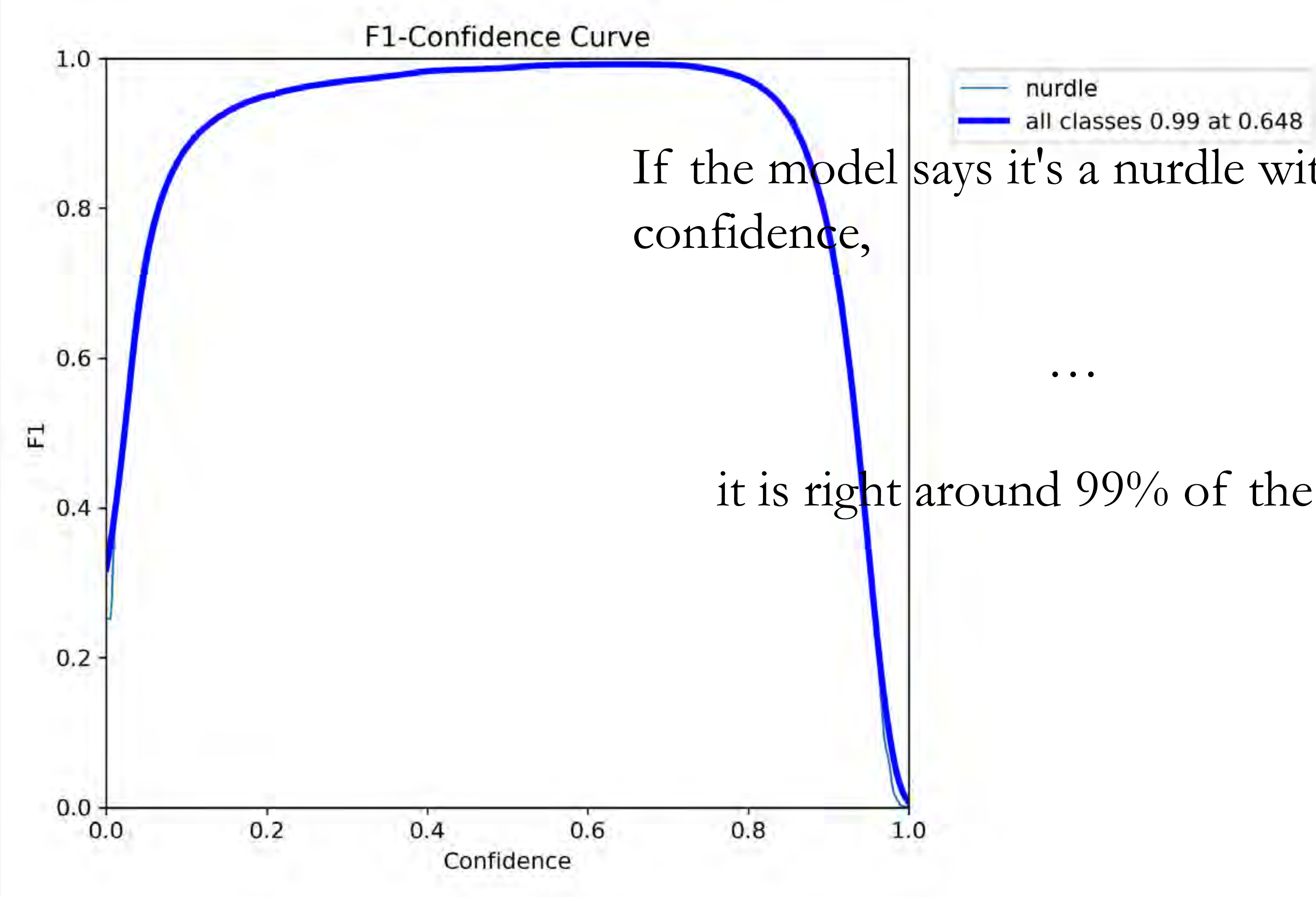
What is a pretrained model?



STEP 5a: Model Training (cont.)

- Experiment with open-source model YOLOv11 (You Only Look Once)
- Training procedure:
  - Divide data into three parts:
    - Learning
    - Checking
    - Final testing

STEP 5b: Model Evaluation



If the model says it's a nurdle with 64.8% confidence,

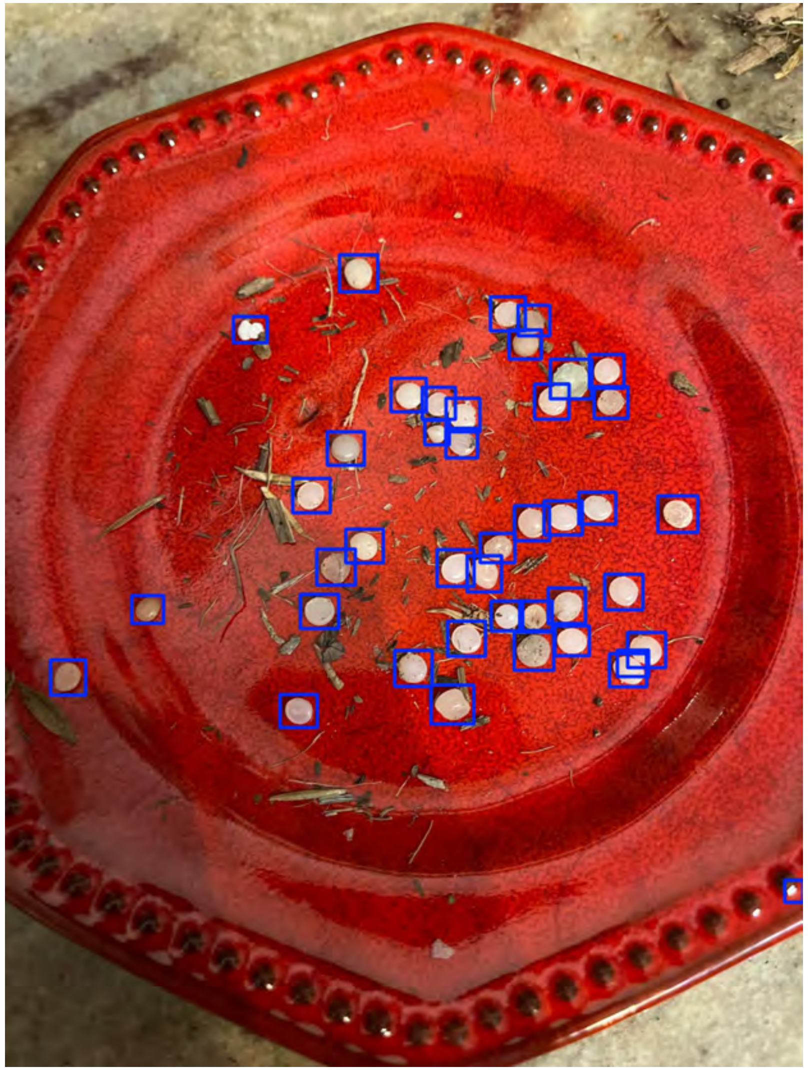
…

it is right around 99% of the time.

STEP 5c: Model Testing

- The model has performed effectively in detecting nurdles.

- Maintains good performance even with blurry images, making it useful for flagging potential nurdles for further review.



Testing the model using citizen scientist's photo

Future Work

- Extending the datasets to mimic closely the variation of nurdles
- Incorporating into applications such as Nurdle Patrol website/mobile application
- Using the Nurdle AI model for forward training to detect microplastics other than nurdles
- Classification and quantification of nurdles in-situ

Thank you!

nurdlepatrol.org

MATAGORDA BAY MITIGATION TRUST

NURDLE PATROL.org

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Contact us at
seneca.holland@tamucc.edu

Leveraging Data to Tackle the Litter Problem and Expand Collaboration in Texas with **The Texas Litter Database**

www.texaslitter.org

Kirsten Sorensen

Research and Cleanups Program Manager
Keep Texas Beautiful

Keep Texas Beautiful

The Challenge

Keep Texas Beautiful

Litter is a persistent issue across Texas, with significant impacts on our environment, habitat, local economies, infrastructure, public health, and industry

- There’s an estimated 152 pieces of litter per person in the United States
- More than 2,000 pieces of litter per mile (roadway and waterway)
- In Texas, rain and weather events carry litter to waterways that flow to the Gulf

(Source: Keep America Beautiful Litter Study, 2020)

Better Data to Inform Decisions

Keep Texas Beautiful

The Texas Litter Database

was created in partnership by Keep Texas Beautiful, HARC, and Black Cat GIS, with funding from the Garver Black Hilyard Family Foundation, launched in 2021, and relaunched as a GIS database in 2024

It is the first statewide litter database of its kind.

THE GARVER • BLACK • HILYARD FAMILY FOUNDATION

HARC

black cat GIS & Biological Services

Keep Texas Beautiful

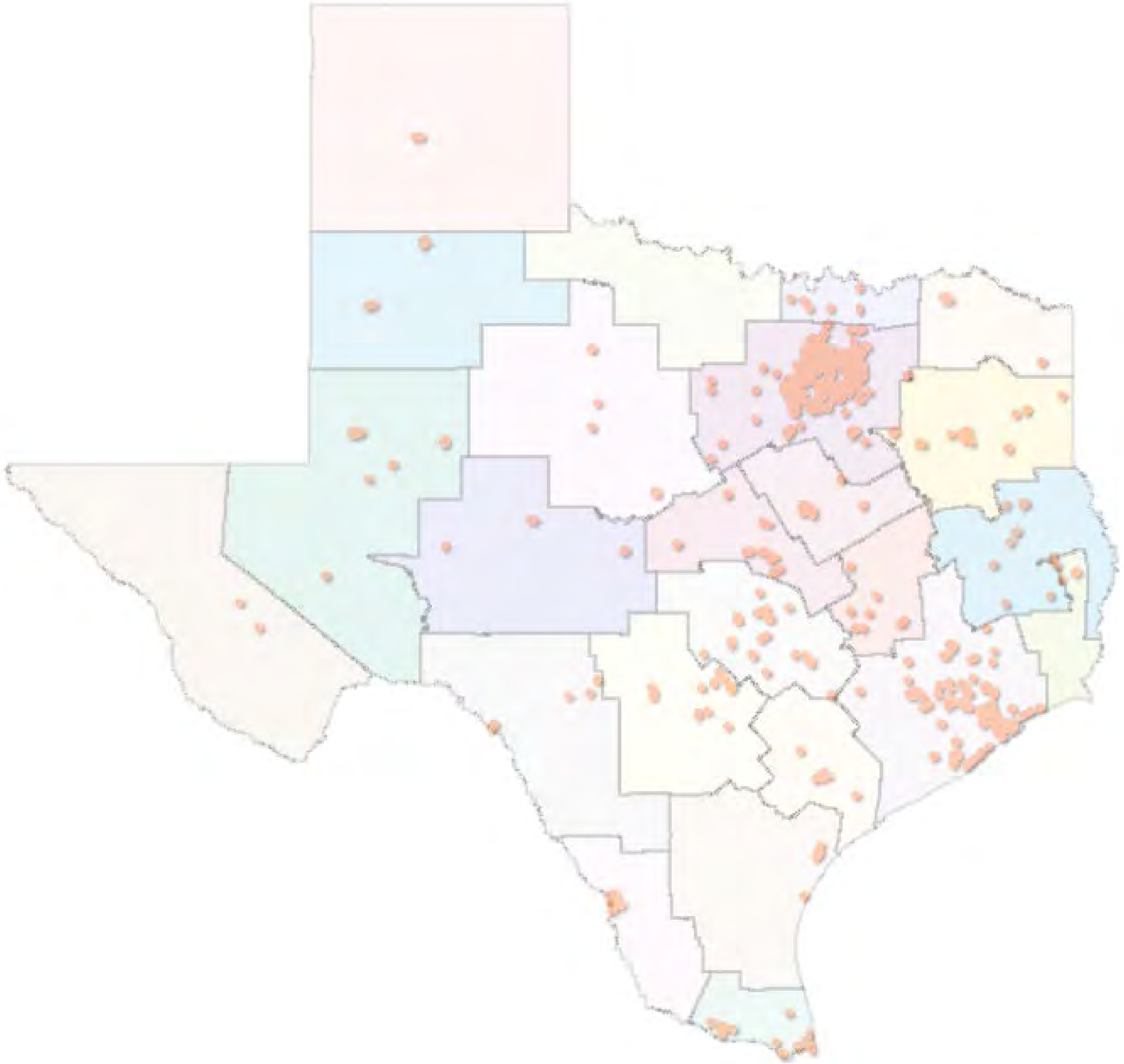
The Texas Litter Database

Keep Texas Beautiful

What It Is & How It Works

GIS-Based Platform: Launched in 2024 to enhance tracking and reporting of litter cleanups, accessible to anyone in Texas – from citizen scientists to formal institutions

Public Data Source that is available for anyone to analyze and leverage

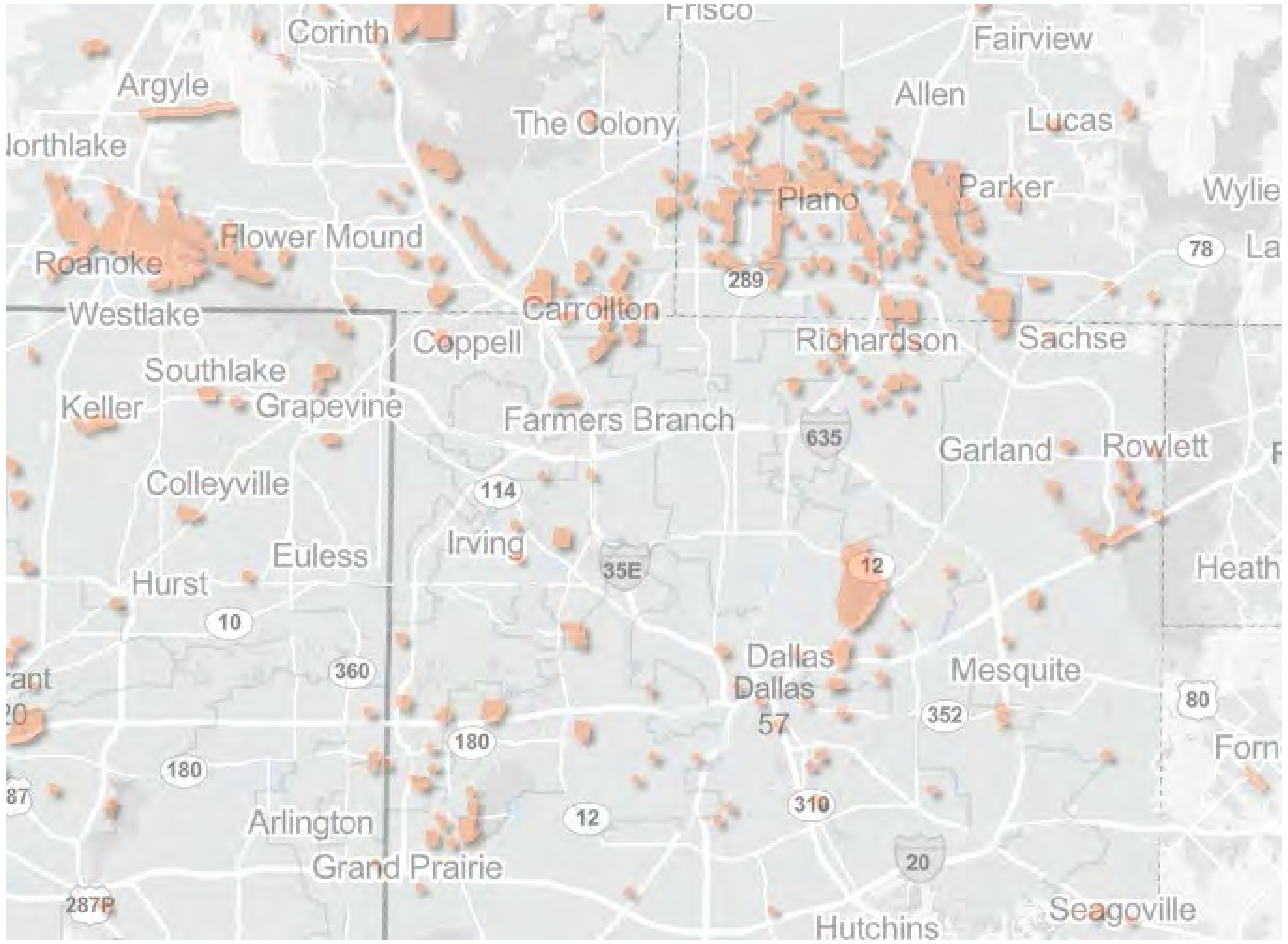


Harnessing Data for Action

Keep Texas Beautiful

Continuous Reporting of litter cleanups can:

- **Map Litter Hotspots** → identifying where intervention is needed
- **Track Trends Over Time** → measuring progress and impact
- **Informed Solutions** → data can be leveraged to inform intervention strategies



Problem → Solution

Keep Texas Beautiful

Targeted Educational Campaigns

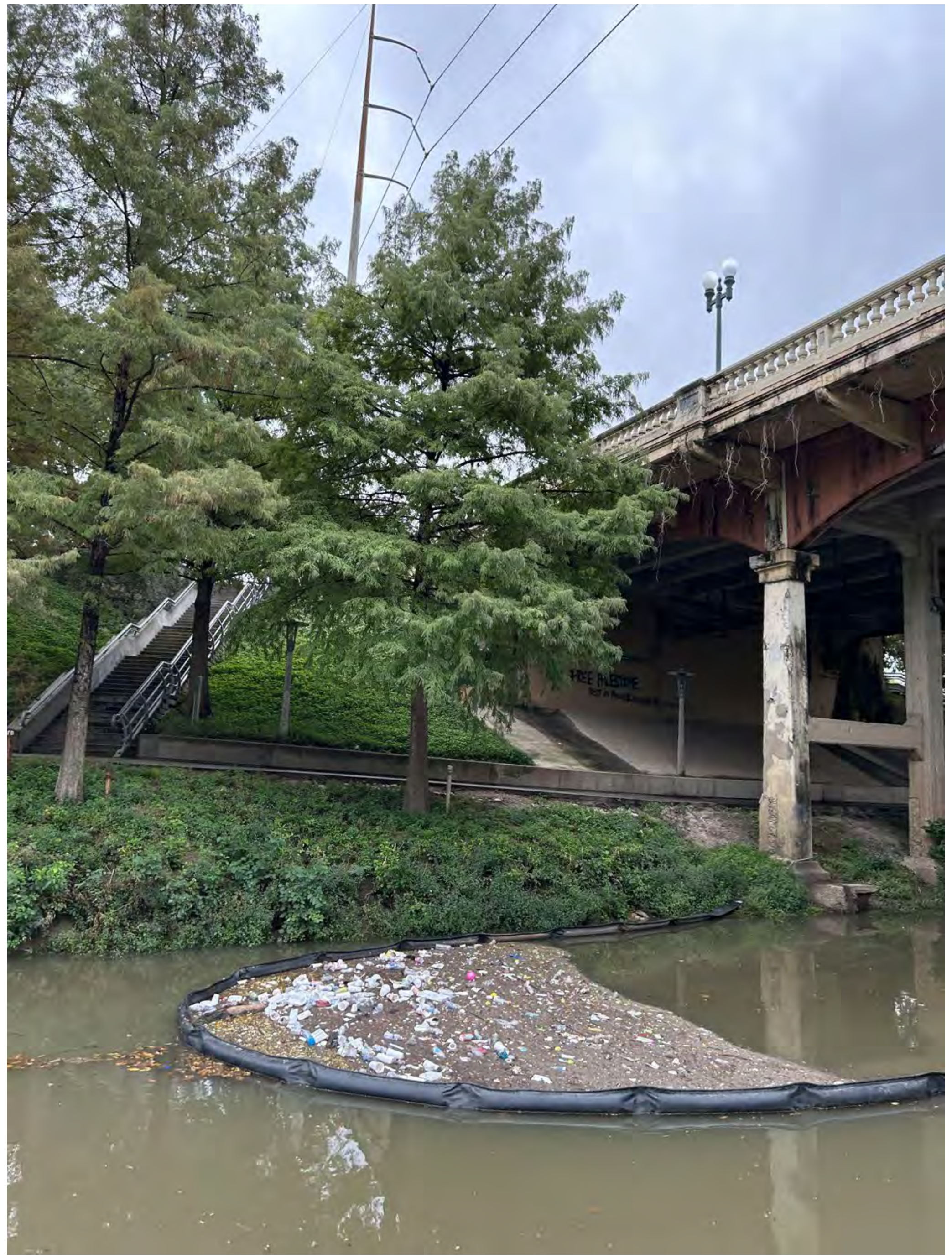
Communicate the problem to your community so they can help address it

Grant Applications

Use data sets to apply for grants to implement infrastructure solutions, campaigns, etc

Measure Efficacy of Infrastructure

Anything from measuring litter before and after installing a trash can or signage to installing litter booms



Problem → Solution

Keep Texas Beautiful

Engage Businesses

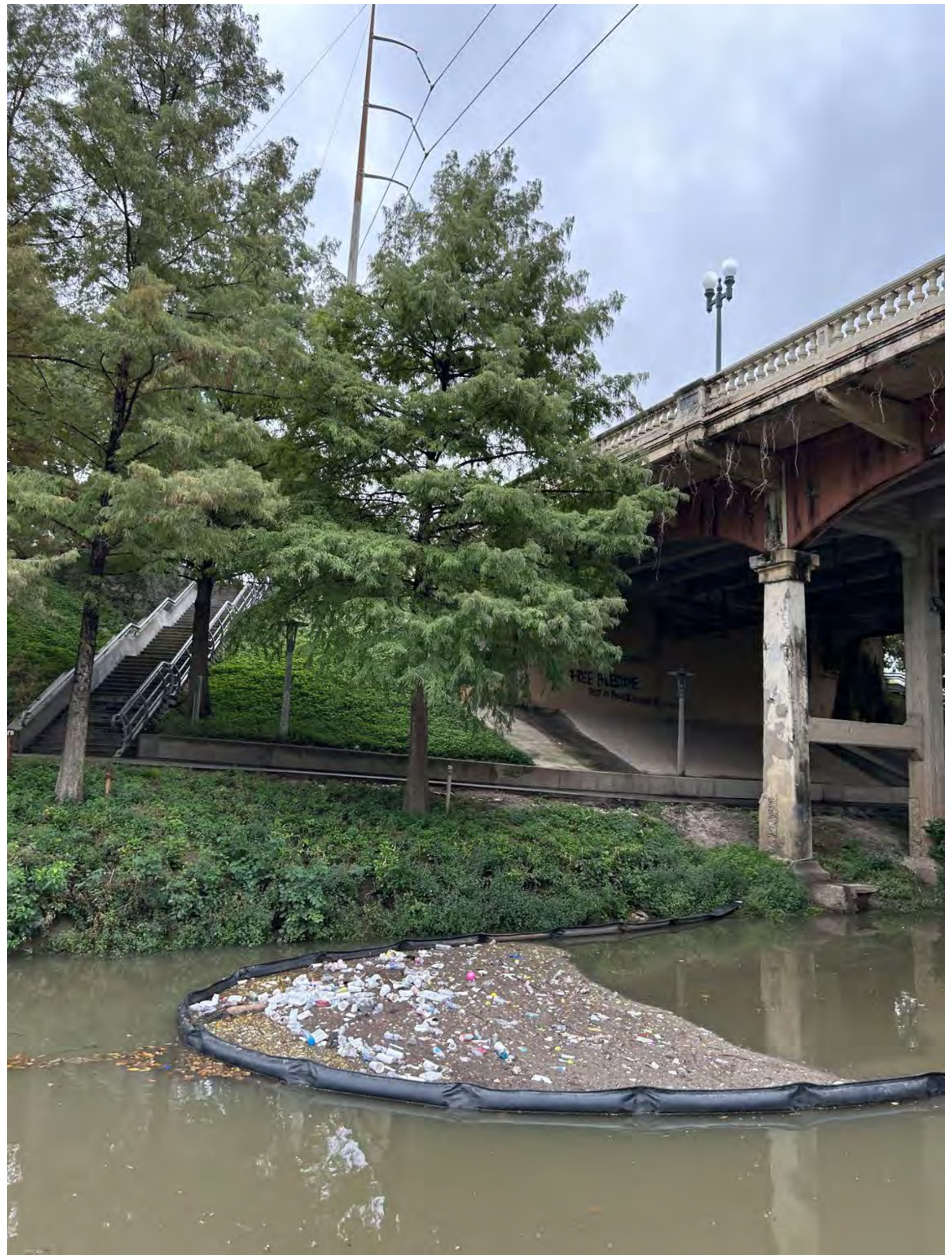
Create opportunities for local businesses to be part of the solution

Data for Research and Legislative Support

Data can be sorted by County, Council of Government (COG), or Congressional District

Drive Collaboration in your Community

The Texas Litter Database can be used as a standardized measure by municipalities, a tool for civic engagement, education source



Success in Adoption

Keep Texas Beautiful

Launched on October 2, 2024, The Texas Litter Database saw a 167% increase in reporting over a two-month span from the same timeframe in 2023

Since the database has launched, overall reporting is up 212%

Not necessarily more litter - more data!

Types of Data: Cleanup Reports

Cleanup Reports are a summary of your total cleanup efforts, including:

- Contact information
- Location (drawn directly on a map)
- Site Details
- Trash Volume
- Volunteer Data

Types of Data: Litter Audits

Keep Texas Beautiful

Litter Audits are a sample of litter collected that is counted, itemized, and inventoried

- Categories such as hard and solid plastics (plastic bottles, cigarette butts, etc)
- Ability to estimate fragments when too numerous to count
- Provides the best possible data about a cleanup and how litter interacts with that environment

Examples: any "hard" plastic that is not styrofoam or plastic film

Hard and Solid Plastic

Item	Tally	Total #
6 pack rings		
Beverage Bottles/ Containers		
Bottle/ Container Caps		
Buoys and Floats		
Cigar plastic tips		
Cigarette butts		
Disposable lighters		
Fishing Lures and Line		
Food Containers		
Fragments		
Non-Food Containers		
Personal care products		
Plastic Cups/ Plates		
Plastic Rope/net pieces		
Plastic Toys		
Plastic Utensils		
Shotgun Shell Casings		
Straws		
Other:		

Insights

Keep Texas Beautiful

What We've Learned So Far

- 74% of all litter in Texas is made of plastic
- You can expect to find 109 individual pieces of trash per 500 square meters in Texas
  - 55 of those items will be made of hard and solid plastic
- 8/10 of the most commonly found items are made of plastic

Texas Litter Database

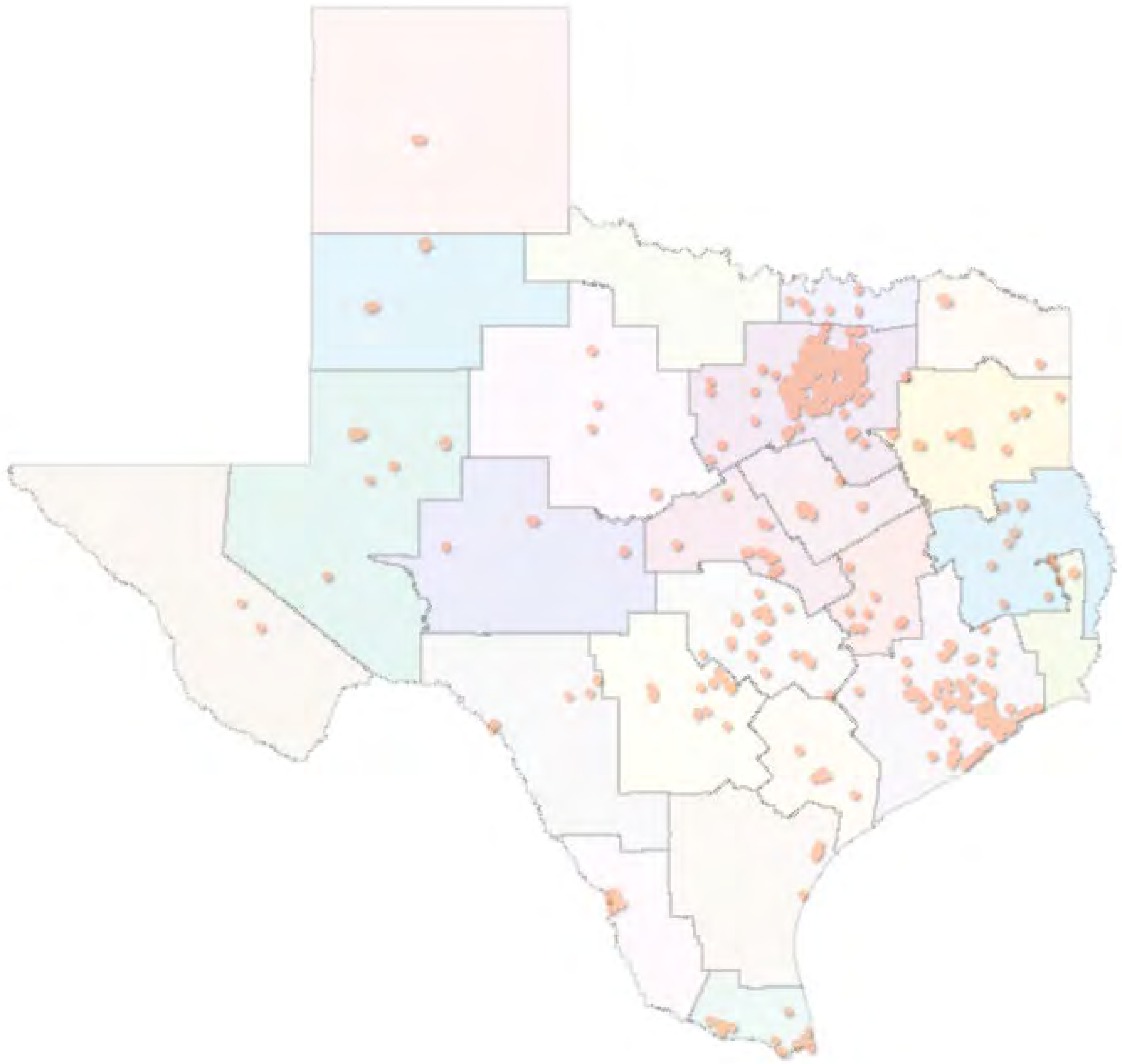
Keep Texas Beautiful

The Following Features are available with th version of the Texas Litter Database:

- Map function to view individual cleanups
- Charts function to track item count trends
- Ability to download entire data set, or filter by county, COC or congressional district
- TEKS-aligned lesson plan for K-12 students

Coming Soon:

- Mobile data entry
- Story Map highlighting use cases across the state



Expanding Collaboration

Keep Texas Beautiful

Engaging More Partners

KTB wants to connect with anyone in Texas conducting litter cleanups to spread the word and support/encourage adoption

Strengthen ties with research institutions, community leaders, municipalities, and volunteer organizations

How to Get Involved

Keep Texas Beautiful

Submit Your Data - www.texaslitter.org

Stay in Touch - texaslitter@ktb.org

Thank you!

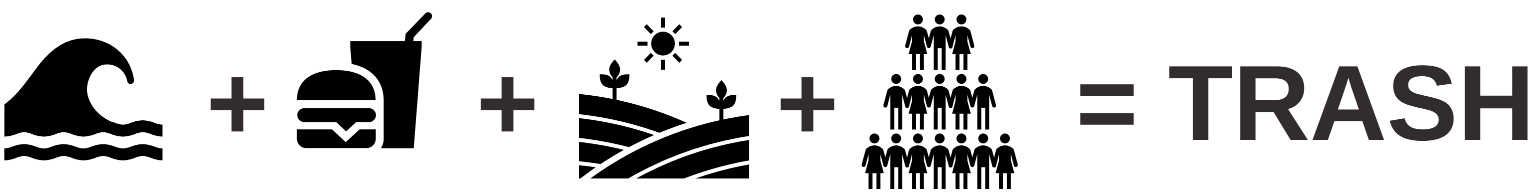
BAYOU CITY SECRETS: MAPPING MARINE DEBRIS IN THE LOWER GALVESTON BAY WATERSHED TO AID MANAGEMENT

Amanda Hackney, Dr. David Retchless, Jess Lucas

TEXAS A&M UNIVERSITY
GALVESTON CAMPUS®

Turning Surveys Into Predictions

- Several years of STOP survey data
- What factors drive the total number of litter items?
- Where can we expect high amounts of trash?

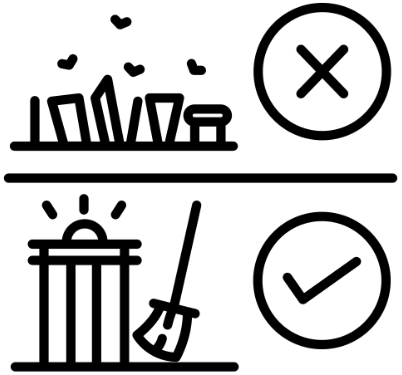


TEXAS A&M UNIVERSITY
GALVESTON CAMPUS

STOP Litter Surveys

STOP: Study, Track, Remove and Prevent methodology

- Measure a line transect
- Pick up every single piece of trash
- Collect all trash the size of a cigarette butt or larger
- After collection, record number of individual items directly on datasheet



Setting up a transect

Data Collection

Site name:		
Date surveyed:		
Start/ end time:		
Contact name:		
Contact email:		

STUDY
TRACK
REMOVE +
PREVENT

Number of people:		Length of transect (line):	
Total weight of bagged trash:		Number of bottles picked up in 2 minute count:	
Coordinates of survey midpoint:		Is a trash can visible from the survey site?	

(Find the middle of your survey transect along the shoreline and report the latitude/ l

Hard and Solid Plastic

Examples: any "hard" plastic that is not styrofoam or plastic film

Item	Tally	Total #
ESTIMATED FRAGMENTS (Circle best choice)	1 - 25 26 - 100 101 - 999 Over 1000	
6 pack rings		
Beverage Bottles/ Containers		
Bottle/ Container Caps		
Buoys and Floats		
Cigar plastic tips		
Cigarette butts		
Disposable lighters		
Fishing Lures and Line		
Food Containers		
Non-Food Containers		
Personal Care/ Hygiene Products		
Plastic Cups/ Plates		
Plastic Rope/net		
Plastic Toys		
Plastic Utensils		
Shotgun Shell/ Wad		
Straws		
Writing Pens, Markers		
Other		

Styrofoam

Examples: sty

Item
ESTIMATED FRAGMENTS (Circle best choice)
Styrofoam Cups/ Plates
Fishing Floats
Food Wrappers/ Containers
Insulation
Jugs/ Containers
Other

Plastic Films

Examples: chip bags, clear wrappers, candy wrappers

ESTIMATED FRAGMENTS (Circle best choice)	1 - 25 26 - 100 101 - 999 Over 1000	
Item	**Tally**	**Total #**
Abandoned Utility Flag		
Shopping/ Trash		
Food or Drink		
Latex Balloons		
Mylar Balloons		
Newspaper Film		
Personal Care/ Hygiene		
Ribbon		
Other		

Metal

Examples: any metal including foil, aluminum, iron, tin, etc.

ESTIMATED FRAGMENTS (Circle best choice)	1 - 25 26 - 100 101 - 999 Over 1000	
Item	**Tally**	**Total #**
Aerosol cans		
Aluminum Foil		
Aluminum/ Tin cans		
Crab/ Fish traps		
Metal Bottle Caps		
Metal Wire		
Other		

Glass

ESTIMATED FRAGMENTS (Circle best choice)	1 - 25 26 - 100 101 - 999 Over 1000	
Item	**Tally**	**Total #**
Beverage Bottles		
Jars		
Other		

Rubber

ESTIMATED FRAGMENTS (Circle best choice)	1 - 25 26 - 100 101 - 999 Over 1000	
Item	**Tally**	**Total #**
Flip flops/ Shoe soles		
Work (Thick) Gloves		
Tires		
Rubber Balls		
Other		

PPE

Examples: any wearable object used to protect the wearer from illness

Item	Tally	Total #
PPE Disposable Gloves		
PPE Face Masks		
Other		

Paper/ Lumber

Examples: any MAN MADE products made from trees/ wood

ESTIMATED FRAGMENTS (Circle best choice)	1 - 25 26 - 100 101 - 999 Over 1000	
Item	**Tally**	**Total #**
Cardboard Cartons		
Lumber/ Building Material		
Paper/ Cardboard		
Paper Bags		
Food Container/ Wrapper		
Other		

Clothing/ Fabric

ESTIMATED FRAGMENTS (Circle best choice)	1 - 25 26 - 100 101 - 999 Over 1000	
Item	**Tally**	**Total #**
Clothing		
Gloves (non rubber)		
Rope/ nets NON NYLON		
Towels/ Rags		
Shoes/ Shoe Tops		
Other		

Large/ Hazardous

Item	Tally	Total #
Regular Household Batteries		
Car/ Boat Batteries		
Other Hazardous Waste		
Boats/Vehicles		
Appliances		
Furniture		
Construction Material		
Other		

It's so easy to make a difference! Thank you for taking your time to provide Texas scientists this incredibly valuable information!

Enter your data at txlitter.org!

San Luis Pass Marsh Roadway

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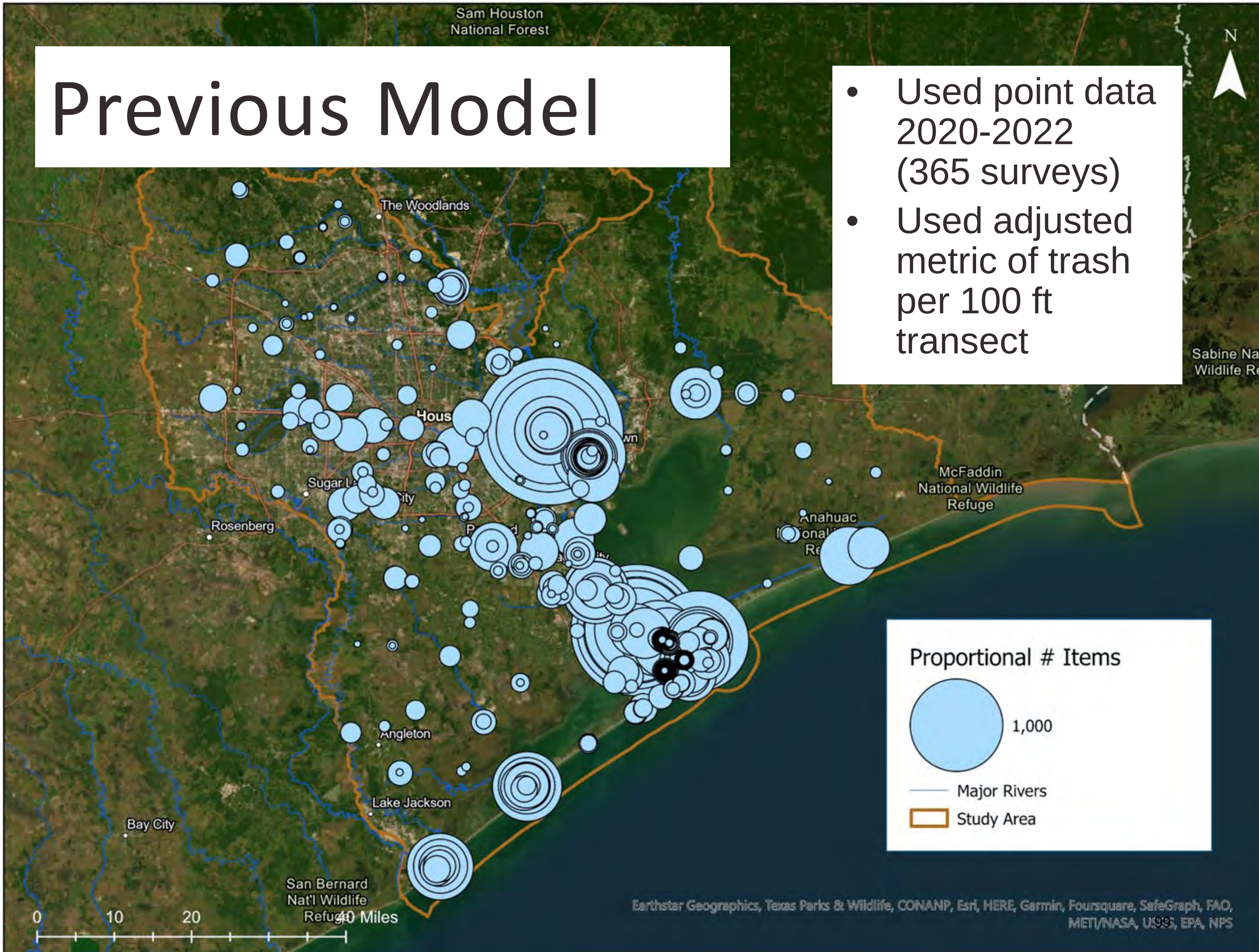
GALVESTON CAMPUS

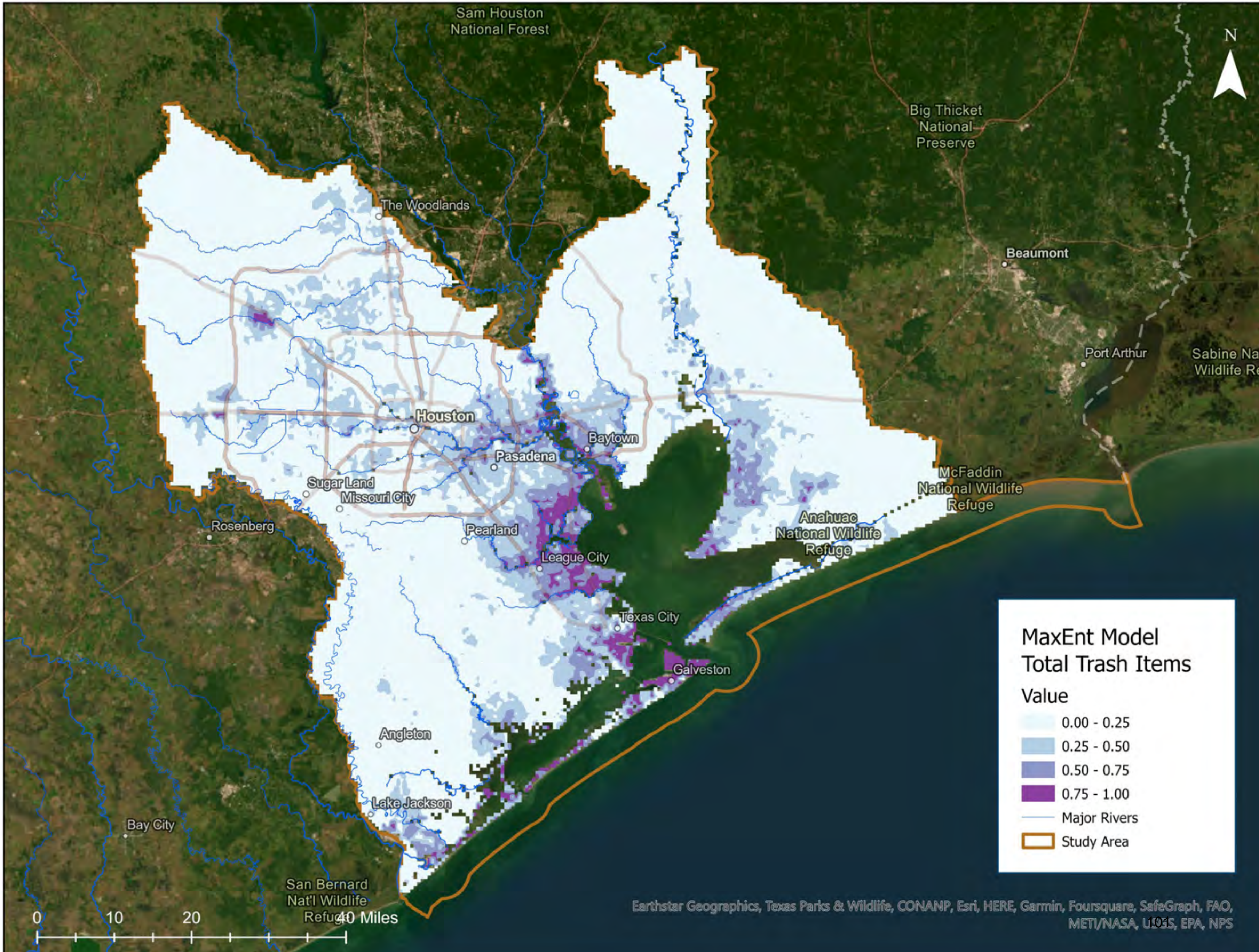
Previous Model

- Used point data 2020-2022 (365 surveys)
- Used adjusted metric of trash per 100 ft transect



Previous Model

- Used exploratory regression
  - Distance to Justice 40 tract
    - closer more trash
  - Distance to Bus Stop
    - farther more trash
  - Distance to Wastewater Outfall
    - closer more trash
  - Aspect
    - heaviest 125 (ESE) -175 (SSE)
  - Elevation
    - greater trash at lower areas
  - Census Population
  - Census Household Count



Sam Houston
National Forest
Big Thicket
National
Preserve
The Woodlands
Beaumont
Port Arthur
Sabine Nati
Wildlife Ref
Houston
Baytown
Pasadena
Sugar Land
Missouri City
McFaddin
National Wildlife
Refuge
Rosenberg
Pearland
Anahuac
National Wildlife
Refuge
League City
Texas City
Galveston
Angleton
Lake Jackson
Bay City
San Bernard
Nat'l Wildlife
Refuge
0
10
20
40 Miles
N
MaxEnt Model
Total Trash Items
Value
0.00 - 0.25
0.25 - 0.50
0.50 - 0.75
0.75 - 1.00
Major Rivers
Study Area
Earthstar Geographics, Texas Parks & Wildlife, CONANP, Esri, HERE, Garmin, Foursquare, SafeGraph, FAO,
METI/NASA, USGS, EPA, NPS

Updated Data 2024

- Texas Litter Database converted to using polygons
- Data from 2020- Dec 2023 (405 surveys)

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GIS Analysis

- Data was downloaded from the Texas Litter Database
  - February 2020- Dec 2023
- Incomplete or outlier surveys removed
- 405 surveys
- Area standardized- 500 sq m
- Fragments estimated in field- not used at this time

Statistical Analysis

- Negative Binomial Regression

Distance to:	Summary data within 2km circle:	Survey Polygon:
Bridges	Average Income	Slope
Bus Stop	# Gas Stations	Aspect
Justice 40 Tract	# Fast Food	Elevation
Major Road	Daytime (worker) population	Landcover types
Minor Road	Daytime worker density	
Highway	Nighttime (resident) population	
Streets	% Built Environment	
MS4 Outfall	% Impervious Surfaces	
Landfill		
Superfund Site		
Boat Ramp		
Stormwater Outfall		

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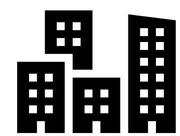
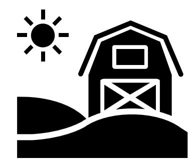
Results- combined

- All 405 points
- Conflicting significant variables

- Let's split!
  - Urban vs Rural (U.S. Census)
  - Daytime vs. Nighttime population
  - Coastal vs Inland





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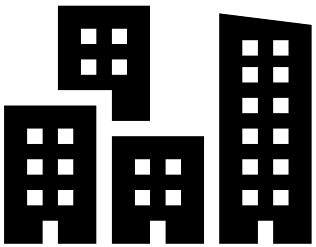
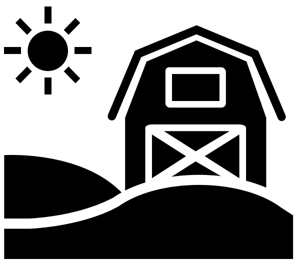
Results- Urban

- 118 surveys



Variable	Correlation	Litter Effect
Justice 40 Tract	-	Closer = more trash
MS4 Outfall	-	Closer = more trash
Streets	-	Closer = more trash
Stormwater Outfall	-	Closer = more trash
Slope	+	Greater = more trash
Aspect	-	Lower values= more trash
Daytime (worker) population	+	Greater = more trash
Daytime worker density	-	Less density= more trash

Results- Rural



- 217 surveys

Variable	Correlation	Litter Effect
Bridges	+	Farther = more trash
Major Road	-	Closer = more trash
Minor Road	-	Closer = more trash
Streets	+	Farther = more trash
Landfill	-	Closer = more trash
Stormwater Outfall	+	Farther = more trash
Gas Stations within 5km	+	Greater = more trash
Fast Food within 2km	-	Less = more trash
Superfund Site	-	Closer = more trash
Daytime (worker) population	+	Greater = more trash
Daytime worker density	-	Less density= more trash
Nighttime population	-	Less = more trash

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Variable	Urban	Rural
Bridges	N/S	+
Major Road	N/S	-
Minor Road	N/S	-
Streets	-	+
Landfill	N/S	-
Stormwater Outfall	-	+
Gas Stations within 5km	N/S	+
Fast Food within 2km	N/S	-
Superfund Site	N/S	-
Daytime (worker) population	+	+
Daytime worker density	-	-
Nighttime population	N/S	-
Justice 40 Tract	-	N/S
MS4 Outfall	-	N/S
Slope	+	N/S
Aspect	-	N/S

- Urban driven by more physical landscape variables- slope, aspect
- Rural has more trash in remote areas
- Less trash in areas with greater daytime worker numbers
- More trash in lower density daytime worker areas

Future Work

- **Use variables to create MaxEnt predictions for study area**
- **Explore ways to designate coastal vs noncoastal areas**

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Jess Lucas- j.lucas@blackcatgis.com

DETECTION OF MICROPLASTICS IN SEDIMENT AND INVERTEBRATES ON TEXAS BEACHES

A Presentation

By:

Maureen Hayden

TEXAS A&M
UNIVERSITY


URI

Plastics Ingestion in Invertebrates

- Invertebrates are the base of the marine food web
- Plastics impact invertebrates
  - Accumulation/retention
  - Translocation
  - Absorption of chemicals
  - Altered behavior

Piping Plover
(*Charadrius melodus)*

Objectives

Objective 1: To determine whether microplastics occur within beach sediment

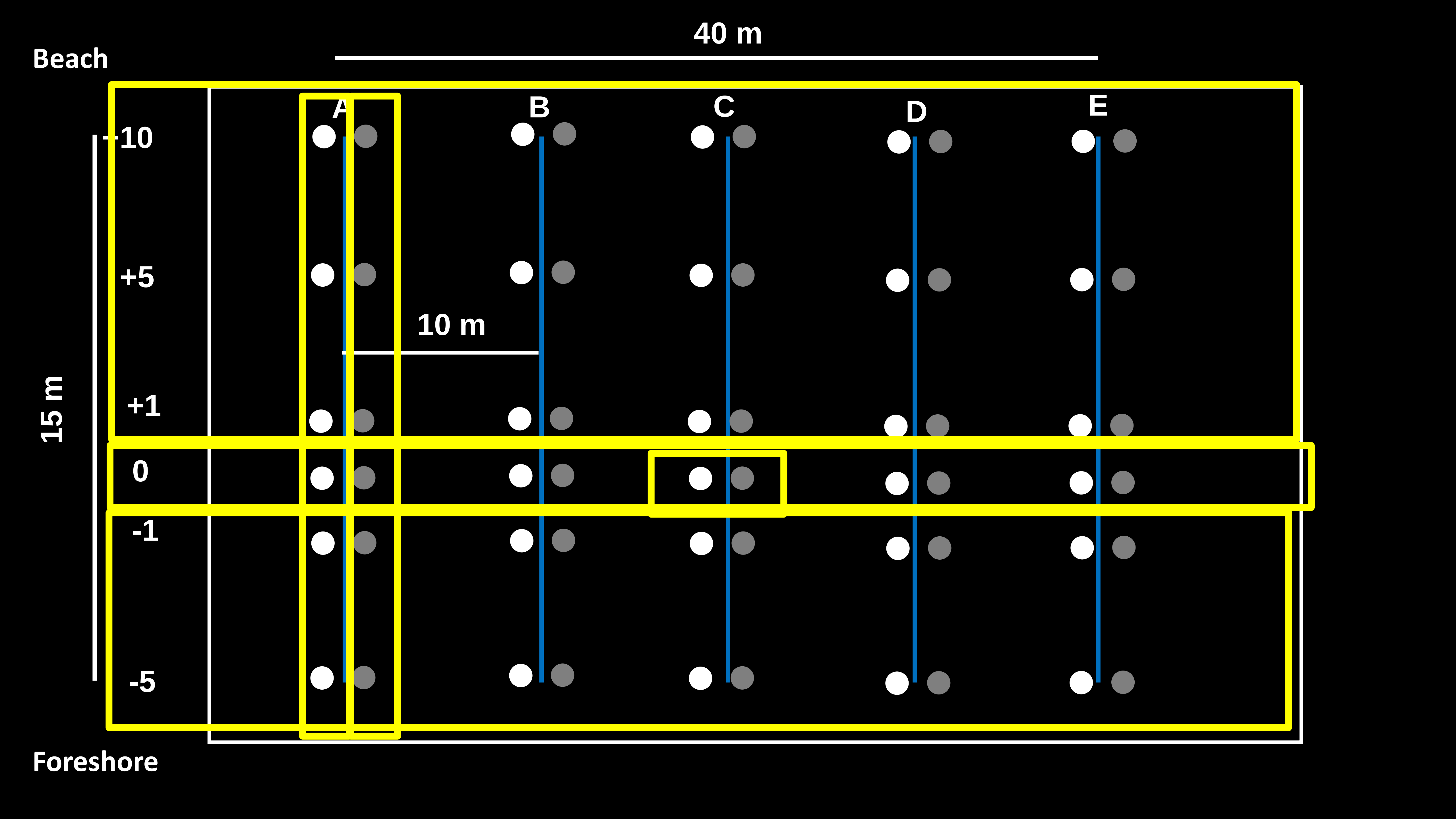
Objective 2: To determine if Texas beach invertebrates ingest microplastics

Objective 3: To examine the relationship between plastics within sediment and plastics ingested by invertebrates


Sea Rim State Park
Galveston Island State Park
Mustang Island State Park

Sampling Method

- Sample using a grid transect 40 X 15 m with 0 m at the swash zone during low tide
- Invertebrate and Sediment samples take at the same time
- Sample Times
    - Fall :September-December 2021
    - Winter: January-April 2022
    - Summer: May-August 2022


40 m
Beach
A
B
C
D
E
+10
+5
10 m
+1
15 m
0
-1
-5
Foreshore

Objective 1: To determine whether microplastics occur within beach sediment

Sediment was dried in an oven at 50C for 4 days

Dry Sediment was transferred to glass storage containers

Sediment Microplastic Isolation Unit

- 50 g of dry sediment
- Stirred for 5 minutes
- Settle for 30 minutes (valve in the open position)
- Filtrate was run through a vacuum filter and collected on black filter paper

Nile Red Staining and Imaging

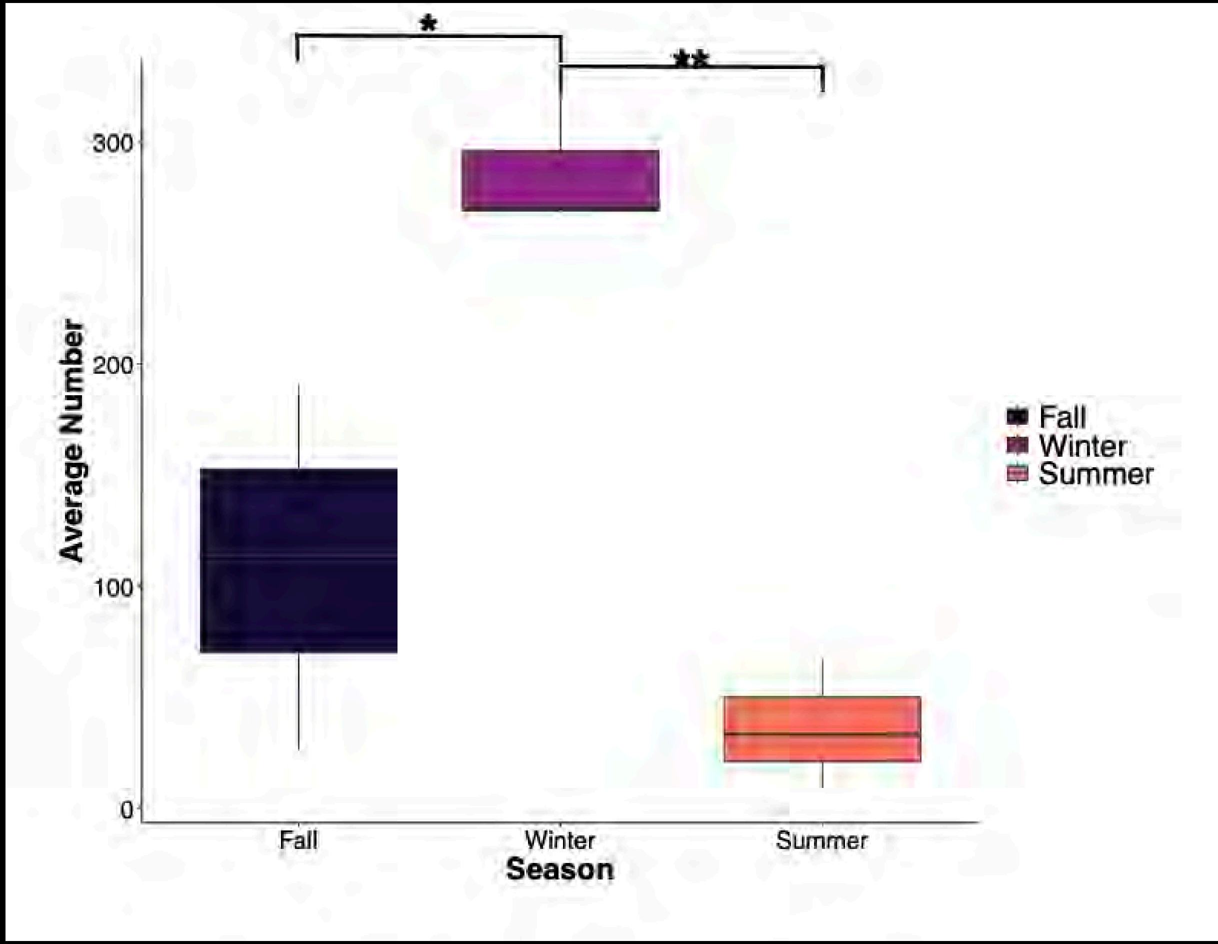
- Stained with 4 mL of Nile Red solution
- 48-72 hrs to dry
- Photos taken with Canon DSLR Camera
- 254 nm UV light

Sediment Sample
SRSP 7/23/22 0E

Plastic Particles Within Sediment

Winter had **significantly greater** number of plastic particles in sediment cores

No significant difference in number of plastic particles in sediment **between sample sites**



Objective 2: To determine if Texas beach invertebrates ingest microplastics

Haustoriid Amphipod

Mole Crab

Scolelepis squamata

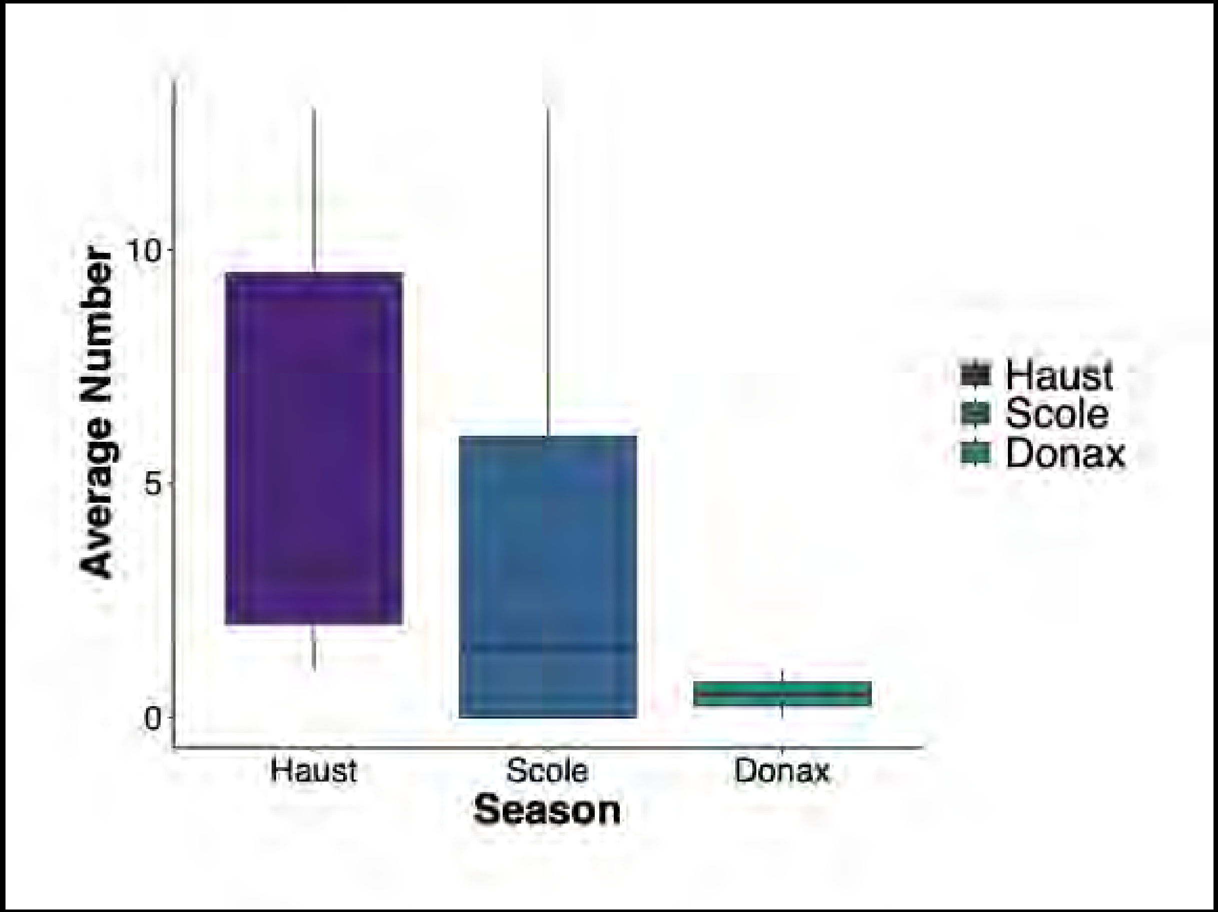
***Donax* Clam**

World Register of Marine Species

- Random Sample (20%)
- 10 invertebrates from each taxon
- 5 mL in 10% Hydrogen Peroxide
- 5 days at 37ºC
- Vacuum filtration and Nile Red Staining

Particles ingested by Invertebrates

- There was **no significant difference** for the total number of particles ingested **between sample site or season**
- There was a **significant difference** for the total number of ingested particles **between species**
  - Amphipods ingested significantly more particles than clams



Plastics, Sediment, and Invertebrates

Objective 3: To examine if there is a relationship between plastics in sediment and plastics ingested by invertebrates

Relationship between Sediment and Invertebrates

- Linear regression
- Number of particles in the sediment (independent variable)

- Number of invertebrates (N)
  - Significantly **positive** relationship (p-value = 0.021)
- Invertebrate diversity (H)
  - Significantly **negative** relationship (p-value = 0.012)
- Invertebrate evenness (E)
  - Significantly **negative** relationship (p-value = 0.012)

Conclusion

- Microplastics particles were most abundant during winter within sediment samples
- Amphipods ingested significantly more microplastics than clams
- Experimental studies are needed to understand the impact of plastic ingestion on invertebrates

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- National Federation of the Blind of Texas
- National Federation of the Blind
- Texas Sea Grant

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- Moore Institute for Plastic Pollution Research

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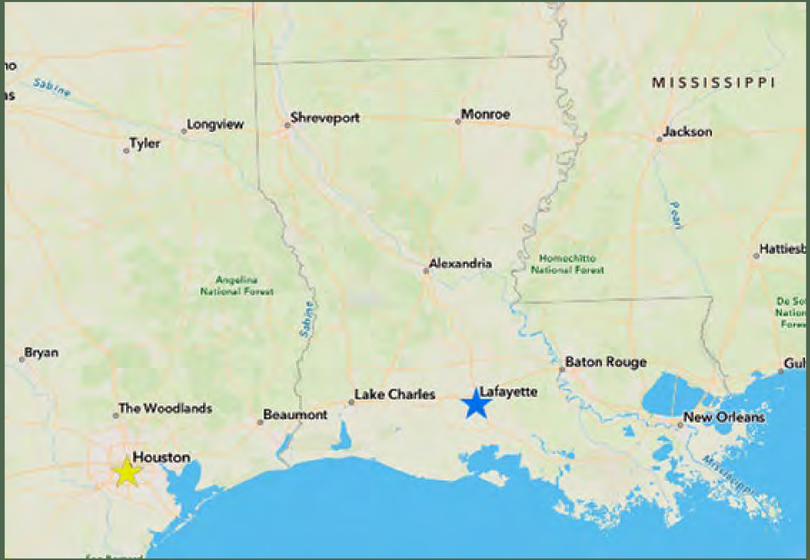
- Joseph Zamora

Questions?

Microplastics have moved into virtually every crevice on Earth

You eat over 900 tiny pieces of plastic a day and researchers don't fully know what it's doing to your health yet

Photography by Robert Clark



Airborne Microplastic Presence in *Tillandsia usneoides*

Microplastics found in every human placenta tested in study

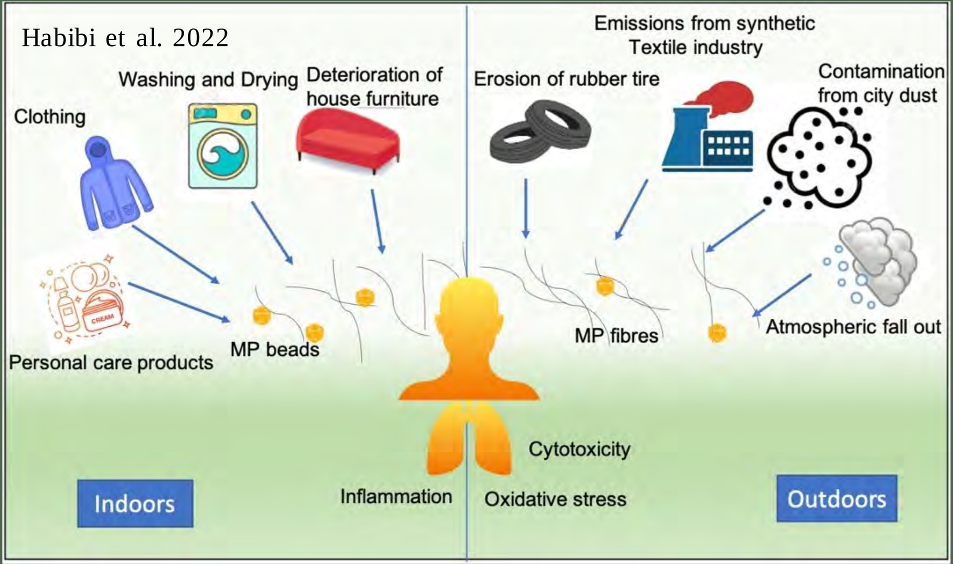
Scientists Are Finding Microplastics In Our Arteries, And They May Be Causing Serious Heart Disease

Story by Jen Sako • 2d • 2 min read

By Ethan Adams, Hallie Blondiau, Ava Thibodeaux, Madison Maier

Source: National Geographic/The Guardian/Harvard/Business Insider

Introduction

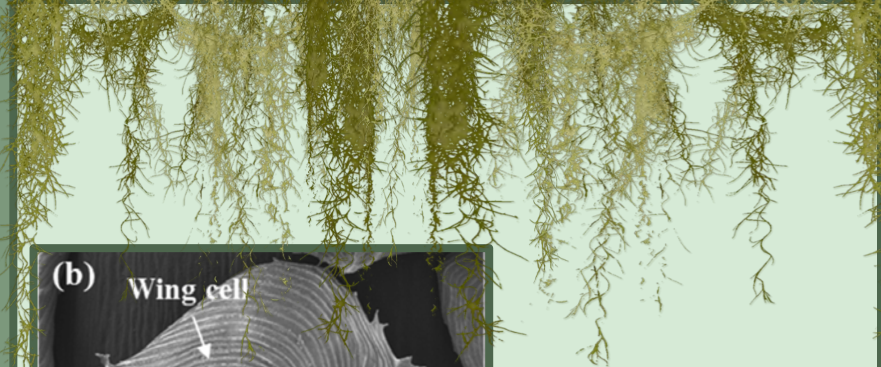


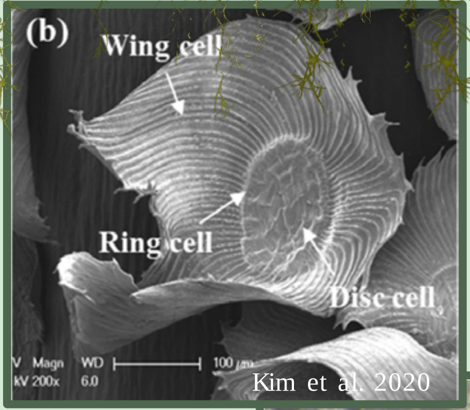
Habibi et al. 2022

- Accumulation in the respiratory system and blood-brain barrier explicitly impacts human health.
    - Suspected Sources: Mass plastic production, automotive pollution, and building materials.

Why *T. usneoides*?

- Why is *T. usneoides* a good bioindicator?
  - "Members of [*Tillandsia*] are characterized by their ability to obtain water and nutrients from the atmosphere, making them noticeable as an air pollution biomonitor." (2)
  - Large surface area due to <u>trichome structures</u>
    - No significant loss due to rainfall
  - Abundant in tropical and subtropical regions
  - High tolerance for particle pollutants (6)





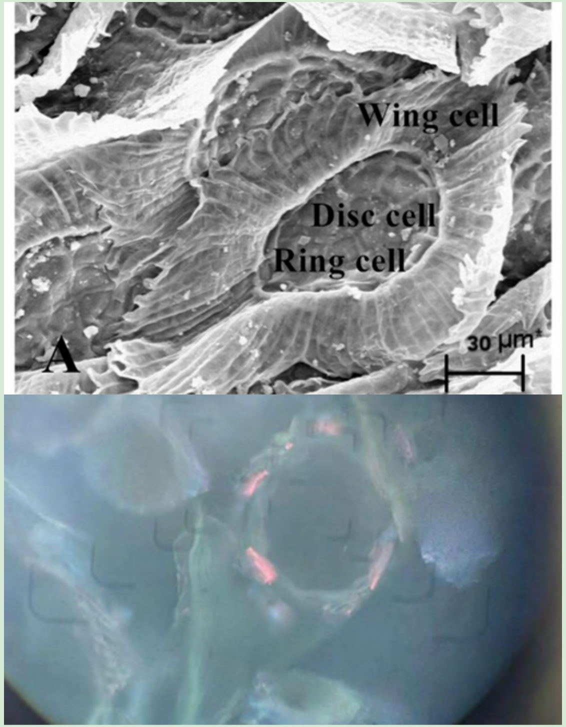
Kim et al. 2020

Poczai et al. 2017

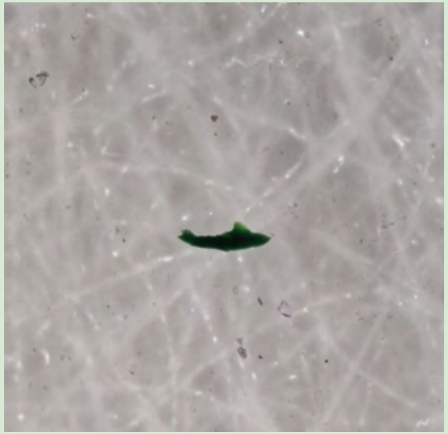
Methods & Materials

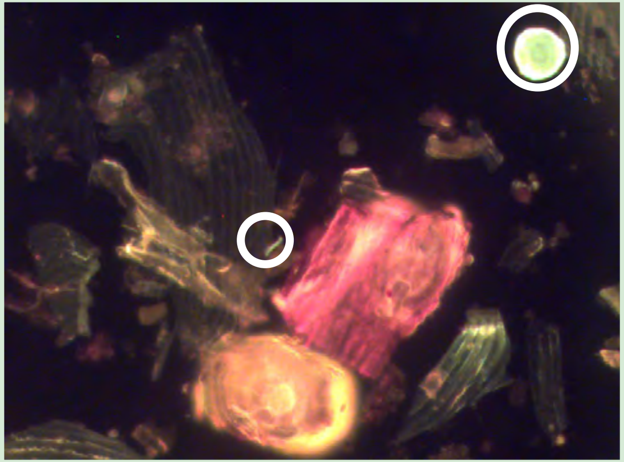
- Samples were collected from various locations on campus, dried in an oven, and then finely ground.
- Wet Peroxide Oxidation (WPO) solution was used to break down the organic matter of *T. usneoides*, leaving only the inorganic material
- Samples were vacuum filtered
    - Nothing smaller than 0.22μm found
- The filters were examined using fluorescent microscopy.

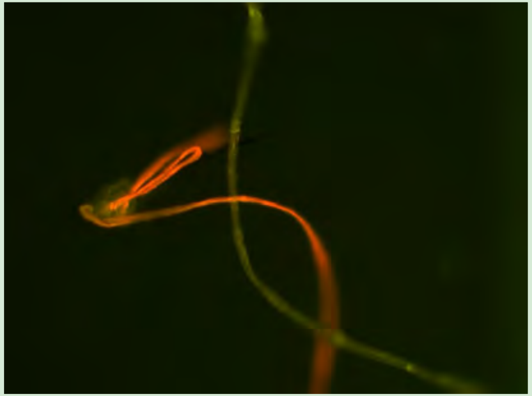
Results

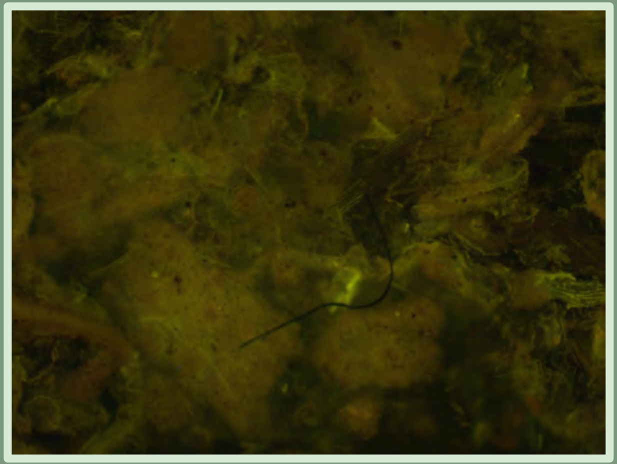
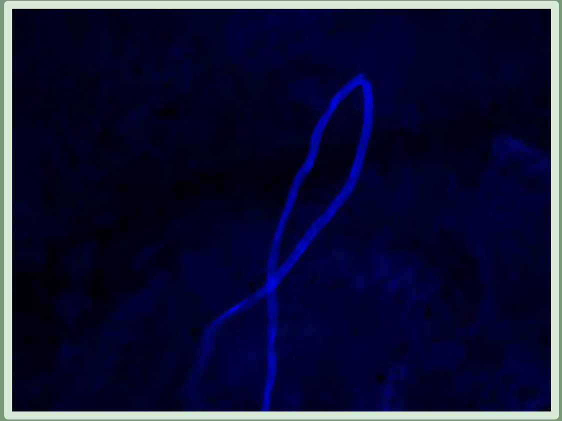
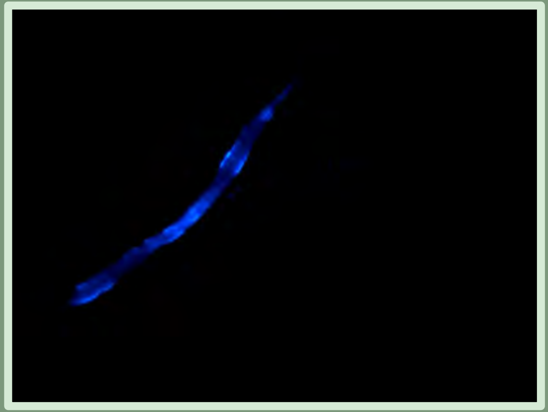
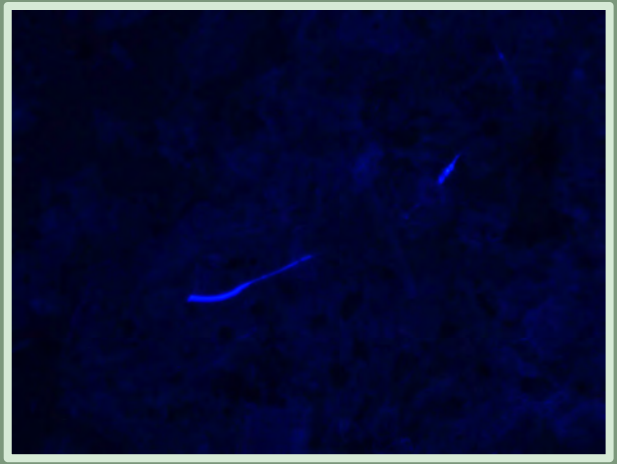
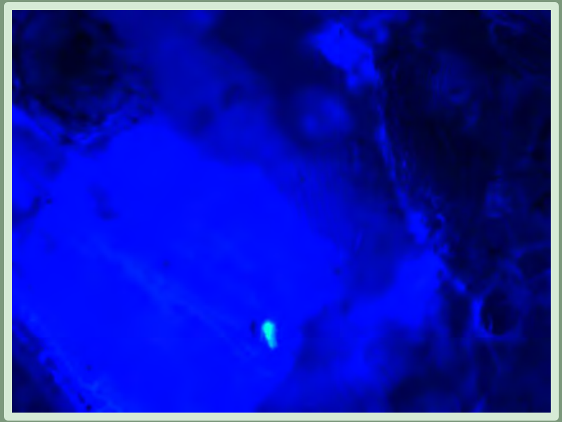


Adapted from Zhang et. al. (2019)

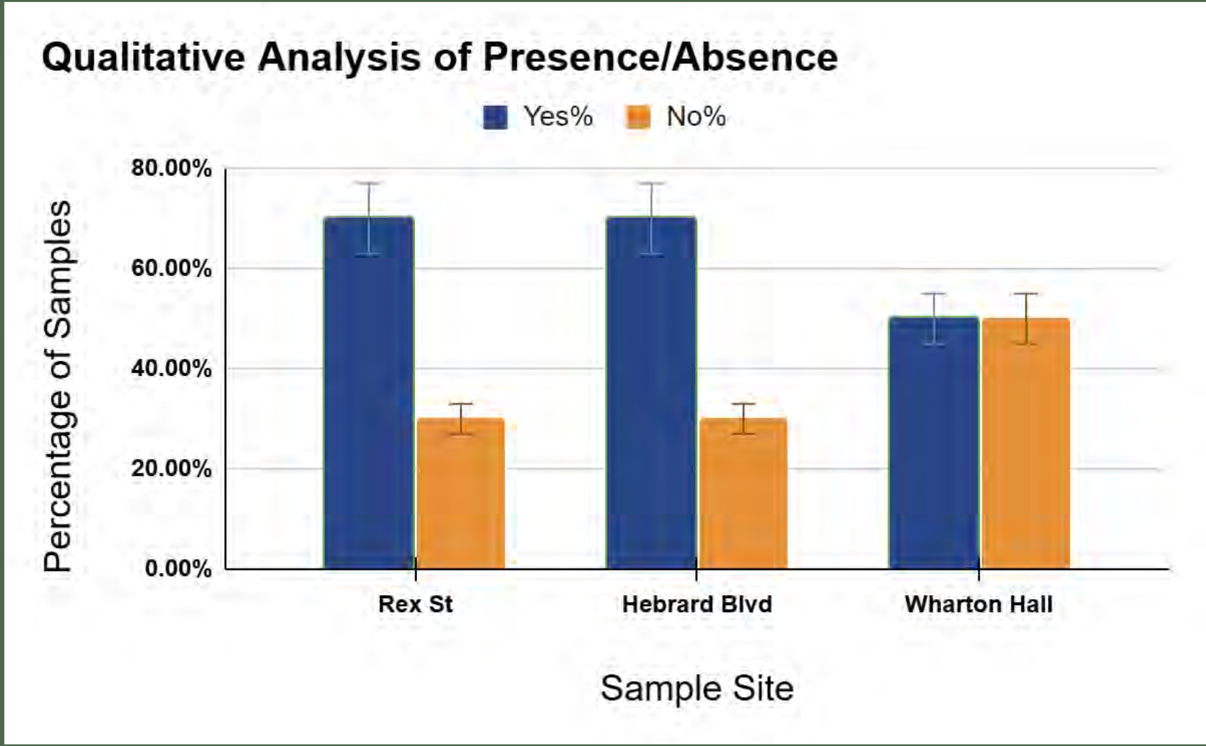






So Far….



Qualitative Analysis of Presence/Absence
Yes%
No%
80.00%
60.00%
40.00%
20.00%
0.00%
Percentage of Samples
Rex St
Hebrard Blvd
Wharton Hall
Sample Site

Discussion

- Qualitative analysis was obtained from dry samples.
- Samples taken from Rex Street and Hebrard Blvd had a higher amount of plastic presence than Wharton Hall samples- we hypothesize these samples contain more post consumer microplastics.
  - The location of the samples collected from Wharton Hall experiences more pedestrian traffic rather than vehicular and high amounts of wind shielding provided by neighboring buildings.
- Main Error: It was concluded that the first slides observed had a higher than expected concentration of free atmospheric plastic, leading to contamination and skewed data.
- Initially, the digestion method used was believed to cause unintentional,further degradation of plastic within the samples.
  - Slides were cleaned with 70% ethanol before re-evaluation.

Future Directions

- IR Spectroscopy to quantify the bonds between airborne plastics and plant matter.
- Nile Red and Phloroglucinol Dye
- Freeze Drying to eliminate extra heat from the drying process, and to pulverize into a finer texture.
- Mineral oil bubbling coupled with centrifugation as a separation method.

Questions:

What types of plastics are these microplastics?

How do these microplastics affect cellular processes?

How are humans influencing the concentrations of airborne

Thank You!

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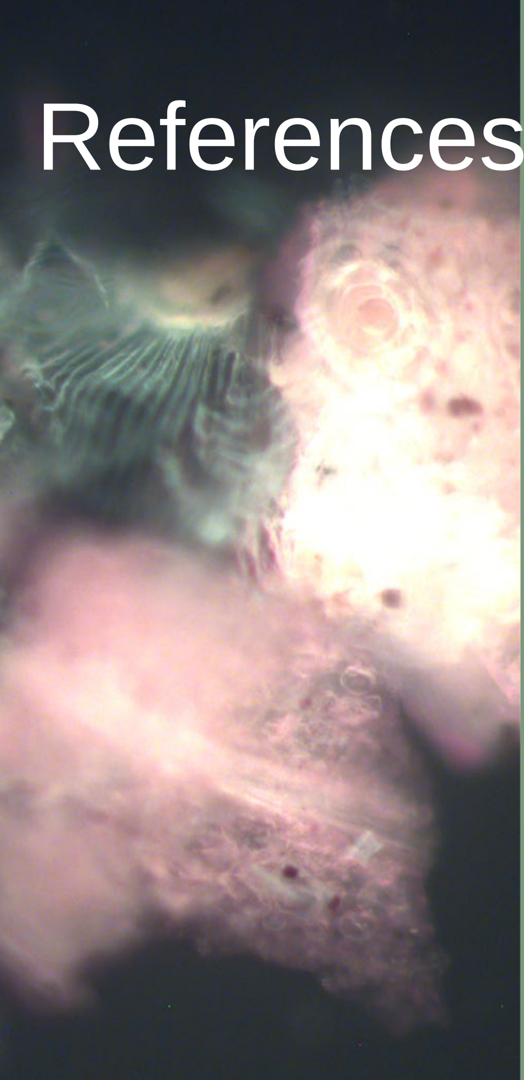
Dr. William E Schmidt, Texas Plastic Pollution Symposium Affiliates, University of Louisiana at Lafayette, previous research volunteers, and attendees.

Without your support, this undergraduate research would not be possible. Our dedication to this project continues because of these valued mentors and organizations.



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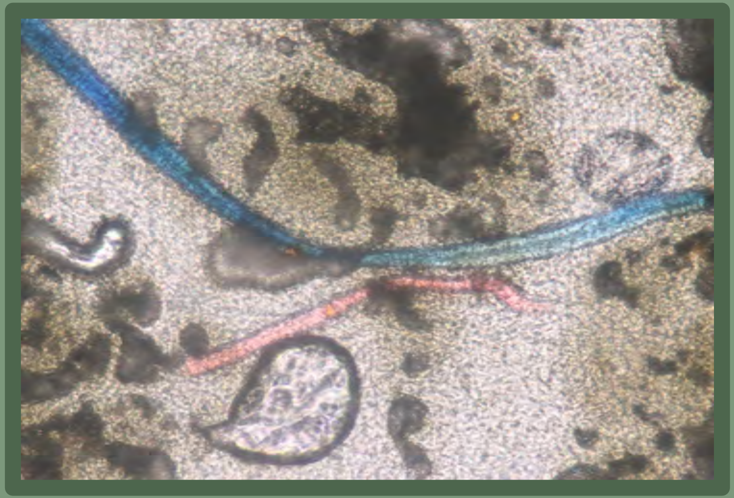
Questions?



MICROPLASTICS AS A DISTURBANCE TO MARINE FOOD WEB DYNAMICS IN TEXAS GULF COASTAL BAYS

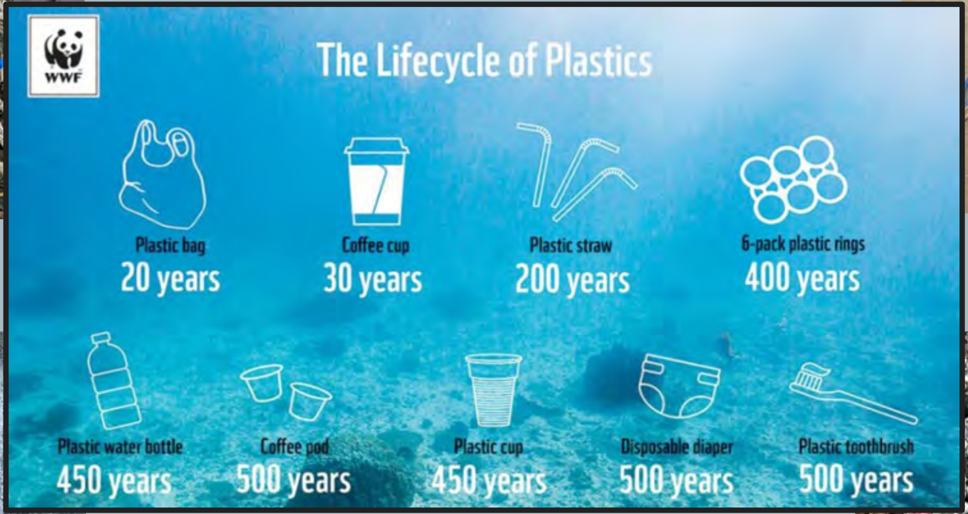
Elizabeth Everett* Committee: Dr. Frauke Seemann, Dr. John Majoris, Dr. Adam Mitchell

1

Think About Plastic With A New Perspective

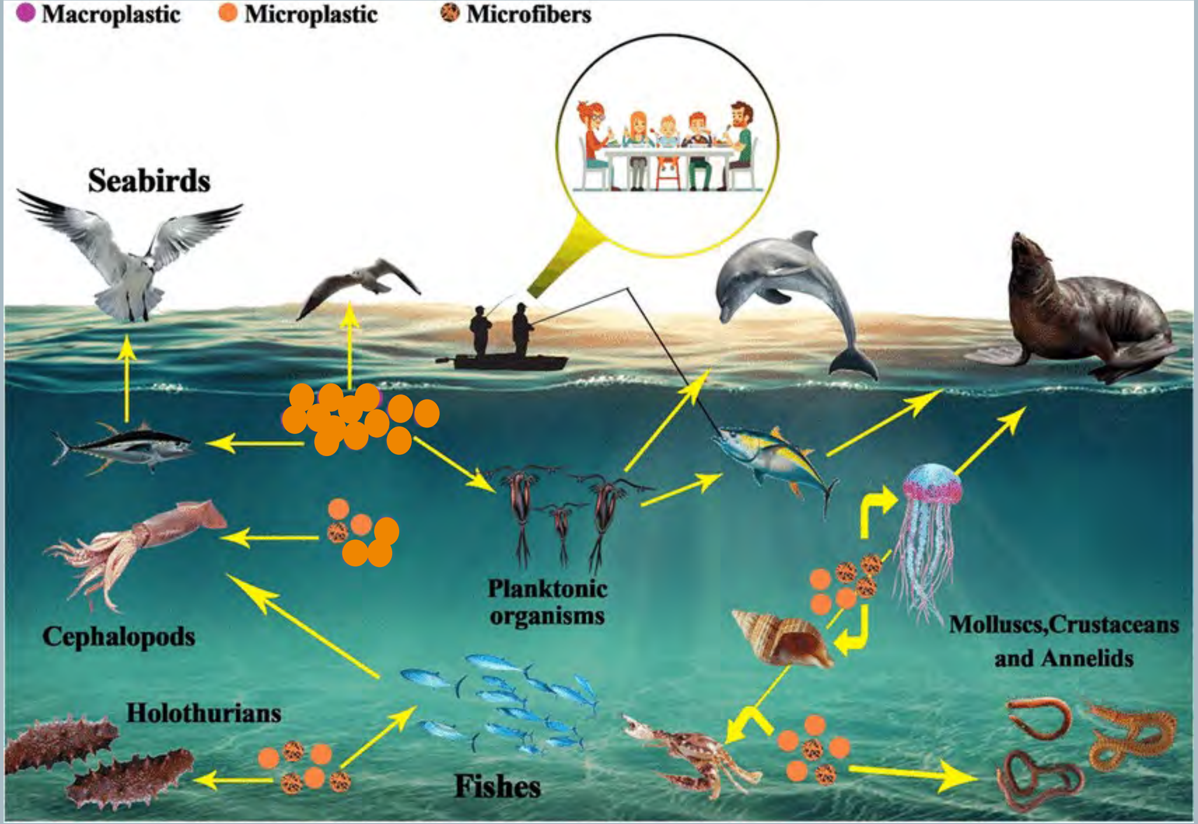
Credit: Matagorda Bay Foundation

Credit: Matagorda Bay Foundation



Credit: Matagorda Bay Foundation

MPs Can Transfer Through The Food Web



Sadeghi, K., Moradi, M., & Hassani, A. H. (2024). Figure illustrating the experimental setup for microplastic removal. In Removal of microplastics from synthetic wastewater via sono-electrocoagulation process. *Journal of Pollution*, 10(2), 754-765, p. 760. https://jpoll.ut.ac.ir/article_96587_8a66989011181bbe803cdbca596f2f71.pdf

The Value and Vulnerability of Matagorda Bay

Freshwater Inflow Supports Diversity

2nd Largest Estuary on Texas Gulf Coast

Plastics

- Microplastics have been found in the Matagorda Bay ecosystem

Can MPs be transferred from one lower trophic organism to another?

What are the impacts of MPs on development, behavior, and survivability?

Can we use MPs from the environment, perform exposures, and use the data as an environmental risk assessment?

MP Concentrations In Matagorda Bay Vary By Month

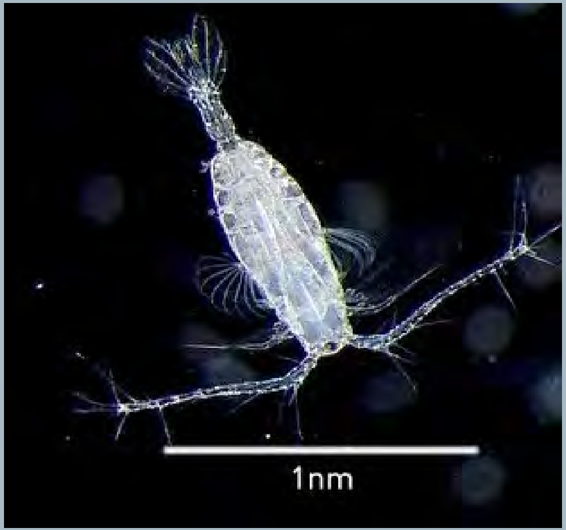
- MPs levels were higher in June and October
- Lavaca, East, and West Bays accumulated the most MPs overall
- MPs likely come from agricultural and city runoff and are influenced by precipitation events

Copepods and Microplastics

Adult *Acartia tonsa ;* Copepod (Center)
Nauplii *Acartia tonsa* (Right)

- Copepods in Matagorda Bay ingest MPs year-round, leading to their bio-accumulation.
- Copepods ingested more MPs in February and October which coincides with seasonal water MP abundance
- MP ingestion levels varied seasonally

Model Organisms



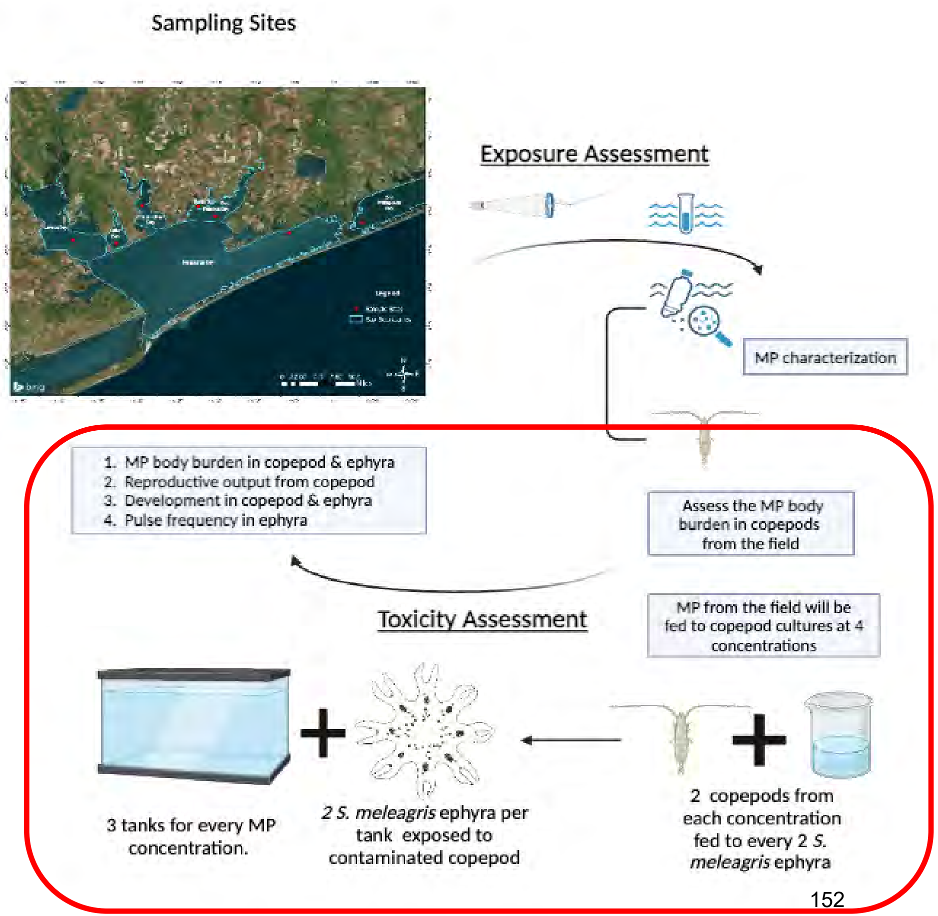
Institute of Electronics

- *A. tonsa* is a dominant zooplankton species
- A key link in marine food webs
- Sensitive to pollutants
- Recognized by environmental agencies (e.g., U.S. EPA, OECD) as a standard test species for marine toxicity assays

Jellyfish Farms

- *Stomolophus meleagris* naturally preys on zooplankton like copepods
- Due to its role in coastal and estuarine food webs, *S. meleagris* can act as a bioindicator of microplastic pollution in nearshore waters

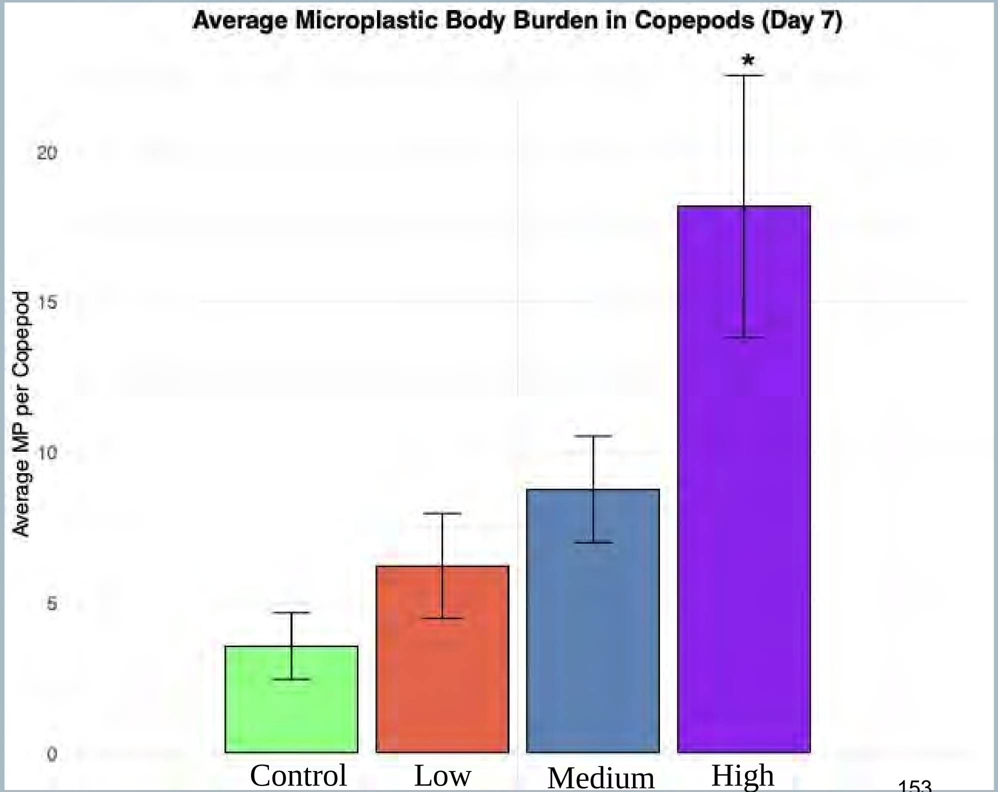
Research In Matagorda Bay



Copepod Body Burden Increased with Concentration

- The most MP accumulation was seen in the **High** concentration group compared to the control

- Positive relationship between MP concentration and MP ingestion

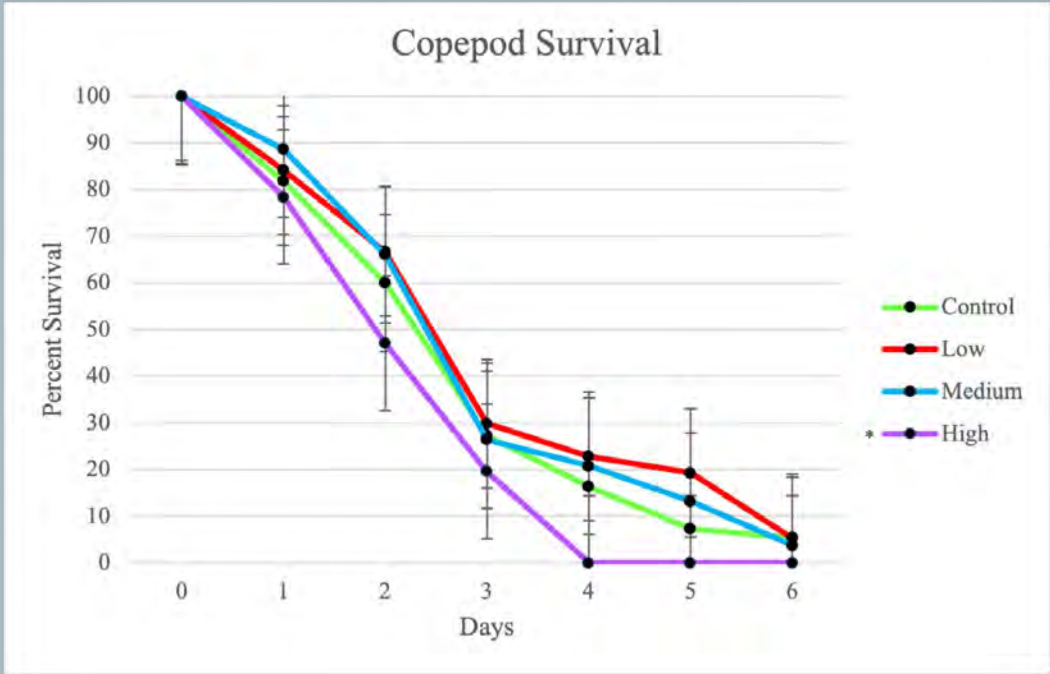


Microplastic Body Burden in Copepods for 7 days. Control (0 MPs), low (0.1 MPs), medium (1 MPs), high (5 MPs). N=5. Kruskal-Wallis. Dunn's Post Hoc. (*) ($p<0.05$) indicate significant differences in concentration compared to the control. Error bars represent standard error.

Copepod Survival Decreased Under High Concentrations of MPs

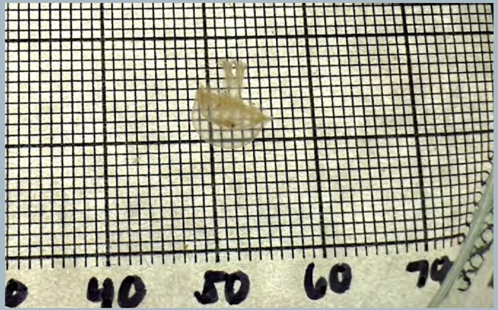
- Copepod survival from 6 days of exposure to MPs

- The **High** concentration represents significant impacts to copepod survival

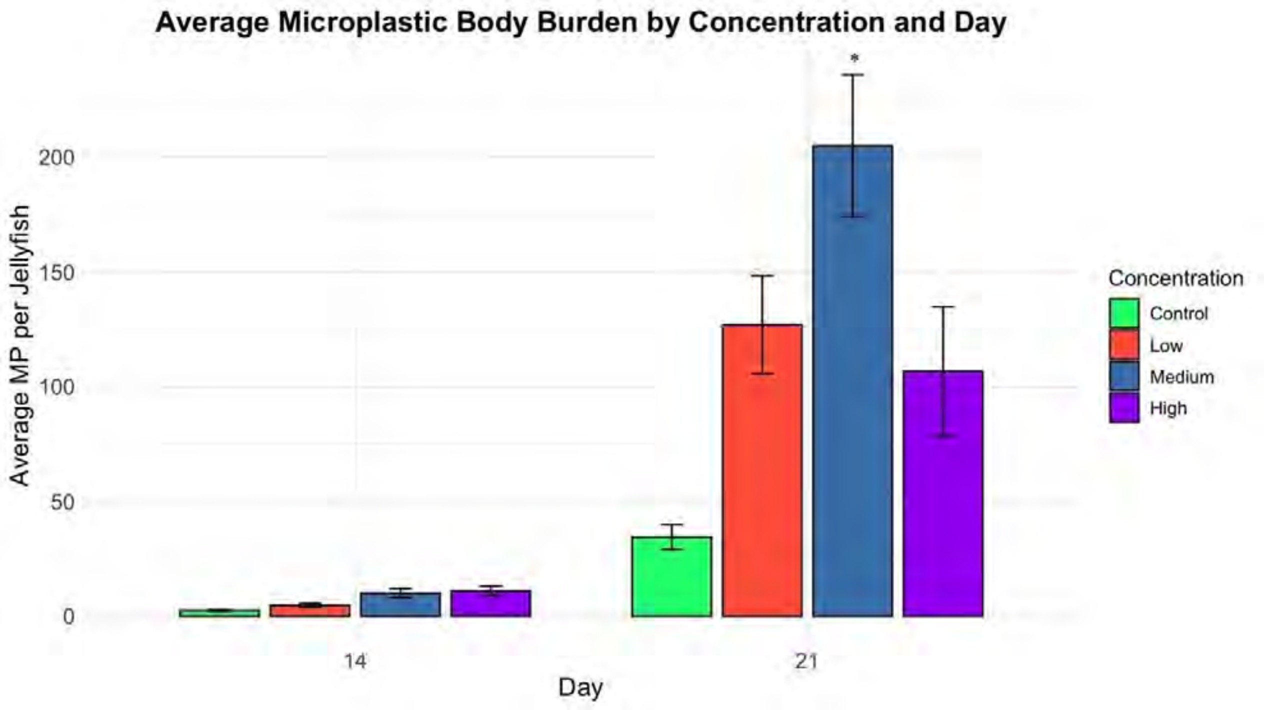


Percent survival of *A. tonsa* from days 0-6 from 4 concentrations: control (0 MPs), low (0.1 MPs), medium (1 MPs), high (5 MPs). N=50 per treatment group. Log Rank Test. SE bars.

Jellyfish Body Burden Increased with Time



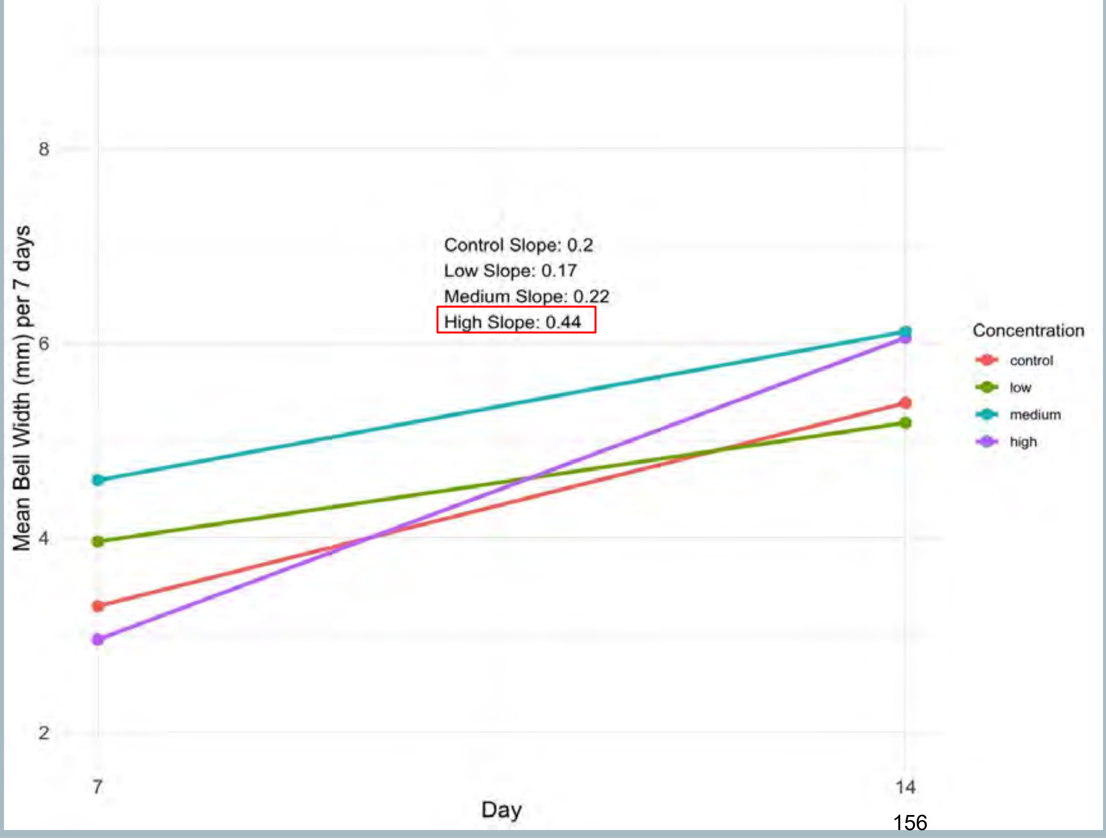
- The MP body burden in jellyfish increases with time
- The MP body burden for **Medium** is significantly higher on day 21 compared to the control
- Suggests bioaccumulation



Microplastic Body Burden in Jellyfish. control (0 MPs), low (0.1 MPs), medium (1 MPs), high (5 MPs). N=3. ANOVA / Kruskal-Wallis. Dunn's Post Hoc Day 14. Tukey Post Hoc Day 21. (*)$p<0.05$ indicate significant differences in concentration compared to the control. Error bars represent standard error.

Jellyfish Growth Day 7-14

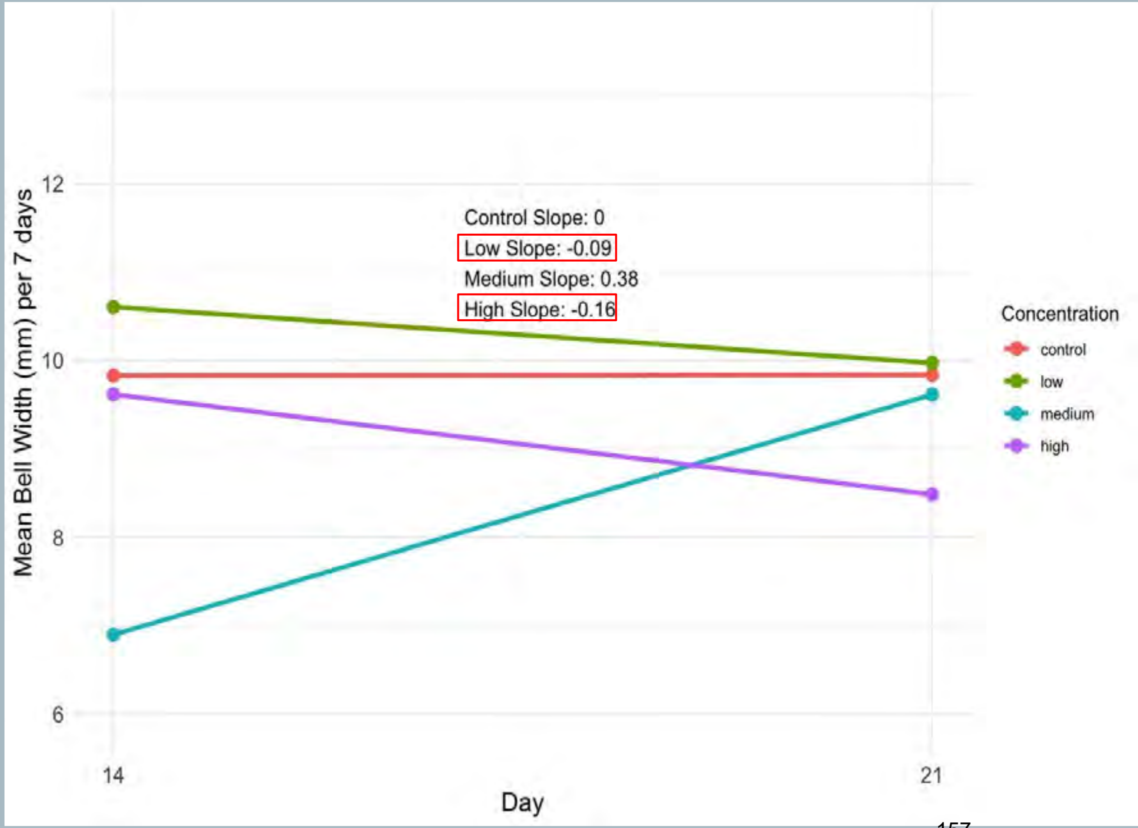
- **High concentration** group experienced the greatest growth in bell width



Bell Diameter Growth Measurements per 7 days. N=6. Day 7- Day 14 from 4 different concentrations: Control (0 MPs/copepod), Low (0.1 MPs/copepod), Medium (1 MPs/copepod), High (5 MPs/copepod). N.S Differences.

Jellyfish Growth Day 14-21

- The **low and high concentration** groups experienced decreased bell growth

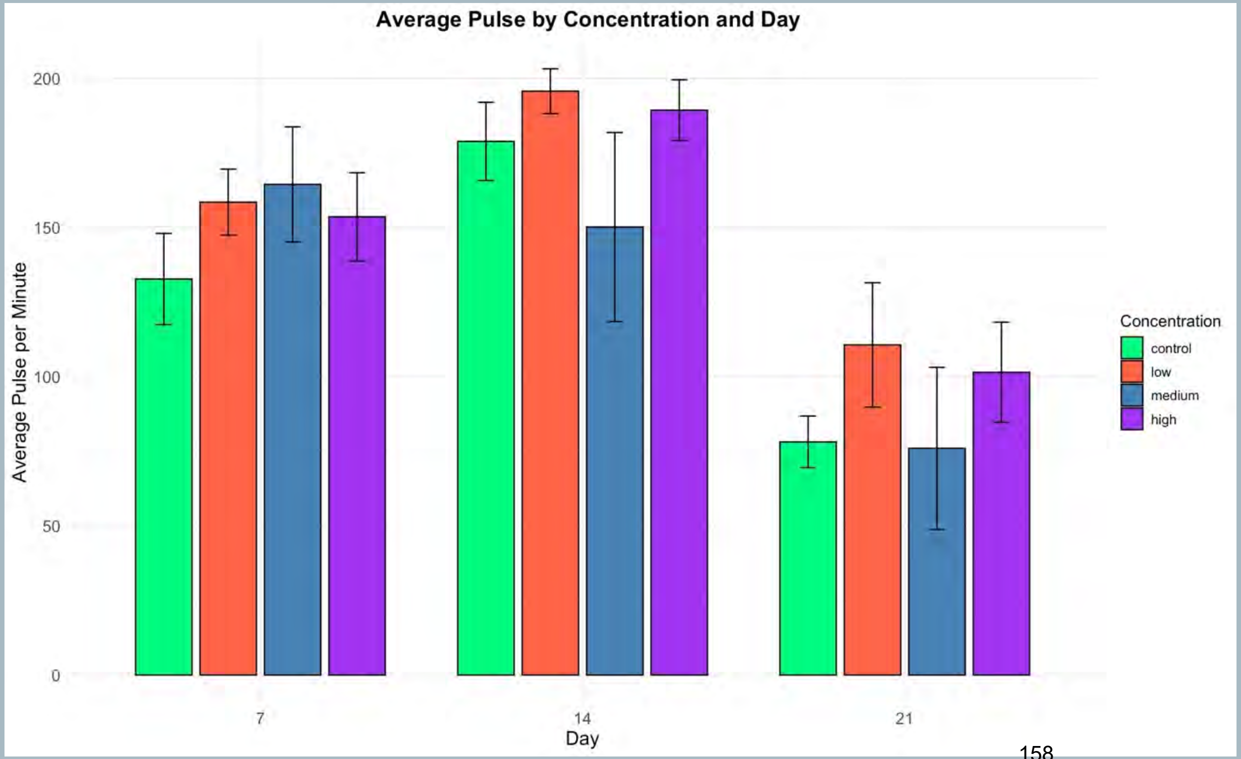


Bell Diameter Growth Measurements per 7 days. N=3. Day 14- Day 21 from 4 different concentrations: Control (0 MPs/copepod), Low (0.1 MPs/copepod), Medium (1 MPs/copepod), High (5 MPs/copepod). N.S Differences.

Pulses Decrease Overall on Day 21

- All groups showed reduced pulse rates during **day 21**

- suggests possible chronic stress effects, energy conservation



Average jellyfish Pulse Frequency from 4 different concentrations: Control (0 MPs/copepod), Low (0.1 MPs/copepod), Medium (1 MPs/copepod), High (5 MPs/copepod). Kruskal Wallis. N=6.No significance across concentrations and days. Error bars represent standard error of the mean.

Summary of Results

- Lavaca, East and West Matagorda Bays had the highest MP levels, especially in **June and October**.

- MP ingestion by *Acartia tonsa* (copepods) mirrored water MP patterns. Adults ingested more MPs than nauplii.

- Trophic transfer confirmed

- Jellyfish exposed to medium and high MPs had **greater bell diameter growth** during Days 7–14.

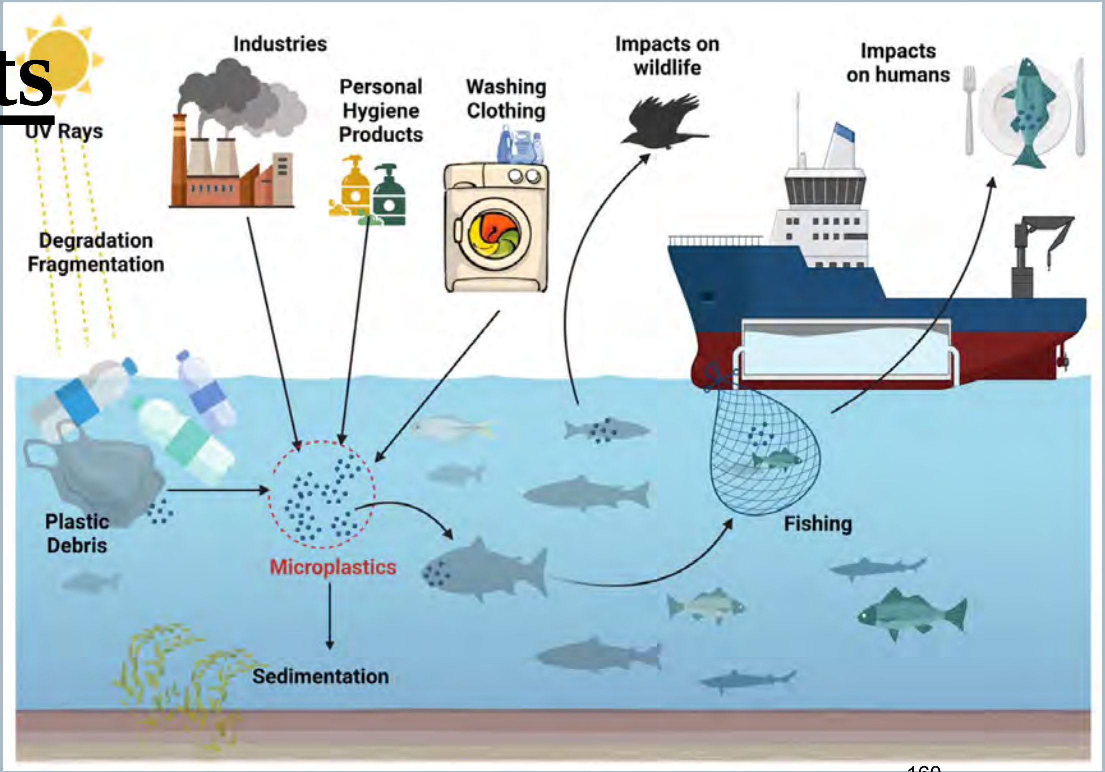
- Growth slowed or declined in low/high groups between Days 14–21.

- *A. tonsa* survival was significantly reduced at high MP concentrations.

Broader Impacts

- One of the first studies that used and linked environmental MP levels to accumulation in *A. tonsa & S. meleagris*

- Proved MPs accumulated in lower trophic organisms which will have impacts up the food web



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- I would like to acknowledge my committee and members of the Seemann Lab, Mitchell Lab, and the Matagorda Bay Foundation for their support.
- I would like to also thank the Texas State Aquarium and Vienna Zoo for their support in the lab.

Questions?

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Evaluation of Microplastic Loading in Texas Diamondback Terrapin (*Malaclemys terrapin littoralis*) and their Associated Habitats

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University of Houston Clear Lake

MATAGORDA BAY MITIGATION TRUST

Environmental Institute of Houston

Texas Plastic Pollution Symposium
Houston, TX; April 3rd, 2025

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Other Contributors

K. Chau, S. McDaniel, M. Mokrech, J. Oakley, R. Puzdrowski, M. Rogers, D. Walker, C. Zhang

Permitting, Institutional Protocols, Access Permissions

TPWD Scientific Collection Permits SPR-0321-026; UHCL IACUC Protocol 0224.001.R0, special land access permits issued by TPWD

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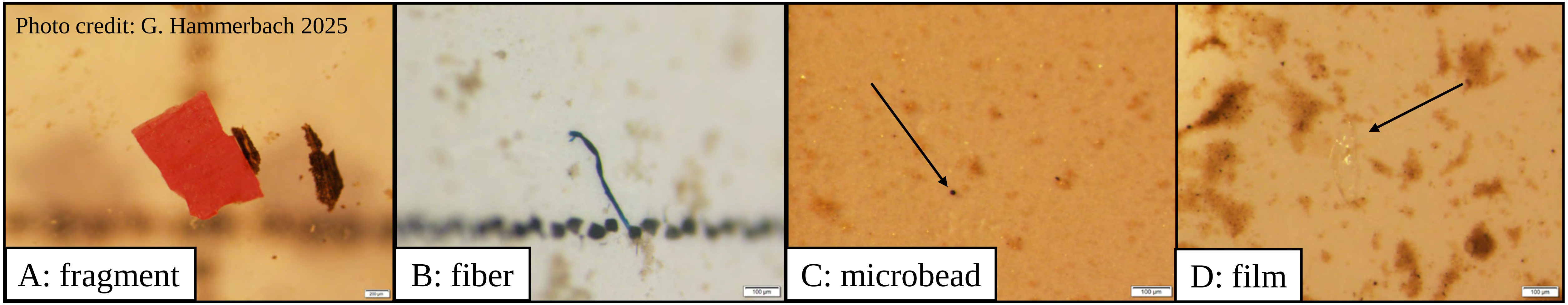
Funding

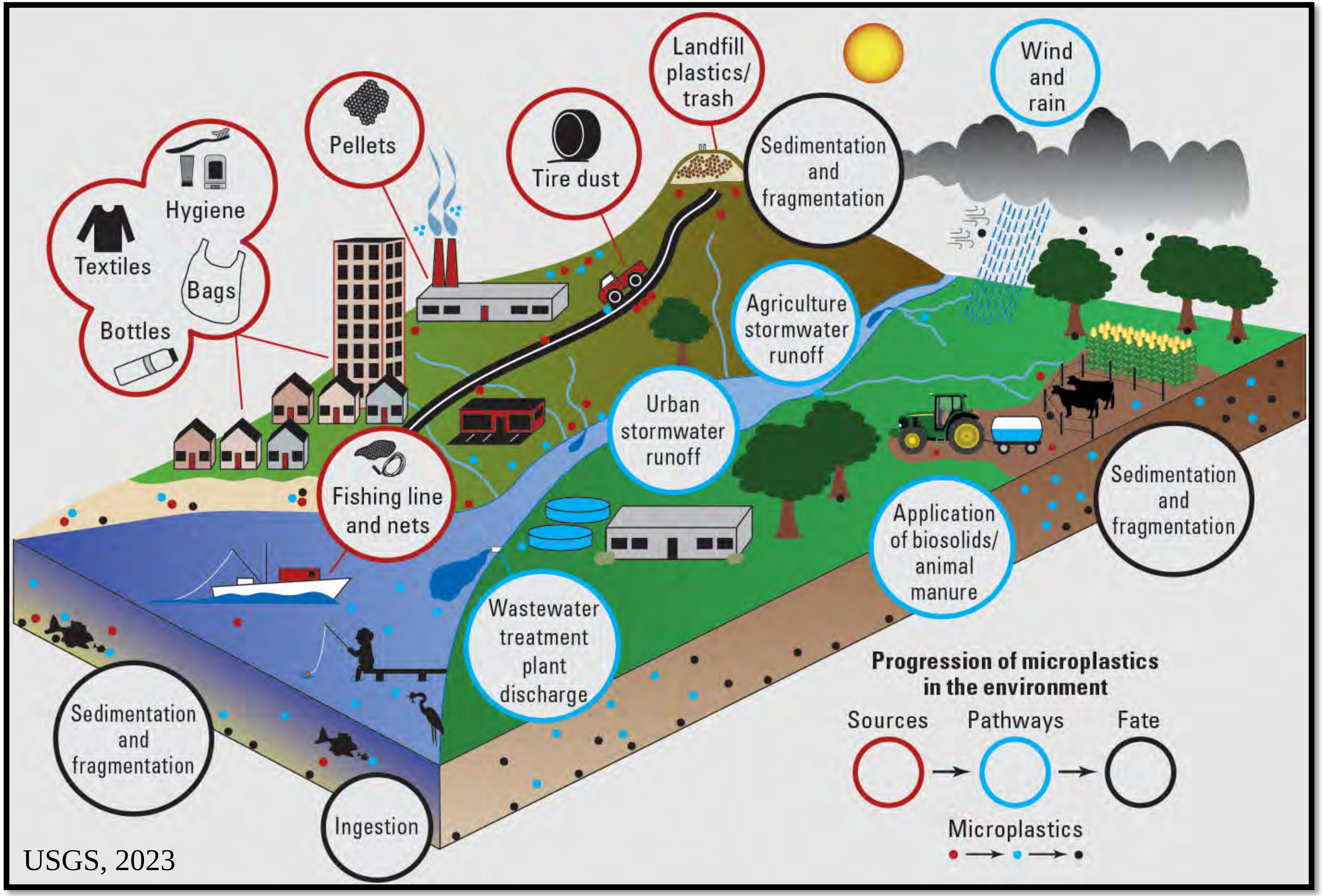
MATAGORDA BAY MITIGATION TRUST

Introduction

- 1-µm to 5-mm in dimension (Dong et al., 2023)
- Composed of synthetic polymers such as polyethylene (PE), polyvinyl chloride (PVC), polypropylene (PP), polystyrene (PS) (Hou and Rao, 2022)
- Classified by type (i.e., fragment, fiber, microbead, film, etc.) (Markley et al. 2024)



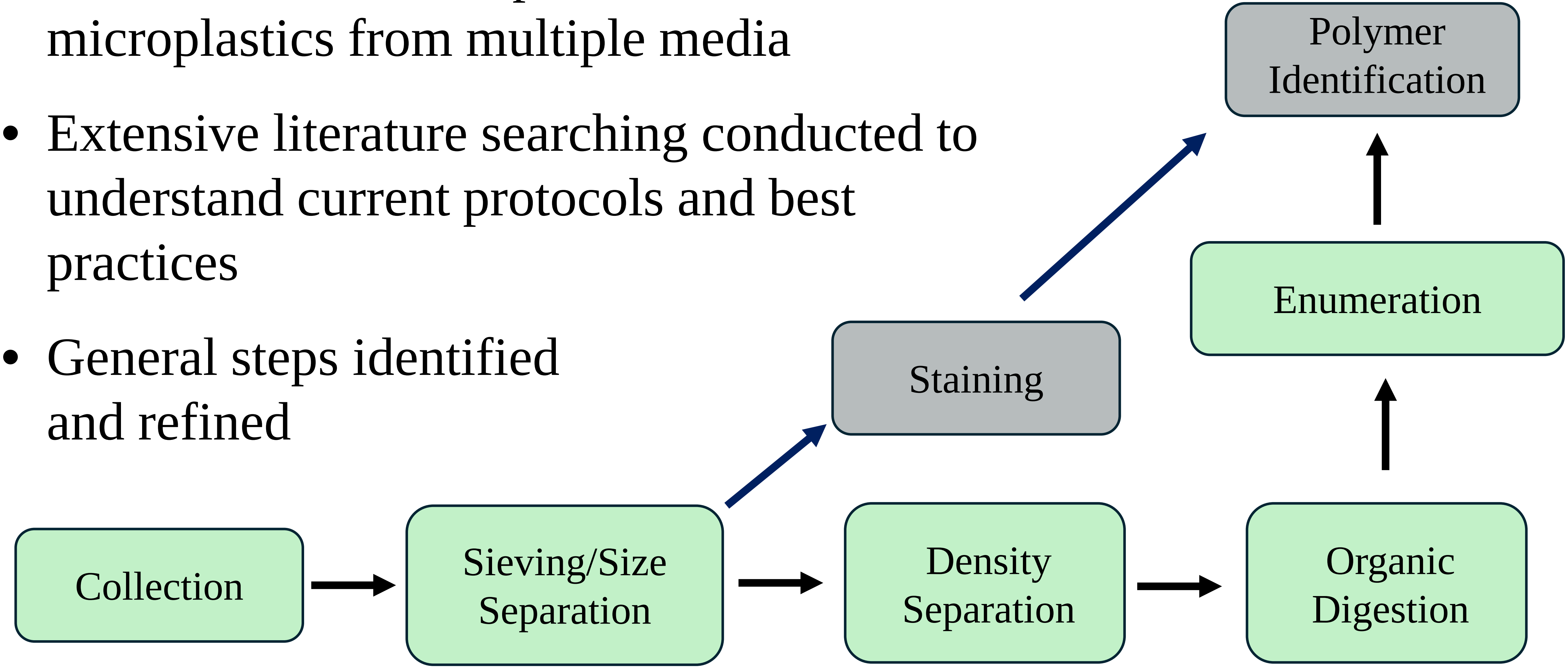
Microplastic Contaminant Pathway



USGS, 2023

Steps for Identifying Microplastics

- Lack of standardized protocols for extraction of microplastics from multiple media
- Extensive literature searching conducted to understand current protocols and best practices
- General steps identified and refined



Objectives

1. Quantify baseline microplastic loading in saltmarshes throughout Matagorda and San Antonio Bay.
2. Compare microplastic loading between spatially distinct sites in Matagorda and San Antonio Bay.
3. Compare site level microplastic loading to health factors in Texas Diamondback Terrapin.
4. Compare excreted microplastics in fecal samples to health factors in Texas Diamondback Terrapin.

Site Distribution

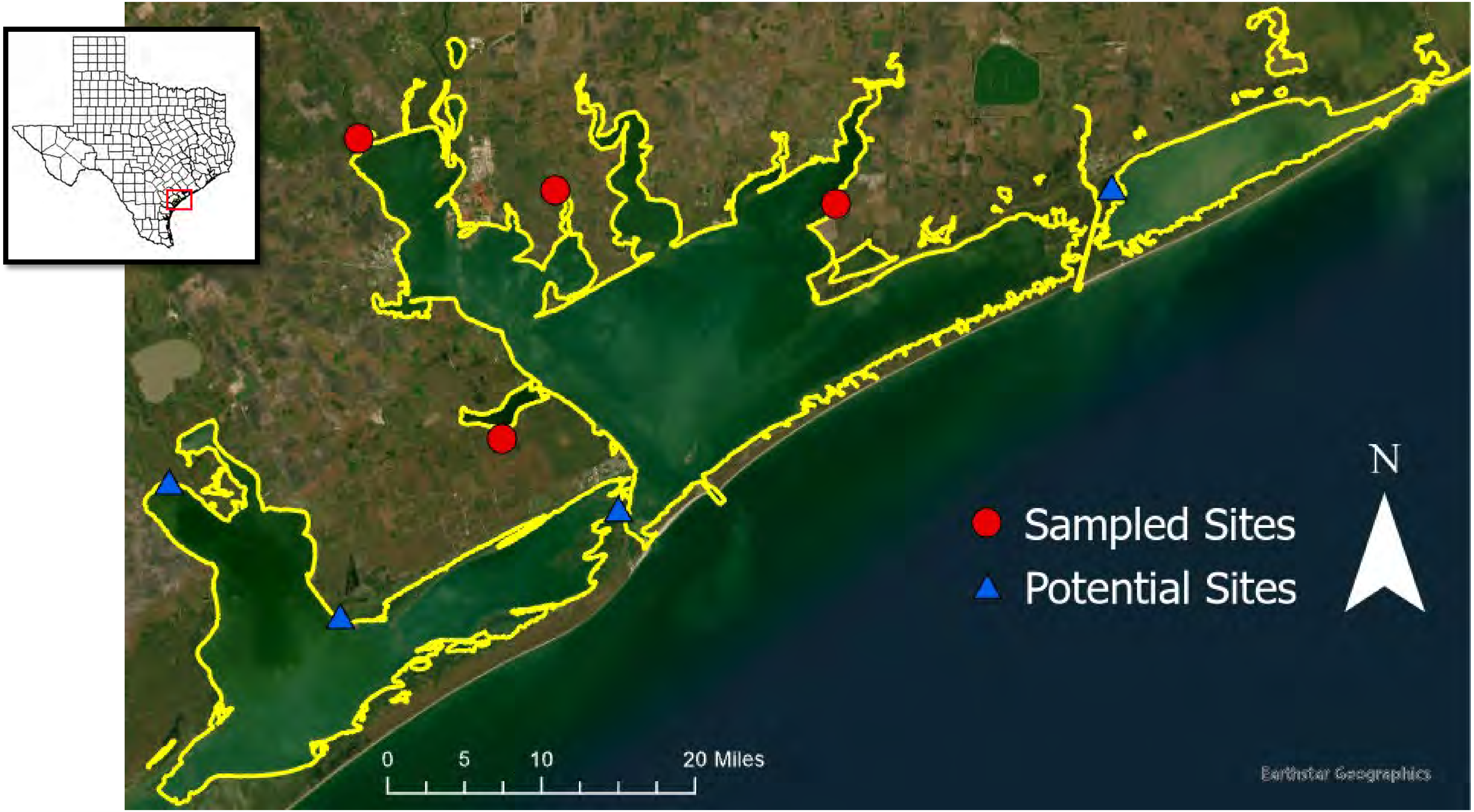
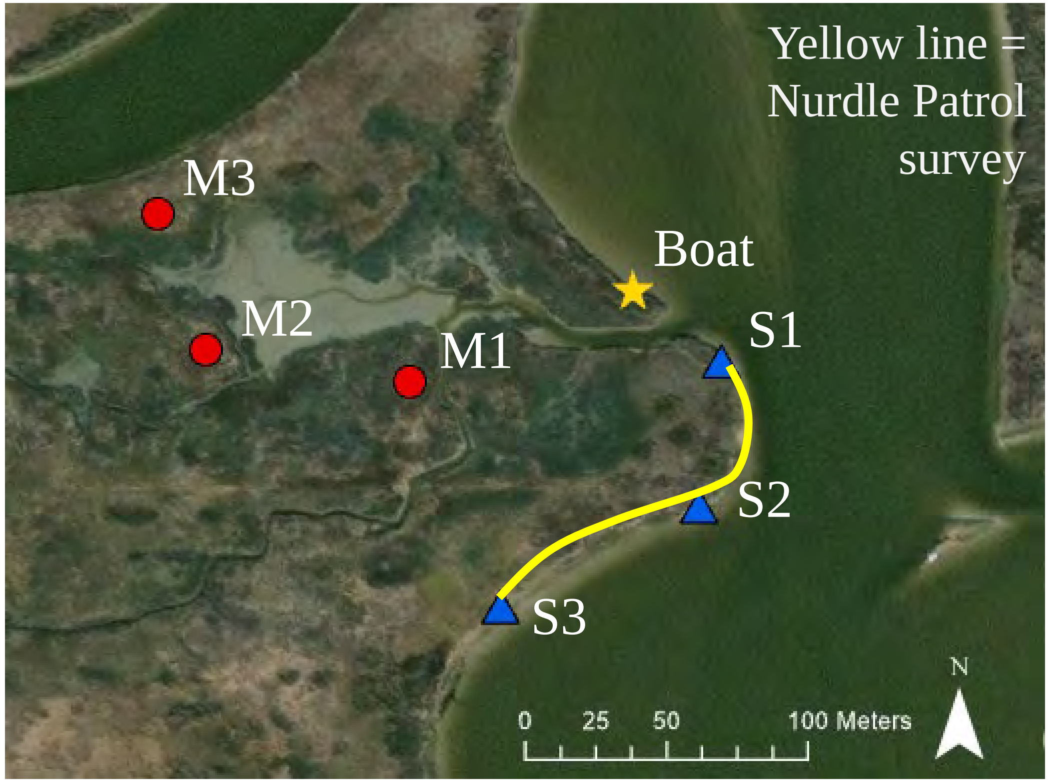


Table 1. Sources, sediment types, core sizes, and sieve sizes across a subset of microplastic literature.

Source	Sediment type	Core diameter	Number of cores	Sample depth(s)
Alvarez-Zeferino et al. 2020	Beach shorelines	19-cm	10 per site	5-cm
Khan and Prezant 2018	Salt marsh (mussel bed)	7.62-cm	3 per plot	10-cm
Lloret et al. 2021	Estuarine marsh	9-cm	2 total	127.5-162.5-cm
Lourenco et al. 2017	Intertidal wetlands	3-cm square (PLOT)	1 per site	1-cm
Lo et al. 2018	Sandy beaches to mud flats (1:1)	50-cm x 50-cm PLOT	10 per transect	2-3-cm
Sartain et al. 2018	Beach shorelines	50-cm x 50-cm PLOT	Unknown	3-cm
Zhou et al. 2020	Sandy to Muddy	30-cm x 30-cm PLOT	5-7 per transect	2-cm

Sediment Sample Collection

Quadrat Distribution

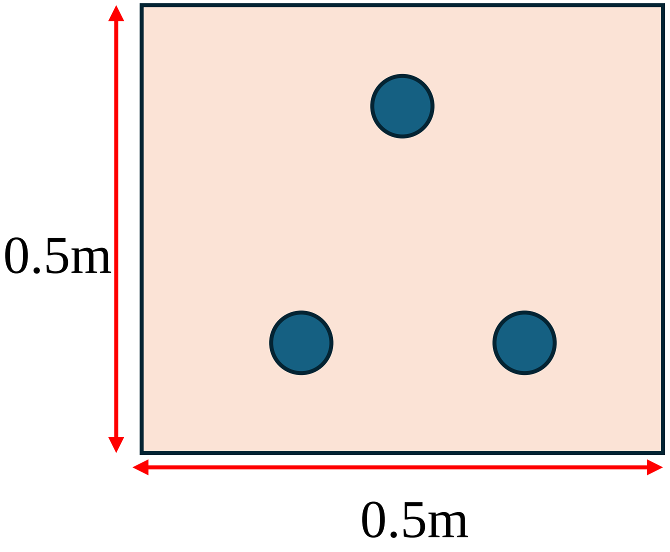


Inner marsh samples (n = 3) per quadrat

Shoreline samples (n = 3) per quadrat

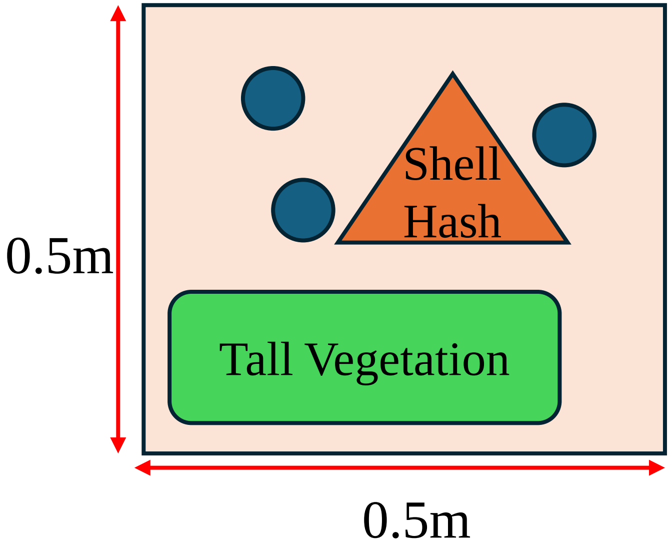
Core Distribution

Standard Array



Core location

Alternate Array



Sample Storage

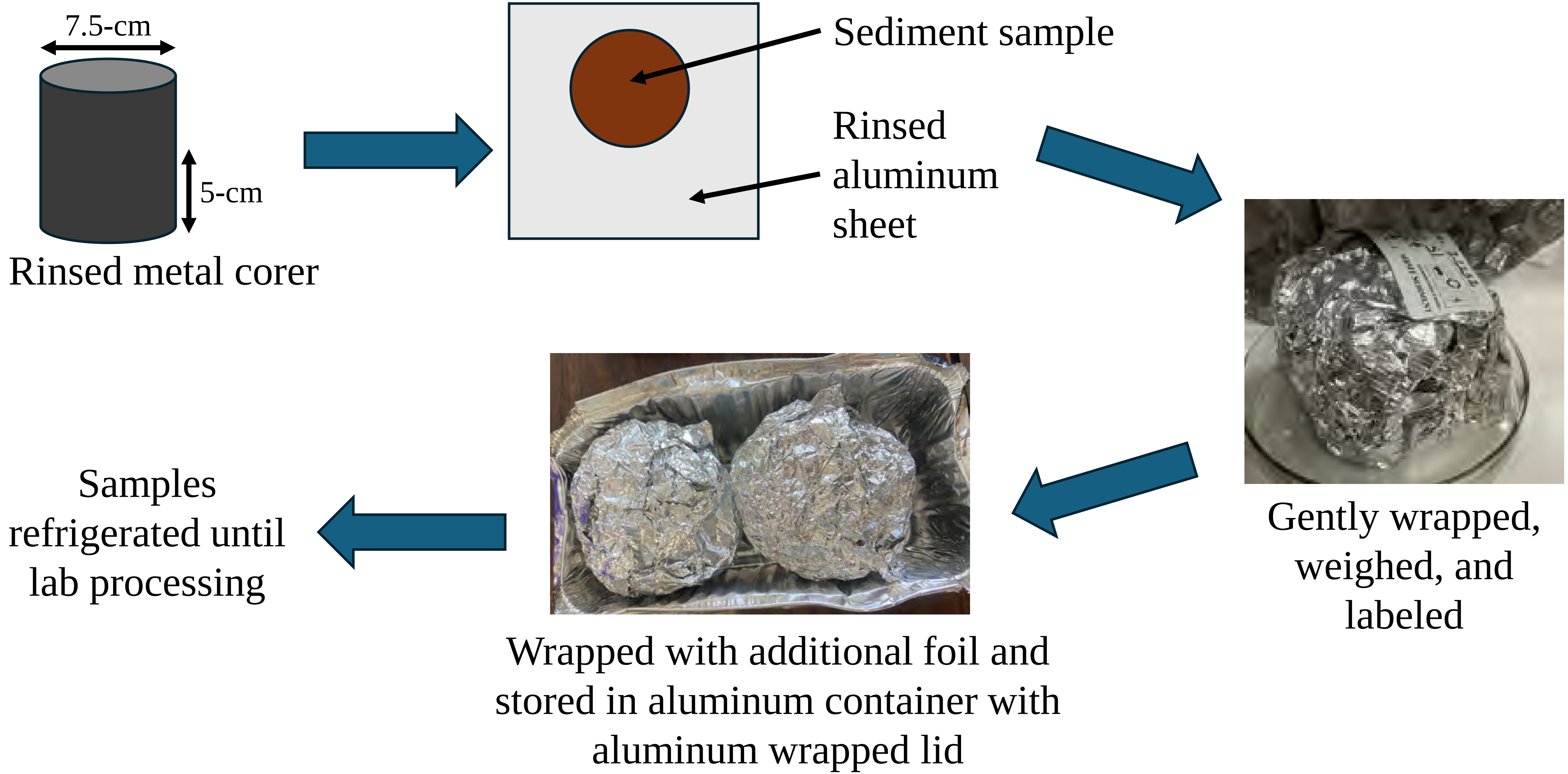
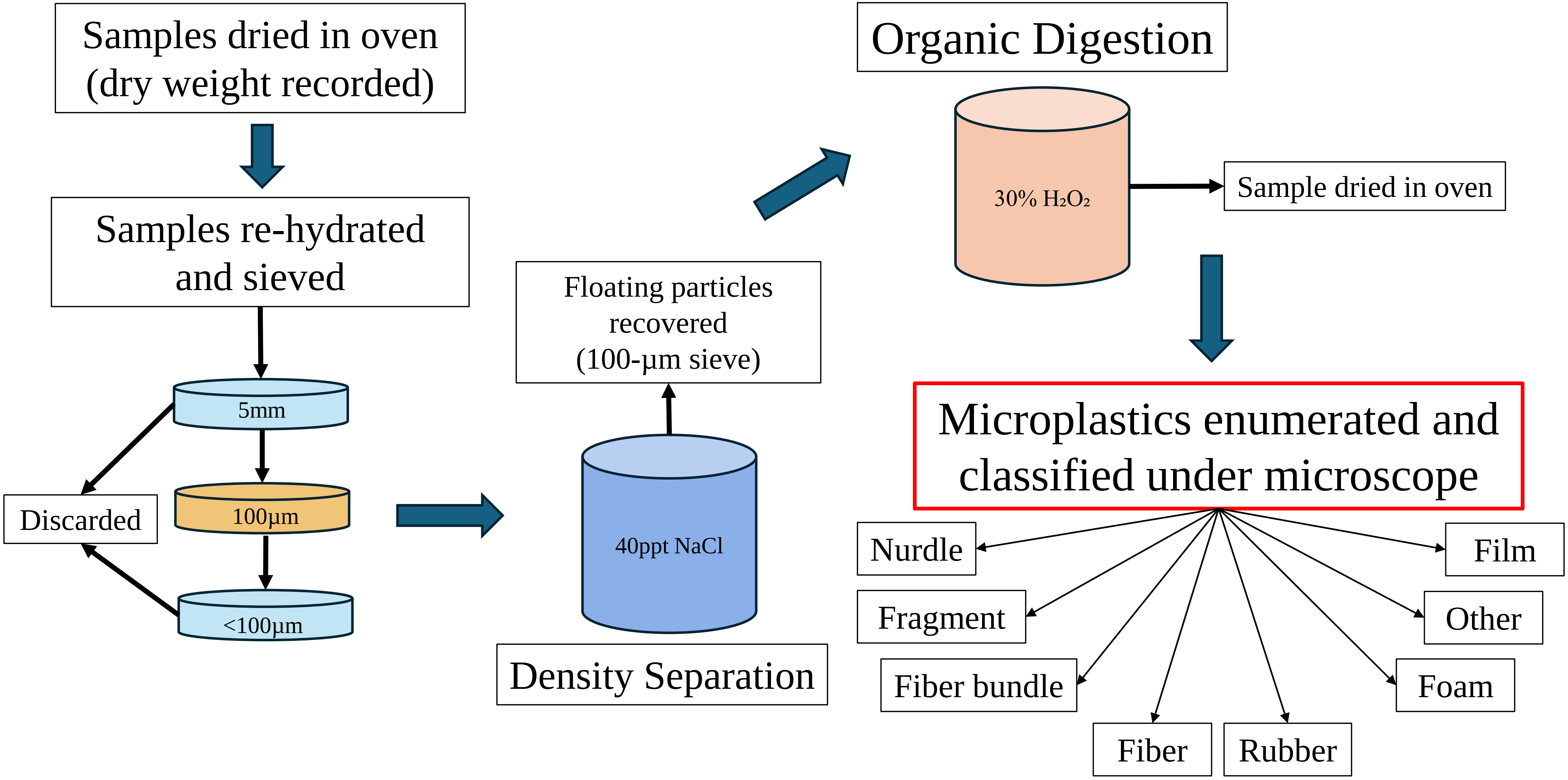


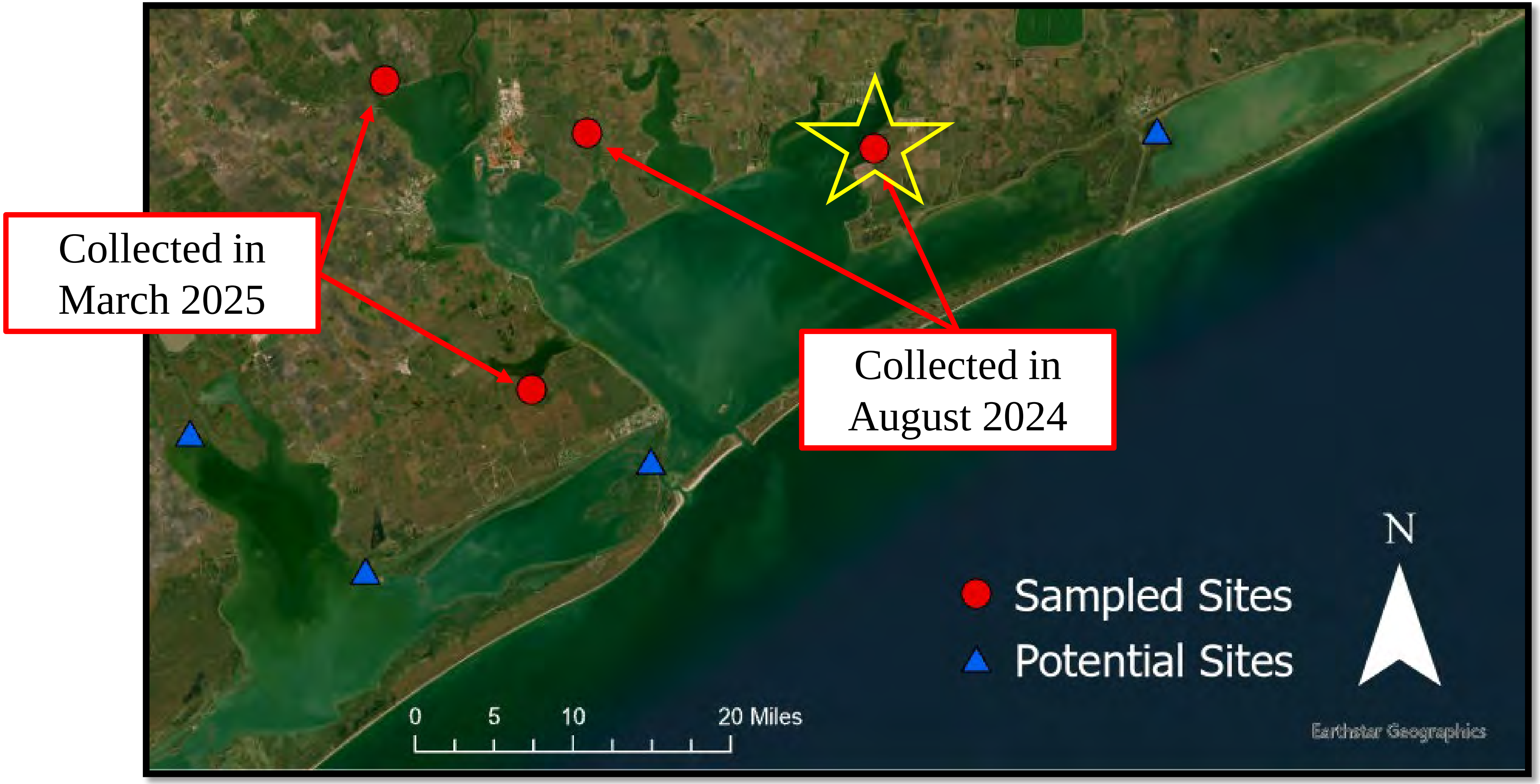
Table 2. Sources, sediment types, sieve size, density separation reagent, and digestion reagent across a subset of microplastic literature.

Source	Sediment type	Sieve Range	Density Separation Reagent	Organic Digestion Reagent
Alvarez-Zeferino et al. 2020	Beach shorelines	1.13–mm – 5-mm	$CaCl_2$	HCl then 30% H_2O_2
Beckwith and Fuentes 2018	Beach shorelines	63–µm – 125-µm	NaCl	None
Lloret et al. 2021	Estuarine salt marsh	250–µm – 5-mm	$ZnCl_2$	Fenton's reagent
Lo et al. 2018	Sandy beaches to mud flats (1:1)	250–µm – 5-mm	$ZnCl_2$	Fenton's reagent
Sartain et al. 2018	Beach shorelines	55–µm – 5-mm	NaCl	None
Vermeiren et al. 2020	Estuary (low to high)	50–µm – 0.5-mm	$ZnCl_2$	30% H_2O_2 vs Fenton's
Zhou et al. 2020	Sandy to Muddy	5–µm – 50-µm	NaCl	Fenton's reagent

Laboratory Processing Flow Chart

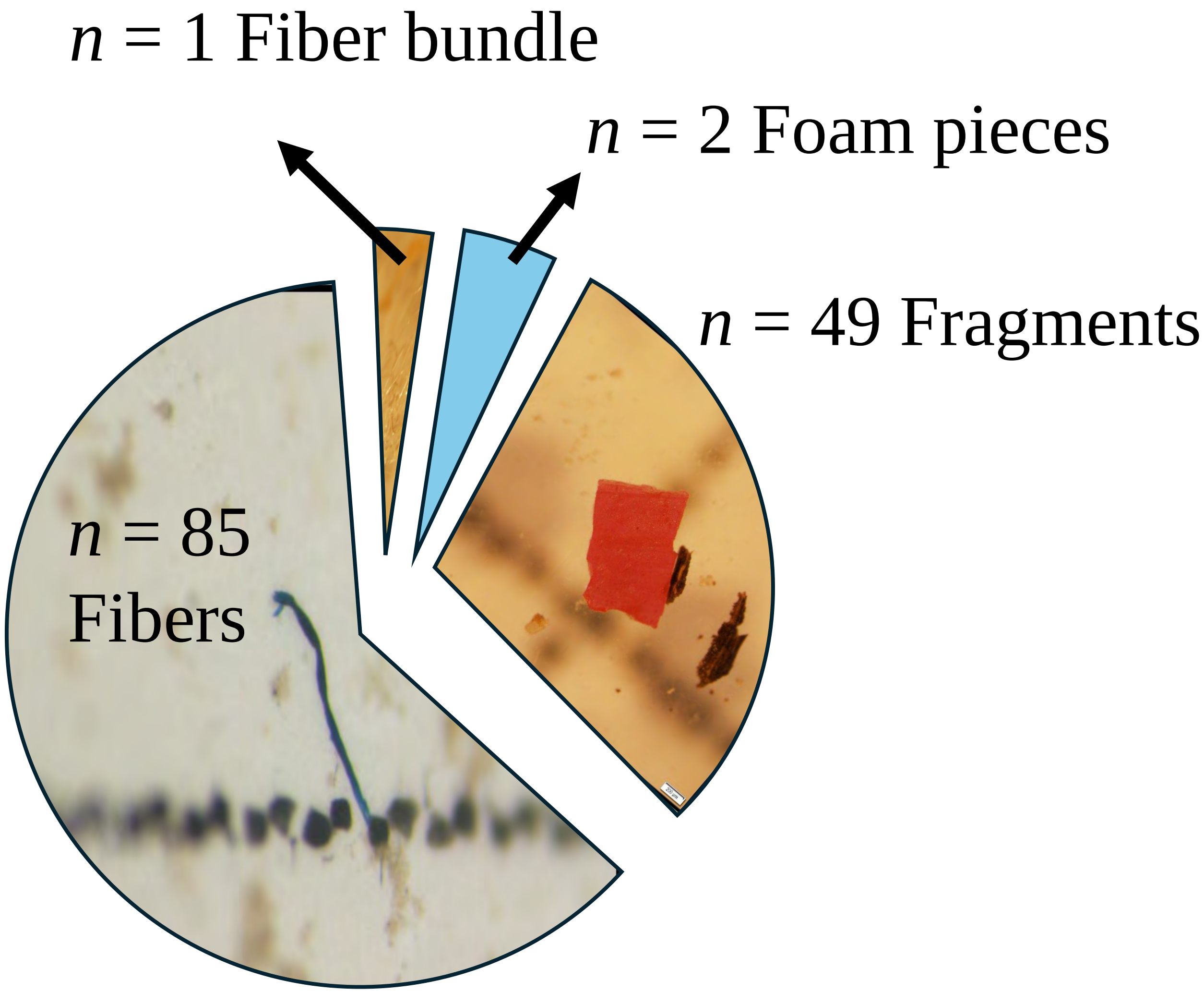


Preliminary Results

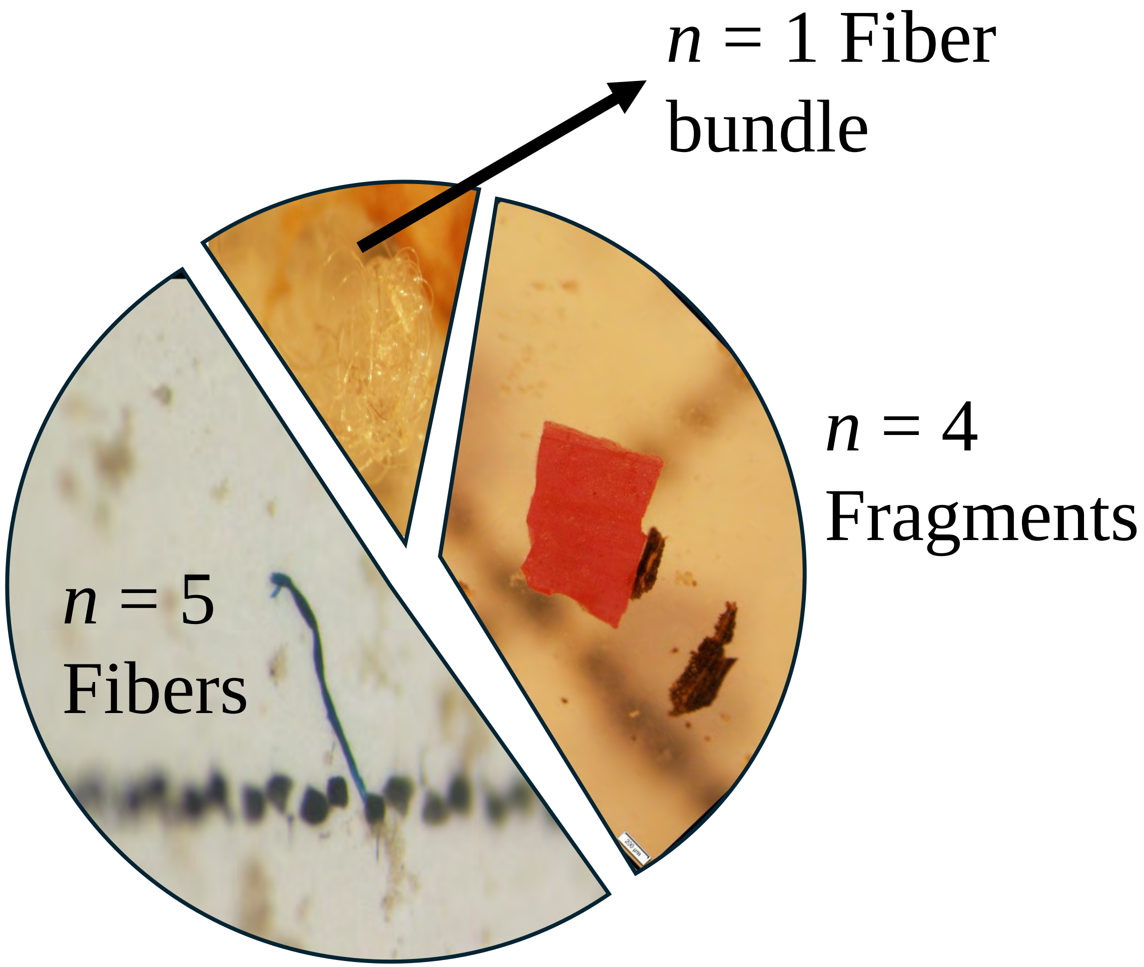


Preliminary Results: Baseline Microplastics

Shoreline Samples (n = 9 cores)

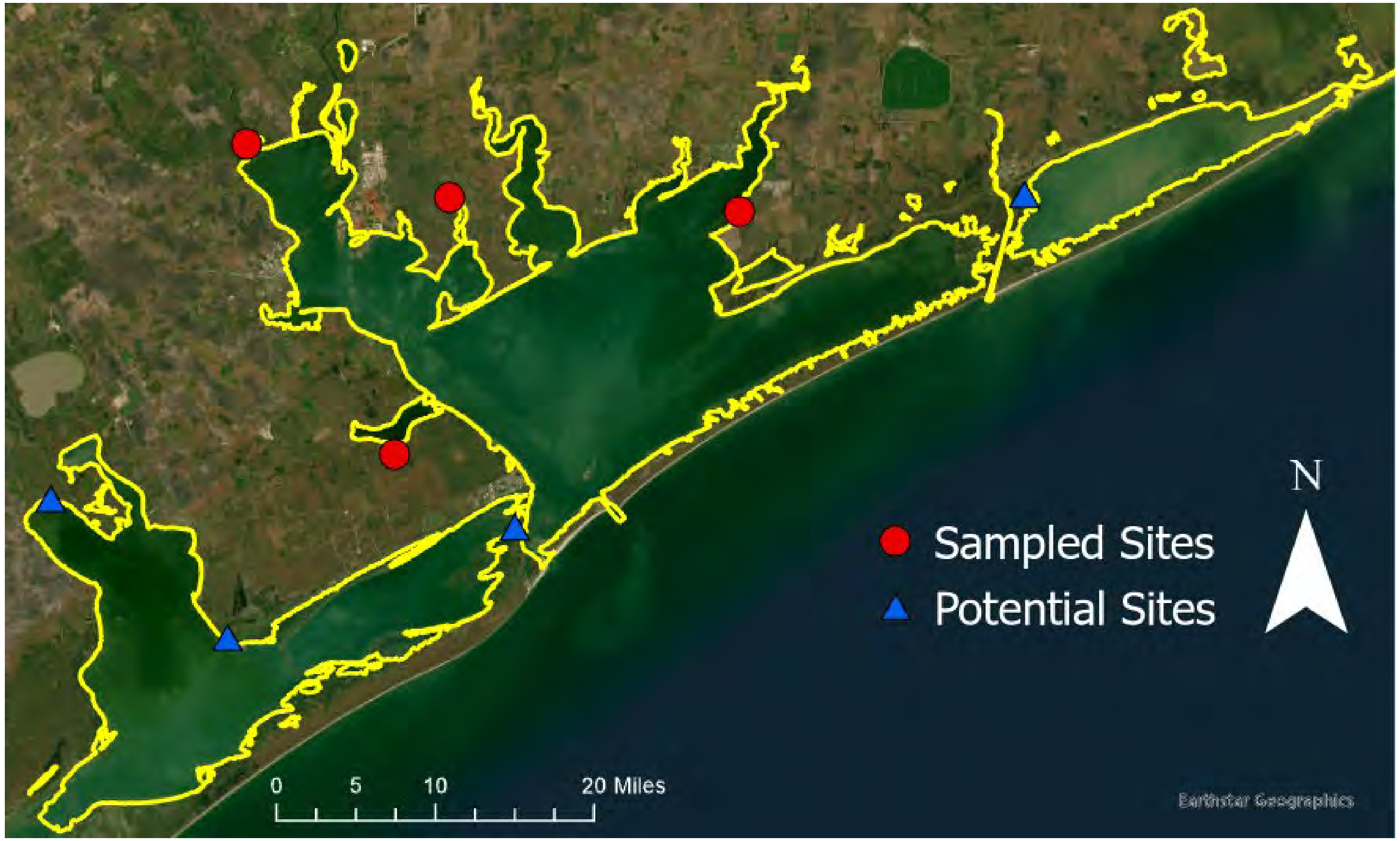


Marsh Samples (n = 4 cores)



Future Plans

- Objective 1: Additional sample collection and processing
- Objective 2: Comparison of microplastic loading between sites and sample types
- Objectives 3 and 4: Comparing microplastic loading at the site level and in fecal samples to health factors in Texas Diamondback Terrapin



Upcoming study in Galveston Bay funded by Galveston Bay and Estuary Program to incorporate staining techniques.

Thank you!

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University of Houston Clear Lake

Environmental Institute of Houston

Funding

MATAGORDA BAY MITIGATION TRUST

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The Houston Zoo's Journey to Single-Use Plastic Free

Texas Plastic Pollution Symposium
April 3, 2025

Houston Zoo

Speakers: Kristin Windle
Adrian Cavazos
Mark Kathman
Colley Hodges
Moderator: Ben Jones

Kristin Windle

Elephant Supervisor

Houston Zoo

Adrian Cavazos

Assistant Vice President of Business Operations

Houston Zoo

Mark Kathman

Regional Vice President

SSA Group

Colley Hodges

Sustainability Director

Houston Zoo

Houston Zoo Staff Participation

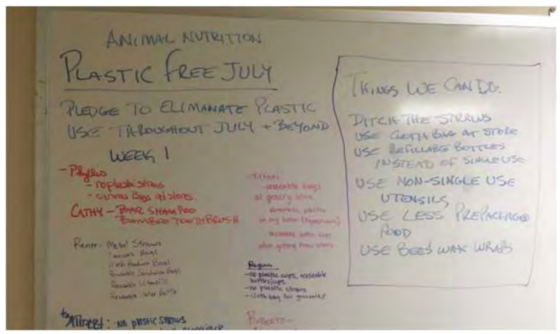
Plastic Free July

- What is Plastic Free July?
- Why should we participate?
- How do we motivate people to join in?

2016- 12 staff
2017- 165+ staff and volunteers
2018- 275+ staff and volunteers
2019- 220+ staff and volunteers

Houston Zoo Staff Participation

Plastic Free July



Houston Zoo Staff Participation

Plastic Free July

Houston Zoo

What made Houston Zoo's staff participation so successful?

- Share ideas.
- Find passionate people to lead.
- Look for what motivates people.
  It is different for individuals and teams.
- We are not looking for perfection. Small, consistent changes make a HUGE difference.
- Celebrate successes!

2017 Strategic Plan

Mission, Vision and Guiding Principles

Mission, Vision and Guiding Principles

The growing challenges to the survival of wildlife and wild places necessitates a re-definition of the purpose of contemporary zoos and aquariums. Our new mission, vision and guiding principles form a powerful response to the challenges ahead, as the Houston Zoo looks toward its Centennial Anniversary in 2022 and beyond.

2017 Strategic Plan

Houston Zoo

Mission, Vision and Guiding Principles

Guiding Principles

- Be a zoo for all
- Provide exemplary animal care; assure animal welfare
- Deliver an outstanding, inspiring guest experience
- Be a workplace that provides staff development and instills empowerment, respect and teamwork
- Provide smart and fun education and learning opportunities
- Promote saving wildlife awareness and action
- Apply best business practices and sound financial management
- Inspire broad community support and collaborations
- Ensure safety for guests, staff and the animals in our care
- Operate sustainably to conserve resources; lead by example
- Change behaviors to help protect wildlife through engaging experiences that connect people

CREATE MEANINGFUL EXPERIENCES

Create meaningful experiences at the Houston Zoo that inspire our guests to take action to save animals in the wild. Engage guests of all ages in order to help them make informed decisions in their relationships with living animals and the ecosystems upon which all life depends.

OPERATE SUSTAINABLY TO BENEFIT THE ENVIRONMENT

Houston Zoo operations will be designed to minimize environmental impact, to conserve natural resources and to lead and inspire sustainability practices by guests, community organizations and businesses.

2017 Master Plan

20-year Phased Plan, Announced April 2017

SITE ORGANIZATION

The Houston Zoo's exhibits will be reconfigured and arranged to create distinct zones, thematically organized to illustrate biogeographic regions, providing opportunities for guests to experience encounters with animals in a naturalistic context. To the greatest extent possible, the animal communities, vegetation, geology and cultural elements in the exhibit zones will accurately reflect the habitat being represented, creating immersive environments with rich layers of interpretation.

GUEST CIRCULATION

The confusing web of pathways that Zoo guests now experience will be replaced by a simplified circulation system that will promote intuitive navigation. A clearly defined central main pathway will connect our two public entrances, and each experience zone will be explored via loop pathways that begin and end on the main pathway.

Single-Use Plastics Reduction

Timeline

2015: Bags

2017: Bottles

2018: Straws & Lids

2022: Retail Packaging

80,000 bags
eliminated per year

300,000 bottles
eliminated per year

23,000 straws
eliminated per year

SSA Group

- Hospitality company
- Foodservice, Retail, and Admissions services for zoos, aquariums, museums, and cultural centers
- 90 accounts across the country
- Food and Retail @ Houston Zoo
- Partners for more than 25 years!

It's A Journey…

SSA group

Houston Zoo

- In the beginning, we were plagued by paralysis by analysis
- Hardest part was starting
- Once we got rolling, the momentum built itself
- Focused both on what we could do internally (e.g. eliminate single-use plastic shopping bags), as well as how we could collaborate with our vendors
- Began working directly with our vendors to advocate for change

Initiatives

- Compostable service ware - 2017
- Eliminated all single-use straws - 2018
- Compostable trash liners - 2019
- Biodegradable materials in majority of retail items – 2021
- Plastic packaging free store – first Zoo in the nation! – 2022
- Launched Just Imagine collection - 2023
- Compostable popcorn bags – 2024
- Washable service ware - 2025

Up & Down Stream Impact

- Supply chain partners have responded incredibly to requests
- Created a ripple effect within the industry
- Shared innovation with all
- Not limited to just plastic reduction

- Our journey continues but has become a much larger collaboration.

Single-use plastic packaging removal
29,000lbs

Water bottles used in eco plush annualll
1,489,408

Single-use plastic bag reduction
24,000,000

Sustainability is Saving Animals in the Wild.

Houston Zoo's Identity

Mission Infused into Partnerships

Houston Zoo

Cypress Circle Cafe

Green Restaurant Certification

Houston Zoo

One of only **9** certified restaurants in Houston

STRATEGIES ADOPTED

- No single-use plastics
- Compostable plateware
- Energy and water-efficient equipment
- Chemical & pollution reduction
- Pre-consumer composting
- Post-consumer recycling
- Plant-based food options

Galapagos Islands Exhibit

Embedded Take-Action Message

Jack's Café & Event Center

Reduced Environmental Footprint, Including Dining

Houston Zoo

AZA Green Award

Top Honors for Sustainability Program 2024

Houston Zoo

AWARD CRITERIA

Recognizes institution-wide green programs to reduce environmental impact form a business operations standpoint

AWARD SUBMISSION HIGHLIGHTS

- First two LEED Gold buildings
- **First U.S. zoo to eliminate food & retail single-use plastics**
- Strides toward 100% LED lighting zoo
- Two new rainwater harvesting cisterns
- Composting in restaurants and for special events
- Leader in small electronics and holiday lights recycling
- 20+ LEED Green Associates on staff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The Plastic Pollution Treaty: How Close Are We to a Global Solution?

Jillian Shiba, J.D.

Marine Policy & Law Fellow

Harte Research Institute

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TEXAS A&M UNIVERSITY CORPUS CHRISTI | HARTE RESEARCH INSTITUTE

The start of the plastic pollution treaty

- In March 2022, over 170 UN Member States adopted resolution 5/14
  - Directed the creation of a treaty to end plastic pollution
  - Established the Intergovernmental Negotiating Committee (INC)
  - Set a goal to create the treaty by the end of 2024

"...develop an international **legally binding** instrument on plastic pollution, including in the marine environment...based on a comprehensive approach that **addresses the full life cycle of plastic**..."

International environmental agreements

- Treaties that are negotiated, signed, and ratified by States to address transboundary environmental concerns
    - Ex: The Paris Agreement, United Nations Convention on the Law of the Sea (UNCLOS)
- To create the plastic pollution treaty, the INC "shall make every effort" to reach consensus on substantial matters

Negotiating blocs

- Benefits
  - Streamline negotiations
  - Give States more leverage

Key regional negotiating blocs

- The African Group
- The Arab Group
- The Coordinating Body on the Seas of East Asia (COBSEA)
- The Group of Latin America and Caribbean Countries (GRULAC)
- The Alliance of Small Island States (AOSIS)
- The Asia Pacific Group
- The European Union (EU)
- The Pacific Small Island Developing States (PSIDS)

Key interest group negotiating blocs

- Generally, interests divided between
  - States seeking an ambitious agreement
  - States seeking a more limited agreement
- The High Ambition Coalition
- The Like-minded Group

The High Ambition Coalition

Main goals for the treaty:

- End plastic pollution by 2040
- Restrain plastic production and consumption
- Create a circular economy for plastics
- Improve plastic waste management and recycling

Members:

- Launched by Norway and Rwanda on August 22, 2022
- 70 members
- Including Canada, Chile, Denmark, France, Germany, Portugal, Republic of Korea, Senegal, Sweden, the UK

HIGH AMBITION COALITION
TO END PLASTIC POLLUTION

www.hactoendplasticpollution.org

The Like-minded Group

Main goals for the treaty:

- Recognize the importance of plastics
- No provisions restricting plastic production or supply
- Improve the management of plastic waste

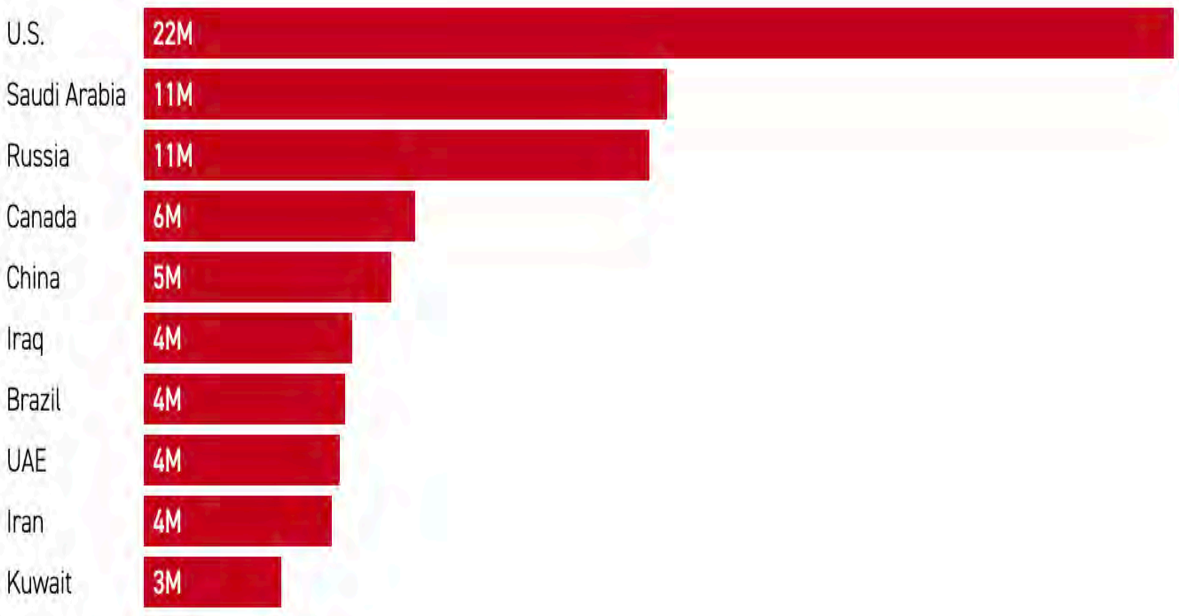
Members:

- Led by Saudi Arabia, Iran, and the Russian Federation
- Announced before INC-3
- Including Bahrain, China, Cuba, Kuwait

The connection between plastics and oil

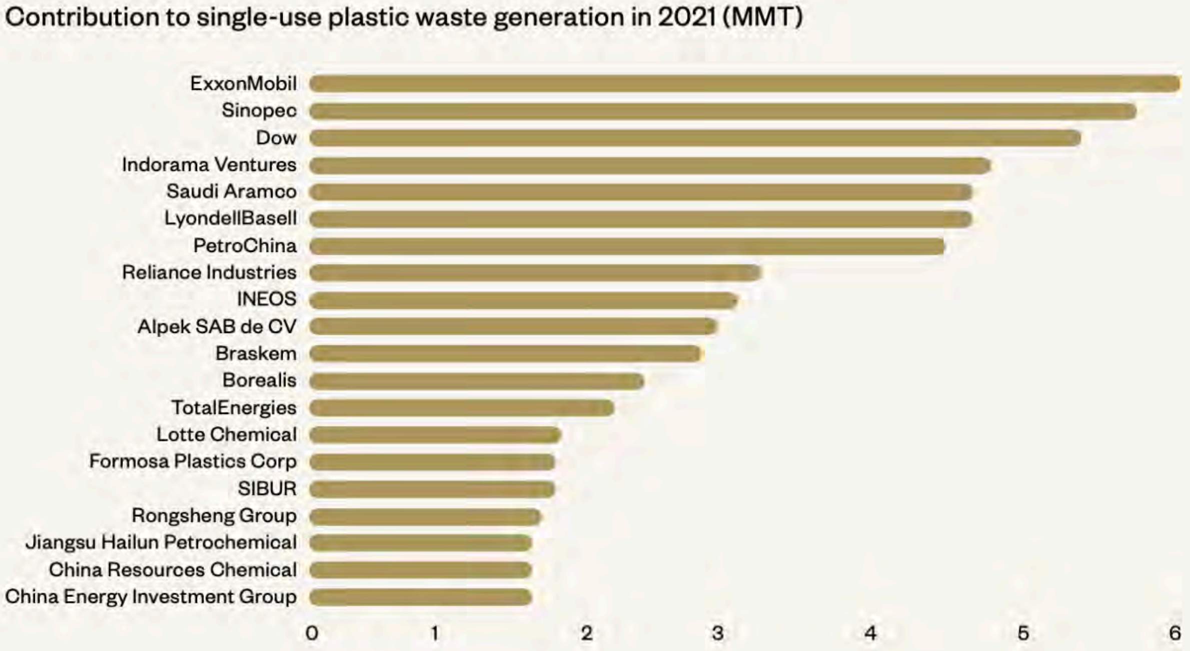
- By 2050, plastics and petrochemicals are projected to account for nearly half the growth in global oil demand
  - Plastics production to account for 20% of oil and gas consumption
  - Plastics production could contribute 21% - 31% of total greenhouse gas emissions

Number of oil barrels produced daily in top 10 oil producing countries, 2023



Source: U.S. Energy Information Administration

The top 20 list of petrochemical companies producing virgin polymers bound for single-use plastic remains effectively unchanged since 2019.



The United States

- Not officially part of a regional group
- Not part of the High Ambition Coalition or the Like-minded Group
- The U.S. signs some international environmental agreements but generally does not ratify them
- At INC-4, supported mandatory global targets to reduce plastic production
- At INC-5, backtracked, supported States setting their own voluntary targets to reduce plastic production
- Now, more unclear
    - Trump Executive Order "Putting America First in International Environmental Agreements"
        - Formally withdrew the U.S. from the Paris Agreement and the United Nations Framework Convention on Climate Change (UNFCCC)
        - Ceased and rescinded financial and policy commitments of international climate initiatives

The most recent negotiating session

- INC-5.1: November 25 – December 1, 2024
    - Busan, Republic of Korea
- Meant to be the last session to create the treaty
- Failed to create a treaty
- Produced a Chair's Text
    - Created to reflect discussions by delegates
    - Will be the starting point for future discussions

Main reasons for failure

- Core disagreements between the Like-minded Group and States seeking an ambitious agreement
  - Plastic products and chemicals of concern
  - Plastic supply and production
  - Finance
  - Mandatory vs. voluntary measures

The EU is “not interested in a waste management convention.”

- Anikó Raisz, Hungarian Environment Minister

“This is not a drill, this is a fight for survival. We did not accept a weak treaty here, and **we never will**.”

- Juan Carlos Monterrey Gómez, Panama’s lead negotiator

“The objective of this treaty is to **end plastic pollution, not plastic itself**.”

- Kuwait, for the Like-minded Group

Objective

"The objective of this Convention is to **protect human health and the environment from plastic pollution**, including in the marine environment **[based on a comprehensive approach that addresses the full life cycle of plastics]**."

Plastic products

- One of the most contentious issues during negotiations
- Some States, including the Like-minded Group, argue that this is beyond the mandate of resolution 5/14
- 8 widely different options in the Chair's Text, including:
  - Global limits on plastic production
  - National limits on plastic production

Plastic product design

- States **shall** "improve plastic product design"
- Disagreement over whether this should be legally binding or voluntary and whether there would be criteria-based global requirements

Supply and sustainable production

- Another highly contentious issue
- Option 1: No article
- Option 2: A global target to reduce the production and consumption of primary plastic polymers

Panama proposal

- Supported by over 100 States
- **Global target to reduce the production** of primary plastic polymers to “sustainable levels”
- The global target would be specified and adopted later
- Would also require States to report their plastic production, import & export data

Releases and leakages

- States **shall** "take measures to prevent, reduce, and, whether possible, eliminate," releases and leakages of plastics, including microplastics; plastic pellets, flakes, and powders; and plastic pollution from fishing activities
- No inclusion of emissions

Plastic waste management

- States **shall** "take measures to ensure that plastic waste is managed in an environmentally sound manner"
- Includes setting targets at a national level to increase plastic waste collection and recycling rates
- Disagreement over whether this should be legally binding or voluntary

Existing plastic pollution

- States **should** "identify, evaluate, and monitor locations or accumulation zones most affected by existing plastic pollution within its national jurisdiction," and "take appropriate removal measures in an environmentally sound manner"
- Broadly supported by States

Financial and technical assistance

- Another highly contentious issue
- Proposal 1 (the U.S., Australia, Canada, the EU, Iceland, Japan, New Zealand, Norway, Switzerland, Republic of Korea, and the UK)
  - **All** parties contributing on a **voluntary basis**
- Proposal 2 (the African Group, GRULAC, Cook Islands, Fiji, and the Federated States of Micronesia)
  - **Developed country parties contributing,** with voluntary contribution from other parties

What's next?

- INC-5.2
  - August 5 – 14, 2025
  - Geneva, Switzerland
- Delegates will start from the Chair’s Text
- Weak treaty vs. no treaty

"This is the most significant environmental multilateral deal since the Paris accord. It is an insurance policy for this generation and future ones, so they may live with plastic and not be doomed by it."

- Inger Andersen, Executive Director of the United Nations Environment Programme (UNEP)

Searching for Solutions to Plastic Pollution

Texas Plastic Pollution Symposium – April 3, 2025

SURFRIDER FOUNDATION
TEXAS COASTAL BEND

The Surfrider Foundation is dedicated to the protection and enjoyment of the world's ocean, waves and beaches, for all people, through a powerful activist network.

Skip the Plastic

nature medicine

Brief Communication
https://doi.org/10.1038/s41591-024-03453-1

Bioaccumulation of microplastics in decedent human brains

Received: 29 April 2024
Accepted: 9 December 2024
Published online: 03 February 2025

Check for updates

Alexander J. Nihart[1,12], Marcus A. Garcia[1,12], Eliane El Hayek[1,12], Rui Liu[1], Marian Olewine[1], Josiah D. Kingston[1], Eliseo F. Castillo[2], Rama R. Gullapalli[3], Tamara Howard[4], Barry Bleske[5], Justin Scott[6], Jorge Gonzalez-Estrella[6], Jessica M. Gross[7], Michael Spilde[8], Natalie L. Adolphi[9], Daniel F. Gallego[9], Heather S. Jarrell[9], Gabrielle Dvorscak[9], Maria E. Zuluaga-Ruiz[10], Andrew B. West[11] & Matthew J. Campen[1]

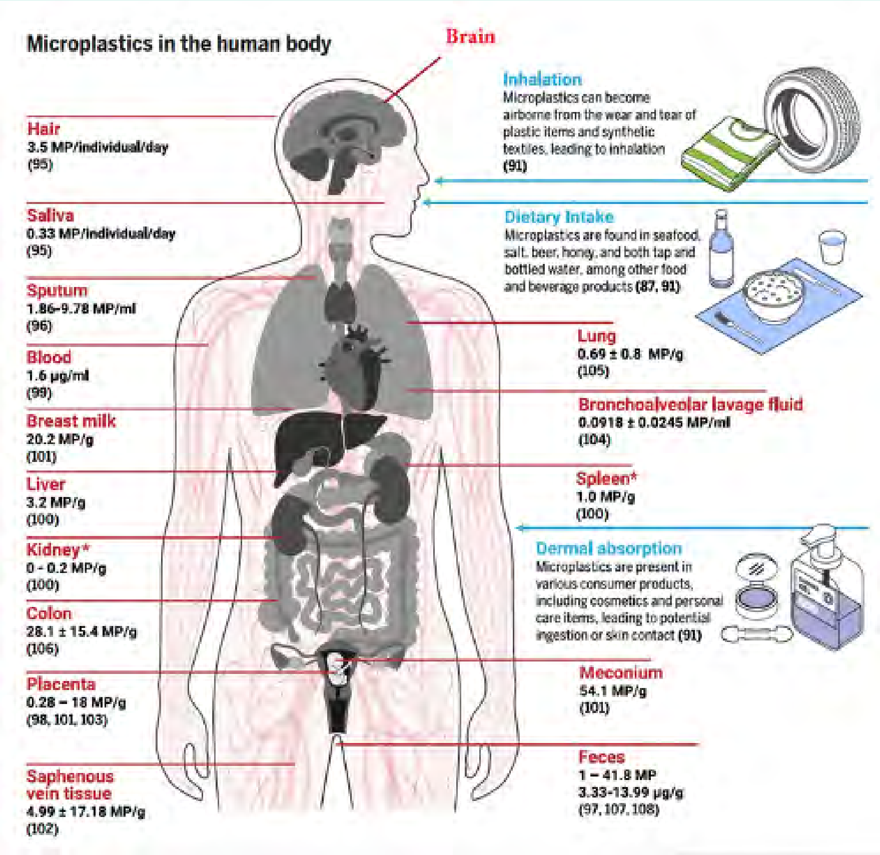
Rising global concentrations of environmental microplastics and nanoplastics (MNPs) drive concerns for human exposure and health outcomes. Complementary methods for the robust detection of tissue MNPs, including pyrolysis gas chromatography–mass spectrometry, attenuated total reflectance–Fourier transform infrared spectroscopy and electron microscopy with energy-dispersive spectroscopy, confirm the presence of MNPs in human kidney, liver and brain. MNPs in these organs primarily consist of polyethylene, with lesser but significant concentrations of other polymers. Brain tissues harbor higher proportions of polyethylene compared to the composition of the plastics in liver or kidney, and electron microscopy verified the nature of the isolated brain MNPs, which present largely as nanoscale shard-like fragments. Plastic concentrations in these decedent tissues were not influenced by age, sex, race/ethnicity or cause of death; the time of death (2016 versus 2024) was a significant factor, with increasing MNP concentrations over time in both liver and brain samples ($P = 0.01$). Finally, even greater accumulation of MNPs was observed in a cohort of decedent brains with documented dementia diagnosis, with notable deposition in cerebrovascular walls and immune cells. These results highlight a critical need to better understand the routes of exposure, uptake and clearance pathways and potential health consequences of plastics in human tissues, particularly in the brain.

Environmental concentrations of anthropogenic microplastic and nanoplastic (MNP), polymer-based particulates ranging from 500 µm in diameter down to 1 nm, have increased exponentially over the past half century[1,2]. The extent to which MNPs cause human harm or toxicity is unclear, although recent studies associated MNP presence in carotid atheromas with increased inflammation and risk of future adverse cardiovascular events[3,4]. In controlled cell culture and animal exposure studies, MNPs exacerbate disease or drive toxic outcomes, but at concentrations with unclear relevance to human exposures and body burdens[5,6]. The mantra of the field of toxicology–'dose makes the poison' (Paracelsus)–renders such discoveries as easily anticipated; what is not clearly understood is the tissue distribution and internal dose of MNPs in humans, which confounds our ability to interpret the controlled exposure study results.

So far, visual microscopic spectroscopy methods have identified particulates in organs, such as the lungs, intestine[7] and placenta[8]. These methods are often limited to larger (>5 µm) particulates; thus, smaller nanoplastics are unintentionally excluded. As a new approach,

A full list of affiliations appears at the end of the paper. e-mail: mcampen@salud.unm.edu

doi.org/10.1038/s41591-024-03453-1



Eric Topol, MD
Chair, Department of Translational Medicine; Director & Founder, Scripps Research Translational Institute; Senior Consultant, Scripps Clinic, Division of Cardiovascular Diseases; The Gary and Mary West Chair of Innovative Medicine

Problem solving is a process of finding and implementing a solution to a challenge or obstacle. In most contexts, this means going through a problem solving process that begins with identifying the issue, exploring its root causes, ideating and refining possible solutions before implementing and measuring the impact of that solution.

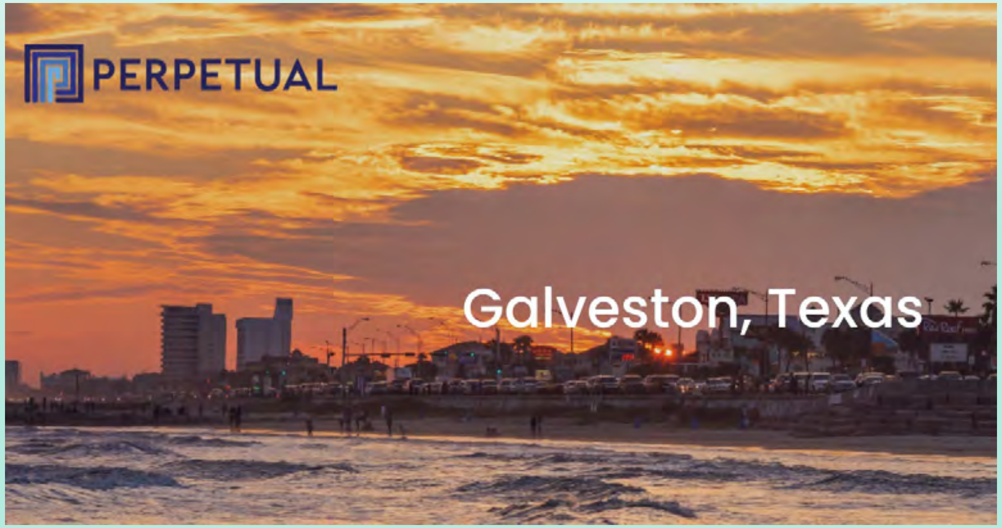
The seven-step problem solving process is:

1. Problem identification
2. Problem analysis and refinement
3. Solution generation
4. Solution development
5. Decision making and planning
6. Solution implementation
7. Solution evaluation

Source: sessionlab.com/blog/problem-solving-techniques

Alternatives

Alternatives



"Over the course of 3 days of workshops, 96% of the respondents said they were likely or very likely to use reusable cup and container systems if the system was available in Galveston.

Many of the core pieces are in place to successfully launch a reusable foodware program in Galveston, which could have a tremendous impact both locally and globally. However, additional funding needs to be secured to continue building operational capacity to launch the Galveston system, so the project team is now working exclusively on raising the necessary funds to be able to proceed…"

Also in Ann Arbor, Michigan, Hilo, Hawaii and Savannah, Georgia

perpetualuse.org

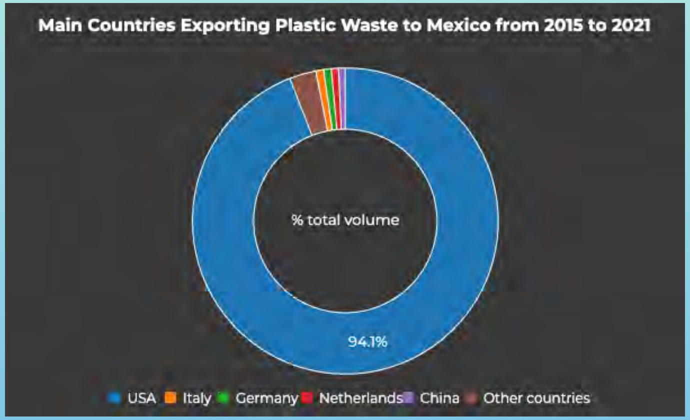
Bioplastics

“At this point, the Surfrider Foundation does not endorse products marketed as biodegradable plastic, including ‘plant-based’ biodegradable plastic, due to a lack of approved certification in the U.S.”

Source: Surfrider Foundation’s Bioplastics Toolkit

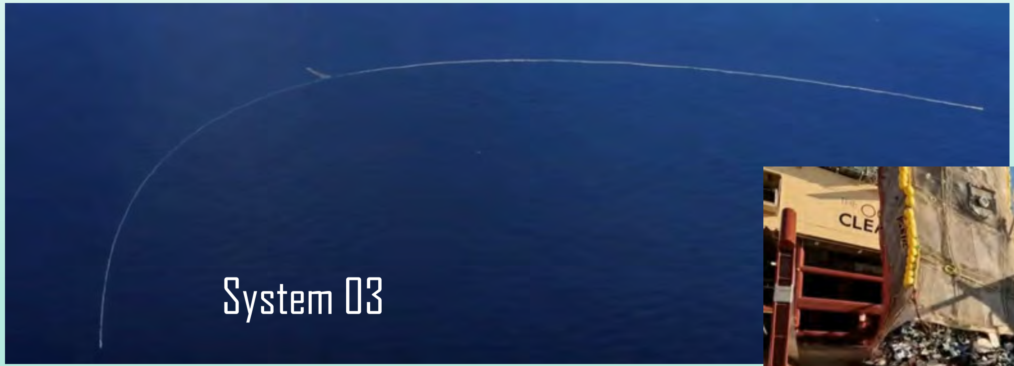
Phasing Out vs. Recycling

Recycling

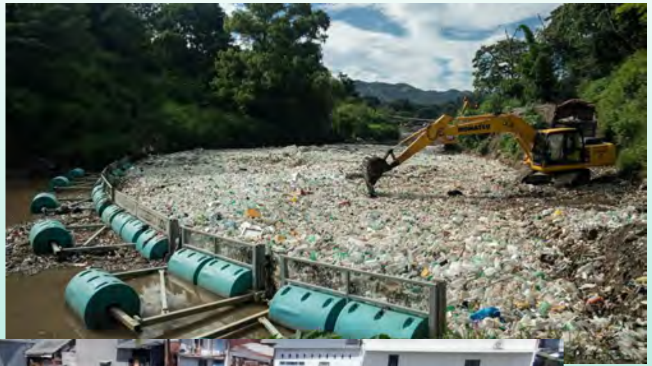


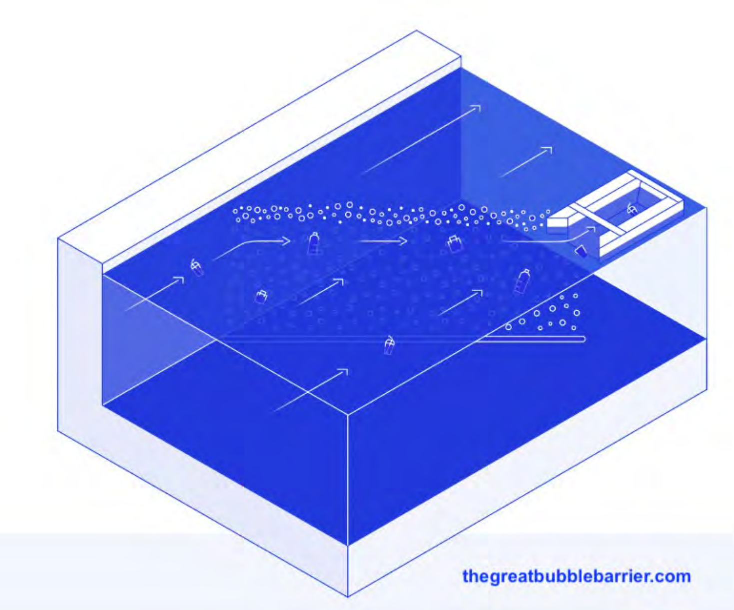
mexicotoxico.org.mx/waste-colonialism

Innovative Solutions



The Ocean Cleanup





Cleanups and Raising Awareness

False Solutions

Waste to energy incineration

Photo: Laurian Ghinitoiu

Advanced or chemical recycling

“Plastics are valuable materials that have for many years have tended to follow a linear model of “make, use, dispose”, resulting in large amounts being buried in landfills or worse, littering our oceans and waterways.

To recycle them, we need to implement emerging recycling technologies often referred to as “advanced recycling” (or, “chemical recycling”). These technologies complement existing mechanical recycling methods, allowing more types of used plastics (3-7's) to be recaptured and remanufactured into new plastics and products.”

www.americanchemistry.com

TexasMonthly February 13, 2024 issue

Plastic Has Overrun the Planet. Does “Advanced” Recycling Offer a Solution?

Policy Changes

Municipal Ordinances

Bag bans

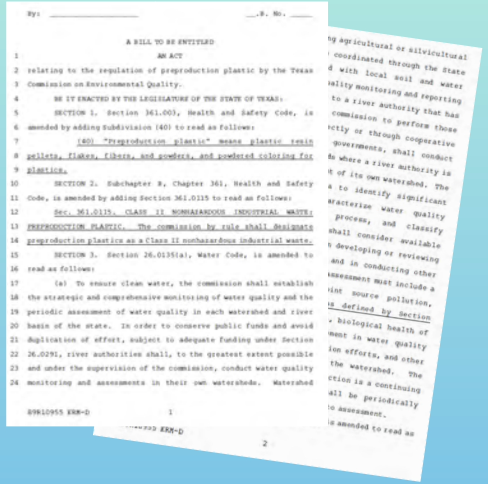
Ballon release prohibitions

Texas Legislation

HB 1904 Seeking to ban balloon releases

HB 4028 / SB 2441 Seeking to reduce preproduction plastic pollution into Texas waters from manufacturing, processing, handling and transport facilities

Photos: Formosa Plastics



By: ______________________ __.B. No. _____

A BILL TO BE ENTITLED

AN ACT

relating to the regulation of preproduction plastic by the Texas Commission on Environmental Quality.

BE IT ENACTED BY THE LEGISLATURE OF THE STATE OF TEXAS:

SECTION 1. Section 361.003, Health and Safety Code, is amended by adding Subdivision (40) to read as follows:

(40) "Preproduction plastic" means plastic resin pellets, flakes, fibers, and powders, and powdered coloring for plastics.

SECTION 2. Subchapter B, Chapter 361, Health and Safety Code, is amended by adding Section 361.0115 to read as follows:

Sec. 361.0115. CLASS II NONHAZARDOUS INDUSTRIAL WASTE: PREPRODUCTION PLASTIC. The commission by rule shall designate preproduction plastics as a Class II nonhazardous industrial waste.

SECTION 3. Section 26.0135(a), Water Code, is amended to read as follows:

(a) To ensure clean water, the commission shall establish the strategic and comprehensive monitoring of water quality and the periodic assessment of water quality in each watershed and river basin of the state. In order to conserve public funds and avoid duplication of effort, subject to adequate funding under Section 26.0291, river authorities shall, to the greatest extent possible and under the supervision of the commission, conduct water quality monitoring and assessments in their own watersheds. Watershed

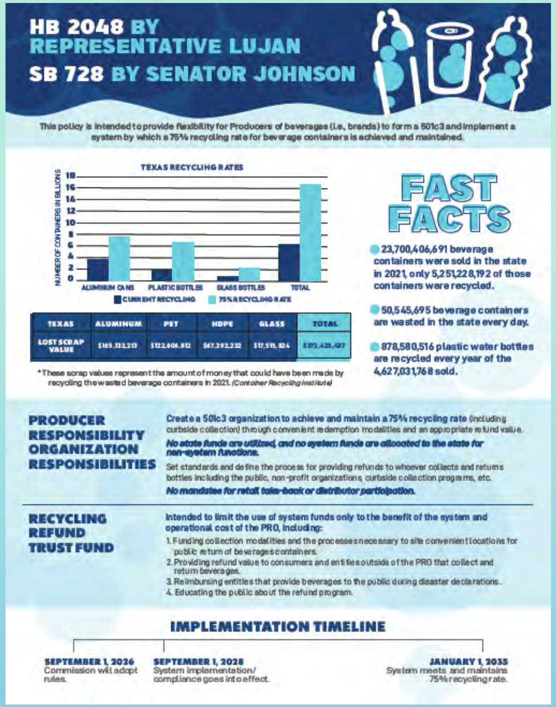
89R10955 KRM-D 1

Photo: Diane Wilson

Policy Changes

Texas Legislation

HB 2048 / SB 782 Seeking to establish a statewide beverage container deposit/refund program


HB 2048 BY REPRESENTATIVE LUJAN
SB 728 BY SENATOR JOHNSON

This policy is intended to provide flexibility for Producers of beverages (i.e., brands) to form a 501c3 and implement a system by which a 75% recycling rate for beverage containers is achieved and maintained.

TEXAS	ALUMINUM	PET	HDPE	GLASS	TOTAL
LOST SCRAP VALUE	$165,132,213	$122,406,812	$67,292,232	$17,515,824	[illegible]

*These scrap values represent the amount of money that could have been made by recycling the wasted beverage containers in 2021. *(Container Recycling Institute)*

FAST FACTS

- 23,700,406,691 beverage containers were sold in the state in 2021, only 5,251,228,192 of those containers were recycled.
- 50,545,695 beverage containers are wasted in the state every day.
- 878,580,516 plastic water bottles are recycled every year of the 4,627,031,768 sold.

PRODUCER RESPONSIBILITY ORGANIZATION RESPONSIBILITIES

Create a 501c3 organization to achieve and maintain a 75% recycling rate (including curbside collection) through convenient redemption modalities and an appropriate refund value.

No state funds are utilized, and no system funds are allocated to the state for non-system functions.

Set standards and define the process for providing refunds to whoever collects and returns bottles including the public, non-profit organizations, curbside collection programs, etc.

No mandates for retail take-back or distributor participation.

RECYCLING REFUND TRUST FUND

Intended to limit the use of system funds only to the benefit of the system and operational cost of the PRO, including:

1. Funding collection modalities and the processes necessary to site convenient locations for public return of beverages containers.
2. Providing refund value to consumers and entities outside of the PRO that collect and return beverages.
3. Reimbursing entities that provide beverages to the public during disaster declarations.
4. Educating the public about the refund program.

IMPLEMENTATION TIMELINE

SEPTEMBER 1, 2026
Commission will adopt rules.

SEPTEMBER 1, 2028
System implementation/ compliance goes into effect.

JANUARY 1, 2035
System meets and maintains 75% recycling rate.

Policy Changes

Federal Legislation

Break Free From Plastic Pollution Act - 2021

Extended Producer Responsibility

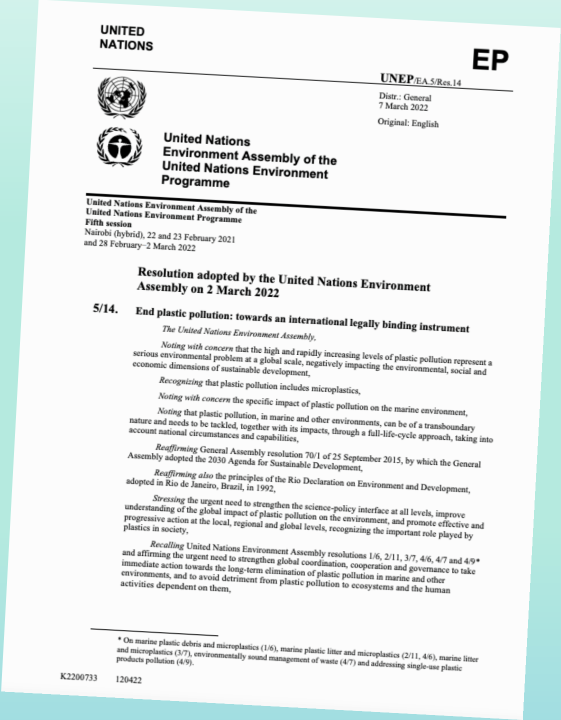
- California, Colorado, Maine, Oregon, New Jersey, Minnesota & Washington have EPR laws

Plastic Pellet Free Waters Act – 2023

Farewell to Foam Act - 2025

breakfreefromplastic.org

UN Global Plastics Treaty



UNITED NATIONS

EP

UNEP/EA.5/Res.14

Distr.: General
7 March 2022

Original: English

United Nations Environment Assembly of the United Nations Environment Programme

United Nations Environment Assembly of the United Nations Environment Programme
Fifth session
Nairobi (hybrid), 22 and 23 February 2021
and 28 February–2 March 2022

Resolution adopted by the United Nations Environment Assembly on 2 March 2022

5/14. End plastic pollution: towards an international legally binding instrument

The United Nations Environment Assembly,

Noting with concern that the high and rapidly increasing levels of plastic pollution represent a serious environmental problem at a global scale, negatively impacting the environmental, social and economic dimensions of sustainable development,

Recognizing that plastic pollution includes microplastics,

Noting with concern the specific impact of plastic pollution on the marine environment,

Noting that plastic pollution, in marine and other environments, can be of a transboundary nature and needs to be tackled, together with its impacts, through a full-life-cycle approach, taking into account national circumstances and capabilities,

Reaffirming General Assembly resolution 70/1 of 25 September 2015, by which the General Assembly adopted the 2030 Agenda for Sustainable Development,

Reaffirming also the principles of the Rio Declaration on Environment and Development, adopted in Rio de Janeiro, Brazil, in 1992,

Stressing the urgent need to strengthen the science-policy interface at all levels, improve understanding of the global impact of plastic pollution on the environment, and promote effective and progressive action at the local, regional and global levels, recognizing the important role played by plastics in society,

Recalling United Nations Environment Assembly resolutions 1/6, 2/11, 3/7, 4/6, 4/7 and 4/9* and affirming the urgent need to strengthen global coordination, cooperation and governance to take immediate action towards the long-term elimination of plastic pollution in marine and other environments, and to avoid detriment from plastic pollution to ecosystems and the human activities dependent on them,

* On marine plastic debris and microplastics (1/6), marine plastic litter and microplastics (2/11, 4/6), marine litter and microplastics (3/7), environmentally sound management of waste (4/7) and addressing single-use plastic products pollution (4/9).

K2200733 120422

Heads of State, Ministers of environment and other representatives from 175 UN Member States endorsed a historic resolution at the UN Environment Assembly on March 2, 2022, to end plastic pollution and forge an international legally binding agreement by 2024. The resolution addresses the full lifecycle of plastic, including its production, design and disposal.

Do-It-Yourself

theglobalhues.com/7-rs-of-waste-management-steps-to-sustainability

Thanks for listening!

Neil McQueen, CHMM

Co-Chair – Texas Coastal Bend Chapter, Surfrider Foundation

co-chair@coastalbend.surfrider.org

361-765-4445

THE OCEAN
NEEDS MORE
FRIENDS

SURFRIDER
FOUNDATION.

surfrider.org/programs/rise-above-plastics

Please support the regulation of preproduction plastic by TCEQ

House Bill 4028 and Senate Bill 2441.

Take action today!

ENVIRONMENT TEXAS

TURTLE ISLAND RESTORATION NETWORK

FIGHTING FOR A BLUE-GREEN PLANET

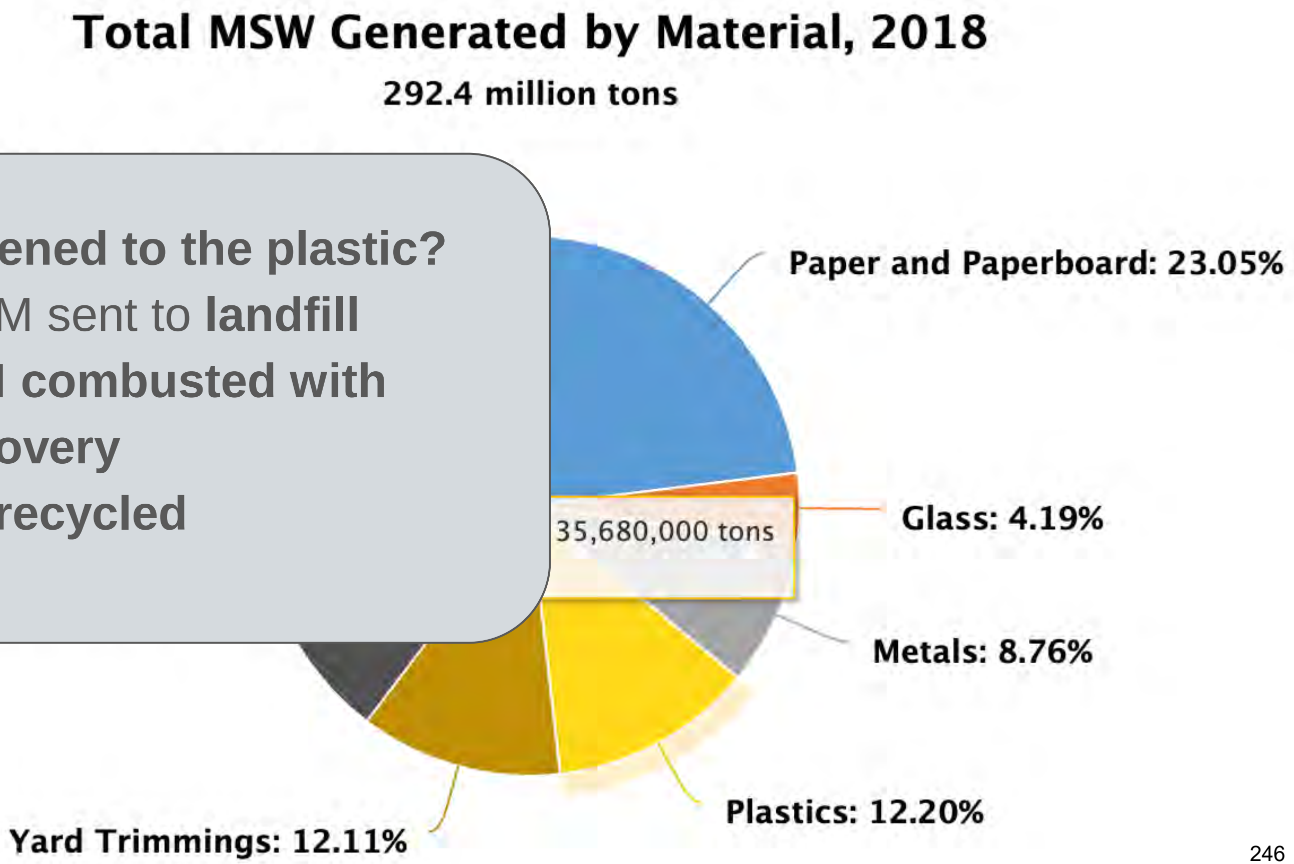
SURFRIDER FOUNDATION

Bioprospecting PET Degrading Enzymes from the Deep Sea

Daryl Barth
Texas Plastic Pollution Symposium 2025
Houston Zoo
April 3, 2025

https://futuroverde.org/2021/07/descubre-el-impacto-del-plastico-en-nuestro-planeta/

Plastic as part of our generated waste in the US



What happened to the plastic?

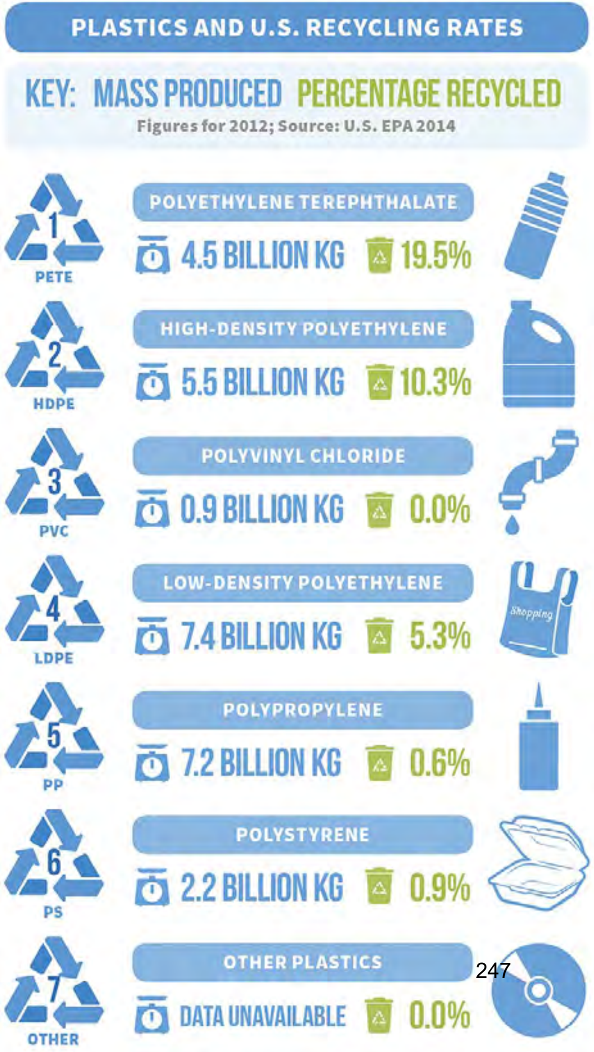
- **76%,** 26.97M sent to **landfill**
- **15%,** 5.62M **combusted with energy recovery**
- **9%,** 3.09M **recycled**

National Overview: Facts and Figures on Materials, Wastes and Recycling | US EPA. https://www.epa.gov/facts-and-figures-about-materials-waste-and-recycling/national-overview-facts-and-figures-materials.

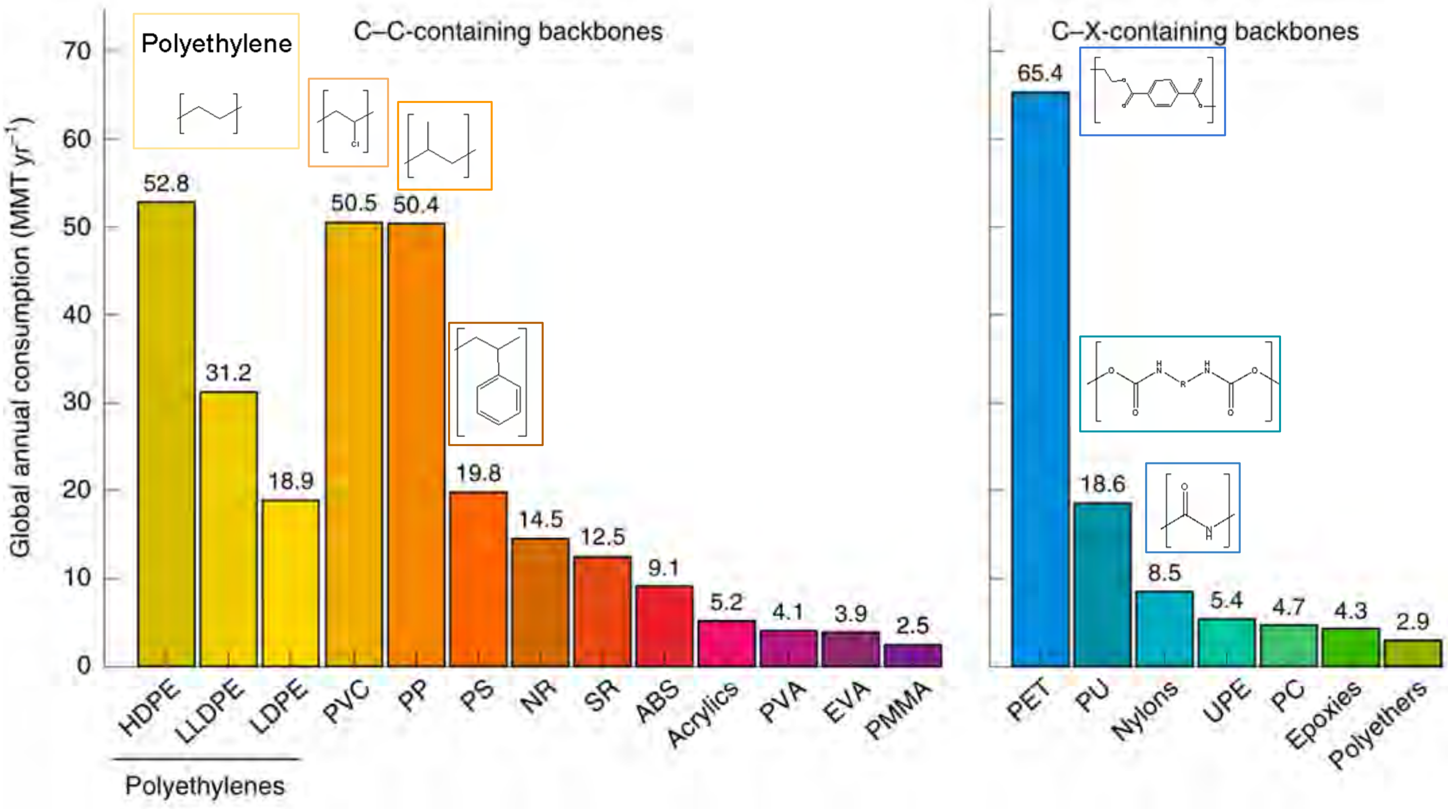
Plastics Recycling as it is now

Current Recycling Methods:

- **Mechanical, limited to thermoplastics (PET, HDPE, etc)**
  - Shredding and melting plastic waste to form new products
    - Degradation of material properties
  - Contamination issues
- **Chemical**
  - Plastics → monomers or other chemicals via pyrolysis, gasification
  - High energy consumption & potential release of harmful by-products
- **Potential of Enzymatic Recycling:**
  - Specificity & Purity of product
  - Mild Conditions
  - Sustainable



Two broad chemical categories of plastic:



Ellis, L. D. *et al. Nat Catal* **4**, 539–556 (2021).

Current State of Enzymatic Recycling

Academically:

Fossil fuel-based polymers	Biochemically characterized wt enzymes
Polyethylene terephthalate (PET)	104
Polyurethane (PUR)	28
Polyethylene (PE)	4, unspecific oxidative enzymes
Polyamide (PA)	13
Polystyrene (PS)	0
Polyvinylchloride (PVC)	0
Polypropylene (PP)	0
Other types of polymers	0

PAZy: Plastics-Active Enzyme Database

Industrially: Enzymatic PET recycling only

CARBIOS
Biotechnology powering plastic and textile circularity

02 May 2024

CARBIOS and Hündgen enter supply agreement for world's first PET biorecycling plant

From end 2026, Hündgen will supply 15kt/year of post-consumer PET flakes to CARBIOS' first commercial plant

Read more

samsara eco

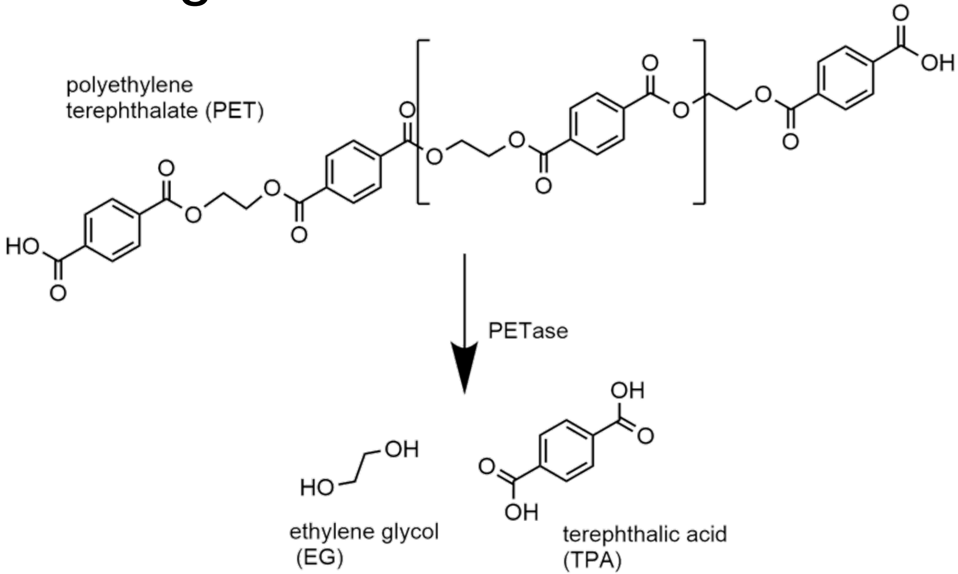
How do we find new/better enzymes capable of plastic degradation?

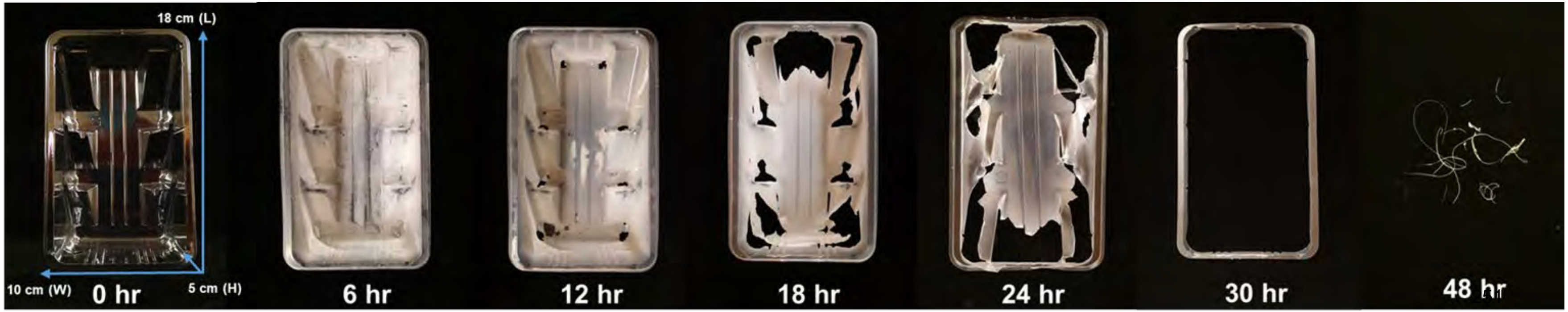
Fossil fuel-based polymers	Biochemically characterized wt enzymes
Polyethylene terephthalate (PET)	104
Polyurethane (PUR)	28
Polyethylene (PE)	4, unspecific oxidative enzymes
Polyamide (PA)	13
Polystyrene (PS)	0
Polyvinylchloride (PVC)	0
Polypropylene (PP)	0
Other types of polymers	0

1. Engineer existing enzymes
2. Look to Nature, bioprospecting
3. Natural Discovery/ Controlled experiments with known plastic degrading organisms
4. De novo design

FAST-PETase, the power of an engineered PETase

FAST-PETase





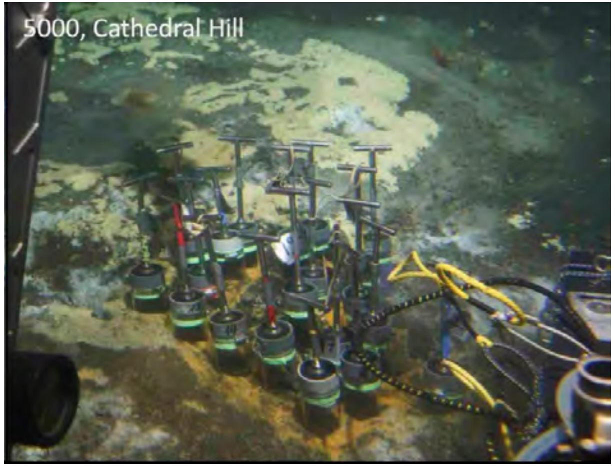
6.4 g

Lu et al. Nature (2021)

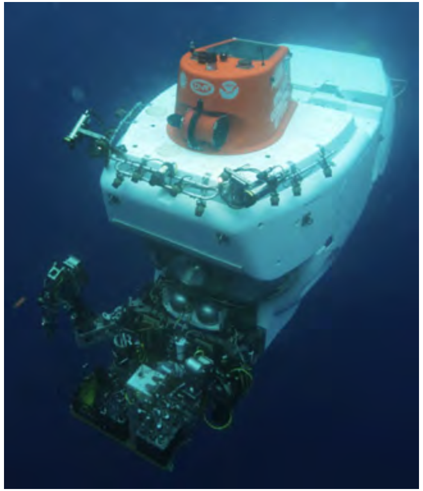
Guaymas Basin as a source of evolutionary novelty

- Thickly sedimented, hydrothermal vent site in the Gulf of California at ~2000 meters depth
- Core temperatures range from 4℃ to 115℃
- Presence of diverse organic polymeric substrates
- Database with 27M unique proteins, 8M found in cores >80℃

Baker Marine Microbial Ecology Lab



Sampling Site

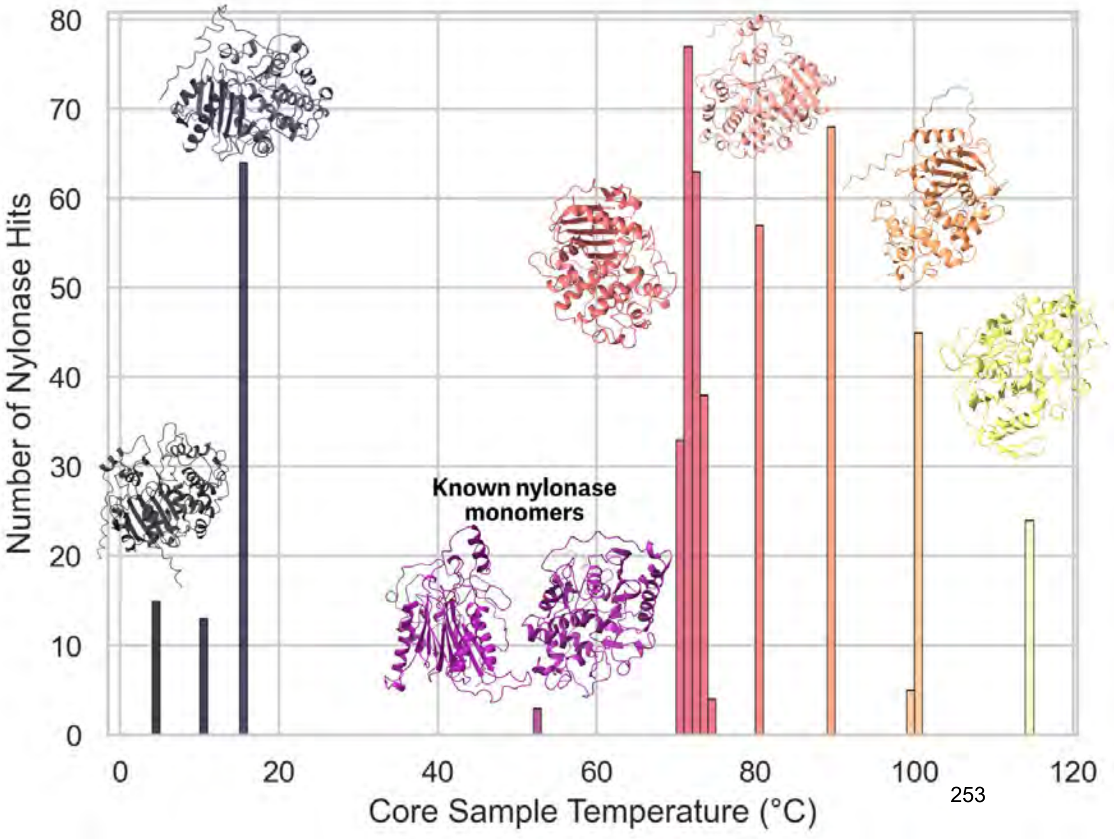


Alvin Submersible

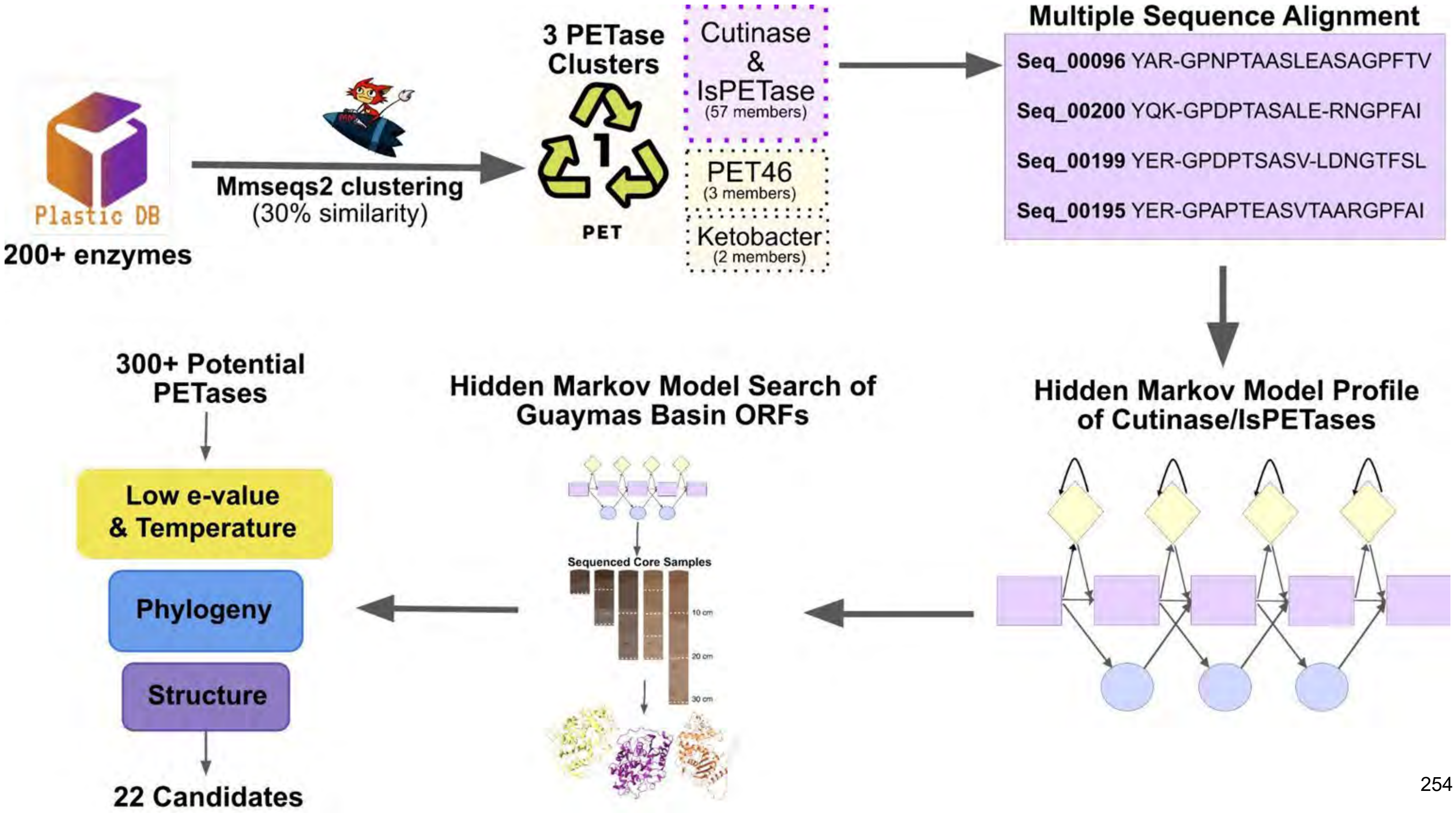
Ramirez G.A., et al. PLoS ONE (2021)

Bioprospecting Guaymas for Plastic Degrading Enzymes

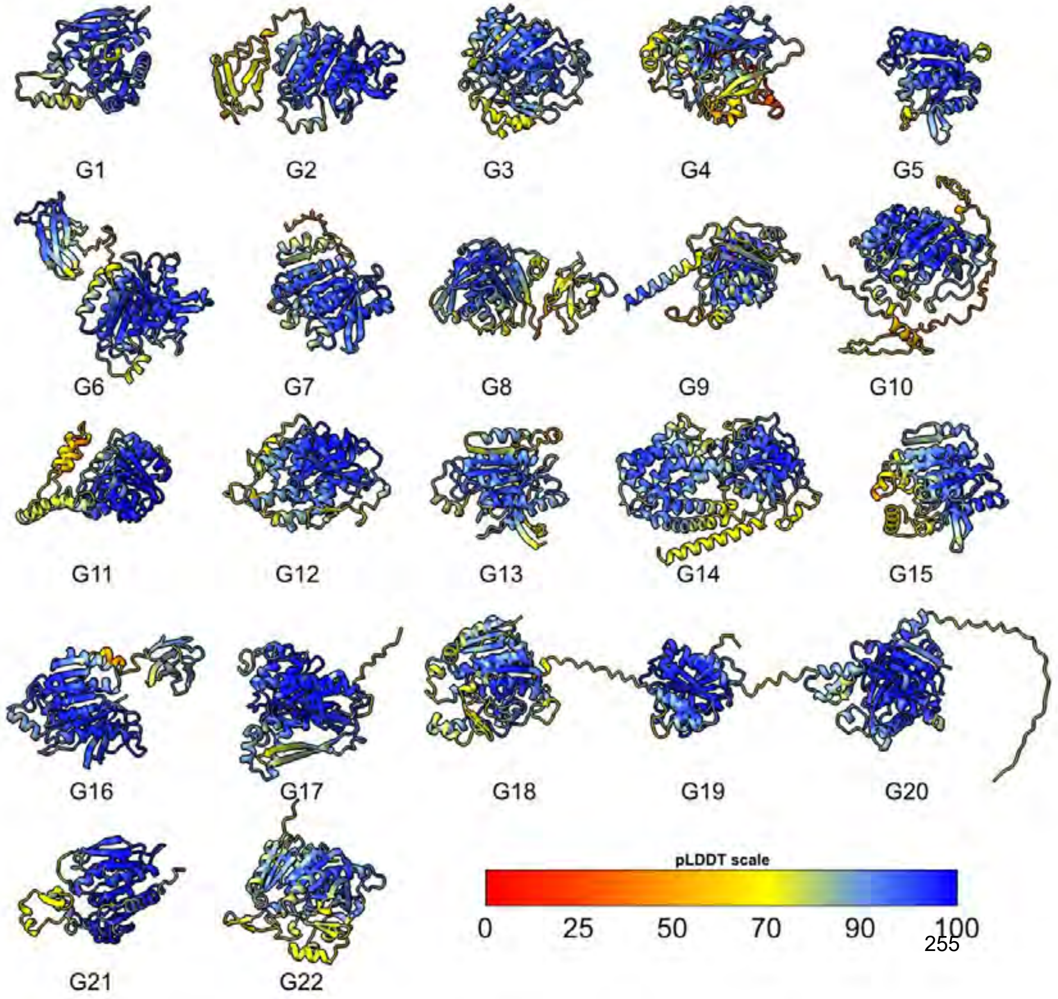
- Preliminary Searches have Yielded:
  - 300+ potential PETases
  - 500+ potential Nylonases
  - 1600+ potential Polyurethanases



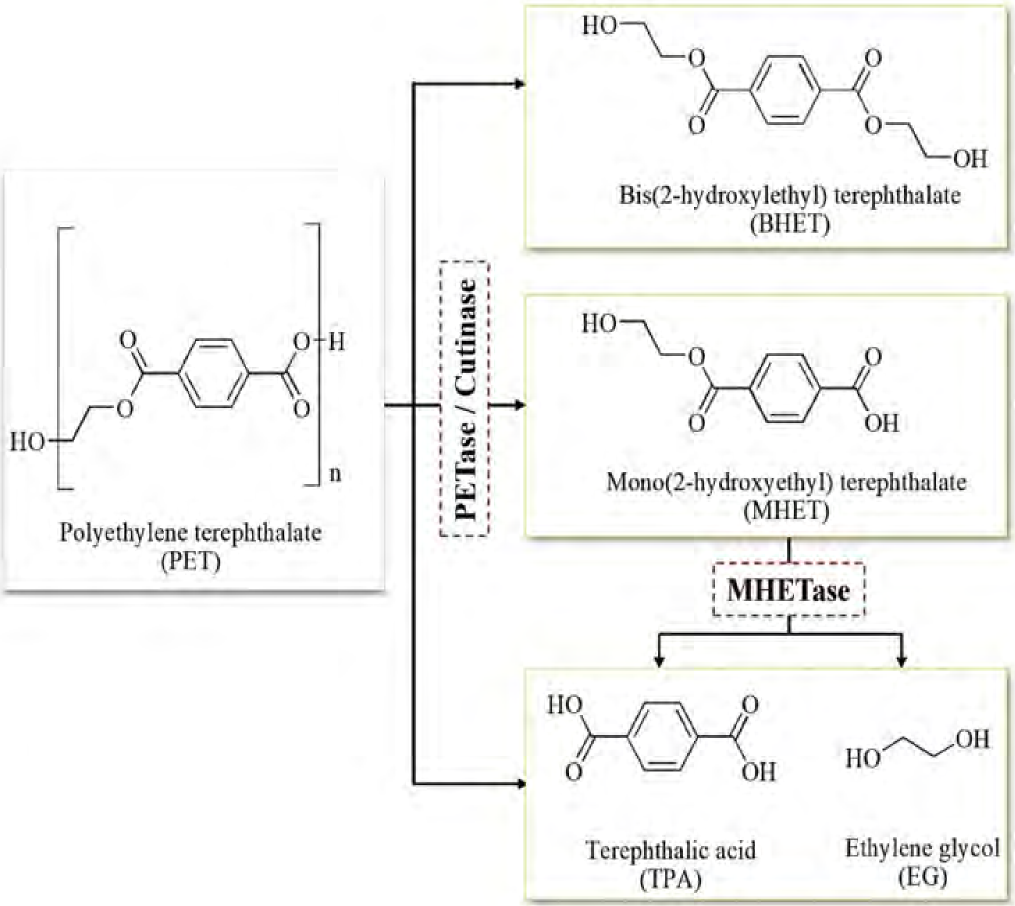
Computational Pipeline for Bioprospecting Guaymas PETases



22 Candidates we expressed in *E. coli*, purified, and tested for PET degrading activity

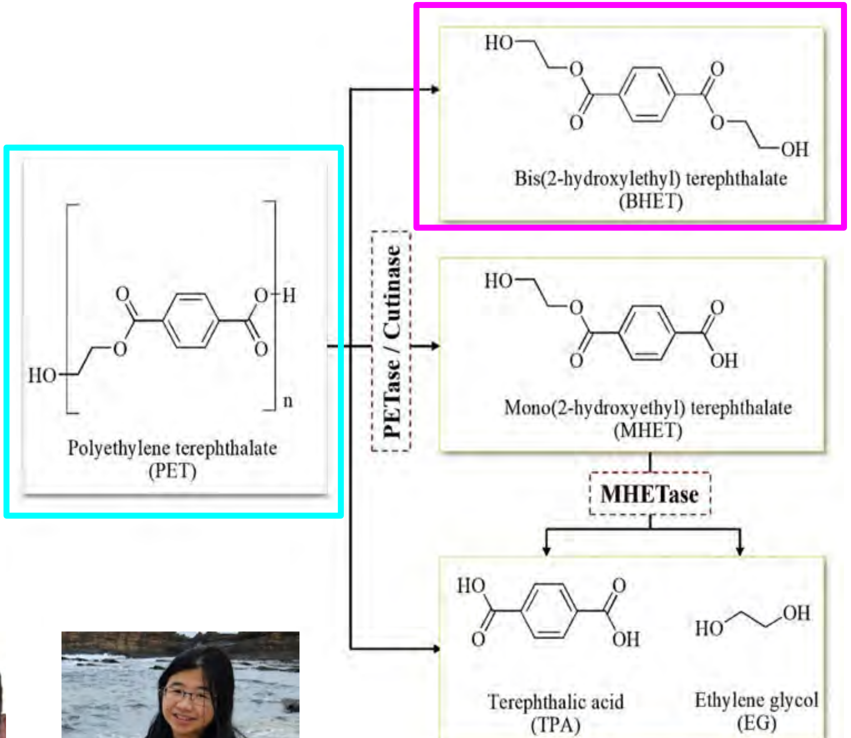


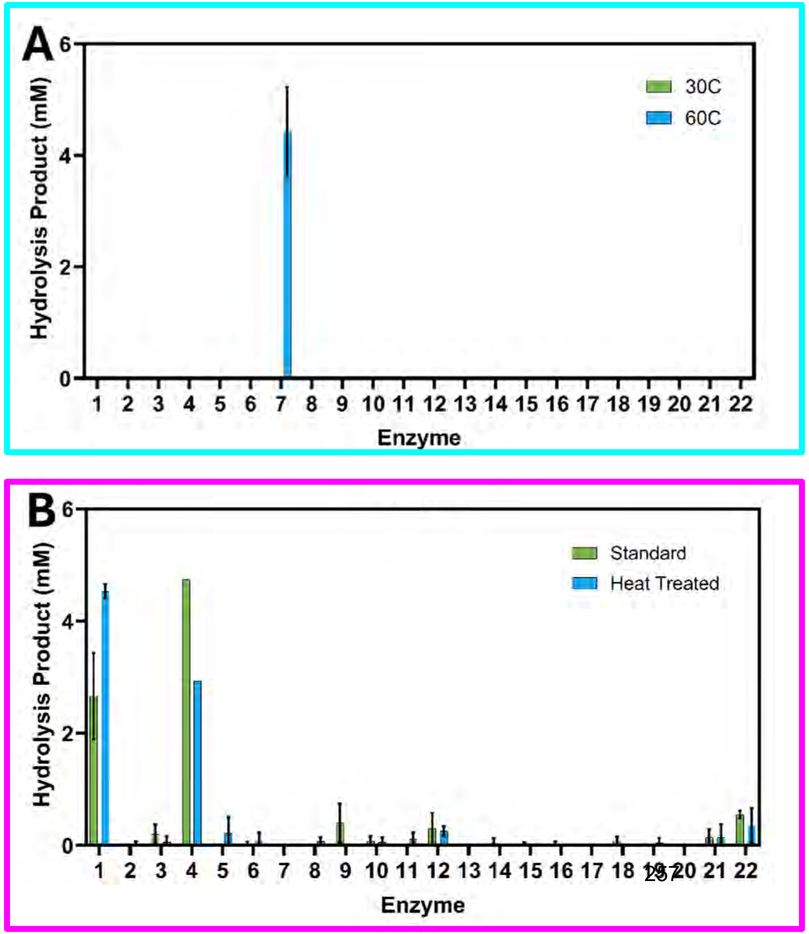
Polyethylene terephthalate breaks down into BHET, MHET, and TPA



Anuar et al, Int J Mol Sci. 2022 Oct

Bioprospecting Guaymas Basin led to the discovery of 1 new PETase and 2 new BHETases.

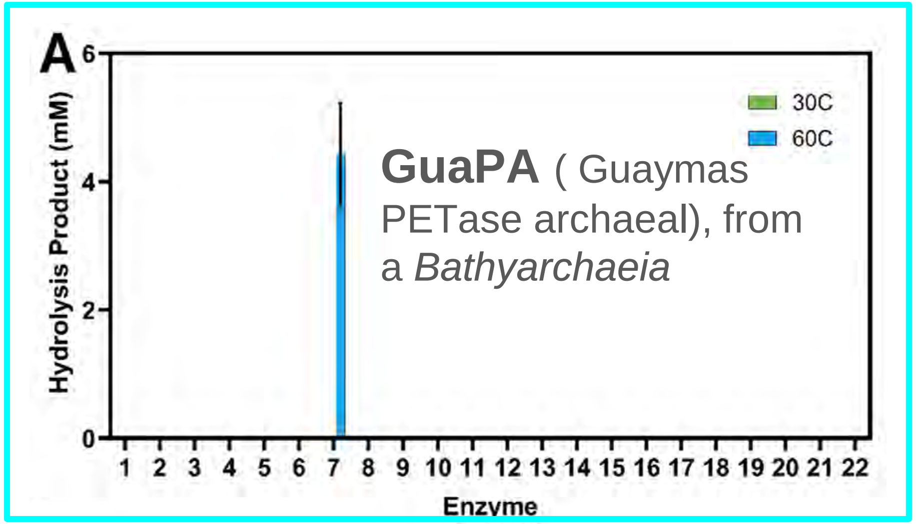


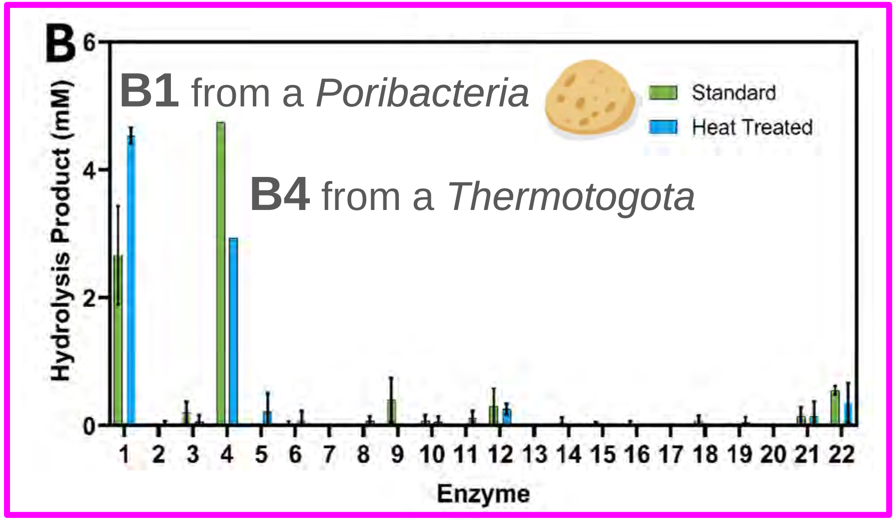



Daniel Acosta


Julie Bondy

GuaPA is the first archaeal PETase capable of cutting sheet plastic and B1, B4 come from uncultured bacteria.





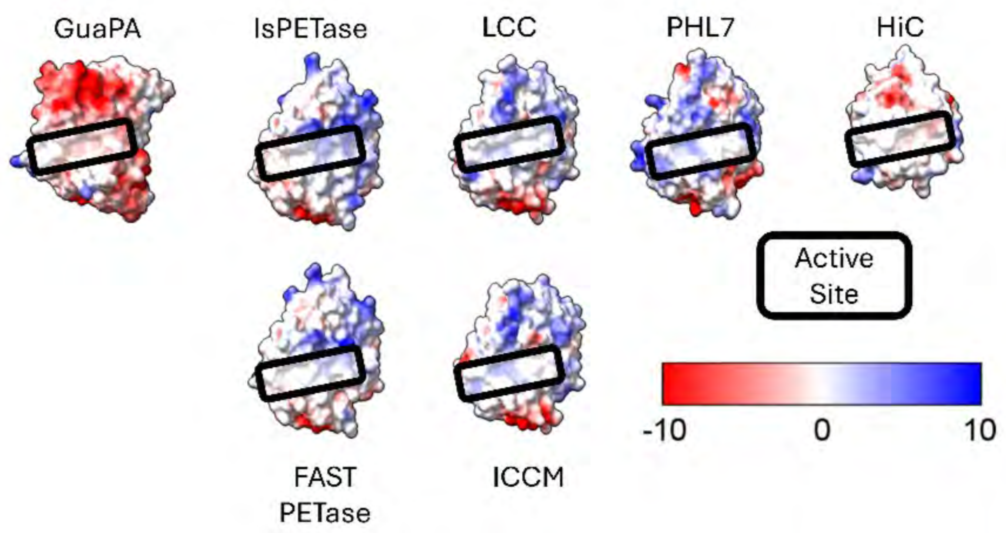
Daniel Acosta

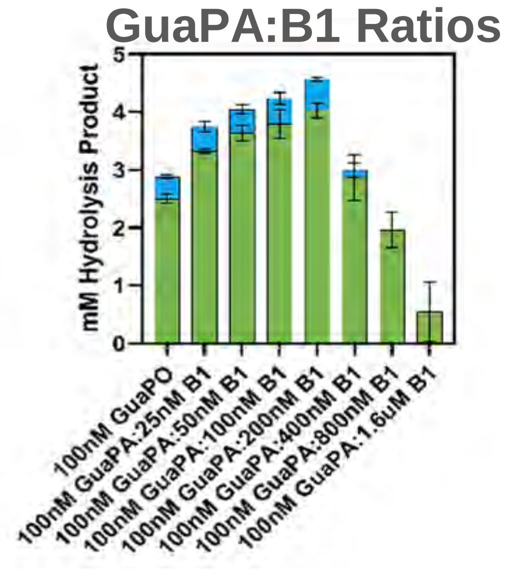
Julie Bondy

Kathryn Appler

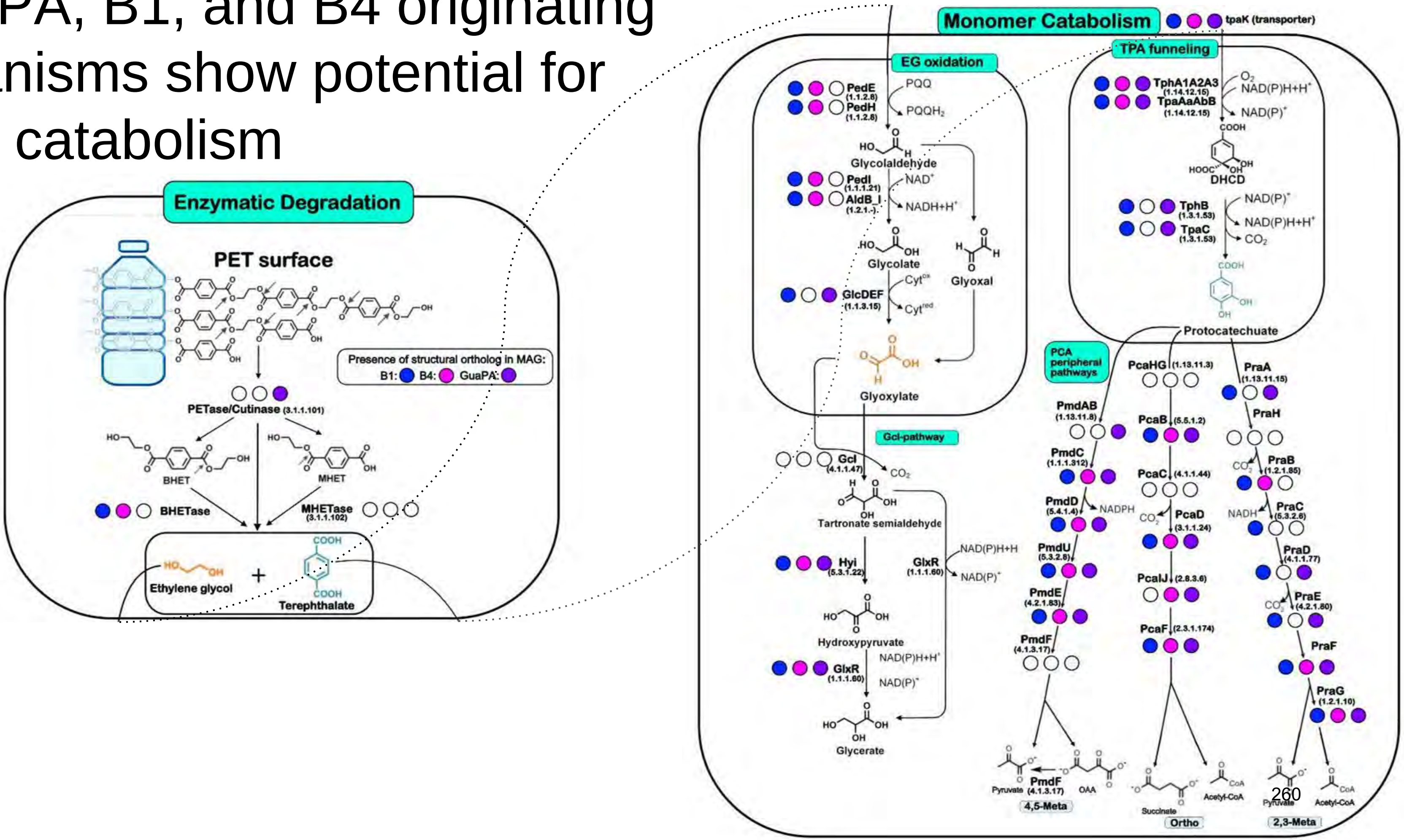
Interesting Characteristics of GuaPA and the new BHETases

- Combining GuaPA with B1 (1:2) improves overall PET degradation
- GuaPA's surface is negatively charged, an anomaly among known PETases
- GuaPA may unlock new classes of PETases





GuaPA, B1, and B4 originating organisms show potential for PET catabolism



In summary & where to next?

- The first archaeal PETase capable of cutting sheet plastic!
- Two new BHETases, one that works in consortium with GuaPA.
- A new starting point to discover and engineer PETases from.
- Hints at a seafloor potentially adapting to the presence of plastics.
- More evidence for Guaymas as a valuable metagenomic resource.

Fossil fuel-based polymers	Biochemically characterized wt enzymes
Polyethylene terephthalate (PET)	104 + **3**
Polyurethane (PUR)	28
Polyethylene (PE)	4, unspecific oxidative enzymes
Polyamide (PA)	13
Polystyrene (PS)	0
Polyvinylchloride (PVC)	0
Polypropylene (PP)	0
Other types of polymers	0

Thanks y'all, any questions?

The Ellington Lab!

Daniel Acosta

Julie Bondy

H-E-B
Helping Here.

The Baker Lab!

Katy Appler

The Marcotte Lab!

The FRI Bioprospecting Stream!

Dr. Kasia Dinkeloo

Unveiling the Hidden Threat: Toxic Effects of Photodegraded Plastic Nurdles on The Early Development Of Marine Medaka (Oryzias melastigma)

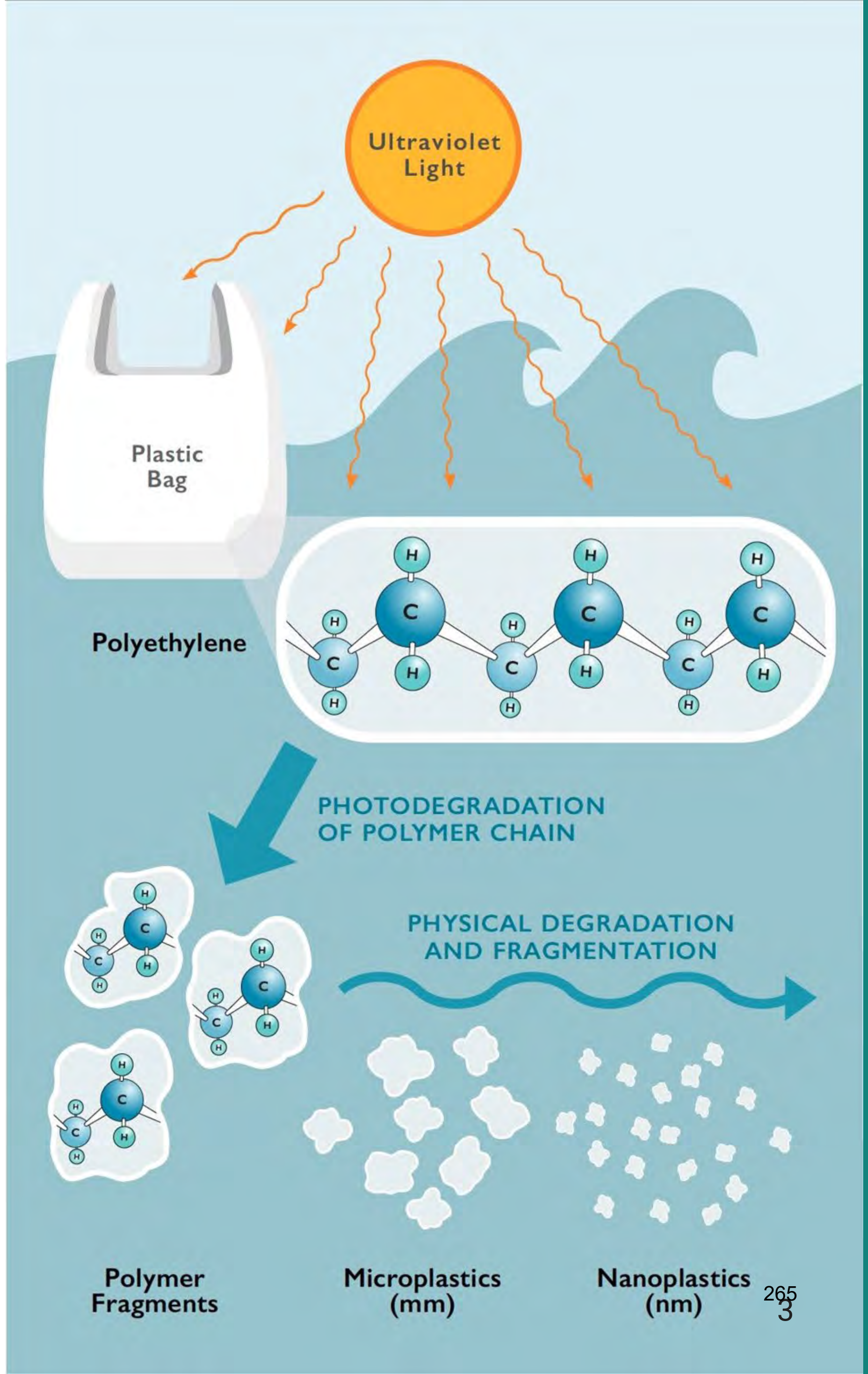
Alissa Richbourg[1], Zhanfei Liu[2], Frauke Seemann[1], Wei Xu[3]

[1]Texas A&M University- Corpus Christi, [2]University of Texas Marine Science Institute, [3]Texas A&M University

Plastic Bottles + Heat = Danger?

Plastic Degradation

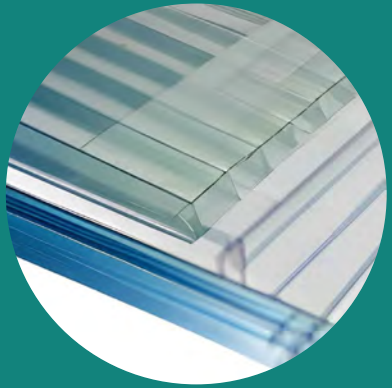
- Plastic debris may enter water through several routes
- Broken down through fragmentation, biodegradation, and **photodegradation**
- Results in the release of **plastic leachates** which may contain additives, polymers, and monomers



Research Goal

Assess the toxicity of photodegraded plastic leachates on the model fish species Oryzias melastigma.

Plastic Polymers



Polycarbonate

(Eyeglasses, outdoor glass, greenhouse panels, CDs, DVDs, medical equipment)

Polyethylene

(Plastic bags, bottles, containers, medical devices)

Polyethylene Terephthalate

(Food and beverage containers, pharmaceuticals, fabrics)

Using a Model Species

Marine Medaka (*Oryzias melastigma*)

A Powerful and Practical Tool for Toxicology

- Small, short generation times, sexual dimorphism, clear embryos
- Larvae are sensitive to pollutants
- Can be used to study physiological and molecular responses to environmental pollutants
- Genome is sequenced and well-understood

Knowledge Gap And Broader Impacts

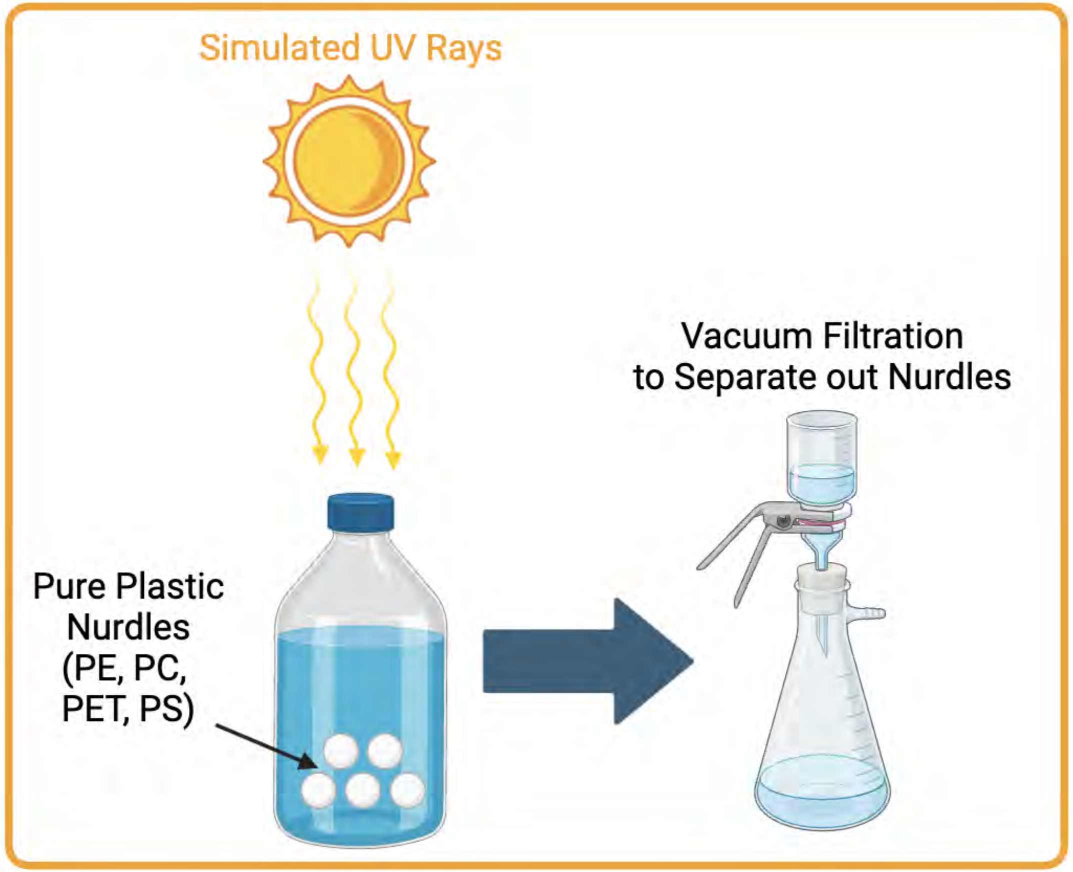
- One of the first studies to examine the effects of photodegraded plastics on marine life
- Evaluate impacts of PC, PE, and PET on the early life stages of *O. melastigma*
- Understand how photodegraded plastics affect biological systems
- Indicate potential threats to human health

Research Question

How do PC, PE, and PET effect developmental progression, hatching rates, mortality, and developmental deformities?

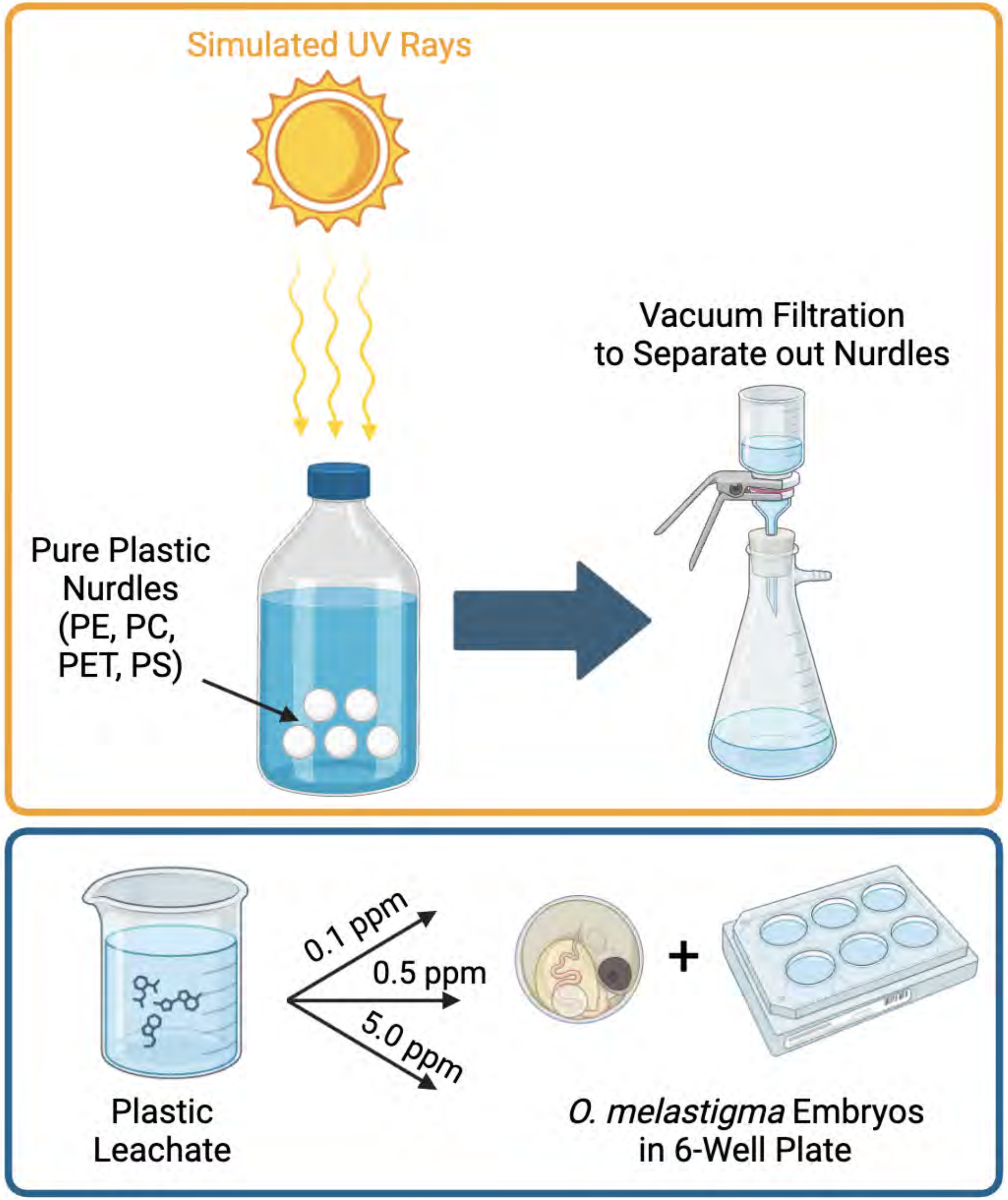
Research Methods

Pure Plastic Nurdles



Research Methods

Pure Plastic Nurdles



PET Leachates Induced Developmental Deformities

- Deformities included spinal curvature, tail deformities, and underdevelopment
- Inhibits movement and can result in mortality
- Deformities were significantly higher in PET 0.5 ppm treatment group

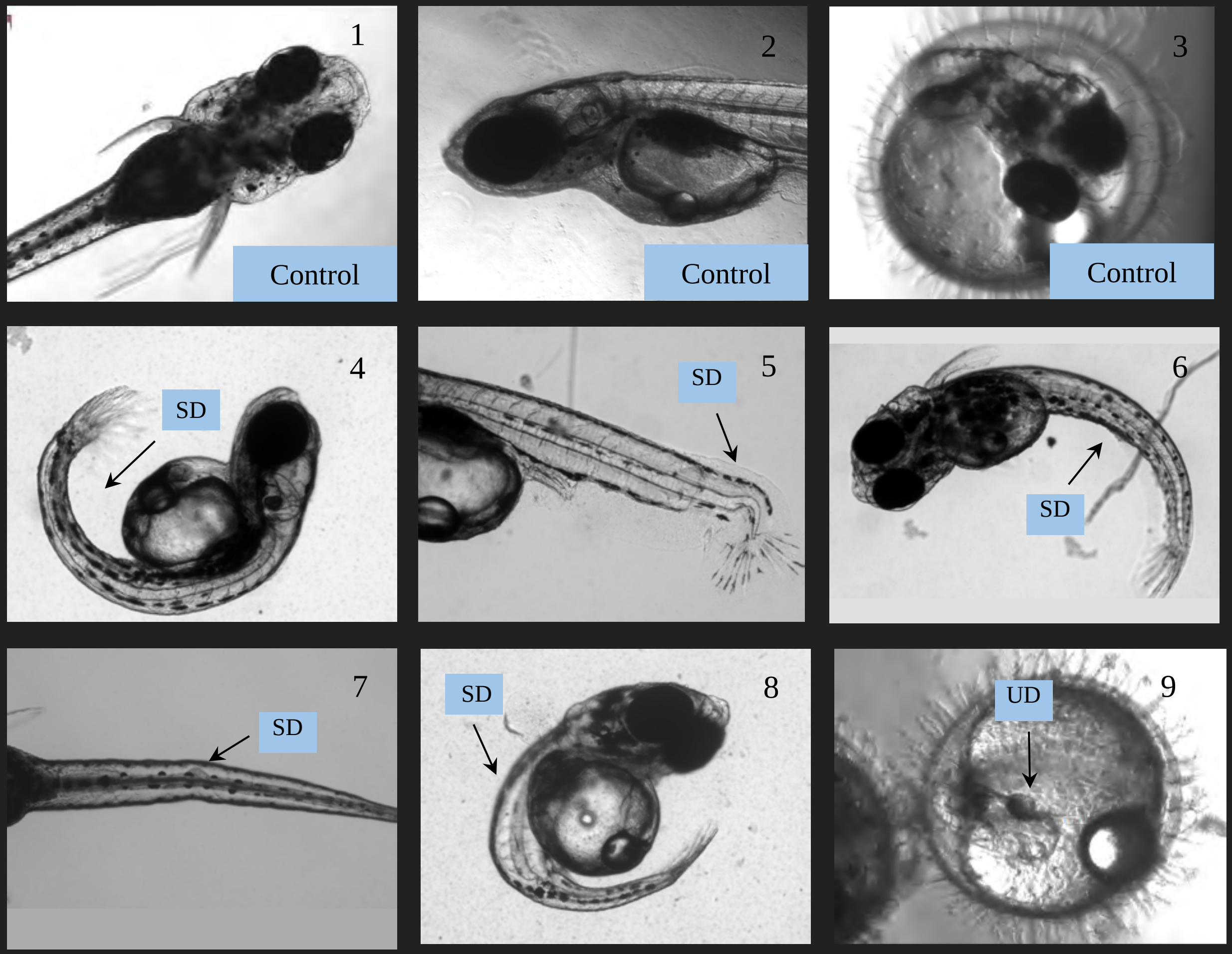


Figure 1. Morphological changes observed in *O. melastigma* larvae exposed to photodegraded polyethylene terephthalate (PET) leachate. 1-3: Control; 4: 0.1 ppm PET treatment; 5-7: 0.5 ppm PET treatment; 8-9: 5.0 ppm PET treatment. SD: Spinal deformities; UD: Underdeveloped.

PC Leachates Induced Developmental Deformities

- Deformities included spinal curvature, tail deformities, and jaw deformities

- Inhibits movement and can result in mortality

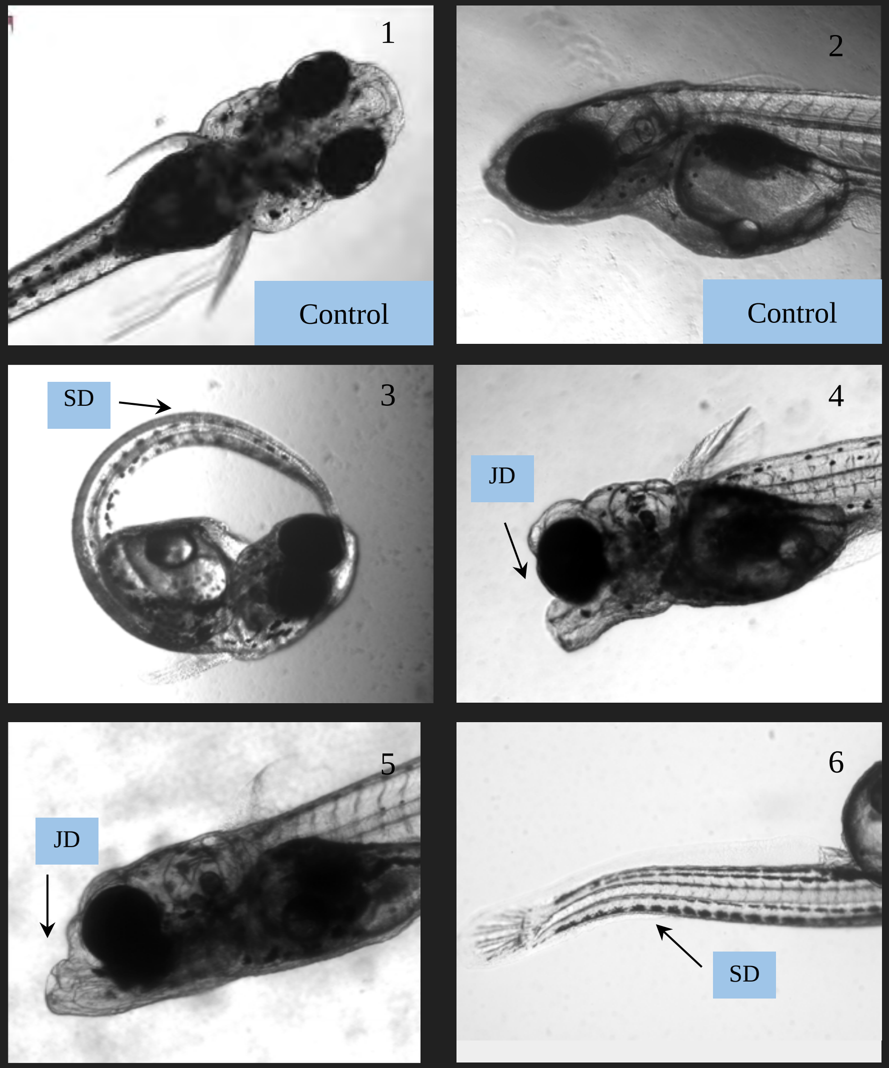
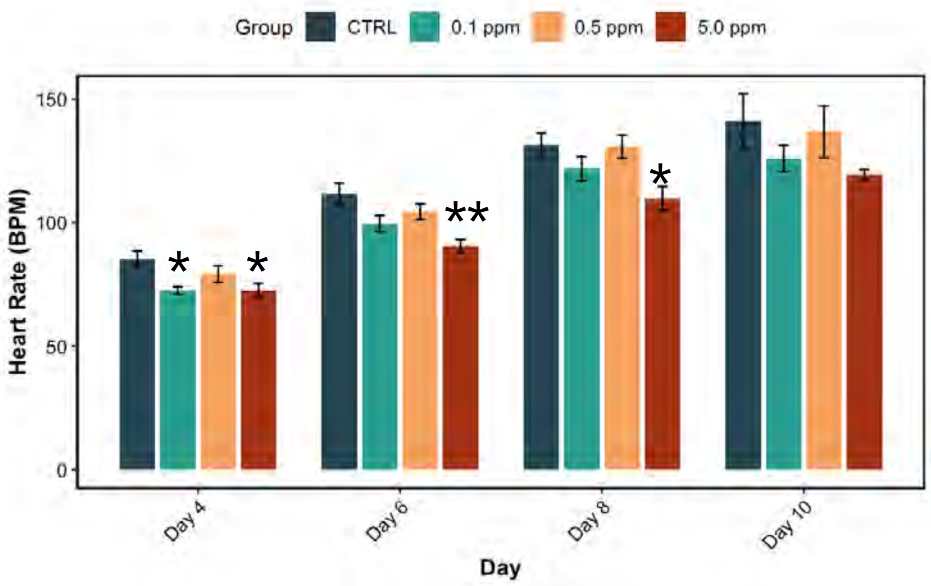


Figure 2. Morphological changes observed in *O. melastigma* larvae exposed to photodegraded polycarbonate (PC) leachate. 1-2: Control; 3-5: 0.1 ppm PC treatment; 6: 5.0 ppm PC treatment. SD: Spinal deformities; JD: Jaw deformities.

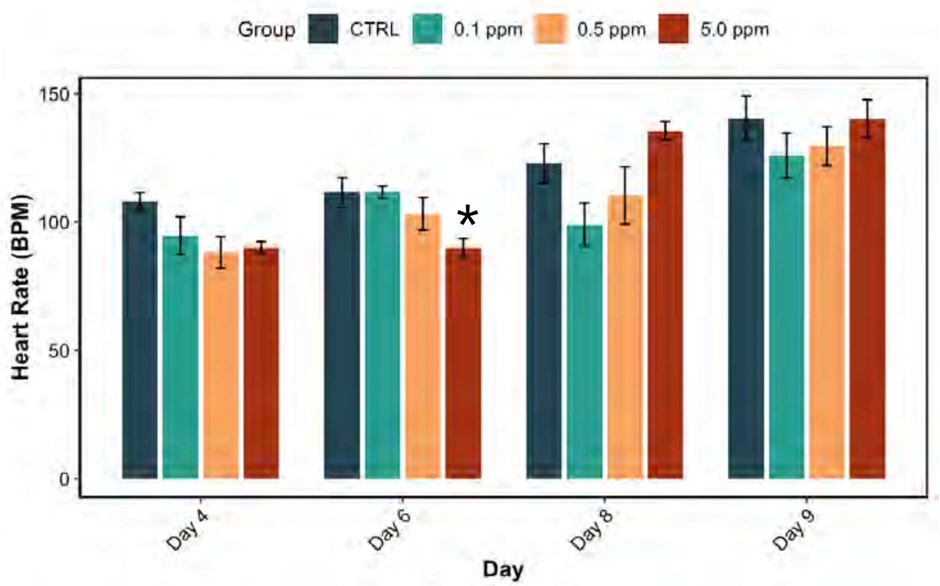
Heart Rates Significantly Lowered During Early Development

Polyethylene Results

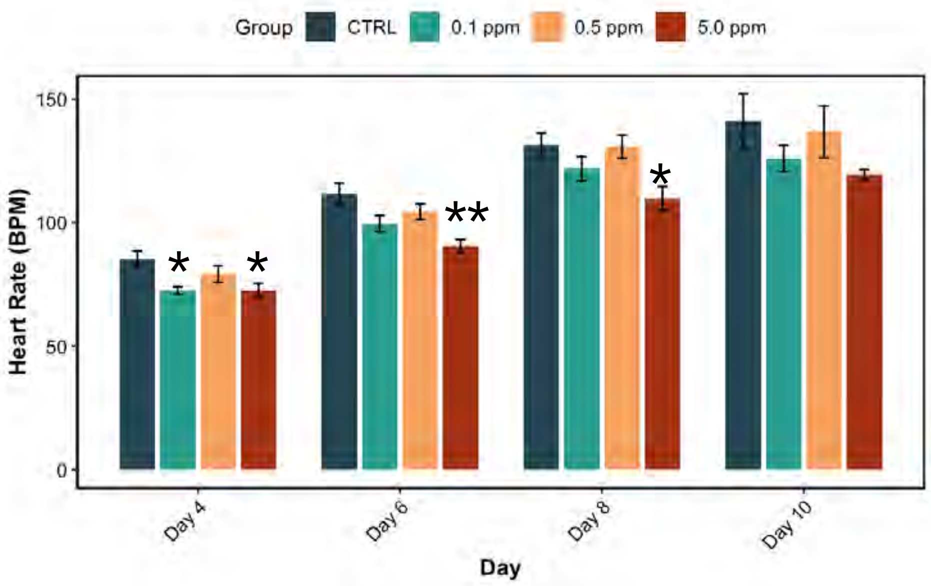


Heart Rates Significantly Lowered During Early Development

Polycarbonate Results

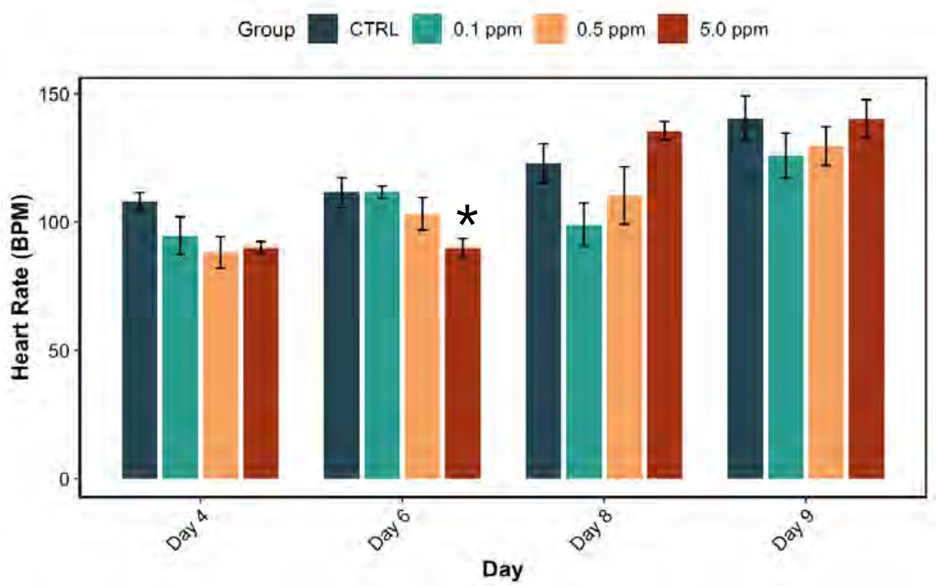


Polyethylene Results

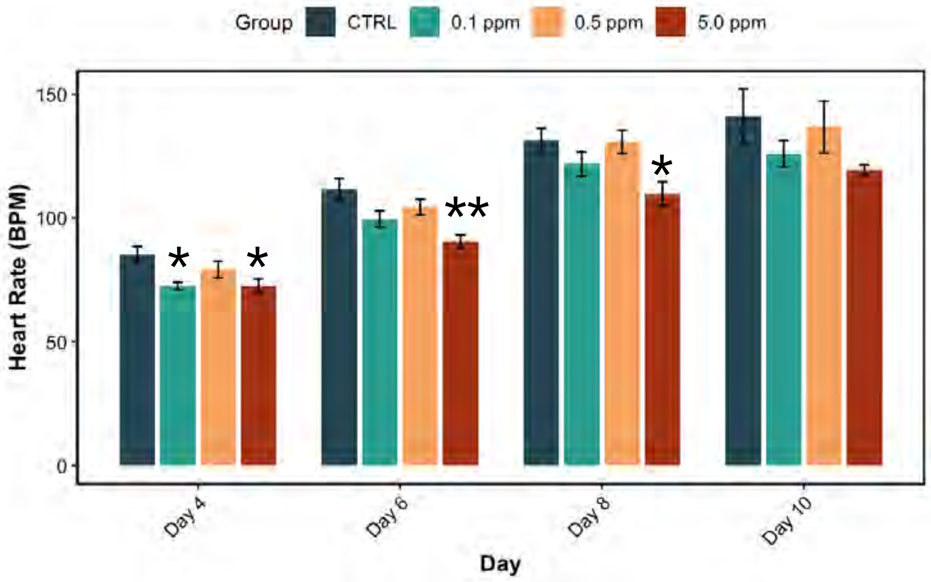


Heart Rates Significantly Lowered During Early Development

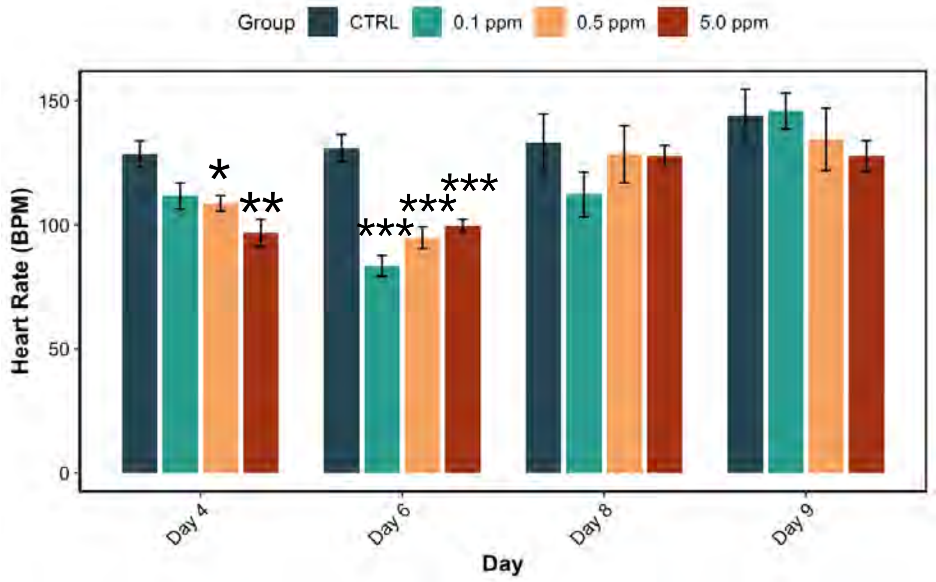
Polycarbonate Results



Polyethylene Results



PET Results



Mortality Rates Increased and Hatching Rates Lowered

- Mortality significantly higher in 0.1 ppm PC treatment group
- Mortality higher in all PC, PE, and PET treatment groups compared to controls
- Hatching rates lower in all treatment groups when compared to controls

Summary of Results

I PC and PET induced developmental deformities, which negatively impacted swimming ability.

II PC, PE, and PET all showed decreased heart rates during early development, potentially indicating oxidative stress.

III Mortality was greater than controls in all treatment groups, and hatching rates were lower than controls, indicating decreased survival rates.

Conclusion

- Photodegraded nurdles may contribute to lower rates of survival and hinder development
- Exposure may induce oxidative stress and impair spinal development, affecting locomotion
- Toxicological assessments of marine medaka provide us with a biological background for how plastic leachates may affect early development
- Next steps will examine these effects on a molecular level

Acknowledgments

Texas A&M University-Corpus Christi

- Dr. Leisha Martin
- Kaitlin Garcia
- Chi Huang
- Dr. Jeffrey Turner
- Dr. Frauke Seemann
- Dr. Wei Xu

University of Texas Marine Science Institute

- Dr. Zhanfei Liu
- Dr. Xiangtao Jiang

Funded By:

- Matagorda Bay Mitigation Trust

TEXAS A&M UNIVERSITY CORPUS CHRISTI

THE UNIVERSITY OF TEXAS MARINE SCIENCE INSTITUTE

MATAGORDA BAY MITIGATION TRUST

Questions?

Contact:
Alissa Richbourg
arichbourg@islander.tamucc.edu

MICROPLASTICS IN GALVESTON ISLAND MARINE ECOSYSTEMS:

A COMPARATIVE ANALYSIS OF TEXAS COLLEGE/UNIVERSITY STUDENTS' ENVIRONMENTAL PERCEPTIONS

Presentation by: Maeryn Rut

Primary Research Question

To what extent does the awareness of microplastic pollution and its impacts in Galveston Island marine ecosystems differ between college students attending Galveston Island and mainland Texas universities?

Primary Research

Project Design

Methodology

- Mixed Method Comparative Case Study
- Demographic: Texas college/university Students
- Self Reported Survey: Likert Scale and Open Ended Questions

Data Collection Process

- Email Professors and college/university student organizations
- Promotional Instagram Account
- In-person campus visits

Revised Research Question

To what extent does proximity to Galveston Island marine ecosystems impact Texas college/university students' awareness of microplastic pollution and its impacts in certain aquatic environments?

Results

1

- 93 responses from 16 different schools
- Texas A&M College Station: 20 responses
- Overall Findings

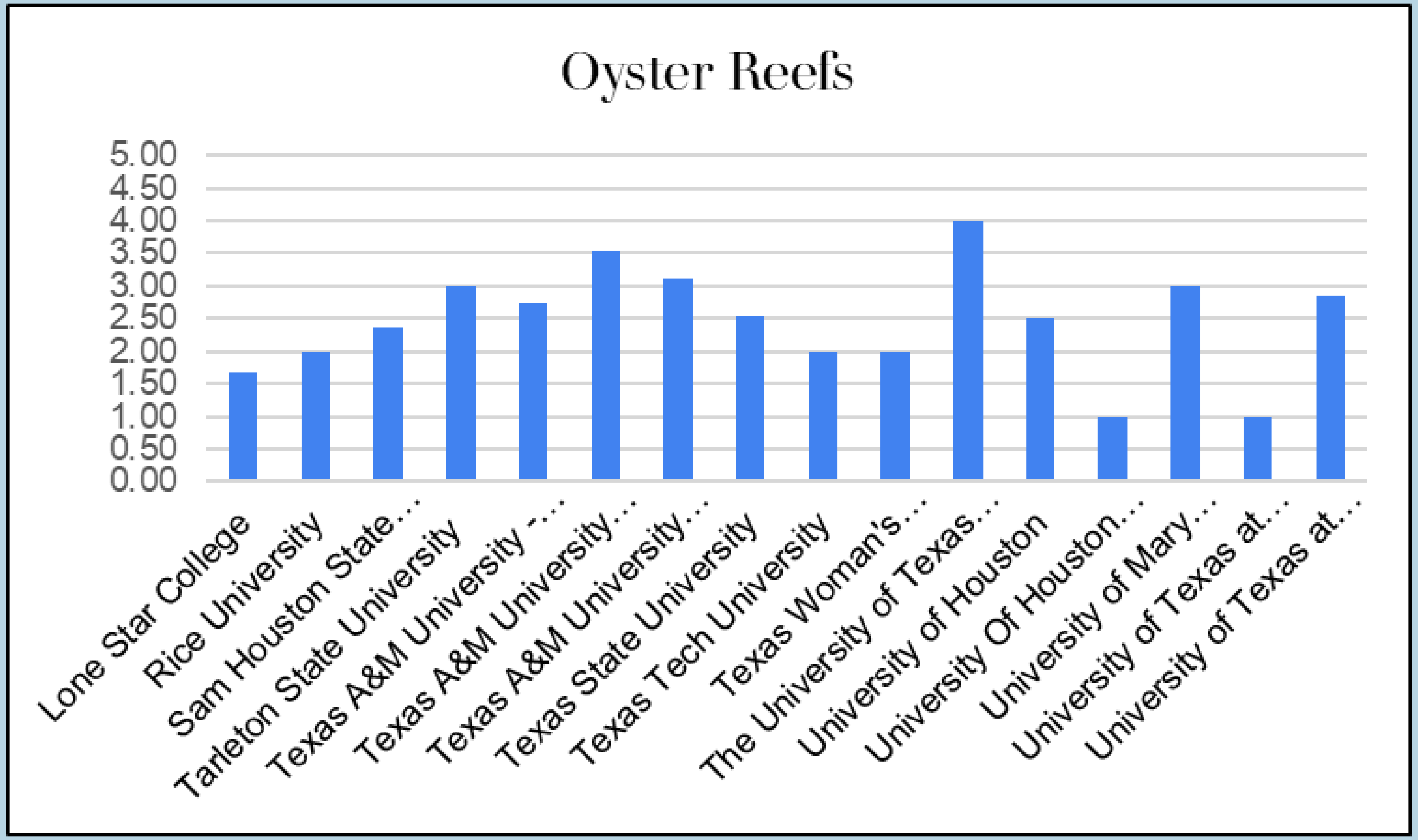
2

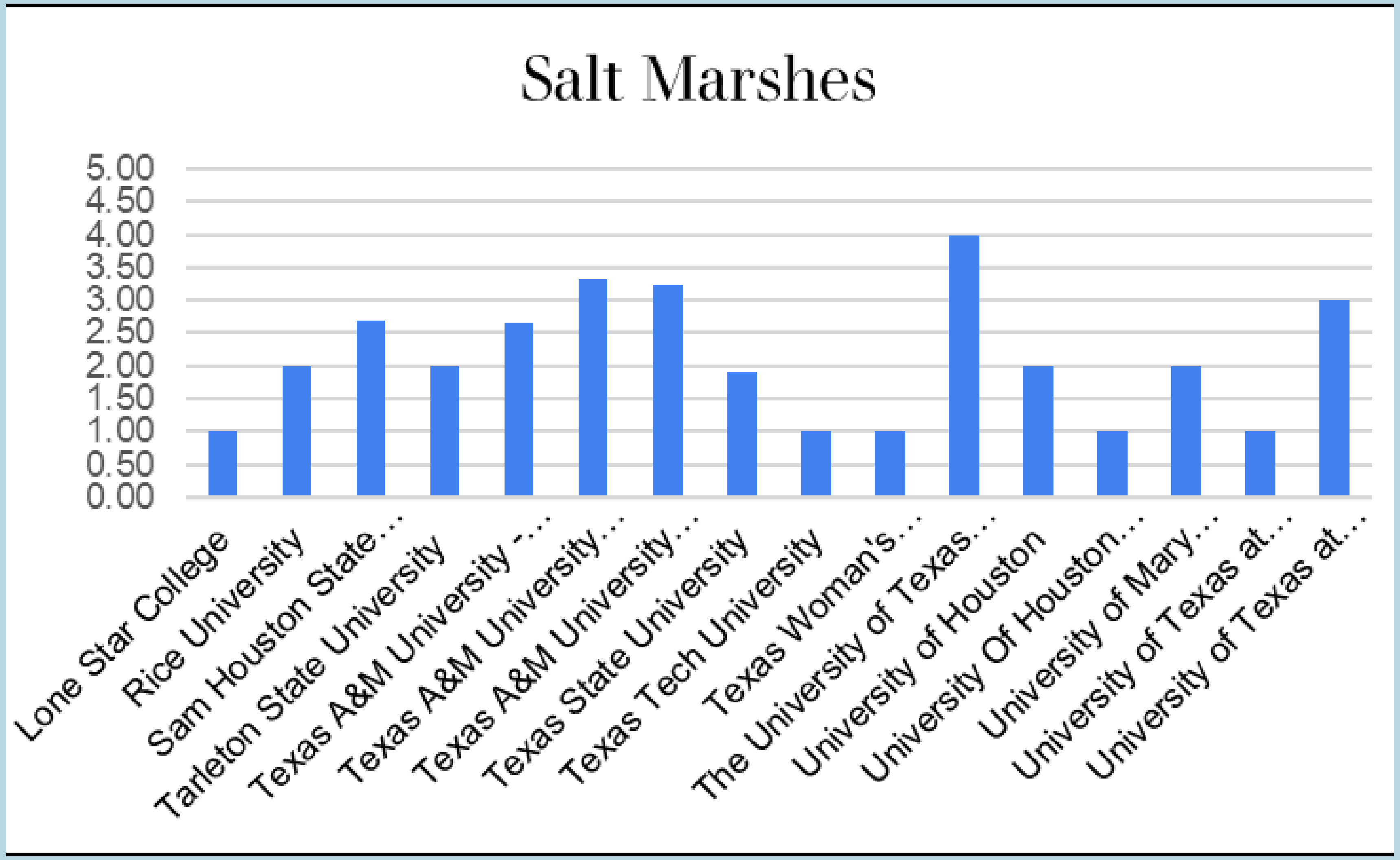
- Oyster reefs and salt marshes less known ecosystems
- Variety of educational backgrounds and experiences presented

School Name	Sample Size
Lone Star College	2
Rice University	1
Sam Houston State University	16
Tarleton State University	1
Texas A&M University - College Station	20
Texas A&M University- Corpus Christi	9
Texas A&M University Galveston	17
Texas State University	11
Texas Tech University	1
Texas Woman's University	1
University of Texas at Austin- Marine Institute	1
University of Houston	1
University Of Houston Clear Lake	1
University of Mary Hardin-Baylor	1
University of Texas at Arlington	1
University of Texas at Austin	8

Please rate how much you are aware of microplastic pollution taking place in each ecosystem/environment in Galveston Island.

School	Distance From Galveston Island (miles)	Oyster Reefs	Salt Marshes	Beaches	Galveston Bay
Lone Star College	95	1.67	1.00	4.00	3.67
Rice University	52	2.00	2.00	3.00	3.00
Sam Houston State University	119	2.38	2.69	4.00	3.94
Tarleton State University	324	3.00	2.00	5.00	5.00
Texas A&M University - College Station	148	2.75	2.65	4.50	3.95
Texas A&M University Corpus Christi	4	3.56	3.33	4.67	3.44
Texas A&M University Galveston	259	3.12	3.24	4.53	4.35
Texas State University	215	2.55	1.91	4.00	3.36
Texas Tech University	585	2.00	1.00	3.00	3.00
Texas Woman's University	315	2.00	1.00	4.00	2.00
The University of Texas at Austin- Marine Institute	162	4.00	4.00	5.00	4.00
University of Houston	50	2.50	2.00	4.00	4.00
University Of Houston Clear Lake	40	1.00	1.00	3.00	3.00
University of Mary Hardin-Baylor	230	3.00	2.00	5.00	5.00
University of Texas at Arlington	300	1.00	1.00	4.00	4.00
University of Texas at Austin	215	2.86	3.00	3.71	2.57
Correlation with Distance:		-0.02	-0.16	-0.07	-0.26


Oyster Reefs
5.00
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
Lone Star College
Rice University
Sam Houston State...
Tarleton State University
Texas A&M University -...
Texas A&M University...
Texas A&M University...
Texas State University
Texas Tech University
Texas Woman's...
The University of Texas...
University of Houston
University Of Houston...
University of Mary...
University of Texas at...
University of Texas at...


Salt Marshes
5.00
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4.00
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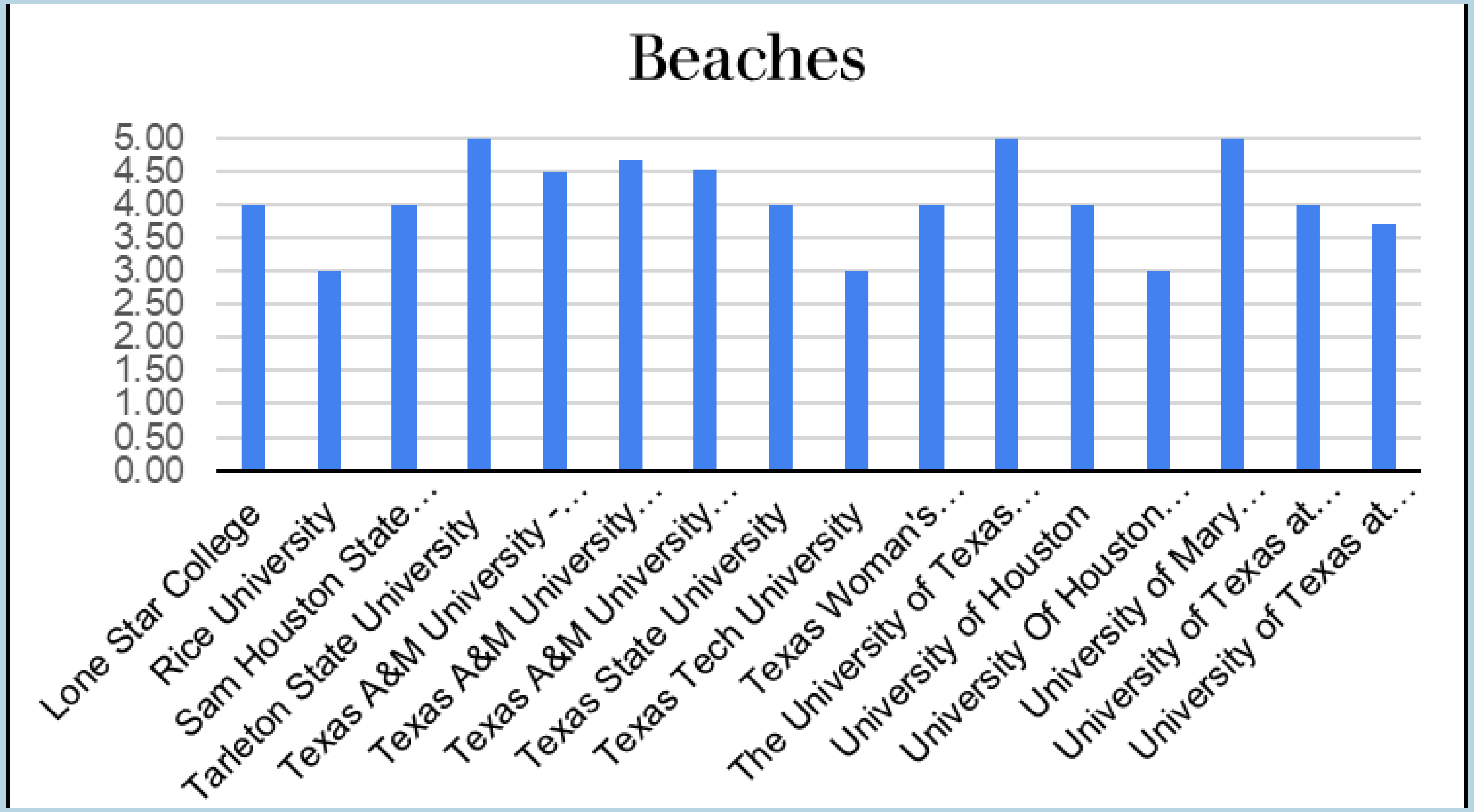
3.00
2.50
2.00
1.50
1.00
0.50
0.00
Lone Star College
Rice University
Sam Houston State...
Tarleton State University
Texas A&M University -...
Texas A&M University...
Texas A&M University...
Texas State University
Texas Tech University
Texas Woman's...
The University of Texas...
University of Houston
University Of Houston...
University of Mary...
University of Texas at...
University of Texas at...


Beaches
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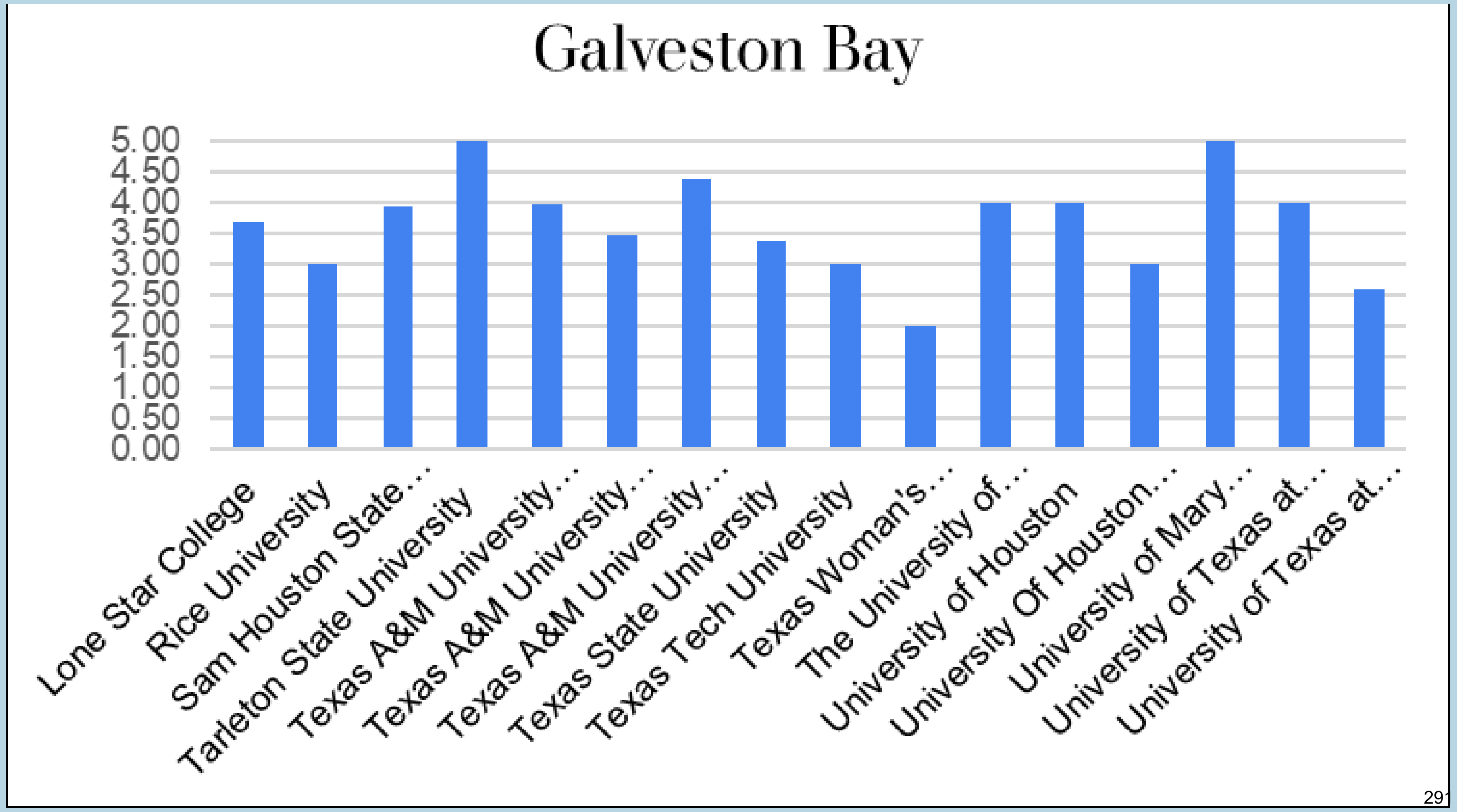
Lone Star College
Rice University
Sam Houston State...
Tarleton State University
Texas A&M University -...
Texas A&M University...
Texas A&M University...
Texas State University
Texas Tech University
Texas Woman's...
The University of Texas...
University of Houston
University Of Houston...
University of Mary...
University of Texas at...
University of Texas at...


Galveston Bay
5.00
4.50
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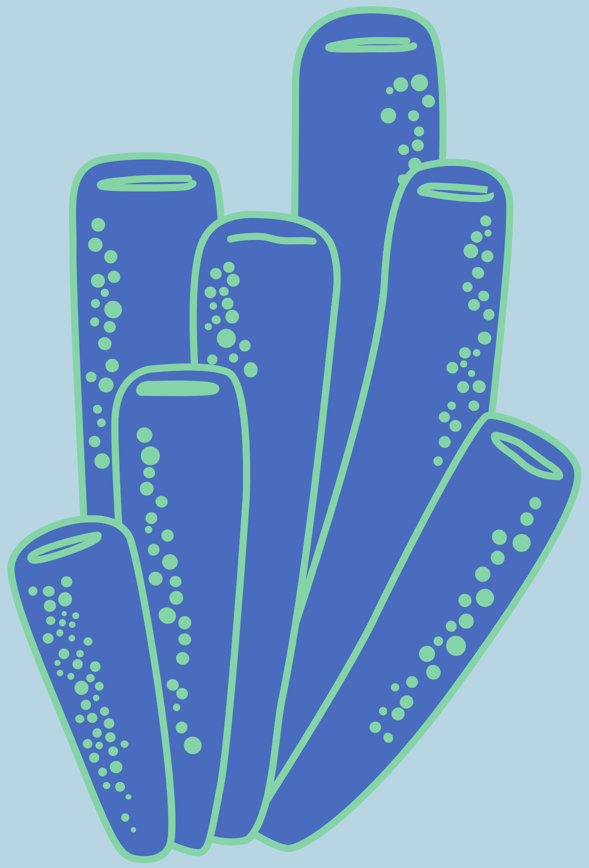
2.50
2.00
1.50
1.00
0.50
0.00
Lone Star College
Rice University
Sam Houston State...
Tarleton State University
Texas A&M University...
Texas A&M University...
Texas A&M University...
Texas State University
Texas Tech University
Texas Woman's...
The University of...
University of Houston
University Of Houston...
University of Mary...
University of Texas at...
University of Texas at...

Previous Knowledge	
Number of Responses	General Perception
26	Very little or limited knowledge
22	Basic understanding; somewhat aware
45	Knowledgeable

Attitudes	
Number of Responses	General Perception
14	Not very concerned
56	Concern/awareness, but no action
23	Very concerned and/or provided solutions

Galveston Experience	
Number of Responses	General Perception
23	No experience or no answer
35	Poor experience
19	Neutral
16	Great experience; often frequent visitor



Qualitative Data

1

Discussion

- Importance of environmentally conscious behavior
- Project Limitations: unequal sample sizes, factor exclusion

2

Future Directions

- Implication of public awareness of microplastic pollution
- Microplastic research knowledge gap

Thank You!

email: maerynrut.research@gmail.com

Beach Heroes Program

by Brandi Keller

County Extension Agent - Coastal & Marine Resources ~ Galveston County

Sea Grant TEXAS AT TEXAS A&M UNIVERSITY

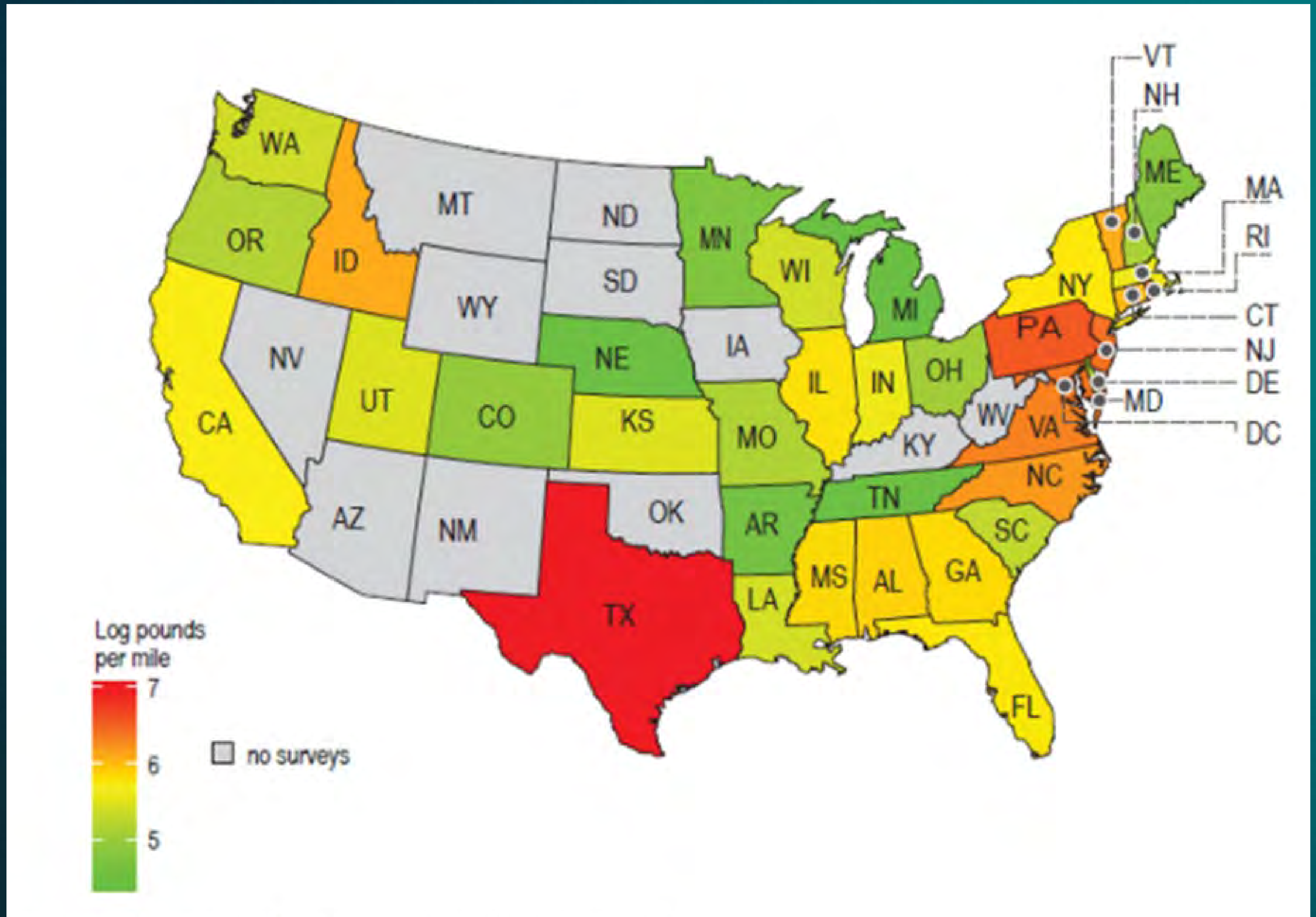
TEXAS A&M AGRILIFE EXTENSION


2023
BEACH HEROES
CHILDREN COMBATTING PLASTIC POLLUTION
Presented by Galveston Bay Area Chapter Texas Master Naturalist
GALVESTON ART WALK
Artwork to be displayed at:
Art Walk | January 13 from 6–9 PM
The Grand 1894 Opera House in Edna's Room
Free Admission!
Check out the Beach Hero Winners!
Clean the Ocean Please
The Grand
1st PLACE


Be a Beach hero
2023 Galveston Beach Hero
Oppe Elementary
Keep Galveston Clean
2023 Galveston Beach Hero
Keily Mendoza
Oppe Elementary
Thank you for sharing your artistic talent; you are a true beach hero!
2023 Galveston Beach Hero
Rollin
Oppe Elementary
2023 Galveston Beach Hero
Brijah Smith
Oppe Elementary
2023 Galveston Beach Hero
Oppe Elementary
2023 Galveston Beach Hero
Jane Goldberg
Oppe Elementary
Thank you for sharing your artistic talent; you are a true beach hero!
BE A BEACH HERO!
2023 Galveston Beach Hero
G. Lonfid
Oppe Elementary
Thank you for sharing your artistic talent; you are a true beach hero!
Save the turtles!
2023 Galveston Beach Hero
Kylar Frazier
Oppe Elementary
Thank you for sharing your artistic talent; you are a true beach hero!
Keep Galveston Clean
2023 Galveston Beach Hero
Oppe Elementary
2023 Galveston Beach Hero
Oppe Elementary
adida


EXIT
JayLynn
Rosa
Bryce
Lily
Gabriel
Marley
Nico
Renata
Darwin
Edison

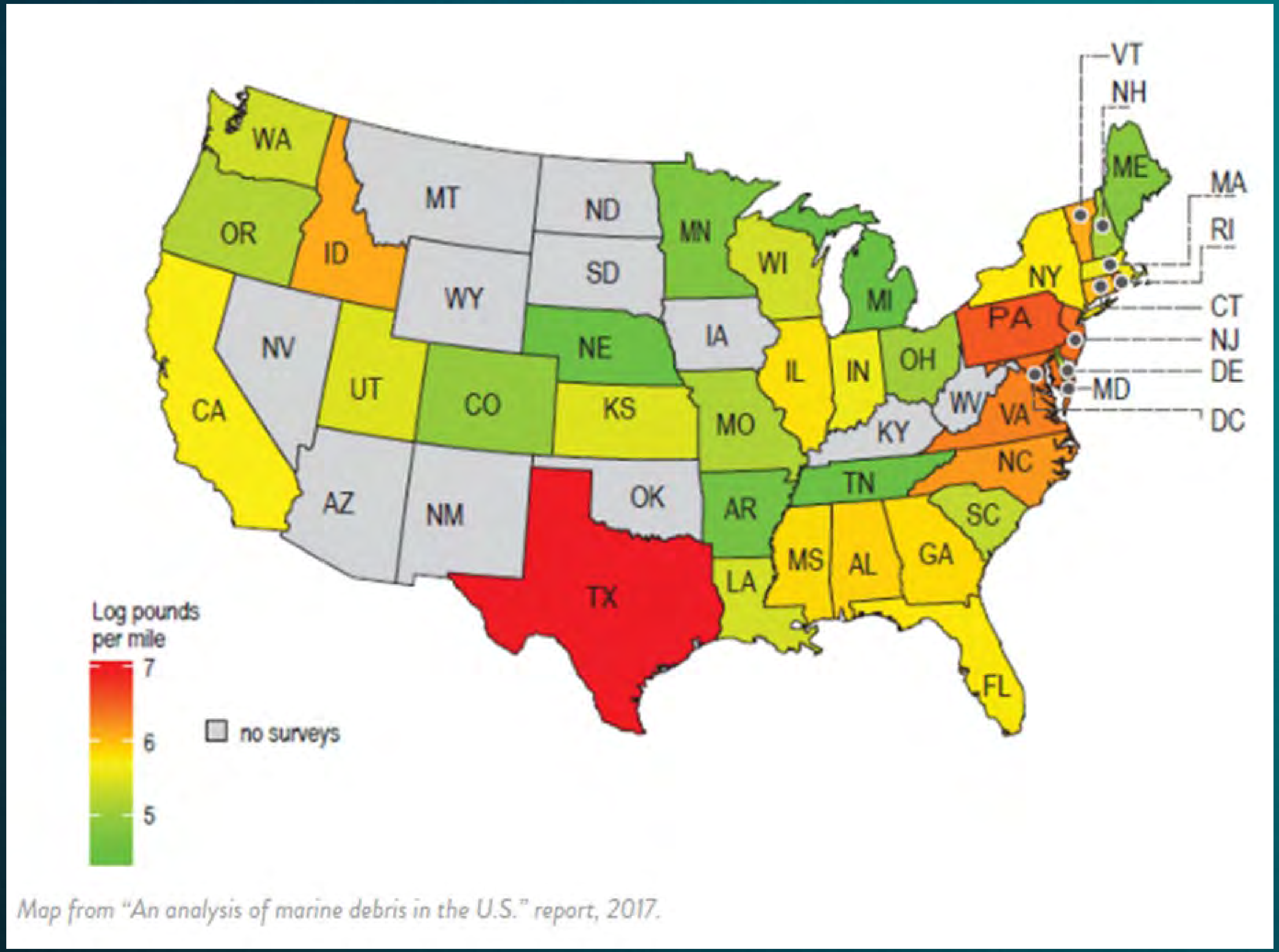
Plastic Pollution on the Texas Coast



Map from "An analysis of marine debris in the U.S." report, 2017.

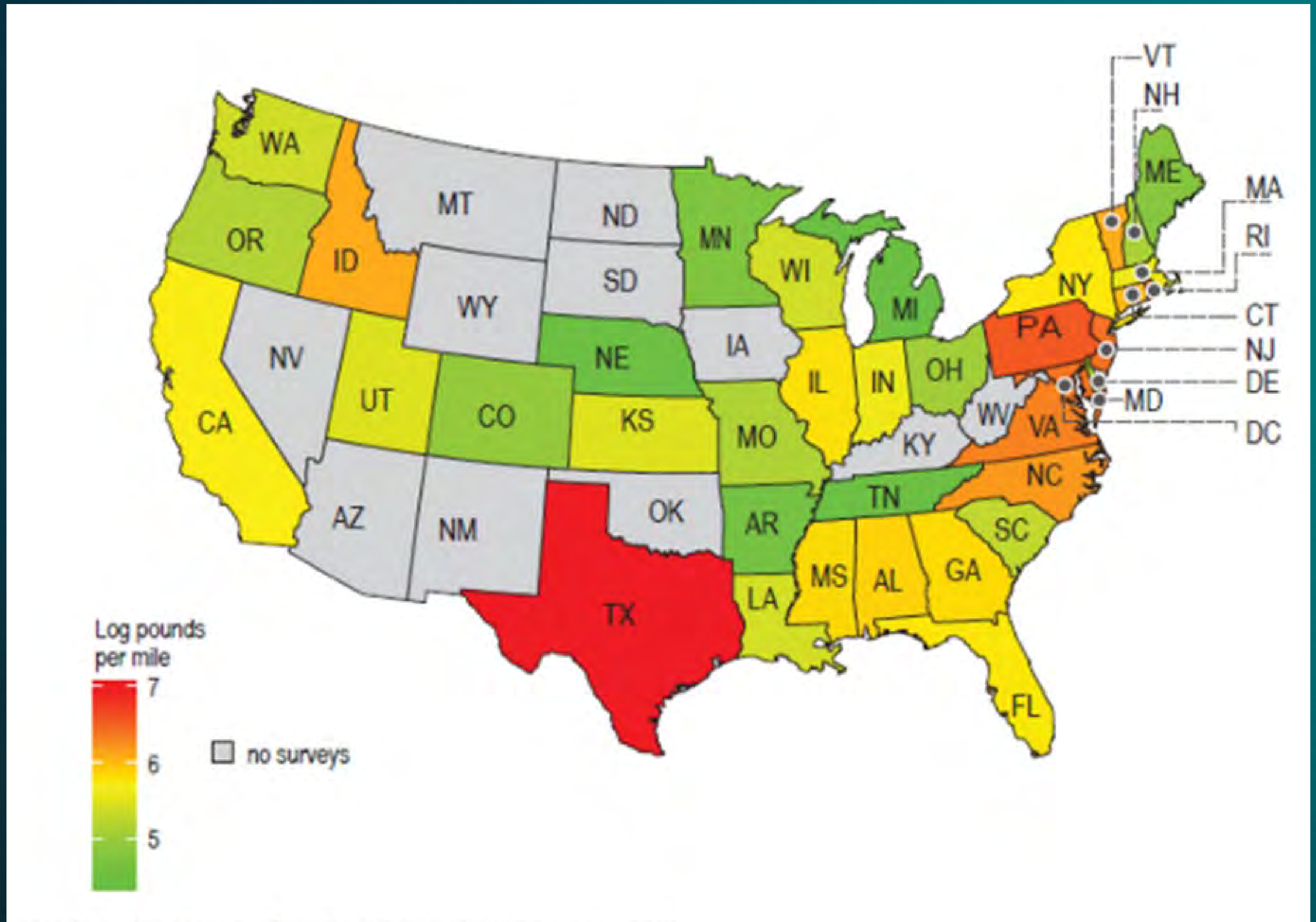
Statewide debris load based on ICC data after correcting for sampling bias. Values represent the average weight of debris per mile for all debris surveys across each state."Accumulation and distribution of marine debris on barrier islands across the northern Gulf of Mexico" Swanson, K., Wessel, C., Weatherall, T., & Cebrian, J. (2019, November).

- Texas has the highest average weight of trash debris per mile surveyed of any state in the nation, according to a report from the National Oceanic and Atmospheric Administration (NOAA) and Ocean Conservancy.



Statewide debris load based on ICC data after correcting for sampling bias. Values represent the average weight of debris per mile for all debris surveys across each state."Accumulation and distribution of marine debris on barrier islands across the northern Gulf of Mexico" Swanson, K., Wessel, C., Weatherall, T., & Cebrian, J. (2019, November).

- Texas has the highest average weight of trash debris per mile surveyed of any state in the nation, according to a report from the National Oceanic and Atmospheric Administration (NOAA) and Ocean Conservancy.
- Trash accumulates on the Texas coast ten times faster than it does on the coasts of other Gulf states



Map from "An analysis of marine debris in the U.S." report, 2017.

Statewide debris load based on ICC data after correcting for sampling bias. Values represent the average weight of debris per mile for all debris surveys across each state."Accumulation and distribution of marine debris on barrier islands across the northern Gulf of Mexico" Swanson, K., Wessel, C., Weatherall, T., & Cebrian, J. (2019, November).

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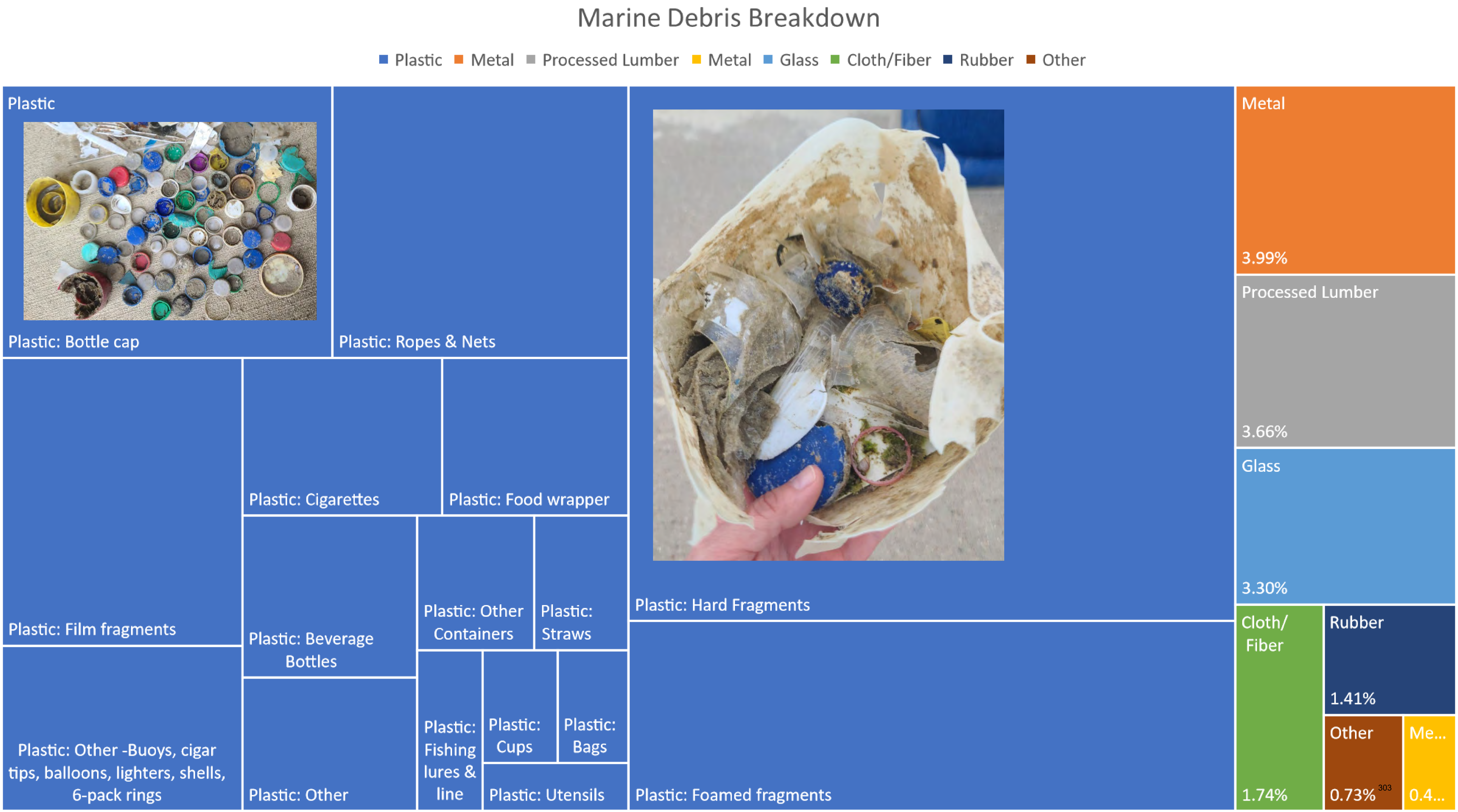
- Significant increase of accumulation in spring and summer


Marine Debris Breakdown
Plastic
Metal
Processed Lumber
Metal
Glass
Cloth/Fiber
Rubber
Other
Plastic
Plastic: Bottle cap
Plastic: Ropes & Nets
Plastic: Hard Fragments
Plastic: Film fragments
Plastic: Cigarettes
Plastic: Food wrapper
Plastic: Beverage Bottles
Plastic: Other Containers
Plastic: Straws
Plastic: Other -Buoys, cigar tips, balloons, lighters, shells, 6-pack rings
Plastic: Other
Plastic: Fishing lures & line
Plastic: Cups
Plastic: Bags
Plastic: Utensils
Plastic: Foamed fragments
Metal
3.99%
Processed Lumber
3.66%
Glass
3.30%
Cloth/ Fiber
1.74%
Rubber
1.41%
Other
0.73%
Me...
0.4...

Beach Hero Program

Beach Hero Program

Providing a positive opportunity for grade school children to artistically depict their commitment to combating plastic pollution. By teaching children, we hope they will in turn teach their families and friends.

- Message: combat plastic pollution - marine debris, sea turtles, monofilament recycling
- Engage students to share commitments and actions
- Art supplies donated to schools to create a piece displaying their commitment.
- Exhibits at schools and event spaces (Grand Opera House)

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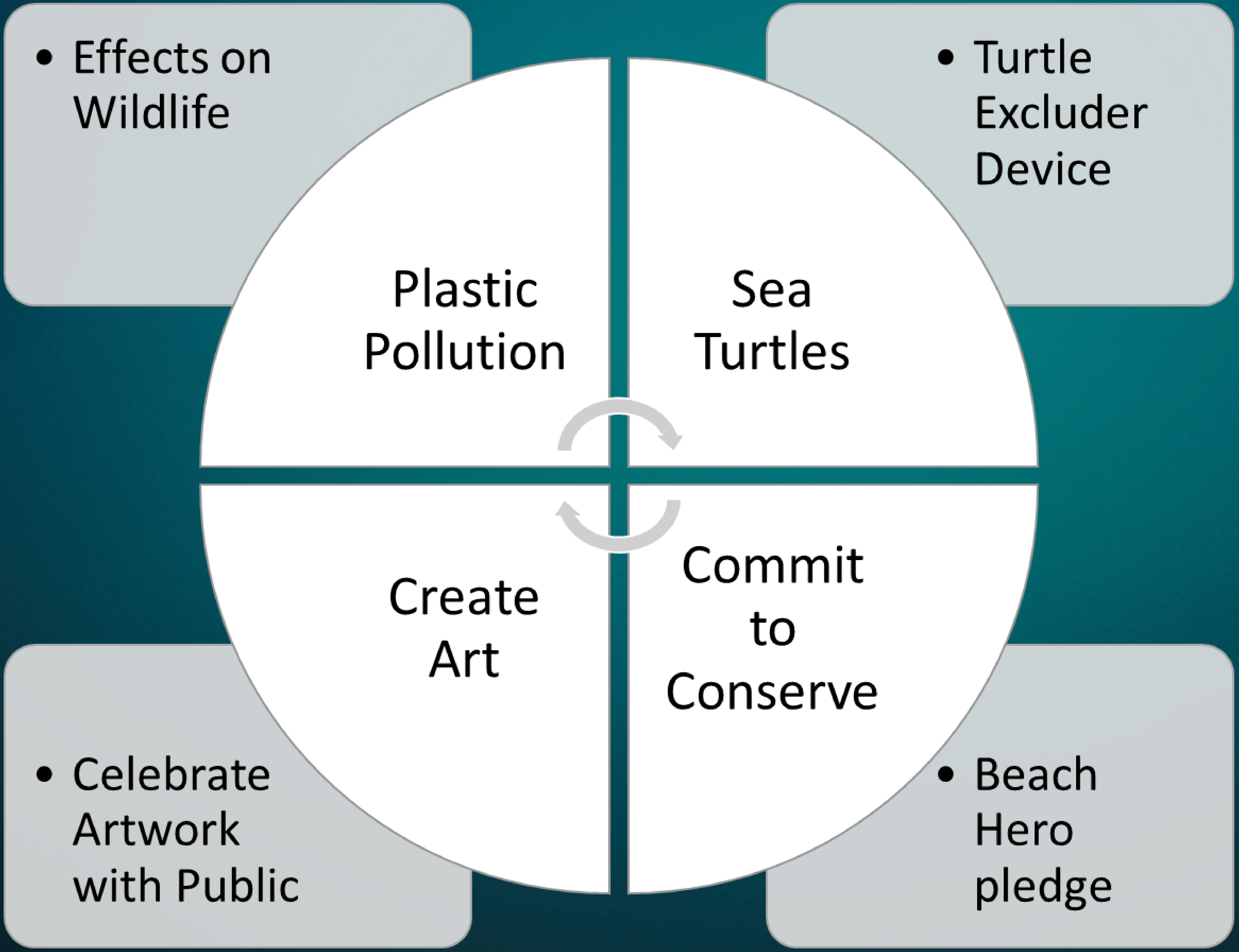
Volunteers + Science + Art =



Effects on Wildlife
Turtle Excluder Device
Plastic Pollution
Sea Turtles
Create Art
Commit to Conserve
Celebrate Artwork with Public
Beach Hero pledge

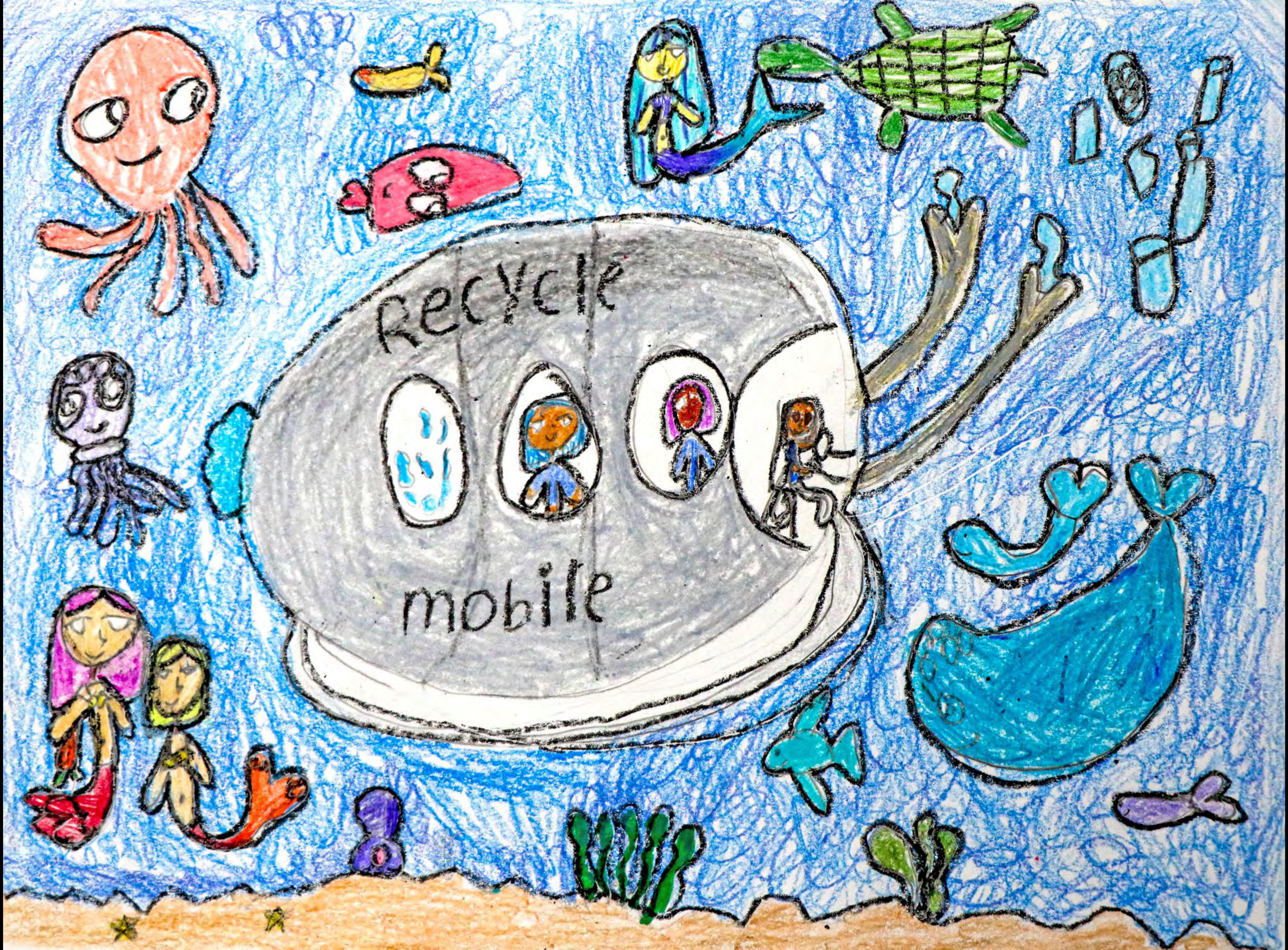
Galveston Bay Area
Master Naturalists

Program Activities

Art Exhibit


2nd PLACE
USE THE CAN MAN!
TRASH CAN!

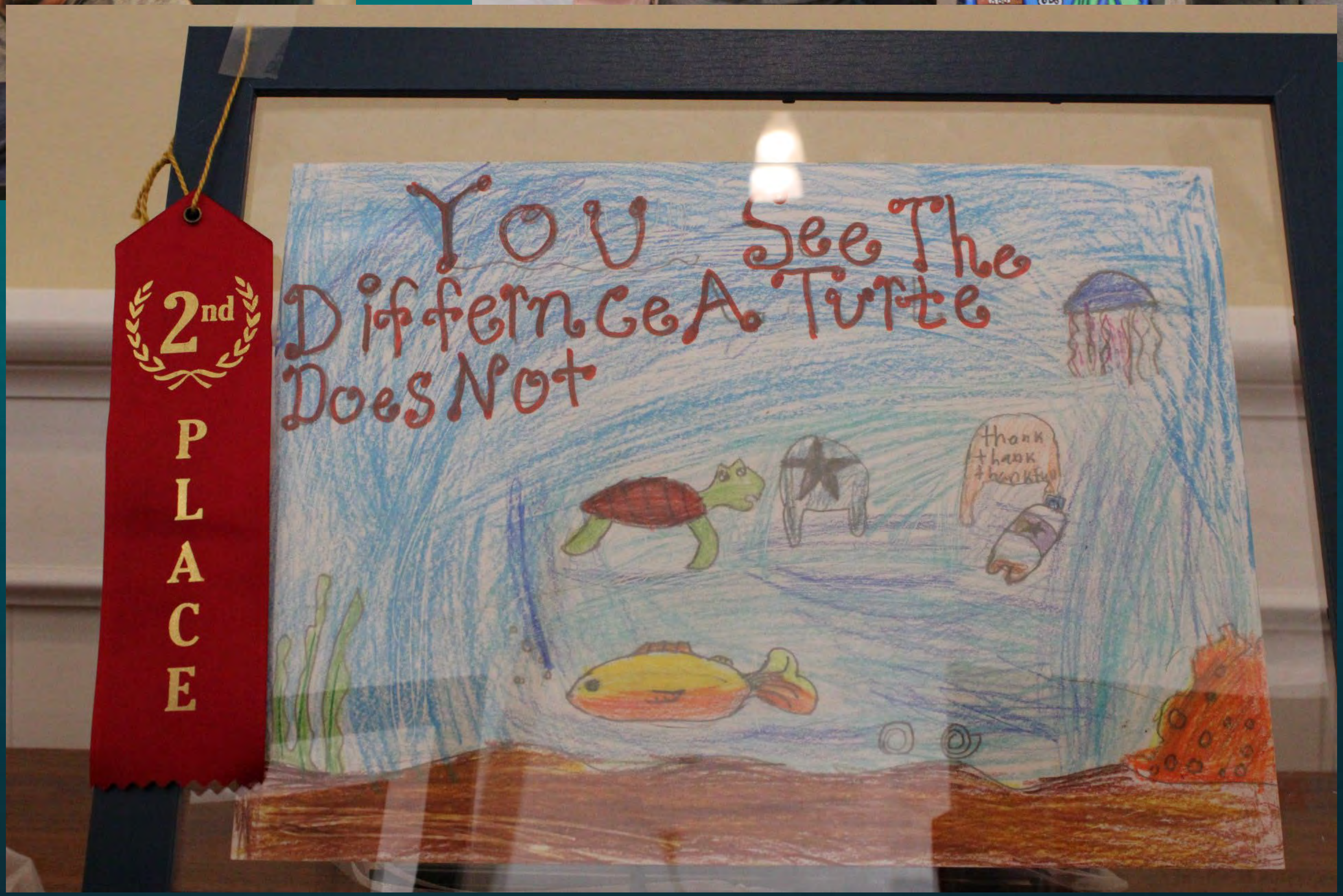

PARKER
1st PLACE
1st PLACE
Water is Life


Recycle
mobile


!Be A Beach Hero!
Be a HERO!
Please keep the oceans clean you'll be a HERO!
181


Stop pollution-ing.
Hel
Be a Beach Hero!
No pollution zone!
888

If we live You live
Save our ocean!


2nd PLACE
YOU See The
DiffernceA Turte
DoesNot

AT A GLANCE

2
SCHOOLS
2018

5
SCHOOLS
2024

YOUTH PROGRAM
ATTENDEES
2675

Brandi Keller

Texas A&M AgriLife Extension
Galveston County

BRANDI.KELLER@AG.TAMU.EDU

Sea Grant Texas
AT TEXAS A&M UNIVERSITY

Texas A&M AgriLife Extension

04 APRIL 2025

The University of Texas at Austin

BIOPROSPECTING PLASTIC POLLUTION SOLUTIONS

TXPPS 2025

DR. KASIA DINKELOO
Research Educator- Freshman Research Initiative- Bioprospecting Stream, The University of Texas at Austin

The Freshman Research Initiative (FRI) at the University of Texas at Austin

- Unique program aimed at involving College of Natural Science students with research from the moment they step on to campus
- 32 different "streams" pursue novel research in STEM fields
- Freshmen join their stream in the spring semester, and can elect to stay involved with the research as a student or peer mentor for the duration of their college career

How do scientists decide what to study?

- *“Needs-based innovation”*
- What problems exist in the world? Where am I most prepared to be of service?

Our Bioprospecting Lab

- **Plastic pollution and degradation is a central theme of our curriculum and research**
- Our goal is add tools to the toolkit: plastic-degrading enzymes
- **Student research currently focuses on two main areas**:
  - Bioprospecting for plastic-degrading microbes/enzymes from **nurdles**
  - Bioprospecting for plastic-degrading microbes/enzymes from the gut of **plastic-eating superworms**

The “Nurdlers”

- Students who collect and study the microbes that inhabit **nurdles**- small pre-production plastic pellets that are a persistent source of pollution along the gulf shores

Nurdles = Unique Opportunity

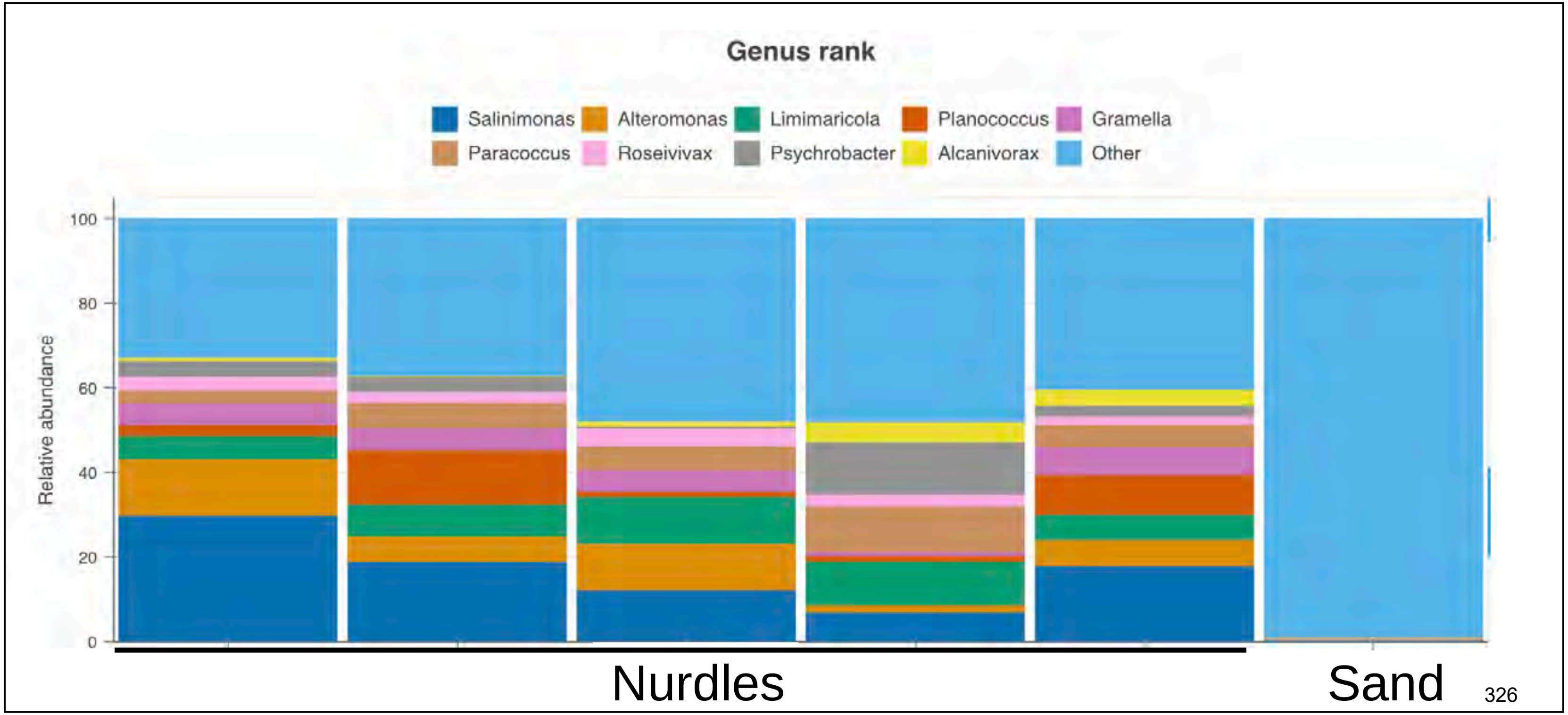
- Widely distributed in the environment
- Often composed of a single polymer
- Often free from additives

Nurdles end up being a “great” experiment to collect environmental microbes that might degrade plastic polymers.

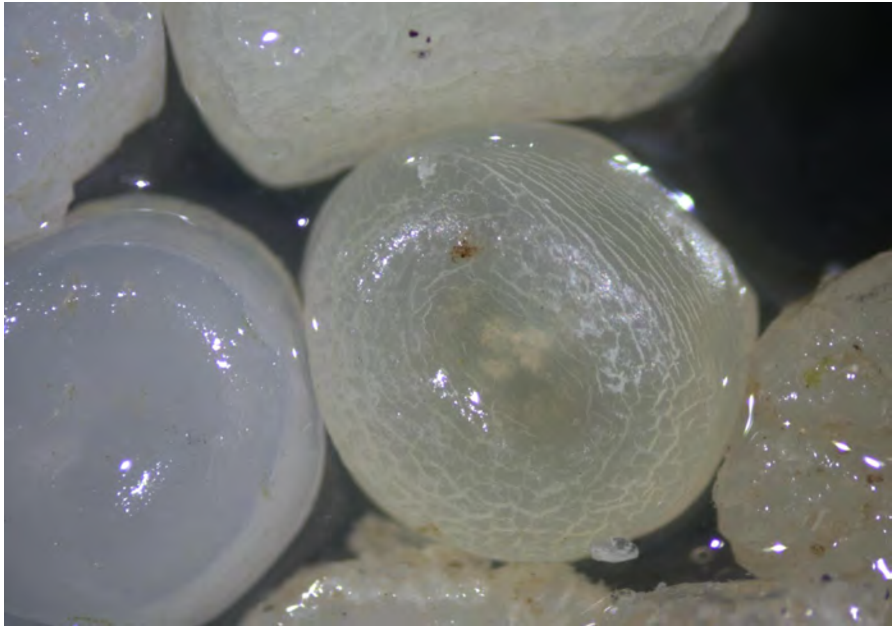
The “Nurdleome”

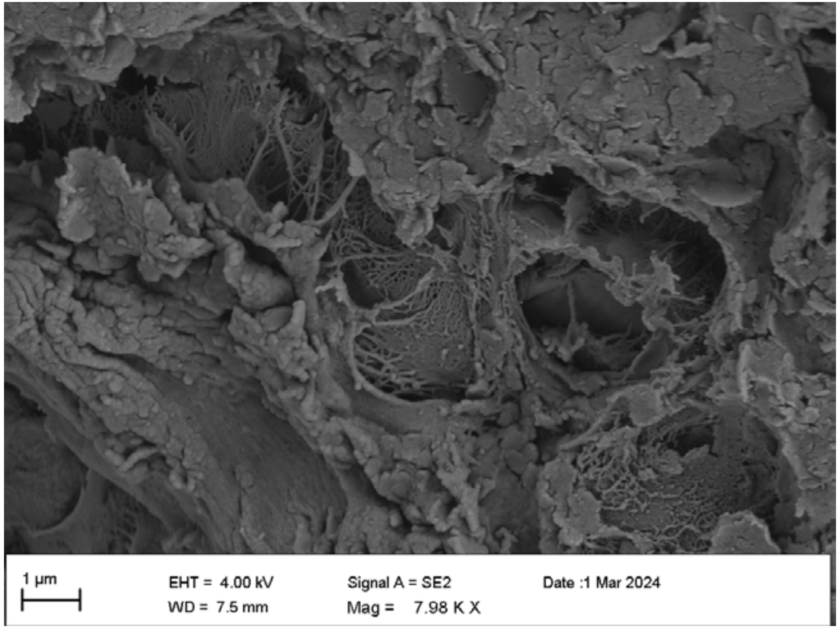
- The microbes found on nurdles may vary greatly depending on location, season, polymer, weathering, etc.
- We isolated microbial DNA directly from the surface of coastal nurdles for **metagenomic sequencing**

Metagenomic Sequencing of Nurdles



See Vibha's poster for more!





Selective cultures yielded *Pseudomonas, Halomonas, Bulkholderia*, and other species. We've still got work to do!

See Vibha's poster for more!

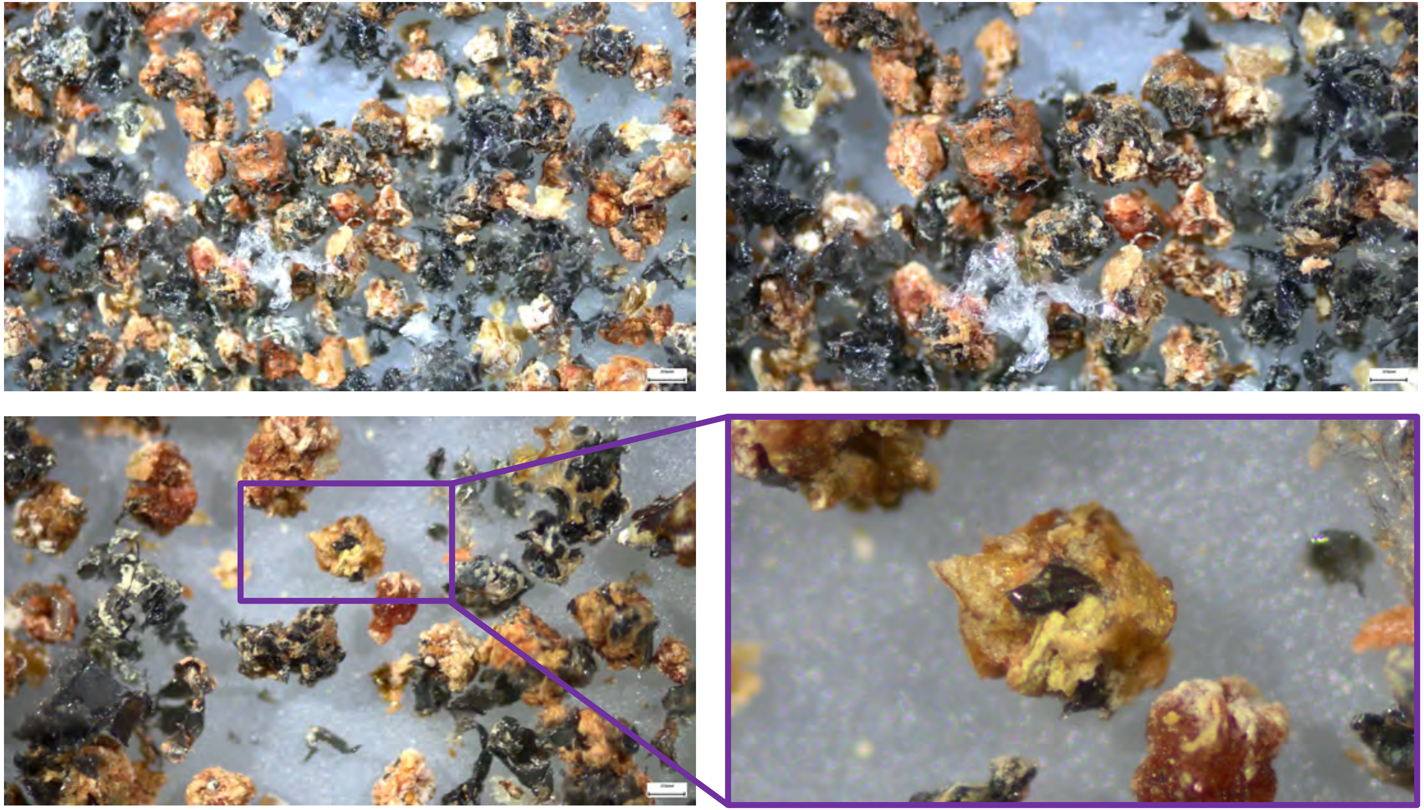
We use Superworms to bioprospect for plastic-degrading microbes

- It has been shown that several species of beetle/moth larvae can happily ingest and break-down Styrofoam, seemingly without adverse effect

- We are using superworms, *Zophobas morio*, to study their gut microbiome's response to different plastic polymers that the worm ingests

Superworms will eat anything!

(well, *almost* anything)

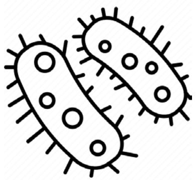


Worm frass containing plastic particles

DNA

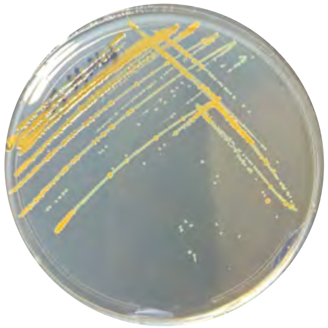
Microbiome Sequencing

Worms eat plastic

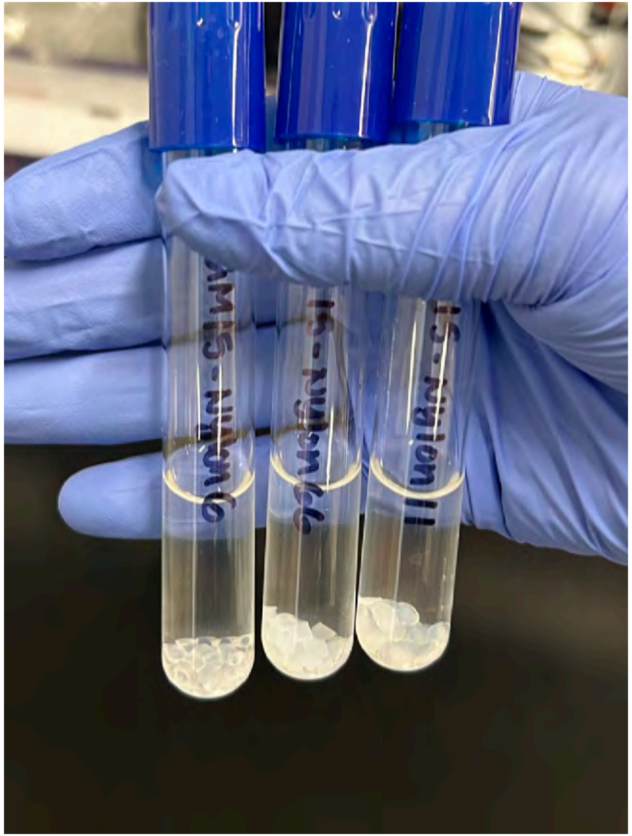


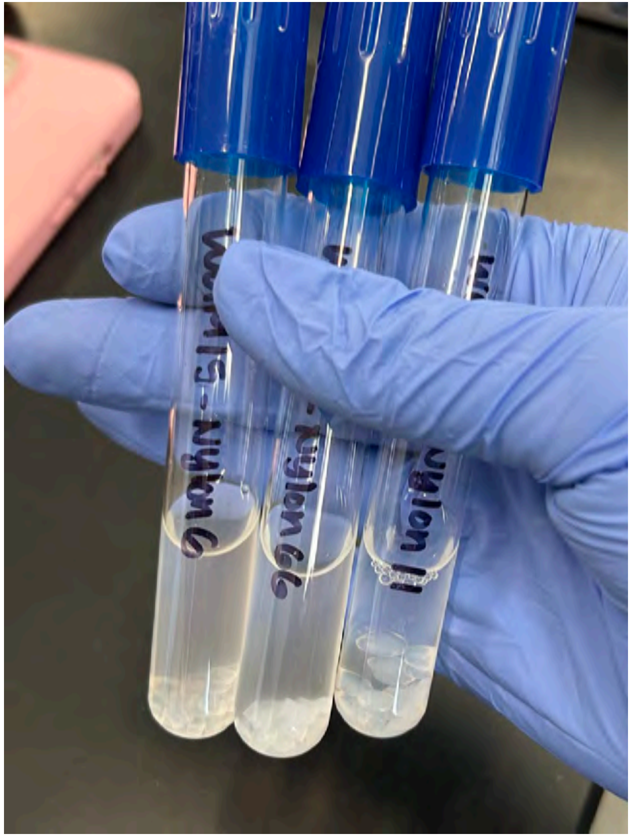
Microbes

Plastic Cultures

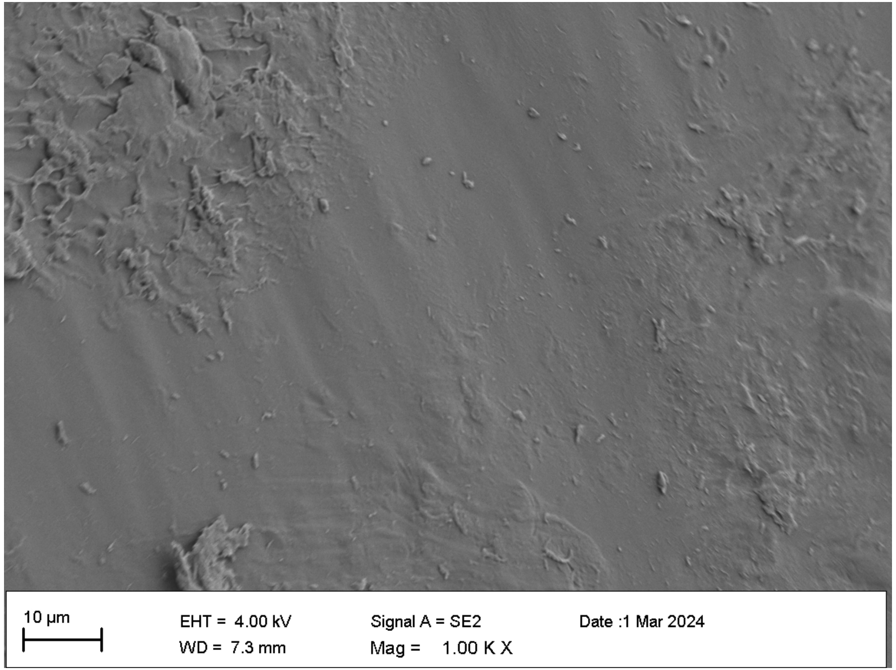


Isolate plastic-degraders
for further analysis

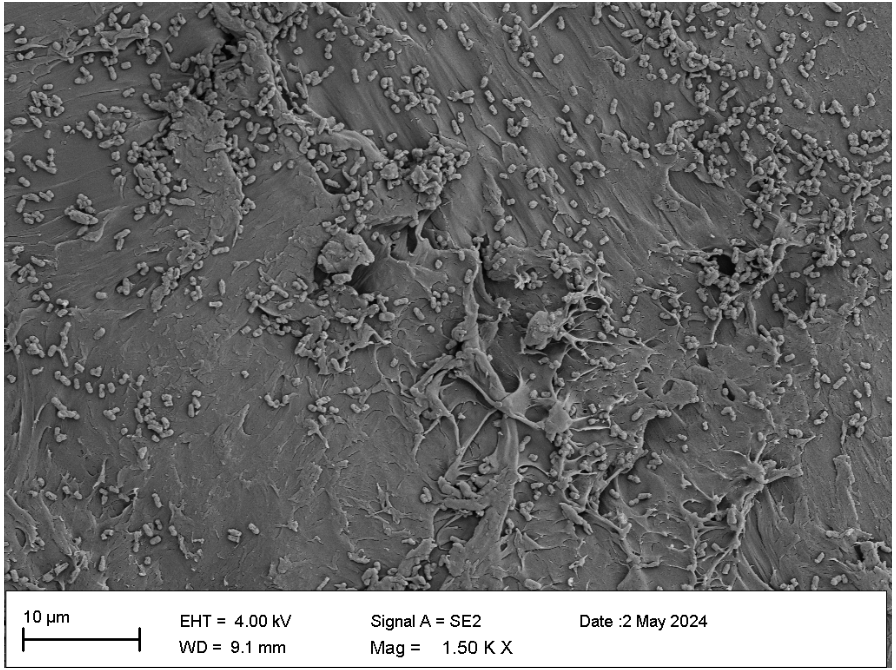




Isolated microbe growing on plastic



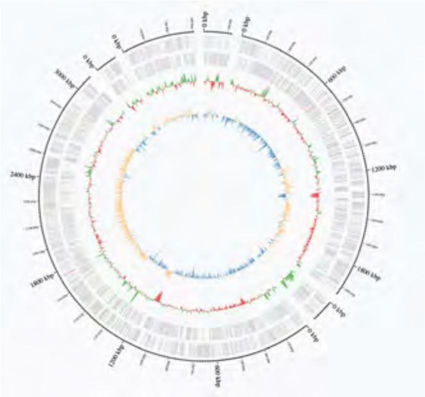
Polystyrene Pellet, Negative Control



Polystyrene Pellet, treated with *Citrobacter*

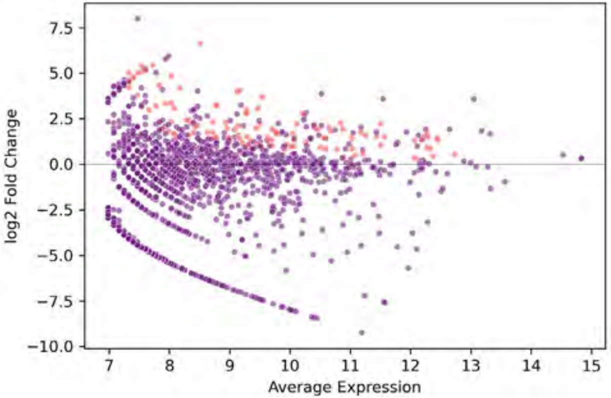
Isolated microbe growing on plastic

What happens next?



Whole-genome sequencing!

Many more growth trials!



Proteomics!

RNA sequencing

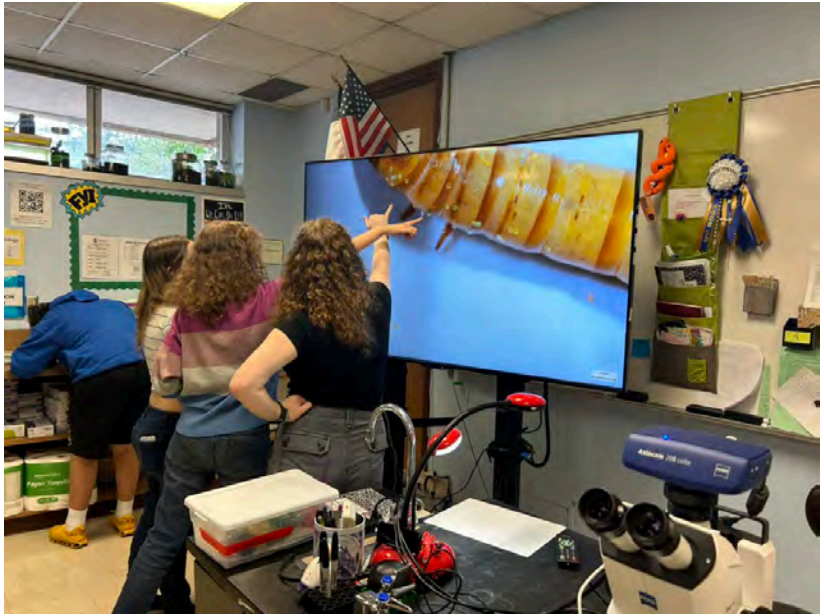
Enzyme Candidates!

More testing!

Studying Plastic Degradation in TX High Schools

- Using superworms and plastic pollution/ degradation as a theme for conversations about biotech, experimental design, and sequencing

Studying Plastic Degradation in TX High Schools



- Students set up worm kits with chosen plastics, observe worm behavior and plastic consumption, and then collect worm frass for DNA extraction and sequencing
- So far, we have collaborated with over 300 students!

The **Bioprospecting Stream** at the University of Texas at Austin

- Large group of high school, undergraduate, and graduate researchers working to find useful products from nature
- Very interested in plastic pollution and degradation
- Working to culture plastic-degrading microbes from nurdles and gut microbiomes, and characterize plastic-degrading enzymes to help combat plastic pollution

The University of Texas at Austin
Freshman Research Initiative
College of Natural Sciences

BRACKENRIDGE FIELD LABORATORY
THE UNIVERSITY OF TEXAS AT AUSTIN

NURDLE PATROL.org

Our Texas Our Future
H-E-B

HABITABLE

Buildings' Hidden Plastic Problem

REDUCING PLASTIC POLLUTION IN BUILDING AND CONSTRUCTION

April 3, 2025

Ryan Johnson, Senior Researcher

Habitable’s Goal: Improve Health

Eliminate **pollution**
from our environments

Tackle **climate change**
from every angle

Design with **equity**
in mind

2.5 trillion square feet of new construction by **2060**

Pop Quiz!

Pop Quiz

Which of these product(s) found in the built environment contains plastics?

1. Interior paint
2. Carpet tile
3. Luxury vinyl tile
4. XPS insulation

Pop Quiz

Which of these product(s) found in the built environment contains plastics?

~20%	~75%
Interior paint	Carpet tile
~20%	~90%
Luxury vinyl tile	XPS insulation

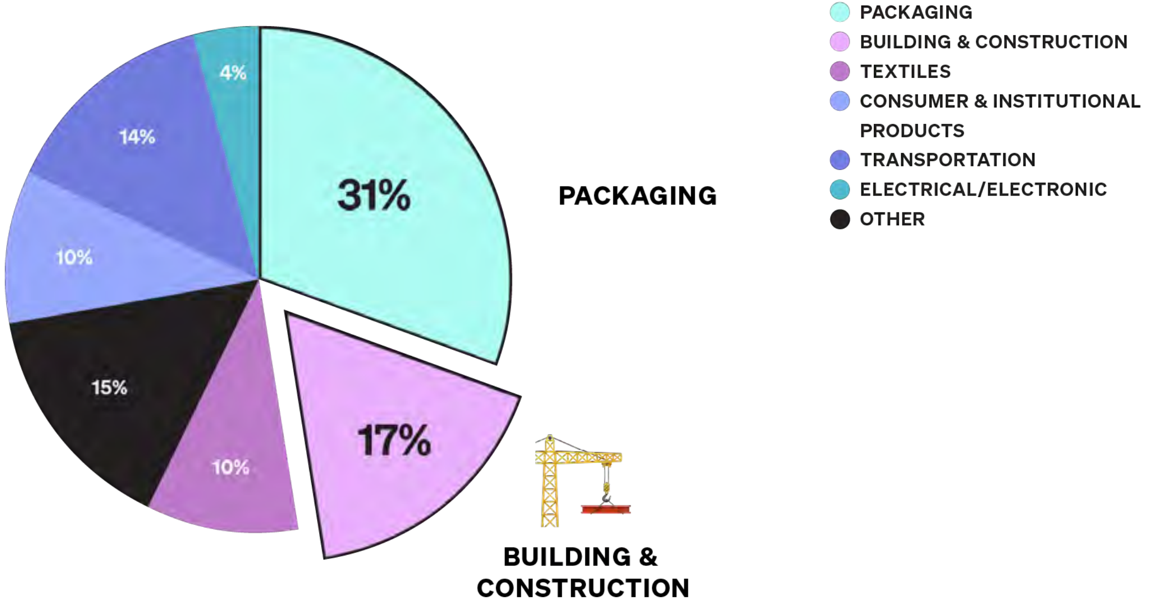
…and many more!!

Built Environment's Role in Plastic Production

Source: OECD "Plastics Use By Application, 2022"

Building materials are one of the top uses of petrochemicals, including plastics

Together, these two sectors account for almost half of global plastic production.

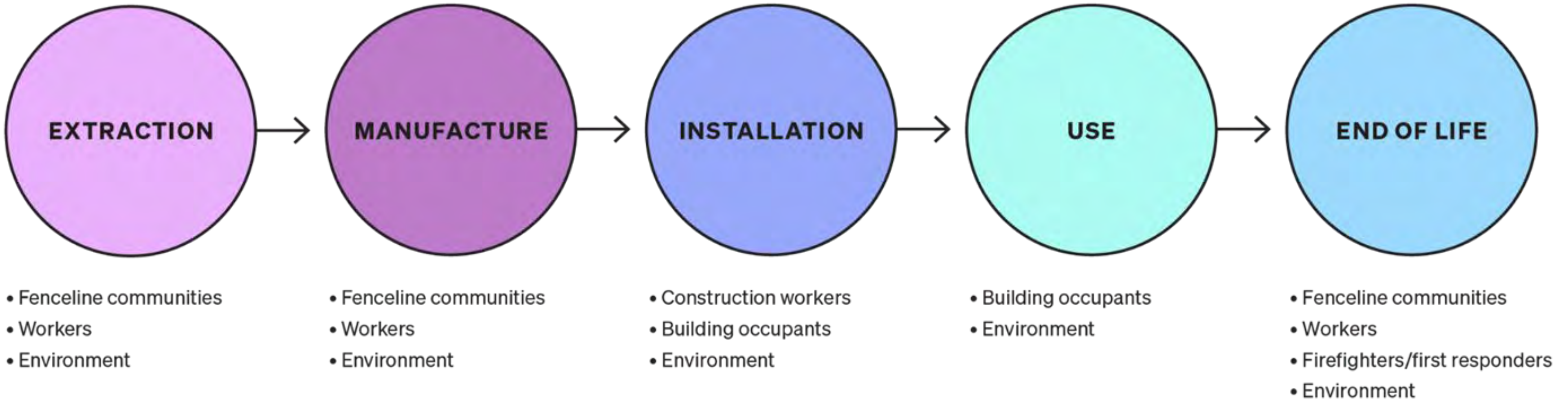


PLASTIC PRODUCTION BY SECTOR

Defining Plastic Pollution

Includes the negative effects and emissions resulting from the production and consumption of plastic materials and products across their entire life cycle.

Building Material Life Cycle Impacts



Some Microplastics Stats

- Construction foam accounts for 51% of foam in Lake Ontario surface waters and 58% of foam on Lake Ontario beaches (Gao et al., 2023)
- Almost 18% of all microplastics in oceans and waterways are estimated to come from architectural paint (Paruta et al. 2022)

Sources
Gao et al. *ACS EST Water* 2023 https://doi.org/10.1021/acsestwater.2c00628.

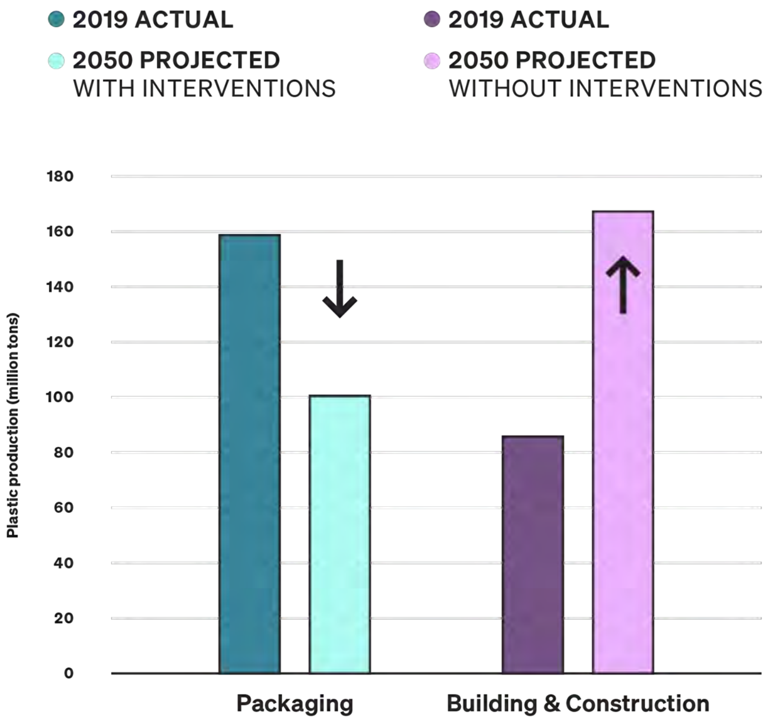
Paruta et al. 2022 https://www.e-a.earth/wp-content/uploads/2023/07/plastic-paint-the-environment.pdf

Replacing One Plastic Problem With Another

Source: Habitable, Buildings' Hidden Plastic Problem

Global projections reveal that the built environment could outstrip packaging in its demand for plastics.

Without intervention, plastic production for use in construction will nearly double by 2050.

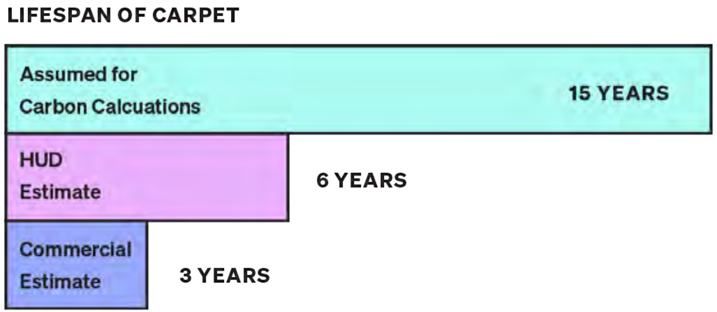


Case Study: Carpet

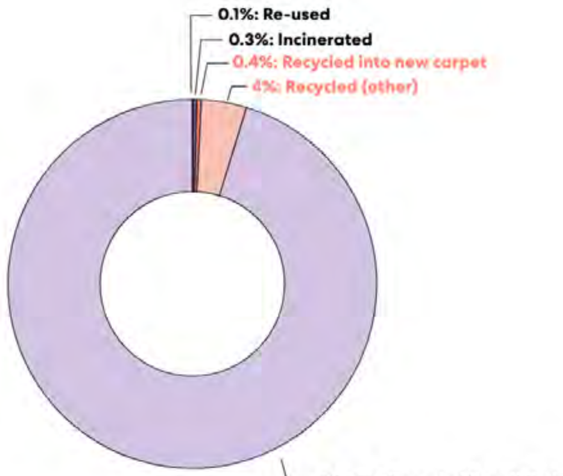
“Single-use” Nature of Plastic Building Products

Source: Leveraging the Built Environment to Move Beyond Petrochemicals, 13

Embodied carbon calculations for carpet products assume a service life of 15 years. In reality, carpet often doesn’t last half that long.



Only 0.45% of discarded carpet is recycled into new carpet.



Source: Buildings’ Hidden Plastic Problem

Building Products Create Plastic Waste

A Solvable Problem

NO/LOW-PLASTIC
BUILDING MATERIAL ALTERNATIVES

PRODUCT CATEGORY	MATERIALS WITH NO/LOW-PLASTIC CONTENT	
FLOORING	Linoleum Ceramic tile Wood	
INSULATION	Mineral Wool Cellulose Wood fiber	Fiberglass Hemp
PAINT	Mineral silicate Lime	
PIPES	Copper Iron	Concrete Steel
SIDING/CLADDING	Brick Stone Wood	Fiber cement Stucco

Informed™ Ranking

Flooring

Prefer	Linoleum
	Solid Wood Floor (pre finished)
	Concrete (no finish/accessories or only densifier without PFAS)
	Ceramic Tiles (no added lead)*
	Solid Wood Floors (site-finished)
	Cork Floors (pre-finished)
	PVC-free Resilient Flooring
	Engineered Wood Floors (pre-finished)
Reduce	Rubber or Rubber/Cork Floors (made without tire-derived crumb rubber)
	Laminate
	Carpet (with no fly ash, no vinyl or polyurethane backing, and no PFAS)
	Engineered Wood Floors (site-finished)
Avoid	Vinyl Floors (no phthalates or hazardous recycled content)
	Rubber or Rubber/Cork Floors (made with tire-deri
	Carpet (containing fly ash, vinyl or polyurethane
	Vinyl Floors (containing phthalates, hazardous stabilizers, and haz… content)

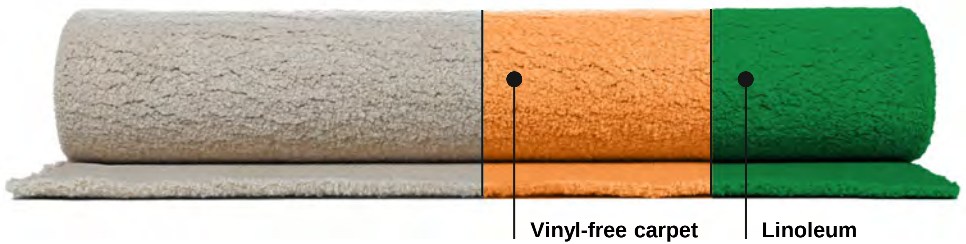
Plastic Flooring

353

Story of Impact: Office Buildings

Let's imagine that **half of the carpet in US office buildings** was switched from vinyl to linoleum, and the remaining half of carpet was vinyl-free.

ILLUSTRATIVE EXAMPLE OF CARPET IN US OFFICE BUILDINGS



Over 50 years this would avoid:

~130m
tons CO2e

~20m
tons of plastic waste

~45,000
train cars worth of flammable, carcinogenic vinyl chloride

US office building stock is estimated to be 15 billion sf.

Assuming 83% of flooring sq ft is currently carpet (half of this carpet is tile and half broadloom)

Assuming starting carpet tile is backed with vinyl and teams move to carpet tile without vinyl. Assuming broadloom is not vinyl backed. Vinyl in carpet tile is 11% of the total carpet weight.

Assuming carpet tile is 70% plastic, broadloom is 62% plastic and linoleum is 0.5% plastic.

Building emissions accounting for materials calculator using BEAM average emissions for carpet and linoleum(BEAM Beta).

What Do These Numbers Mean?

Source: https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator#results; https://toxicfreefuture.org/research/toxic-cargo/key-findings/

33

Coal plants offline for one year

50%

Total plastic waste generated in the US in one year

45,000

Rail cars full of vinyl chloride out of our communities

Download the Reports

Download the fact sheet

Download the policy brief

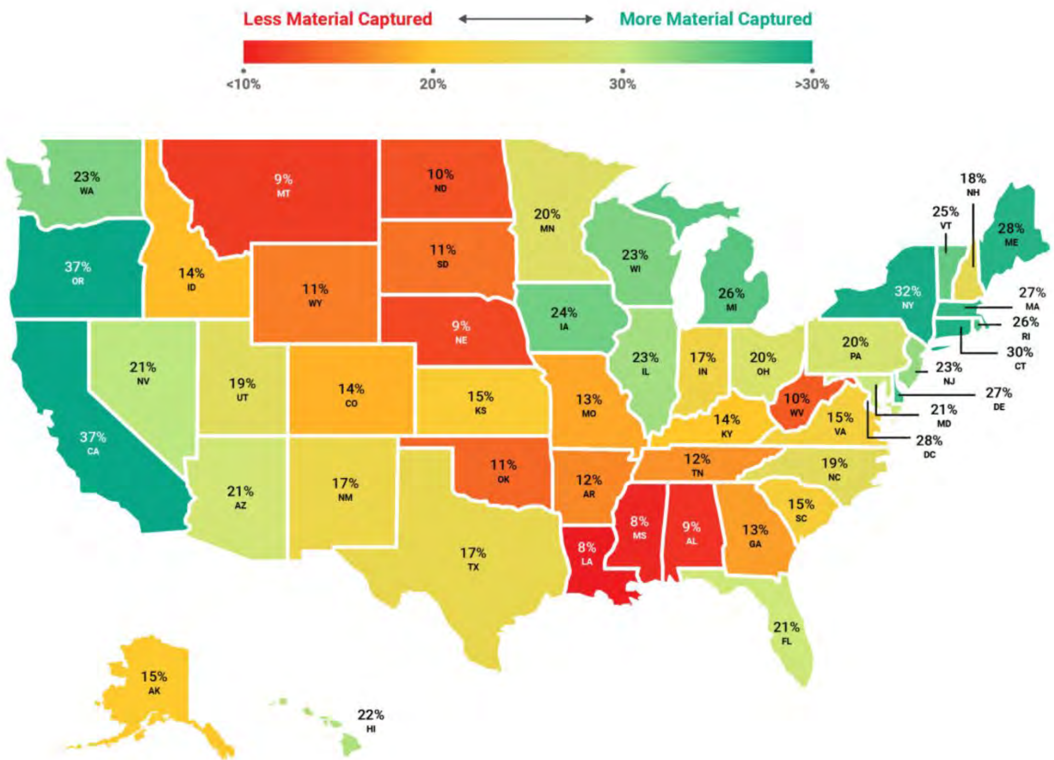
Thank you.

Ryan Johnson, CPH, LEED Green Associate
rjohnson@habitablefuture.org

We know there is a problem, now what?

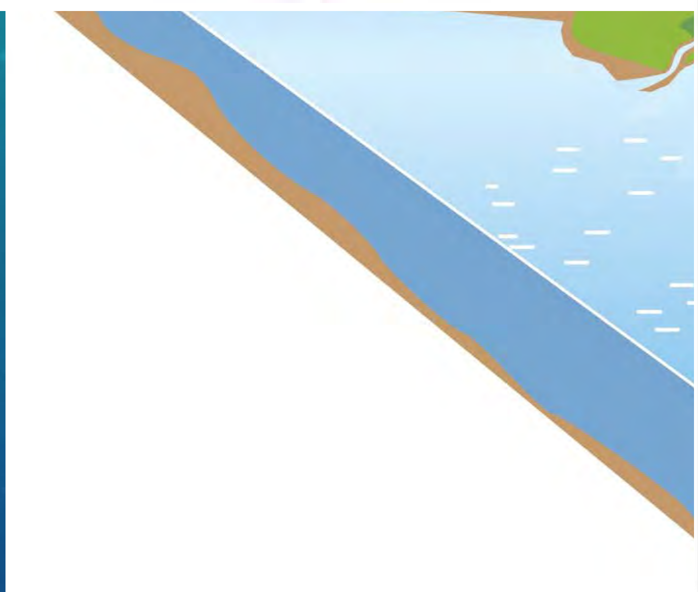
Joanie Steinhaus
Ocean Program Director
Turtle Island Restoration Network
Seaturtles.org

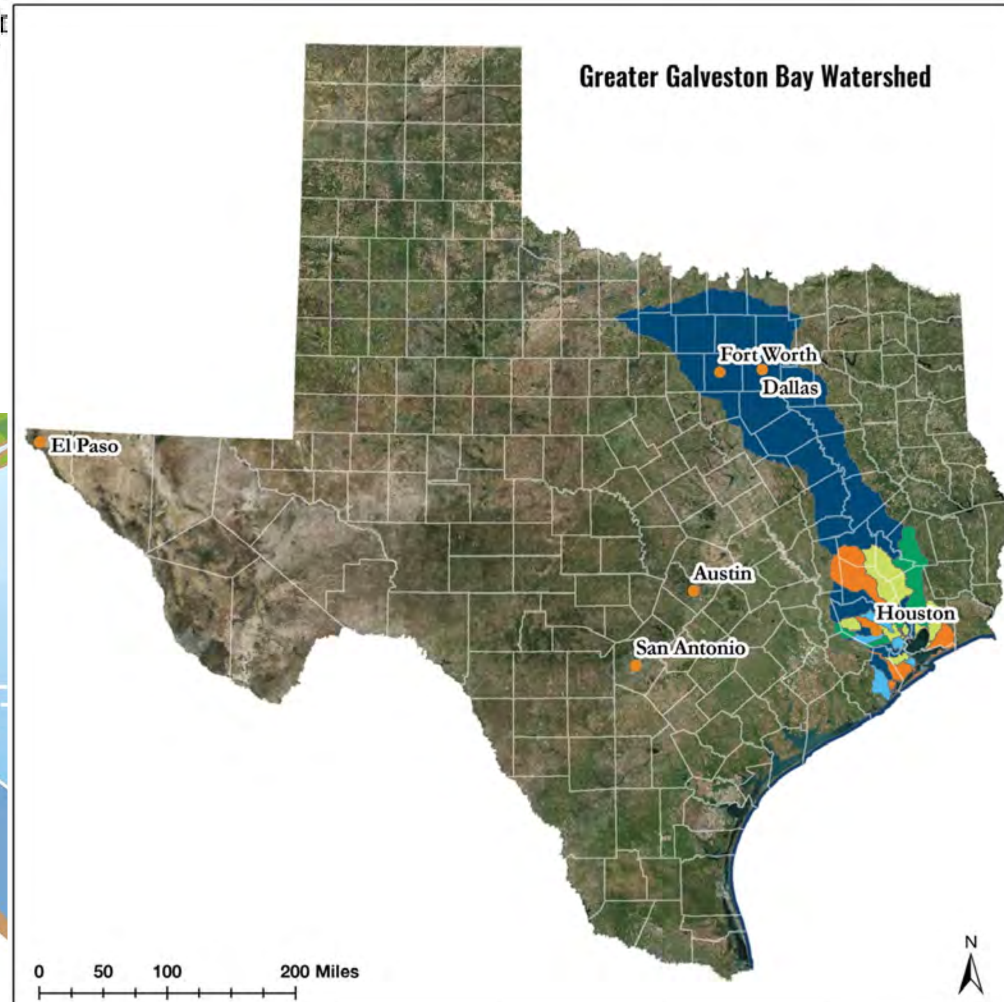
State-by-State Residential Recycling Rates*



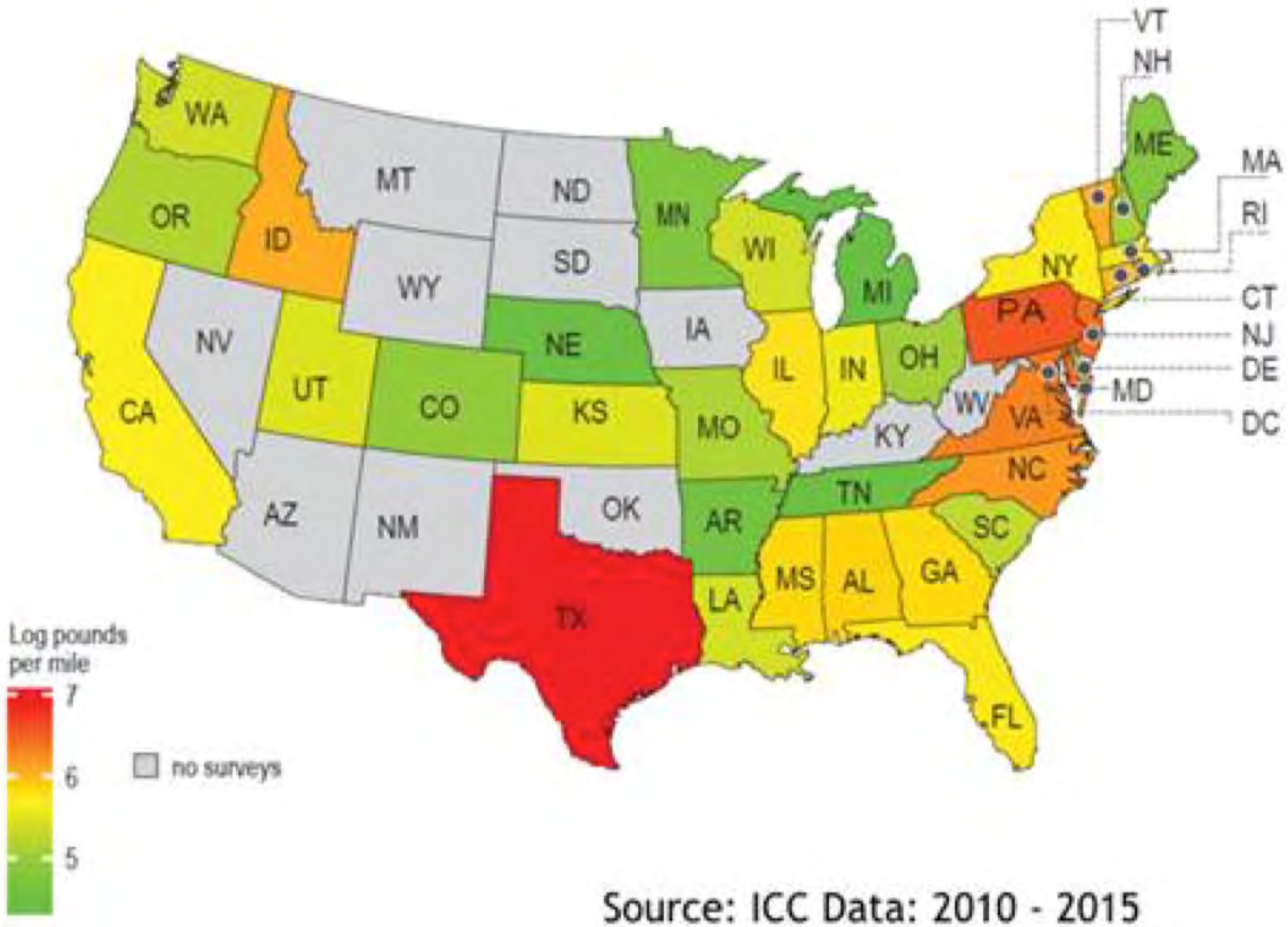
*includes material captured through state deposit return systems

Watershed





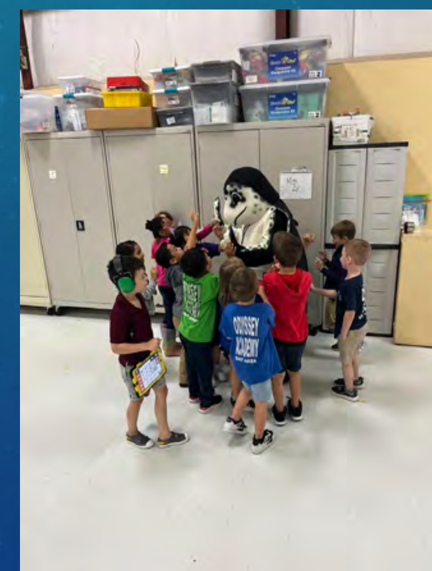
TURTLE ISLAND RESTORATION NETWORK
FIGHTING FOR A BLUE-GREEN PLANET



Source: ICC Data: 2010 - 2015

TIRN’s approach to grassroots mobilization against plastics

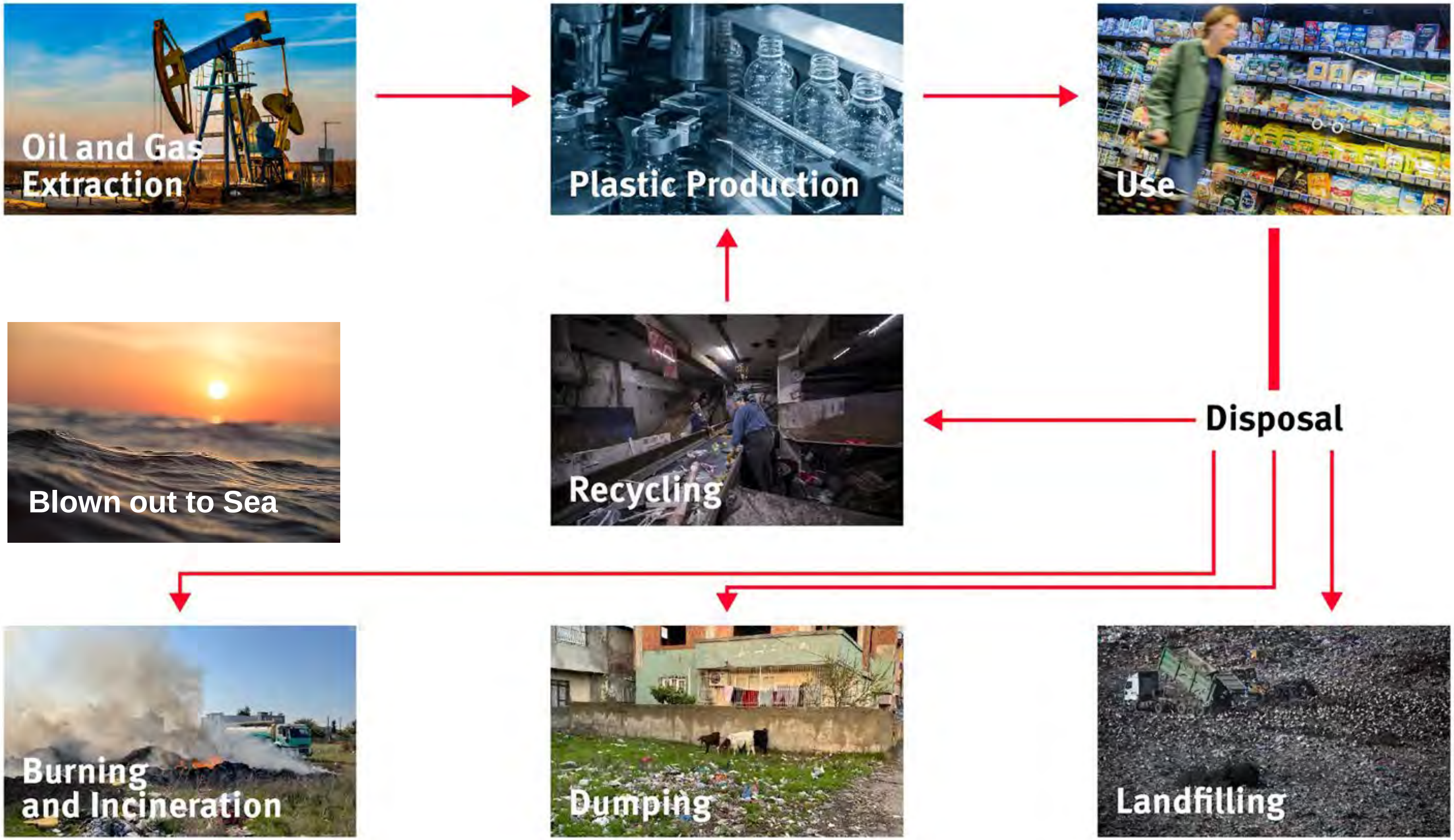
BRING THE BAG
GALVESTON ISLAND



TURTLE ISLAND
RESTORATION NETWORK
FIGHTING FOR A BLUE-GREEN PLANET

MICROPLASTICS AWARENESS PROGRAM

Plastic Lifecycle



Graphic Credit: CHEMICAL RECYCLING: A DANGEROUS DECEPTION WHY CHEMICAL RECYCLING WON'T SOLVE THE PLASTIC POLLUTION PROBLEM; Beyond Plastics and IPEN

TURTLE ISLAND RESTORATION NETWORK
FIGHTING FOR A BLUE-GREEN PLANET

Call to action

- Stay informed and VOTE
- Community involvement-stay informed
- Attend public meetings

- Voice your concern and submit comments
- Make sustainable swaps- support reusable
- **REFUSE** single-use plastics- Commit to ZERO waste!
- Participate in TIRN's programs

TURTLE ISLAND RESTORATION NETWORK

FIGHTING FOR A BLUE-GREEN PLANET

Visit our website to learn more!

Gulf Platforms

Facebook: @TIRNGulf

Instagram: @tirn.gulf

San Antonio Bay Partnership

Bay R.A.T.s Tackle Traps & Trash

Texas Plastic Pollution Symposium

April 3, 2025

Allan Berger

San Antonio Bay Guadalupe River Estuary

Shorelines Cleanup

Abandoned Crab Trap Removal

Elements of Success

Detailed Plans

Report Results

Celebrate the Effort

Data Collection

2024 Shorelines Clean Up Data Sheet

Bay R.A.T.
Removing Awful Trash

Team Name: Fin & Feather Team Leader: Rob Peel

Team Members: Barbara Thigpen, Larry Garner, Phil Salvador, Carl Thigpen, Rob Peel

Clean Up Section(s): Mule Slue

Start Time: 8:00 End Time: 12:00 (Include boat drive time)

The most common items found on bay shorelines and the ones we'd like to tract are listed in the table. ***WHERE DOES IT COME FROM?*** To answer this important question is why we are asking you to record the trash you collect. The hope is that the data can inform potential initiatives to reduce trash in our bays.

Please record the trash you pick up on the back of this sheet. Use hash marks or dots & lines to keep a tally of items collected. At the days end, total up the count for each item and the number of bags collected. Hand in your data sheet at lunch for your chance to win exciting prizes!

Dots & Lines Tally
Dots represent counts from 1 to 4
Lines represent 5 to 8
Diagonal lines 9 and 10
This method is commonly used in forestry and related fields.

* **LARGE ITEMS** – items too large for you to collect can be picked up later with the appropriate boat & manpower. Please record these items and its GPS by using a smart phone photo or free photo apps such as Solocator.

Please give us your feedback and suggestions for improving this event!
Watch For rattle Snakes

QUESTIONS? CALL ALLAN BERGER 713-829-2852

Hand in Data Sheet at the After Party

Send Us Your Photos!
brigidberger61@gmail.com

YOUR DATA MATTERS! Please Count & Record **Hand in Data Sheet at the After Party**

TEAM NAME: Fin & Feather DATA RECORDER: Rob Peel

	Total
Team Prizes will be given for 1.) Most Number of Large Black Bags, full buckets, & full crates, 2.) Most Plastic Drink Bottles, 3.) the Most Unusual Item.	
FILLED CONTRACTOR TRASH BAGS+ BUCKETS + CRATES	23
PLASTIC DRINK BOTTLES 240	462
UNUSUAL ITEMS (Take Photo or Bring Item to After Party. Awarded by Popular Vote)	

	Total		Total
Aluminum Cans	47	Jugs or Containers	14
Balloons & balloon strings		Lightbulbs	11
Crab Trap Floats	33	Plastic Bags	3
Drink Cups (Styrofoam or Plastic)		Plastic Pieces	350
Duck Decoys	26	Rope & Netting	6
Fishing Lines / Lures / Corks / Weights	53	Shoes / Footwear	46
Other Fishing Gear – rods, net with handle, stringers		Shotgun Shells	53
Glass Bottles & Jars	20	Styrofoam OTHER	184 3

Large Items for later pick up (Take photo with GPS & email to AllanRberger@outlook.com)

Barb + Carl Larry Phil

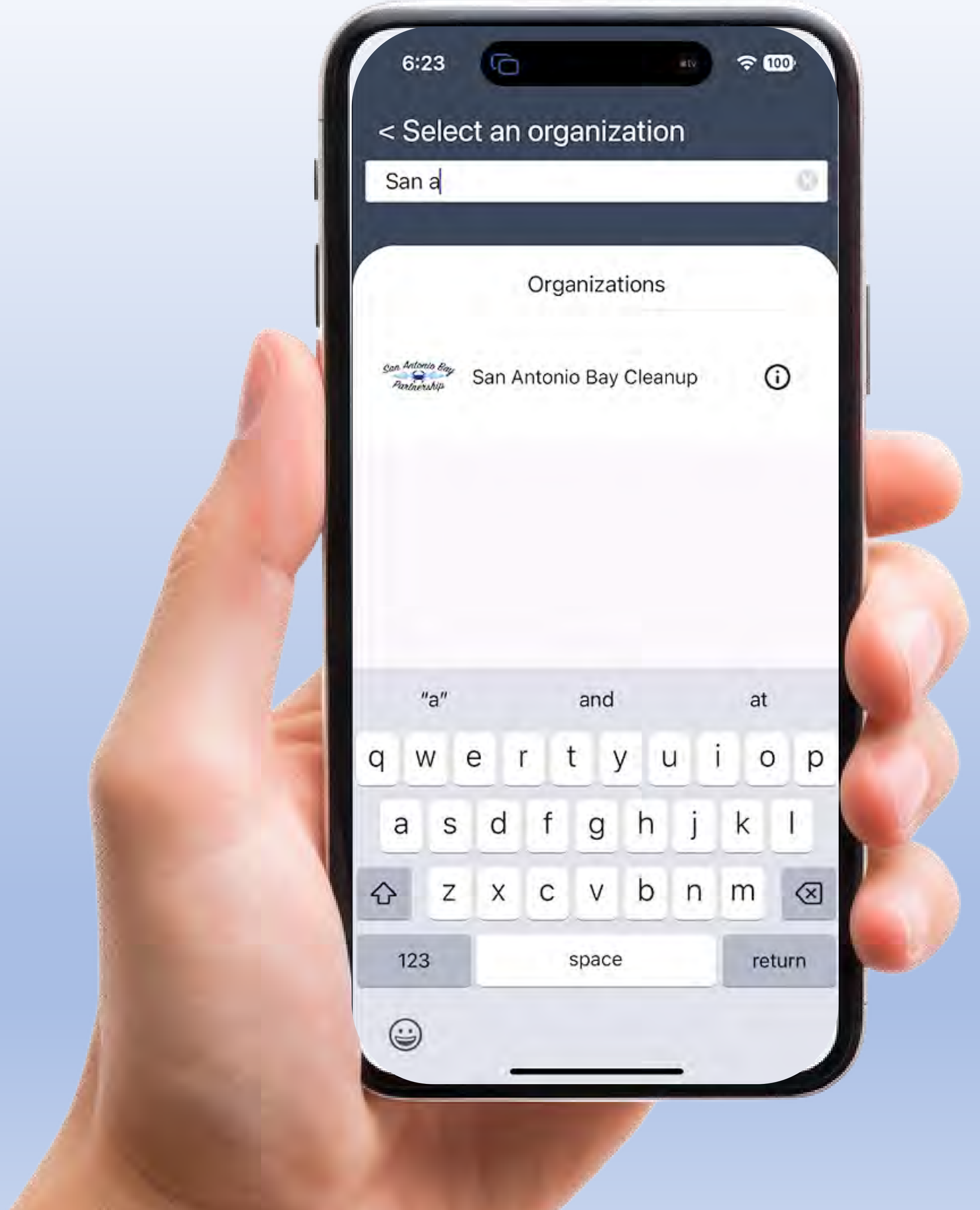
Bay R.A.T.
Removing Awful Trash

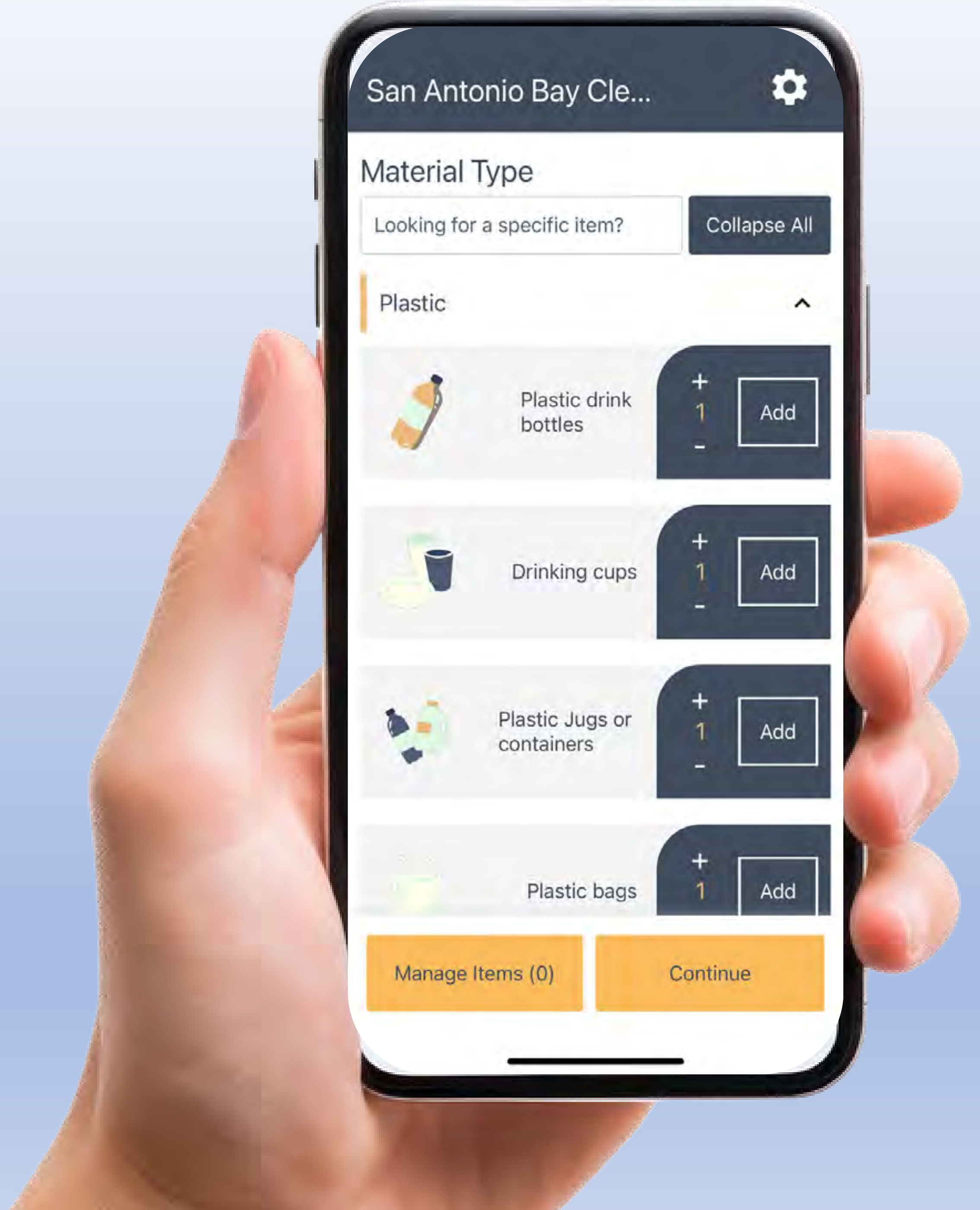
2024 Shorelines Cleanup

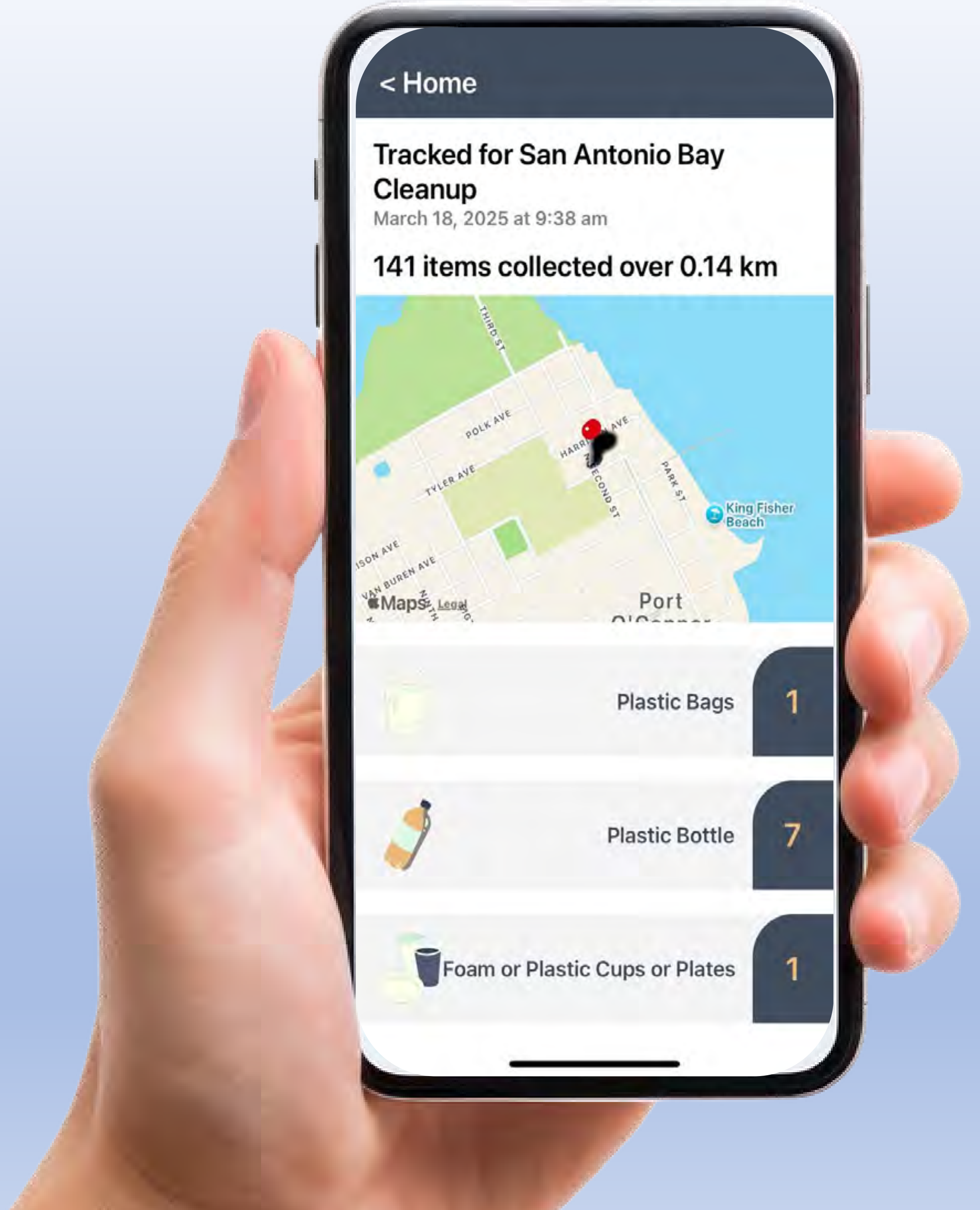
	Totals	254	8393	125	836	53	342	504	60	459	127	476	678	63	1020	5063	465	368	1151	1102	21285	154	548	30
Seadrift	**Monday, 9/23/24**																							
	Berger	4	145	19	14	1	11	36	0	38	3	12	20	0	130	258	57	4	69	117	934	3	9	1
	Dillon	12	103	4	25	1	36	14	0	2	6	4	51	1	60	135	6	1	10	11	470	4	12	1
	CBBEP	4	79	2	13	0	25	19	1	5	6	8	13	5	10	73	12	2	20	51	344	2	8	1
	Larson	0	2	2	2	0	2	1	1	0	0	0	1	0	2	1	8	0	2	11	35	4	14	1
	Texas Chrome	4	134	2	23	3	41	30	5	15	12	6	3	9	45	324	18	1	110	13	794	3	9	1
	Team Msson	5	24	2	4	3	24	3	2	11	0	2	4	0	12	31	2	0	5	14	143	5	20	1
	TWDB	2	11	3	1	0	17	0	0	4	4	1	2	0	12	13	8	0	0	10	86	4	11	1
		31	498	34	82	8	156	103	9	75	31	33	94	15	271	835	111	8	216	227	**2806**	**25**	**83**	**7**
Matagorda Island	**Wednesday 9/25/24**	54	5053																		**5053**	**14**	**84**	**3**
Powderhorn SP	**Friday 9/27/24**																							
	Bottle Captains	6	80	4	1	7	8	11	0	20	3	4	10	0	52	274	55	15	10	9	563	4	9.25	
	Krazy Kayaks	3	160	0	70	0	0	4	0	10	6	101	11	1	15	70	18	3	31	20	520	3	8	
	Powderhorn Pilots	5	58	3	12	2	2	4	0	5	0	16	9	0	50	282	21	12	22	53	551	3	2.25	
	Public Affairs	6	156	16	6	0	0	4	0	13	3	2	4	1	2	311	20	21	0	9	568	4	10	
	Shoreline Showboats	6	45	5	31	0	0	10	4	6	1	16	3	0	18	63	5	3	13	4	227	4	10.5	
		26	499	28	120	9	10	33	4	54	13	139	37	2	137	1000	119	54	76	95	**2429**	**18**	**40**	**0**
POC & Seadrift	**Saturday 9/28/24**																							
	Berger Brothers	6	30	3	22	0	1	11	0	2	8	0	15	0	18	76	23	4	0	22	235	2	9	1
	Fins & Feathers	23	462	0	47	0	33	0	26	53	0	20	14	11	3	350	6	46	53	187	1311	5	20	1
	Lone Star Forever	5	150	2	15	8	2	27	0	8	2	2	183	2	87	410	25	4	4	118	1049	4	16	1
	Dobsky-Zorn	12	186	1	53	15	1	100	1	9	0	21	74	9	60	200	30	25	40	5	830	4	9	1
	TF Ranch	2	59	3	35	1	1	6	0	2	0	8	6	0	25	35	0	0	2	9	192	3	12	1
	Roberts	8	69	6	42	0	46	6	0	6	11	39	4	2	56	21	9	4	0	11	332	2	12	1
	Pokluda	4	134	0	26	0	13	21	1	14	1	8	62	0	44	81	1	12	76	7	501	2	9	1
	Bayucos Bums	11	262	1	39	0	37	28	1	133	4	20	15	13	26	255	12	92	175	91	1204	4	15	1
	Earth Wise Collective UHV	4	137	0	14	0	0	1	4	8	5	9	4	1	2	218	2	28	8	87	528	5	15	1
	Pelican Pickers	1	2	5	0	2	0	3	0	1	2	3	7	0	2	6	0	1	0	0	34	3	9	1
	TMCBF	2	14	0	2	0	0	1	0	2	0	0	0	0	1	44	0	1	0	2	67	2	4	1
	Allan	4	38	1	2	0	3	8	0	6	1	13	12	2	6	122	9	11	6	15	255	3	9	1
	Smith	3	69	0	9	0	0	69	0	9	6	3	22	0	8	60	6	8	0	8	277	3	7	
	Cranes	2	72	0	9	3	0	13	0	4	0	1	6	0	41	50	2	5	0	1	207	2	6	
	Fins & Feathers 9/26/24	16	97	0	60	4	4	17	3	3	14	40	41	0	55	570	64	15	70	87	1144	4	16	1
	UHV Dimitri																				0	5	20	1
	Watson		1		1		3				1					10				3	19	4	16	
	Admin/Dockside																				0	10	25	
		103	1782	22	376	33	144	311	36	260	55	187	465	40	434	2508	189	256	434	653	**8185**	**67**	**229**	**14**

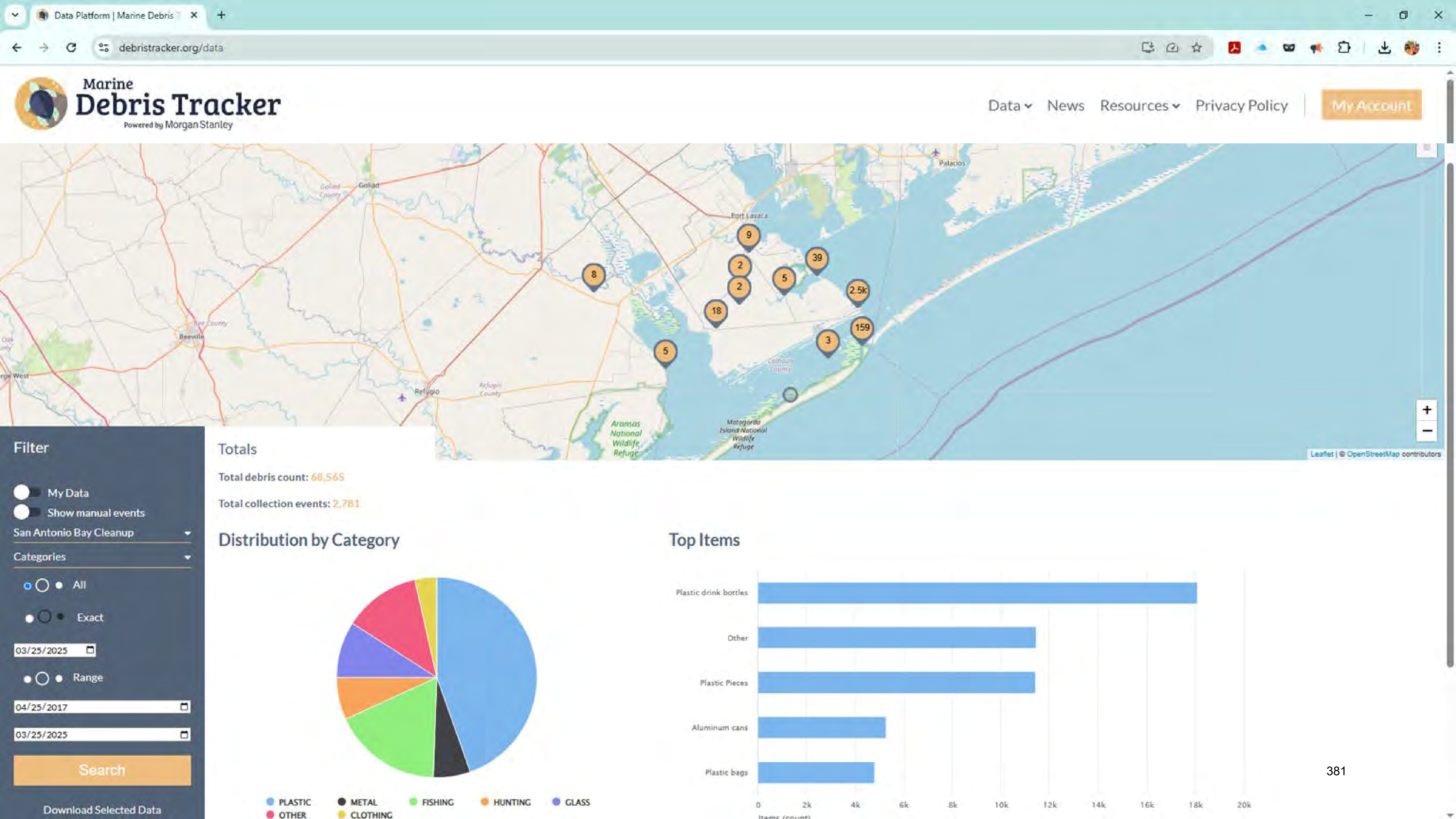

Bay R.A.T.
Removing Awful Trash

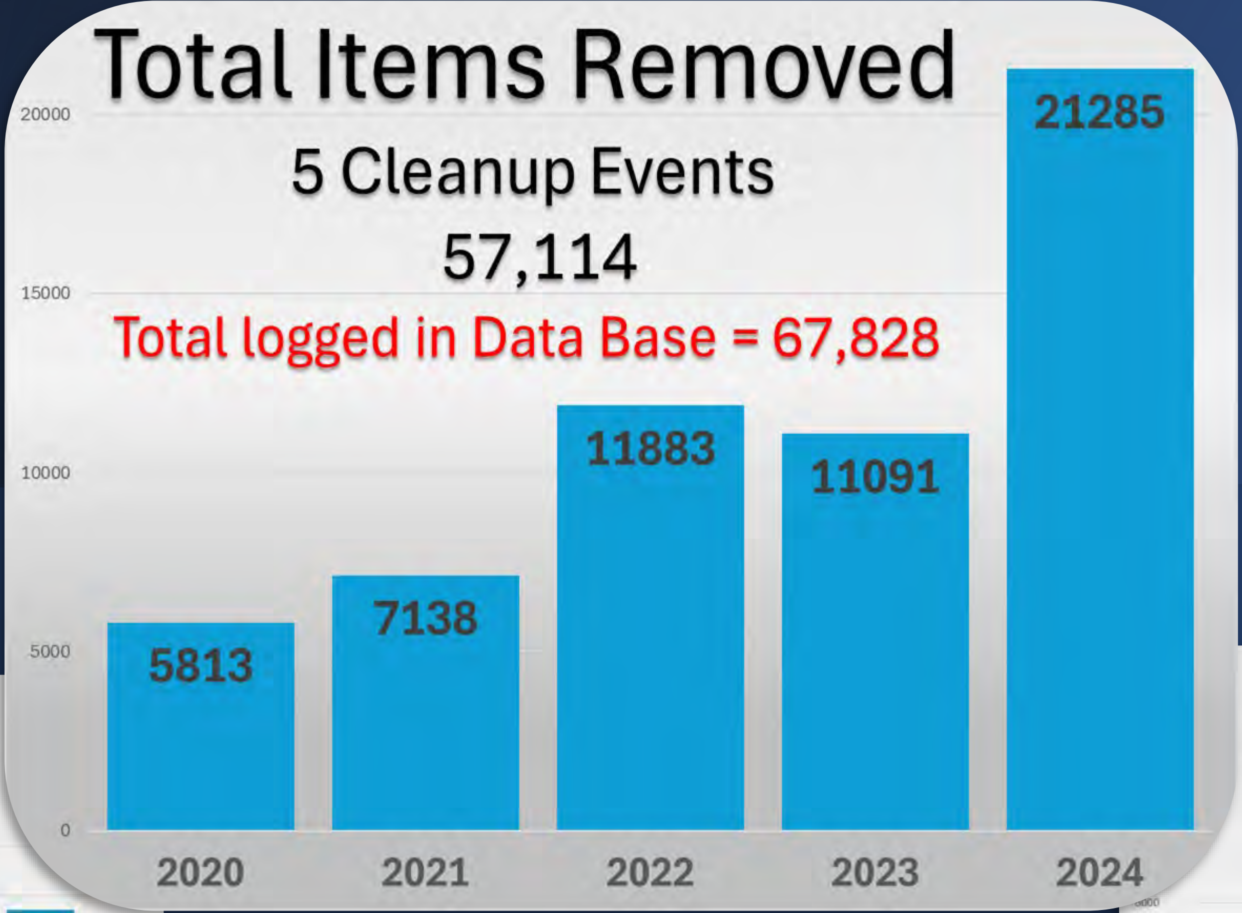
Marine
Debris Tracker
Powered by Morgan Stanley


6:23
100
< Select an organization
San a
Organizations
San Antonio Bay Partnership
San Antonio Bay Cleanup
"a"
and
at
q w e r t y u i o p
a s d f g h j k l
z x c v b n m
123
space
return

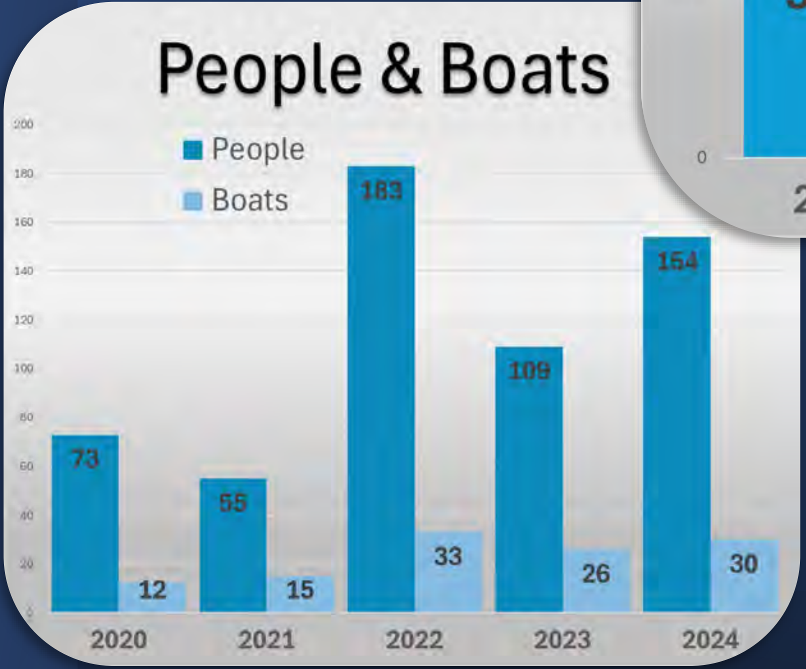

San Antonio Bay Cle...
Material Type
Looking for a specific item?
Collapse All
Plastic
Plastic drink bottles
Drinking cups
Plastic Jugs or containers
Plastic bags
Add
Manage Items (0)
Continue


< Home
Tracked for San Antonio Bay Cleanup
March 18, 2025 at 9:38 am
141 items collected over 0.14 km
THIRD ST
POLK AVE
TYLER AVE
PARK ST
King Fisher Beach
VAN BUREN AVE
Maps
Legal
Port
Plastic Bags
1
Plastic Bottle
7
Foam or Plastic Cups or Plates
1

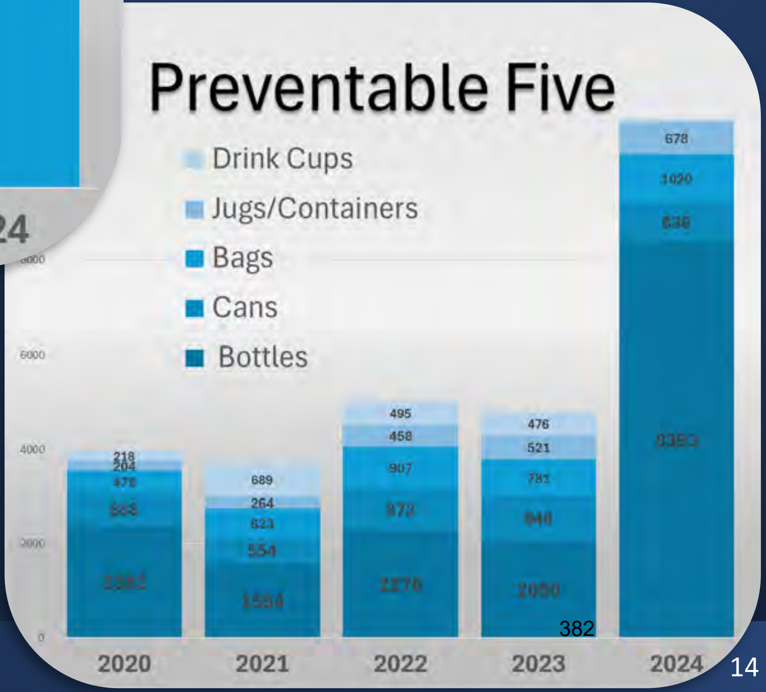

Data Platform | Marine Debris
debristracker.org/data
Marine
Debris Tracker
Powered by Morgan Stanley
Data
News
Resources
Privacy Policy
My Account
Goliad
Port Lavaca
Palacios
Beeville
Refugio
Aransas National Wildlife Refuge
Matagorda Island National Wildlife Refuge
9
39
2
5
8
2
2.5k
18
159
3
5
Leaflet | © OpenStreetMap contributors
Filter
My Data
Show manual events
San Antonio Bay Cleanup
Categories
All
Exact
03/25/2025
Range
04/25/2017
03/25/2025
Search
Download Selected Data
Totals
Total debris count: 68,565
Total collection events: 2,781
Distribution by Category
PLASTIC
METAL
FISHING
HUNTING
GLASS
OTHER
CLOTHING
Top Items
Plastic drink bottles
Other
Plastic Pieces
Aluminum cans
Plastic bags
0
2k
4k
6k
8k
10k
12k
14k
16k
18k
20k



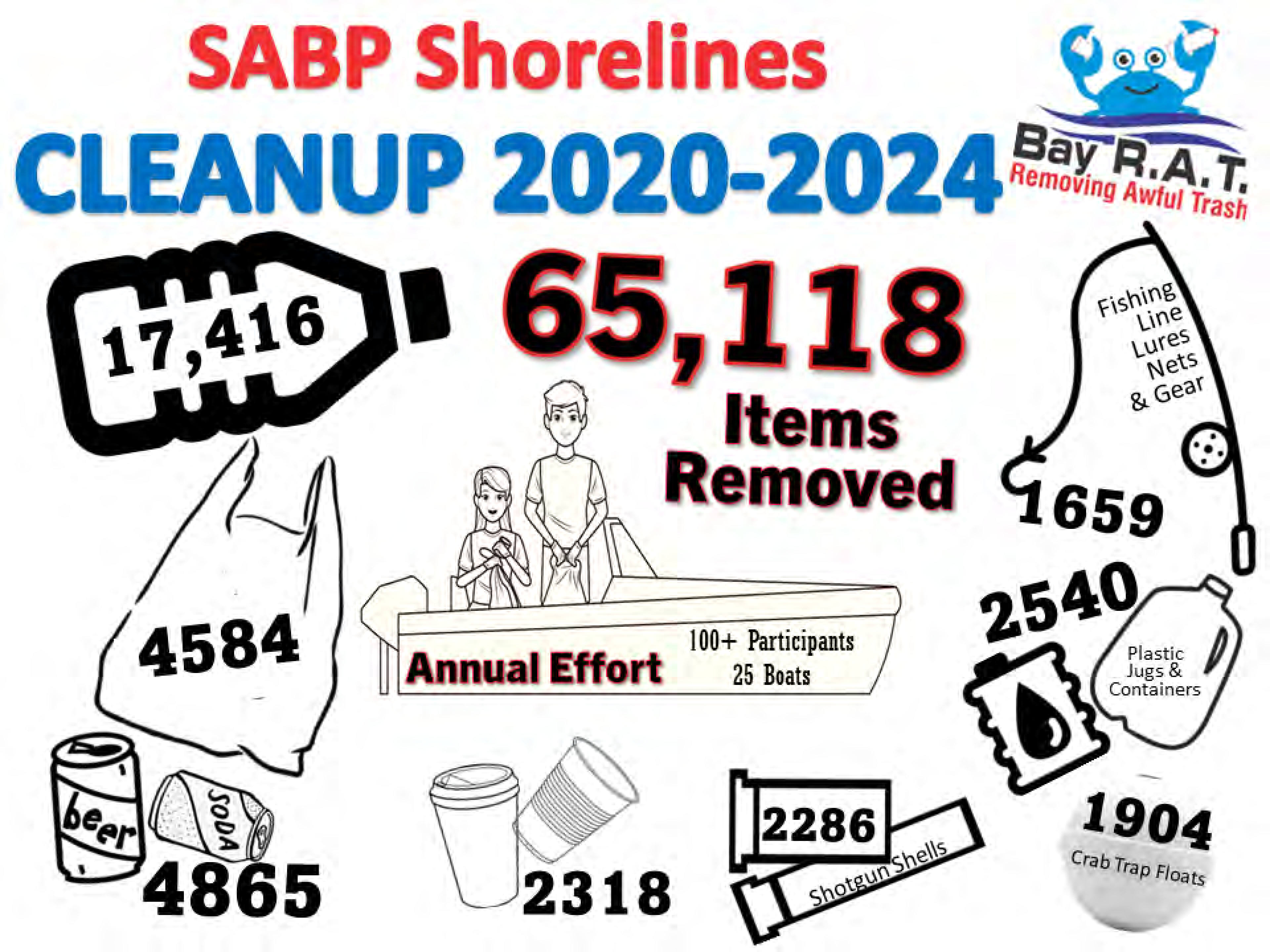
Total Items Removed
5 Cleanup Events
57,114
Total logged in Data Base = 67,828
20000
15000
10000
5000
0
5813
7138
11883
11091
21285
2020
2021
2022
2023
2024



People & Boats
People
Boats
73
12
55
15
183
33
109
26
154
30
2020
2021
2022
2023
2024



Preventable Five
Drink Cups
Jugs/Containers
Bags
Cans
Bottles
218
204
689
264
623
554
495
458
907
476
521
781
678
1020
2020
2021
2022
2023
2024


SABP Shorelines
CLEANUP 2020-2024
Bay R.A.T.
Removing Awful Trash
17,416
65,118
Items
Removed
Fishing
Line
Lures
Nets
& Gear
1659
4584
Annual Effort
100+ Participants
25 Boats
2540
Plastic
Jugs &
Containers
beer
SODA
4865
2318
2286
Shotgun Shells
1904
Crab Trap Floats

R.A.T.

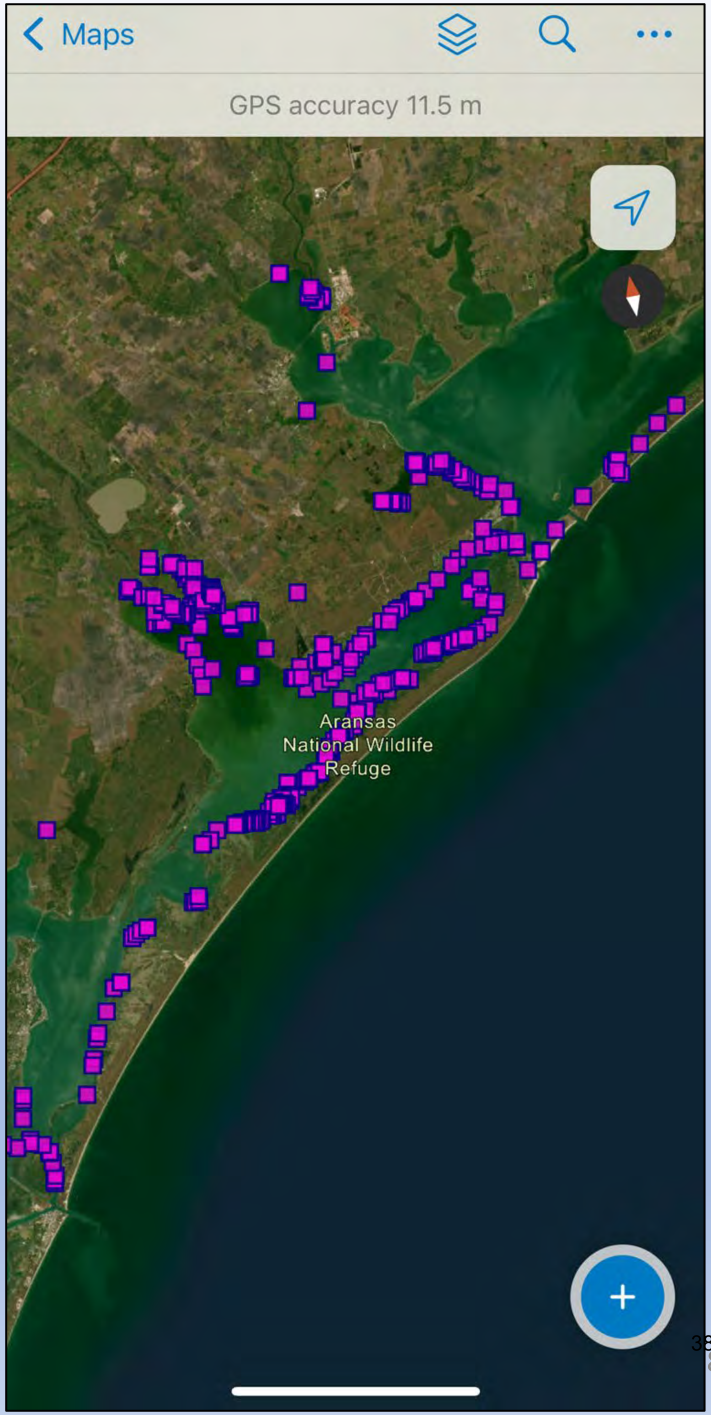
Removing Abandoned Traps

Plastic Pollution!

R.A.T.
Removing Abandoned Traps

Shirley Carvajal-Alvarado
Houston Zoo

ArcGIS Field Maps

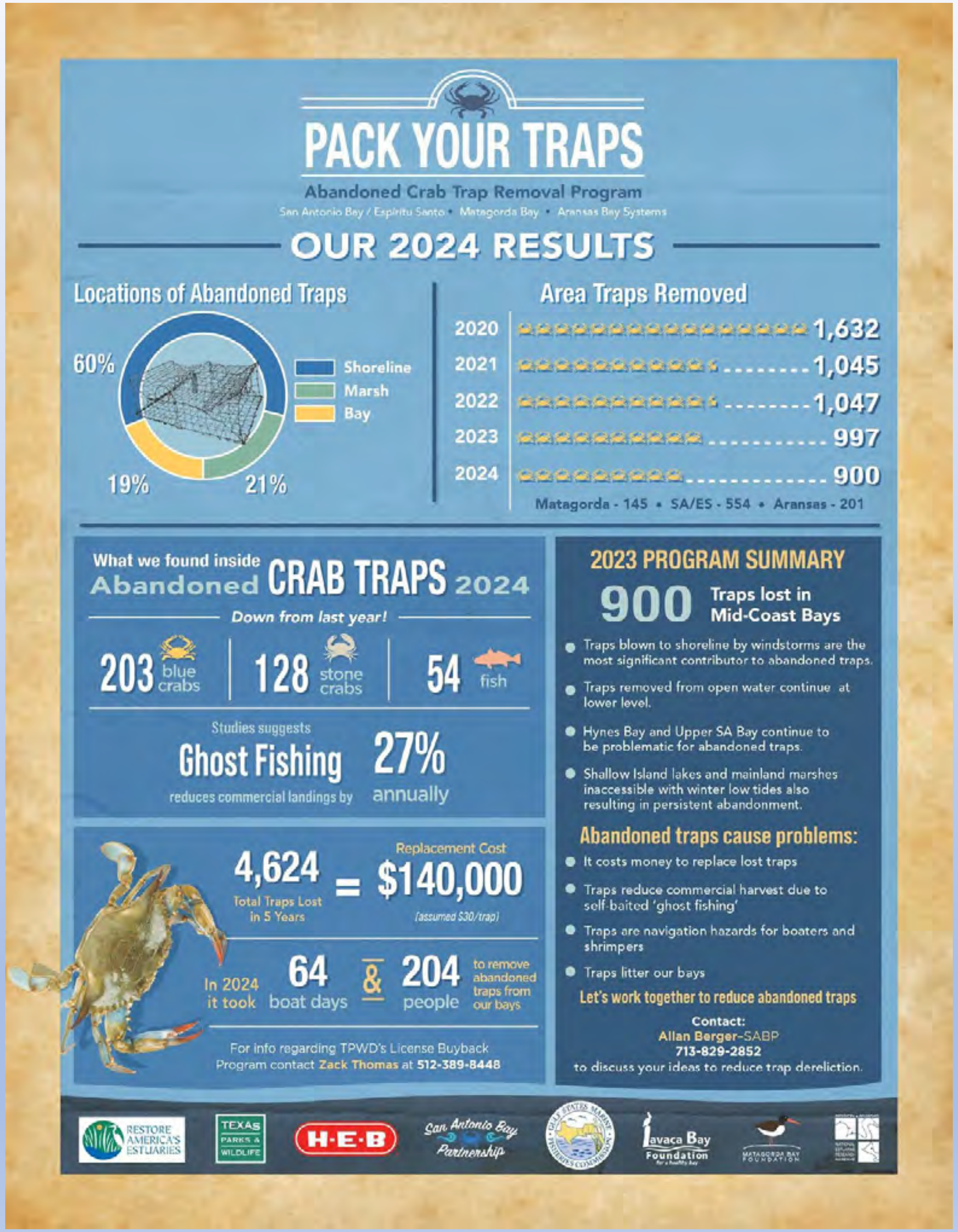


2025 Social Media Post


233 Stone Crabs


686 Blue Crabs


60 Fish



2024 Mail Out

San Antonio Bay Partnership

Abandoned Crab Traps Removed

Area Traps Removed

2020	1,632
2021	1,045
2022	1,047
2023	997
2024	900

R.A.T.
Removing Abandoned Traps

DATA IS SIGNIFICANT
for Essential Insights to Change Behaviors

San Antonio Bay Partnership

Texas Plastic Pollution Symposium

April 3, 2025

Allan Berger, Chair
713-829-2852
AllanRBerger@outlook.com

The Monofilament Recovery & Recycling Program: Protecting the Texas coast for 20 Years.

7th Annual Texas Plastic Pollution Symposium

The Houston Zoo, Houston, Texas – April 3, 2025

TEXAS A&M AGRILIFE EXTENSION

Sea Grant Texas AT TEXAS A&M UNIVERSITY TexasSeaGrant.org

Texas Monofilament Recovery and Recycling

How Bad Could it Be?


8

20^{th} Anniversary

- Established 2004 in Port Aransas, Texas
  - 4^{th} Grade Students at Brundrett Middle School
- Second site established in Port O'Conner, Texas
  - 4^{th} Grade Students at Port O'Conner Middle School

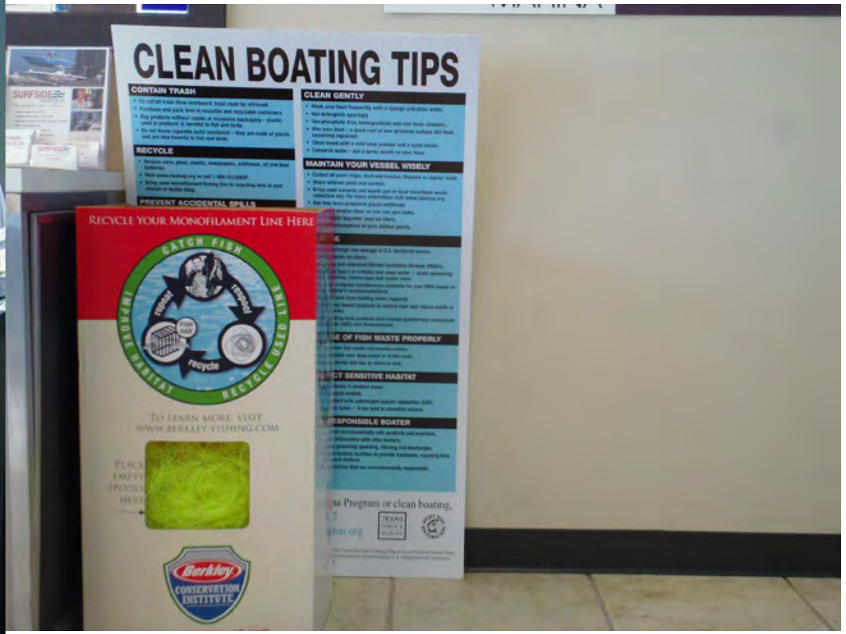

TOMMY JEANS


TOMMY JEANS


PORT A
TRACK


BLAME MY PARENTS!
StrayKat
BILLIARDS
MONOFILAMENT RECYCLING BIN
Sea Grant
Texas
LIVE TO MOTO
YAMAHA

Clean Marina




BMH110828-01
LK
CCL = 45cm


BMH110828-01
LK
CCL = 45cm


LNH101129-01
Cm
SCL 33.4 cm

Master Naturalist Involvement

- Alamo Area
- Cradle of Texas
- Galveston Bay Area
- Mid-Coast
- Rolling Plains
- Heartwood
- Lost Pines
- Piney Woods Lake
- Rio Grande Valley
- South Texas
- Lower Trinity Basin
- East Texas





MONOFILAMENT RECOVERY AND RECYCLING
MONOFILAMENT RECYCLING BIN
Cast your Used Fishing Line Here
NO CANS-NO BOTTLES-NO TRASH
No Hands In Bin
WARNING
NO
GARBAGE
Sea Grant
Texas


Sea Grant


MONOFILAMENT RECYCLING BIN
Cast your Used Fishing Line Here
NO CANS-NO BOTTLES-NO TRASH
TEXAS PARKS & WILDLIFE

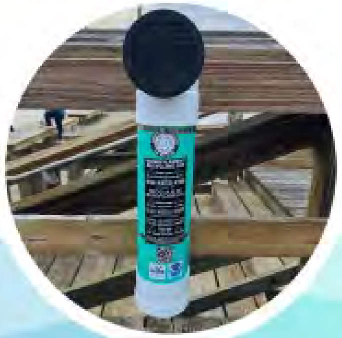

MONOFILAMENT RECYCLING BIN
Cast your
RECICLAJE DE MONOFILAMENTO
Echa aquí
Sea Grant


RECYCLING BIN
Hooks, Lures
NO TRASH
REUSE


No Trash
Please
No Basura
Monofilament
Recycling Bin
BoatUS
Foundation

RECYCLE YOUR FISHING LINE

Texas Monofilament Recovery & Recycling Program



tx.ag/MRRP

Sea Grant
TEXAS
AT TEXAS A&M UNIVERSITY

Monofilament Recovery & Recycling Program (MRRP)

Sea Grant
TEXAS
AT TEXAS A&M UNIVERSITY

A volunteer-led initiative that reduces fishing line in Texas' environment through recycling and angler education.

> Fishing line can last in the environment for hundreds of years, creating entanglement risks for sea turtles, birds, fish, and other coastal and marine wildlife.

> Help join the fight against marine debris by recycling your single-strand fishing line in one of the 300+ collection bins throughout Texas.

Find a recycling station near you:
tx.ag/monomap

TEXAS A&M AGRILIFE EXTENSION TEXAS PARKS & WILDLIFE

VOLUNTEER

Volunteers are essential to the MRRP! Volunteers collect fishing line from recycling bins and ensure it is free of debris like hooks, leaders, weights, and trash. They weigh and report the collected line and send it off to be recycled. If you are interested in volunteering with the MRRP, you can join a group that sponsors a bin and help them to maintain the bin. If there is no recycling bin in your area, you can sponsor a new one. You can also volunteer to participate in local beach cleanup events.

REPORT ENTANGLED ANIMALS

TX Marine Mammal Stranding Network
1-800-9-MAMMAL (1-800-962-6625)

Texas Sea Turtle Hotline
1-866-TURTLE-5 (1-866-887-8535)

Other Animals
List of wildlife rehabilitators by county:
tx.ag/rehab

INFORMATION

For more information about the Texas Monofilament Recovery and Recycling Program (MRRP) and to locate a monofilament recycling bin near you, visit **tx.ag/MRRP**

Thank you to our partners!

This project is supported by the National Oceanic and Atmospheric Administration Marine Debris Program.

DON'T LET YOUR LINE TURN INTO LITTER - RECYCLE IT!

Sea Grant
TEXAS
AT TEXAS A&M UNIVERSITY

tx.ag/mrrp

WHAT IS MONOFILAMENT?

Most fishing line you can buy today is monofilament — a single strand of strong, flexible nylon. Mono is available in different tensile strengths ("tests") and has a round, even cross-section that allows anglers to keep their spools tidy. It is typically less expensive to manufacture than other types of line and can be clear or tinted blue, green, pink, or other colors.

Another popular type of line is braided line, which is made of multiple strong thin fibers threaded together. Braided line does not break down in sunlight, so it doesn't need to be replaced as frequently. However, it cannot be recycled.

Photo: Seth Patterson

WHAT'S THE PROBLEM?

Fishing line is non-biodegradable and can last in the environment for hundreds of years. Exposure to sunlight and heat weakens monofilament, which can cause the line to break and enter the environment. Sea turtles, marine mammals, and other wildlife can ingest the line or become entangled, leading to their injury or death.

RECYCLE YOUR LINE

The Texas **Monofilament Recovery & Recycling Program** (MRRP) is a volunteer-led effort to reduce monofilament in the environment through recycling and education.

Recycle monofilament of all colors at indoor bins in tackle shops or outdoor PVC bins located at boat ramps, piers, and fishing access points across Texas. Berkley Conservation Institute handles the recycling process (*tx.ag/berkleyrecycling*; 800-237-5539). The line is melted down to make tackle boxes, spools, and artificial fish habitats. If your tackle shop doesn't have a recycling bin, encourage them to contact Berkley for a collection box.

PREPARE YOUR LINE

Only the line itself can be recycled. Remove hooks, lures, lead, vegetation, and other materials before placing your line in the recycling bin. If there is no recycling bin in your area, store your line in a container until you are able to access one.

If you have a lot of line that needs to be recycled, you can mail the line directly to Berkley Recycling at 1900 18th St., Spirit Lake, Iowa, 51360.

Photo: Rick Decker

HOW CAN I HELP?

- Change your fishing line regularly to prevent breakage
- Retrieve and properly dispose of any monofilament you encounter
- Contain and store loose pieces of line so they don't blow away
- Deposit your used monofilament in a designated recycling bin
- Secure your fishing gear when in motion to prevent free spooling of line
- Volunteer with the MRRP

WHAT ABOUT BRAIDED LINE?

Fluorocarbon, another type of single-strand line, can also be recycled. However, multi-strand line cannot. Disposing of fishing line in the trash can still lead to environmental harm, potentially affecting wildlife and damaging boat motors. Cut non-recyclable line into six-inch pieces and place it in a covered garbage bin to prevent animals from accessing it.

Making a Difference

- 89 volunteers
  - 271 collection receptacles
- Line Collected in 2024
  - 220.2 pounds
- Line Collected since 2004
  - 5,472.9 pounds
- Fun Fact: 7,242.5 miles of used line, which would stretch across Texas 8.7 times!

People are the solution to plastic pollution.

- Get Involved!
- Actions on the land affect the oceans.
- Dispose of waste properly.
- Reduce the amount of waste.
- Reuse items.
- Recycle.

Getting involved

- Contact me:
  - John.oconnell@ag.tamu.edu
  - (979) 864-1558
  - Alexis Sabine
  - asabine@tamu.edu

Texas Abandoned Crab Trap Removal Program: Supporting volunteer efforts and trap detection

Holly Grand
Outreach and Education Coordinator
TPWD - Coastal Fisheries Division
holly.grand@tpwd.texas.gov

Texas Abandoned Crab Trap Removal Program

- Senate Bill 1410 - Passed during 77th legislative session in 2001
  - Mandated 10-day closure period in February
- Conducted annually since 2002
  - 5,004 volunteers
  - About 20,016 volunteer hours
  - 1,599 vessels
  - 45,209 traps removed

<u>**Saving an estimated 740,500 blue crabs!**</u>

Texas Abandoned Crab Trap Removal Program

- Crabbers are notified of the closure in January.
- Since traps are considered “litter” they must be disposed of or recycled. They cannot be sold.
- Most are in poor condition
- Traps cannot be removed at any other time

2024 Clean-up Efforts

Funding from Gulf States Marine Fisheries Commission went toward:

- Supporting volunteer events hosted by Galveston Bay Foundation, Christmas Bay Foundation, and San Antonio Bay Partnership.
- Trap detection in Christmas Bay to determine crabbing “hot-spots” to help increase volunteer efficiency.


DOOSAN

Aerial Survey

- Christmas Bay – State Coastal Preserve
- Mississippi State University
- August 2024
- Post-processed and mosaicked using the DroneDeploy platform.
- Manually reviewed to identify debris


N
S
W
E
Crab Trap
Other Debris
Undetermined Debris
0
0.5
1
1.5
2 km

Crab Trap

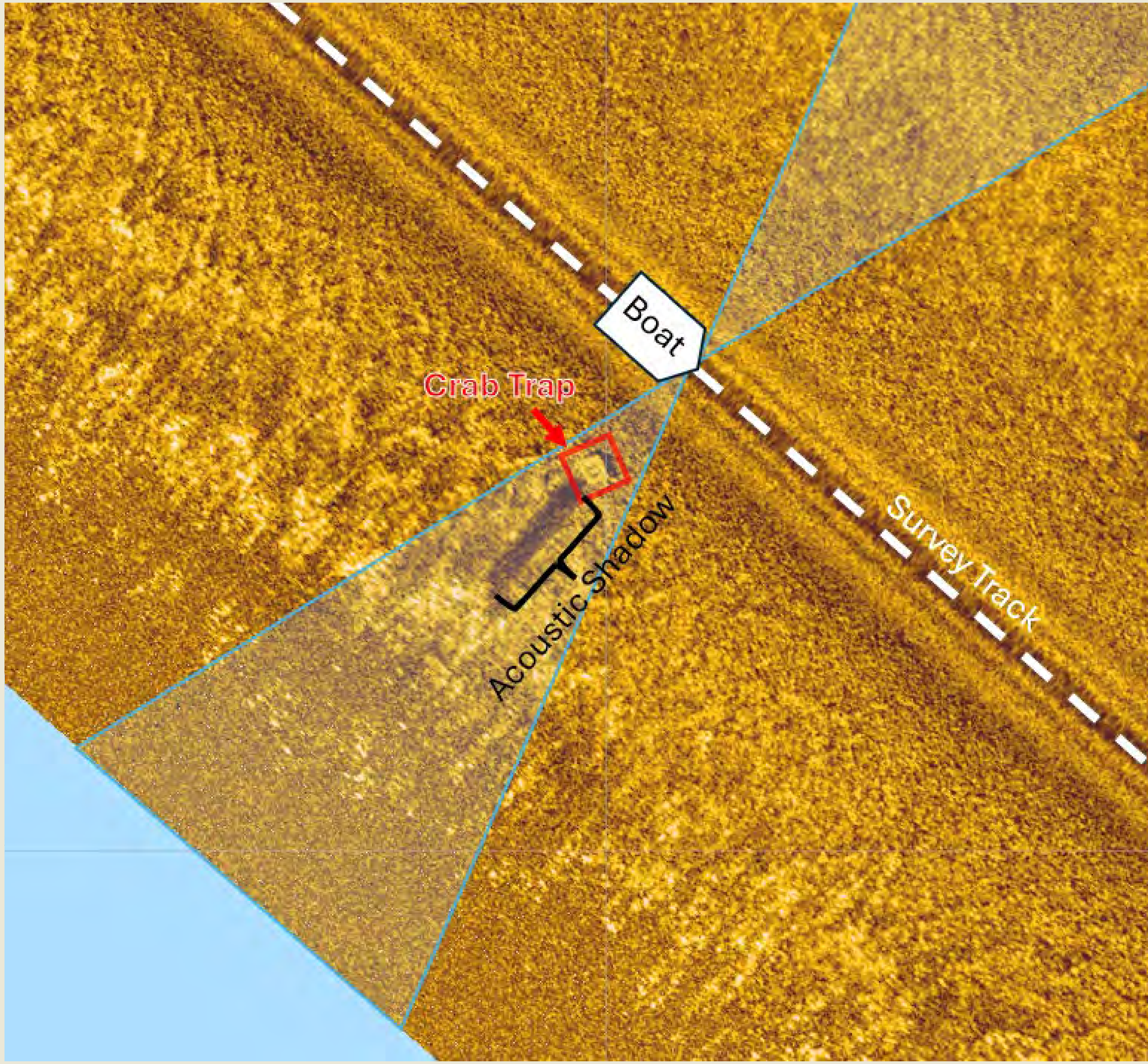
Other Debris

Undetermined Debris

2025 Clean-up Efforts

Additional funding from GSMFC for 2025

- Trap detection – sidescan
  - Christmas Bay (TPWD)
  - San Antonio Bay (SABP)



Thank You

CCA TEXAS

COASTAL BEND BAYS & ESTUARIES PROGRAM

GULF STATES MARINE FISHERIES COMMISSION

Christmas Bay FOUNDATION

San Antonio Bay Partnership

GALVESTON BAY FOUNDATION

Questions?

holly.grand@tpwd.texas.gov

artist BOAT

Community Engagement Through Art and Beautification

In Partnership with the Galveston Park Board of Trustees

artist BOAT

Artist Boat is a 501(c)(3) whose mission is to promote awareness and preservation of coastal margins and the marine environment through the disciplines of the sciences and the arts.

Inspiration and education through unique coastal experiences

In Partnership with the Galveston Park Board of Trustees

Trash Collected from Galveston Beaches

Data collected by the

GALVESTON
PARK BOARD

October 2022 – September 2023

3,449,850 lbs.

October 2023 – September 2024

2,253,380 lbs.

October 2024 – February 2025

404,720

How can you help?

- Trash Pickup
- Beach Cleanups
- Volunteering
- Community Engagement

The problem with the Blue Trash Barrels

Photo courtesy of Galveston Daily News

Beautify the Bucket Art Contest

- 100+ Blue Trash Barrels
- Ocean Related Themes
- 7 Prize Categories
- Displayed & Judged at the World Ocean Day Festival
- Distributed Island Wide

Winners from the 2024
Beautify the Bucket Art Contest

How can beach cleanups be updated?

Marine Debris Art Contest

- Debris collected from Gaveston Beaches
- Flat and 3D Artwork
- Sponsored Cash Prizes
- Displays for 1 Month at a Professional Art Gallery

In Partnership with the Galveston Park Board of Trustees

artist BOAT

Winners from the 2024 Marine Debris Art Contest

In Partnership with the Galveston Park Board of Trustees

artist BOAT

artist BOAT

In Partnership with

GALVESTON
PARK BOARD