

# NOAA Marine Plastic Activity Overview:

1. Marine Debris Program Lessons Learned
2. NCEI Global Marine Microplastics Database and Map Portal

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# NOAA Marine Debris Program

Established in 2006 by Congress as federal lead for marine debris.

**Mission:** to investigate and prevent the adverse impacts of marine debris.



# NOAA MARINE DEBRIS PROGRAM PILLARS

Prevention

Removal

Research

Emergency Response

Regional Coordination

Monitoring & Detection



Classification matters.  
Limited consensus.  
Crosswalks exist.

### Material Class

- ◆ Biohazard
- ◆ Concrete or Asphalt
- ◆ Glass or Ceramic
- ◆ Metal
- ◆ Organic
- ◆ Other
- ◆ Plastic
  - Foam
  - **Hard Plastics**
  - Rubber
  - Soft Plastics
  - Vinyl



Hard Plastics

Beverage Bottles

### Item Class

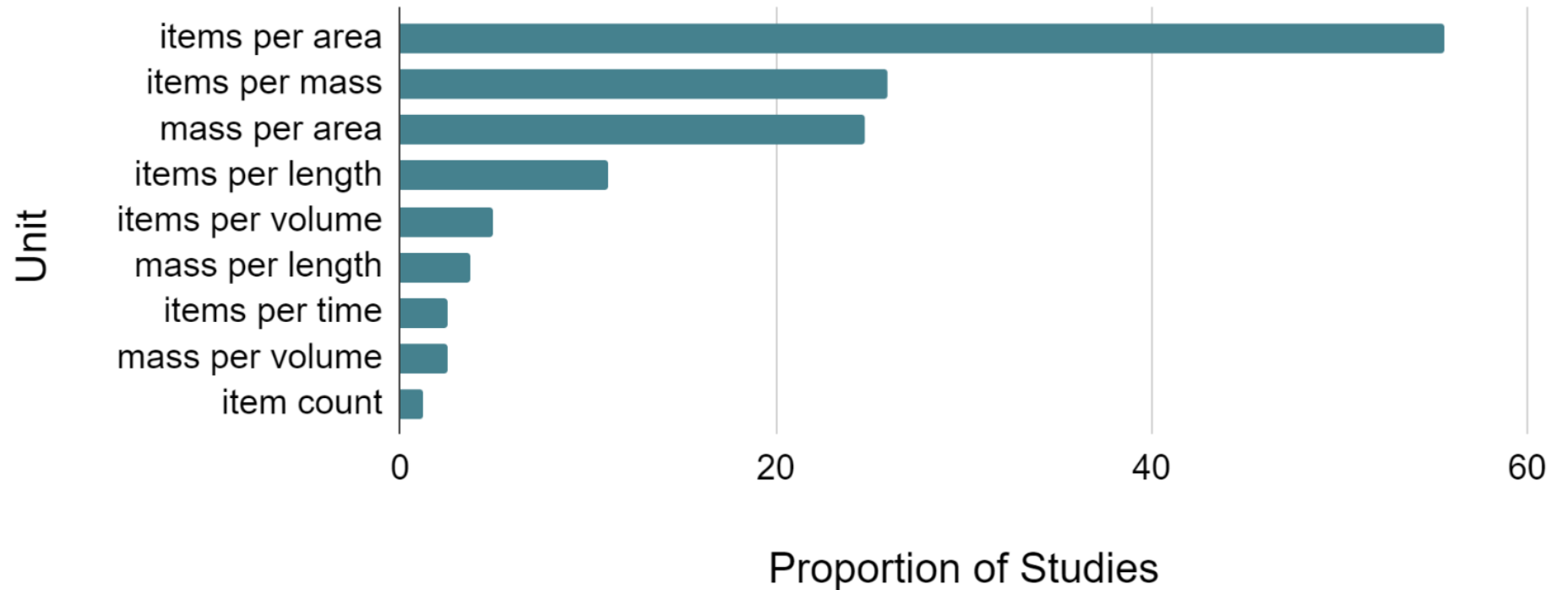
- ◆ Cups, food trays, food wrappers, drink containers
  - Beverage containers
    - Bottles & jars
      - **Beverage bottles**
        - Beer bottle
        - Bottles <2L
        - Bottles, etc. >2L
        - Degraded bottle
        - Drink bottles<=0.5l
        - Drink bottles>0.5l
        - Fizzy drink bottle
        - Ice tea bottles
        - Juice bottles
        - Liquor bottles
        - Milk bottle
        - Soft drink bottles
        - Sport drink bottles
        - Water bottle
        - Wine bottle
      - Food jars
    - Cans or tins
    - Cups

At least 68 unique  
"Trash lists"

Hapich, H., Cowger, W., Gray, A. *et al.* Trash Taxonomy Tool: harmonizing classification systems used to describe trash in environments. *Micropl. & Nanopl.* 2, 15 (2022)

# Reporting units matter! Limited consensus.

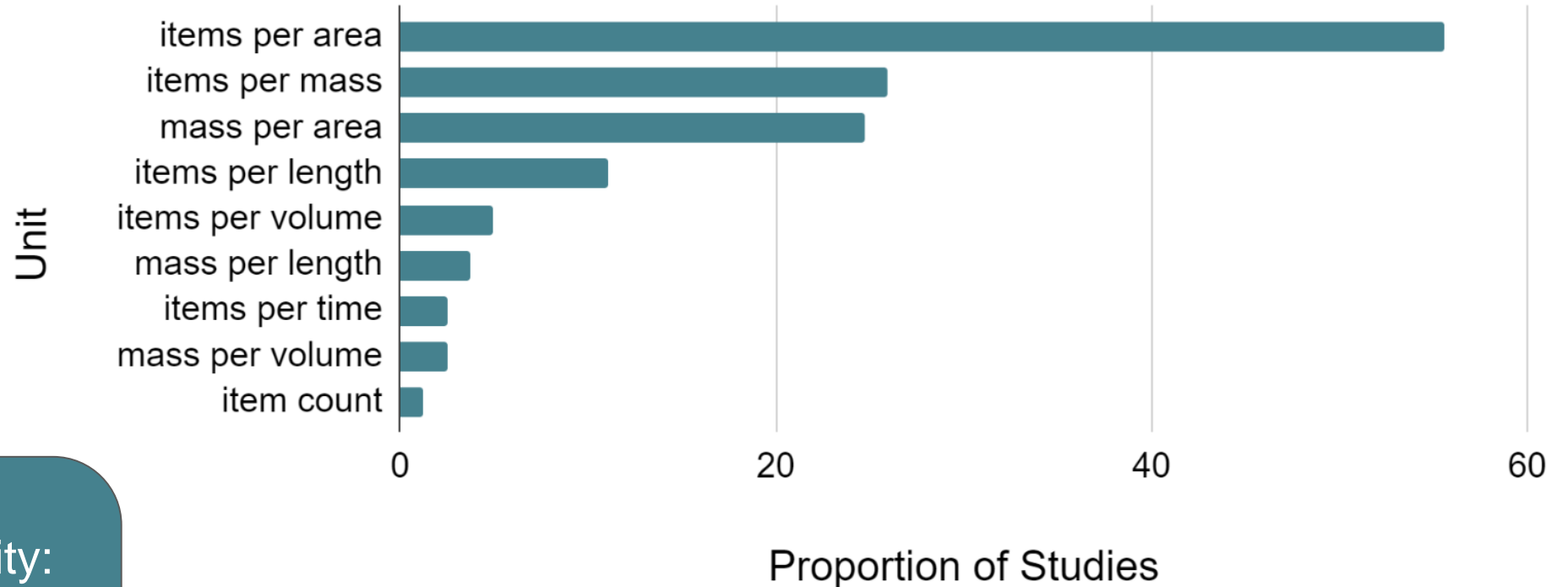
81 micro and  
macro  
shoreline  
studies



Uhrin, A.V., Hong, S, Burgess, H.K., Lim, S., and Dettloff, K. Towards a North Pacific long-term monitoring program for ocean plastic pollution: A systematic review and recommendations for shorelines. *Environmental Pollution*, Volume 310, (2022).

# Reporting units matter! Limited consensus.

81 micro and macro shoreline studies



Key to interoperability:  
Clear reporting of  
sampling dimensions,  
location, effort controls,  
overall methods

Uhrin, A.V., Hong, S, Burgess, H.K., Lim, S., and Dettloff, K. Towards a North Pacific long-term monitoring program for ocean plastic pollution: A systematic review and recommendations for shorelines. *Environmental Pollution*, Volume 310, (2022).

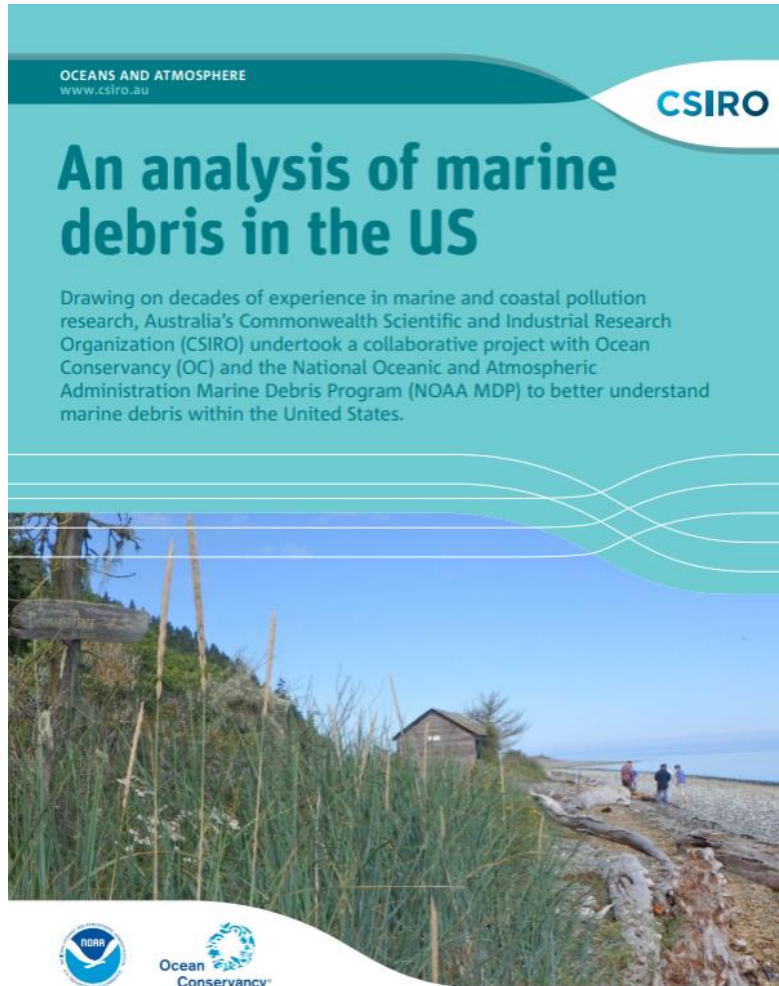
# Data collection methods matter!

Common units  $\neq$  comparability



At least  
we're both  
fruit...

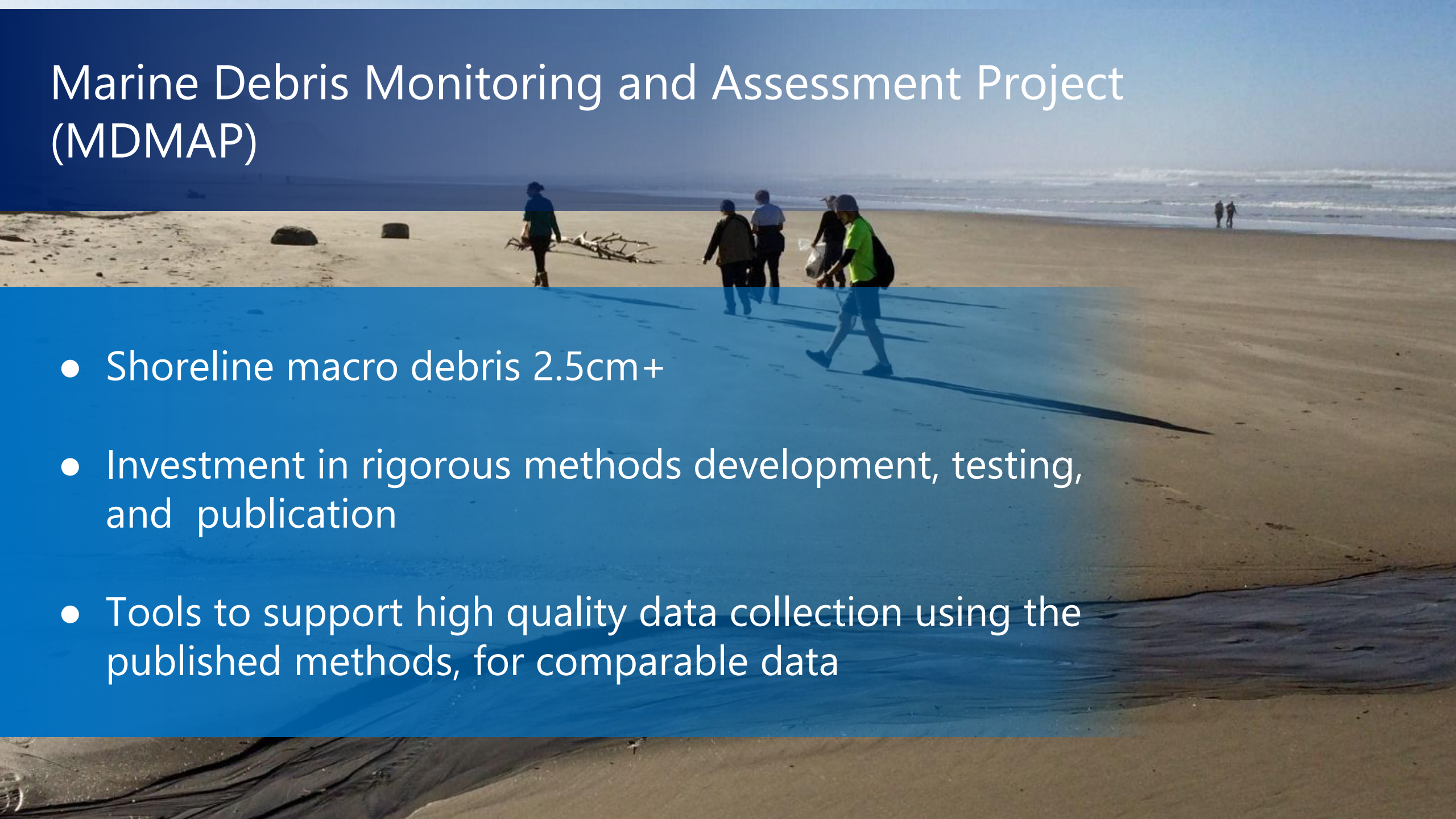
# Shoreline Macro Methods comparison:



- Partnership with Ocean Conservancy & Australia Commonwealth Scientific and Industrial Research Organization (CSIRO)
- Compared results from the Marine Debris Monitoring and Assessment Project, International Coastal Cleanup, CSIRO method
- All tested methods can generate items per length of shoreline
- Different field protocols yield different results, sometimes by orders of magnitude



# Marine Debris Monitoring and Assessment Project (MDMAP)

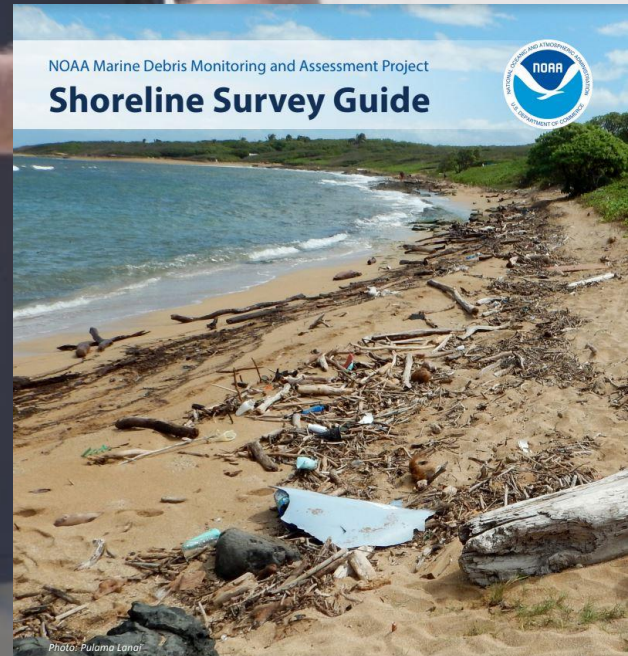


- Shoreline macro debris 2.5cm+
- Investment in rigorous methods development, testing, and publication
- Tools to support high quality data collection using the published methods, for comparable data

# Monitoring Toolbox

<https://marinedebris.noaa.gov/monitoring-toolbox>

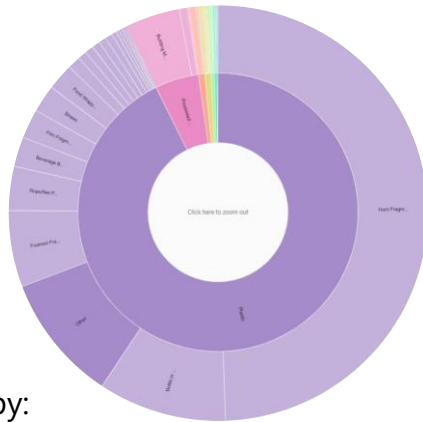
- Data collection protocols
- Training videos
- Open database
  - Data from **standard NOAA data collection methods only**
- API
- Data Visualizations



# Data Visualizations

## Composition

Proportion of items by material and item type

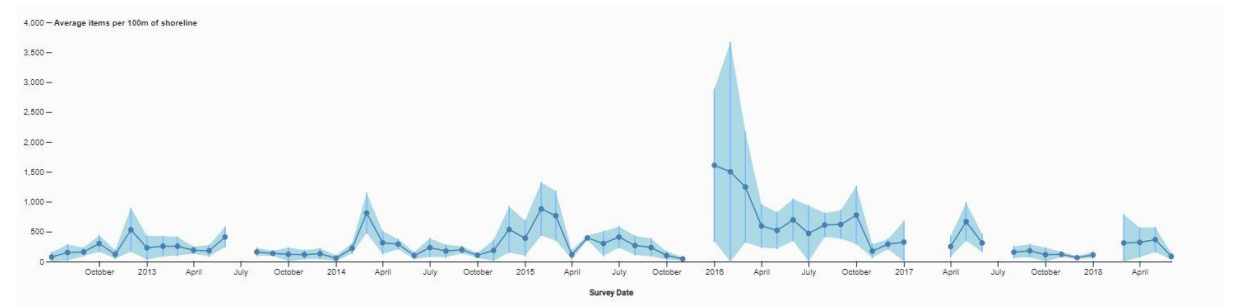


Viewable by:

- survey
- single site
- selection of sites

## Time series

Average items per month per 100m length of shoreline



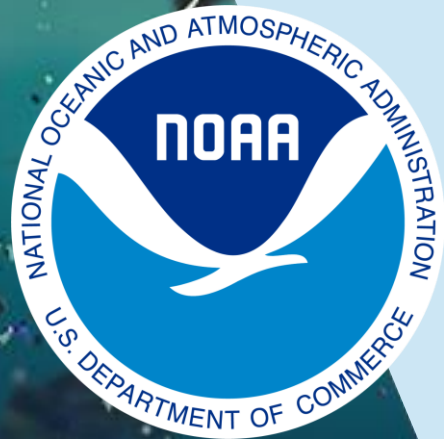
Viewable by:

- all debris or by type
- single site
- selection of sites

# The NOAA NCEI Global Marine Microplastics Database and Map Portal

**Jennifer B. Webster**<sup>1</sup>, Ebenezer Nyadjro<sup>1,2</sup>, Gunnar Kaltenberger<sup>1,4</sup>, Leonard Collazo<sup>1,4</sup>, Tiffany Toft<sup>1,4</sup>, Zhankun Wang<sup>3</sup>, Yee Lau<sup>1,2</sup>, Just Cebrian<sup>1,2</sup>, Tim Boyer<sup>3</sup>, Kirsten Larsen<sup>1</sup>

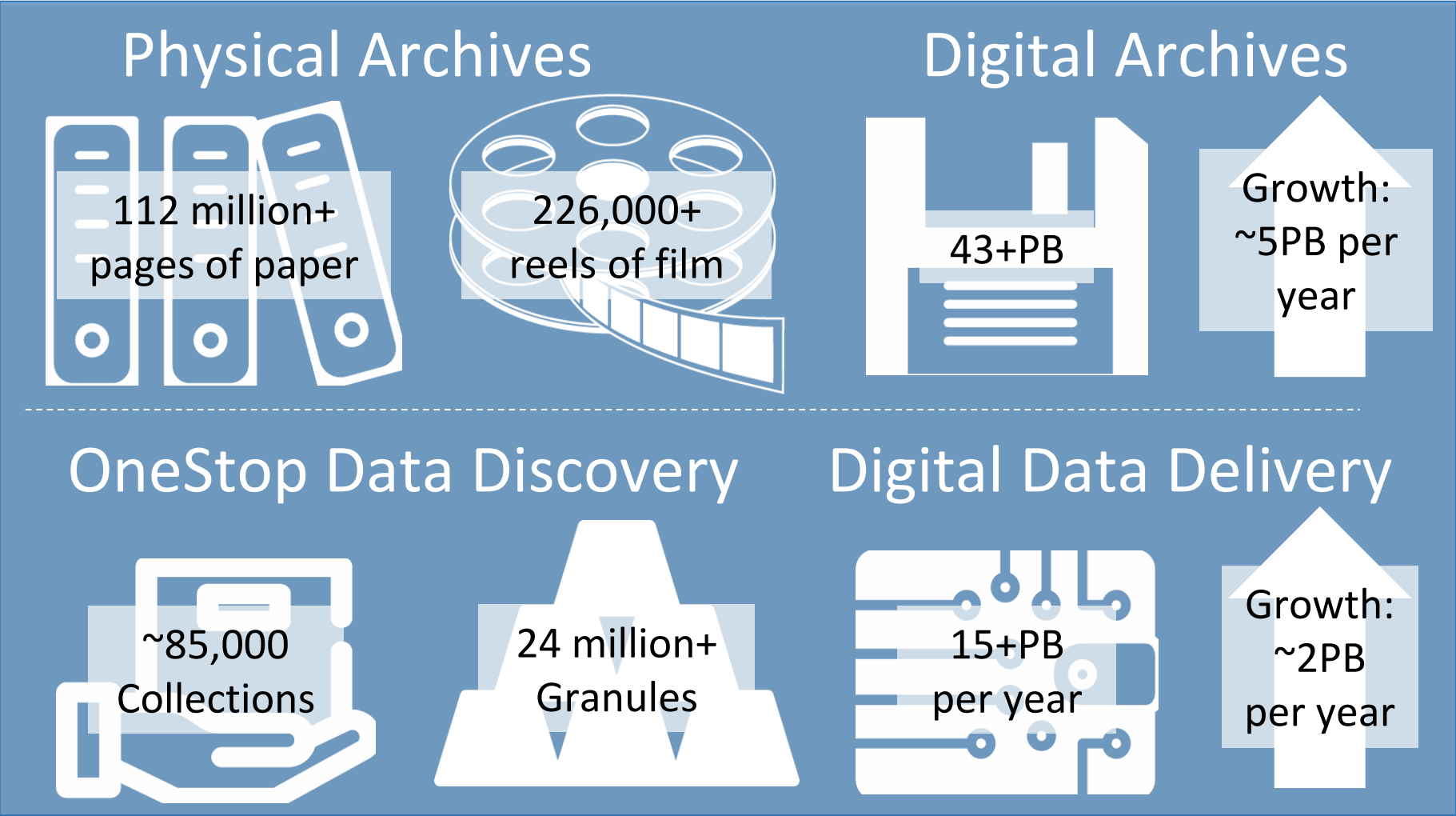
1. NOAA/ National Centers for Environmental Information, Stennis Space Center, MS
2. Northern Gulf Institute, Mississippi State University, Stennis Space Center, MS
3. NOAA/ National Centers for Environmental Information, Silver Spring, MD
4. General Dynamics Information Technology, Inc, Stennis Space Center, MS



**National Centers for  
Environmental Information (NCEI)**

Date: January 25, 2023

# NCEI Core Stewardship Services

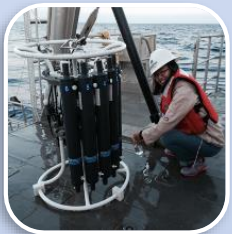


as of November 2021



# NOAA Data: High Impact, Global Reach

## NOAA Observing Systems



## Scientific Data Stewardship

### Research-quality products for decision making

#### Climate & Weather

- Climate Assessments
- Climate Normals
- Billion \$ Disasters
- Drought Monitoring

#### Oceans & Coasts

- Tsunami Warning
- Coastal Digital Elevation Models
- Extended Continental Shelf
- World Ocean Database

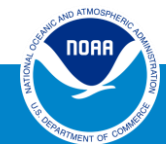
#### Geophysics

- Space Weather
- World Magnetic Model



# NCEI Efforts in Marine Microplastic Monitoring

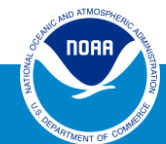
- **Need:** A large-scale, long-term, comprehensive database and archive for marine microplastics
- **Vision:** Establish a global, microplastic database that will **serve a diverse international customer base**, who will use it, together with other NCEI archived data (e.g., Global Ocean Current Database, World Ocean Database, etc.), to attain a holistic understanding of the global microplastic problem.
- **Goals:**
  - Provide a **robust, open access repository for archived information** needed for marine microplastic debris monitoring
  - Advance a **database** and **GIS web portal** in concert with other microplastic observing efforts (e.g., GPML, MOEJ, EMODnet, EUROqCHARM, etc)



# Marine Plastic Monitoring Challenges

## Issues:

- Currently lack of community standard
- NOAA participating on international working groups to establish standards for collecting & reporting





# Steps in Microplastic Database Development

Identify microplastic datasets

Obtain permission from data owners to add data to the NOAA archive and geodatabase

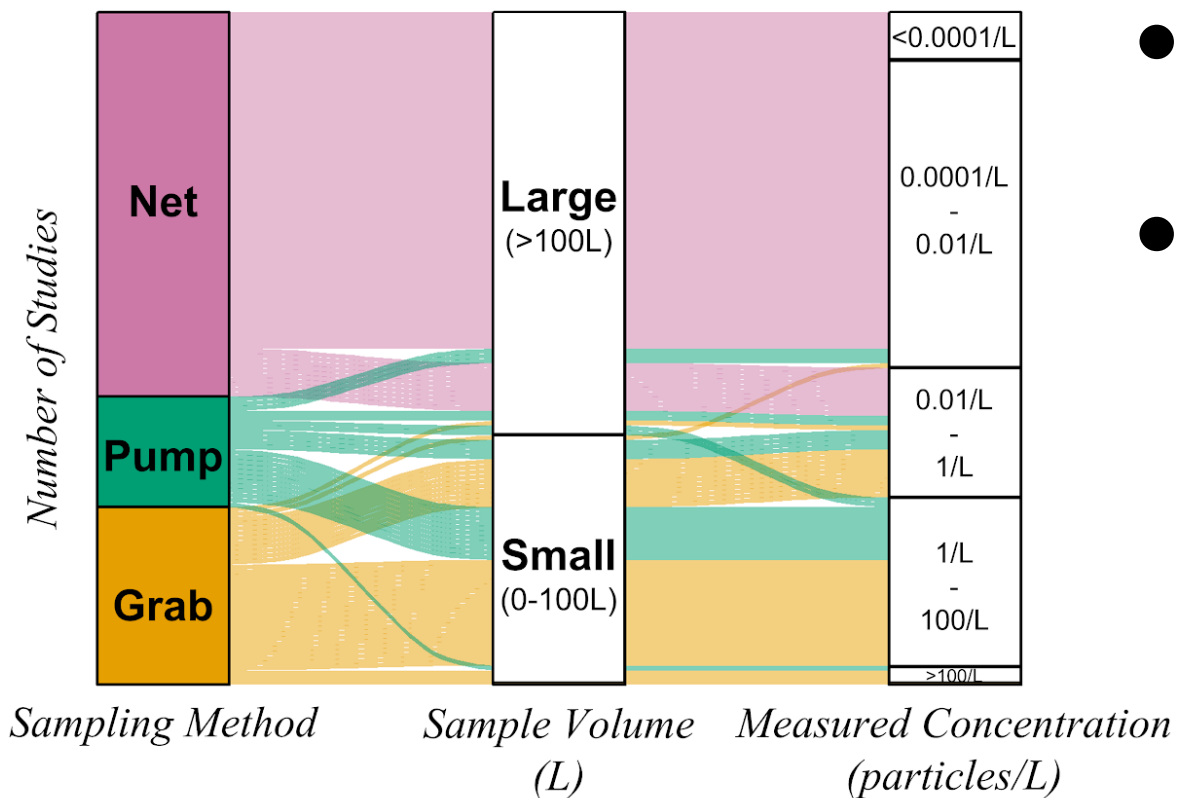
Quality control and archive original data and metadata in NOAA's national data archive

Post-archive quality control of Data for aggregation

Add data to the aggregated geodatabase for ArcGIS visualization



# Microplastics water methods comparison



- Most variance in concentrations explained by sampling method
- Sampling the same place at the same time using different common methods yielded different concentrations by **orders of magnitude**

Watkins L, Sullivan PJ, Walter MT. What you net depends on if you grab: A meta-analysis of sampling method's impact on measured aquatic microplastic concentration. *Environmental Science & Technology*, 55 (19): 12930–12942 (2021).

# Data Quality Control for Microplastic

## Data Archive

- All data submitted to NCEI is checked for consistency and data transfer correctness. Errors or questionable data are resolved with the data provider.
  - Preferred data format is .CSV or NetCDF but will work with other formats
  - Data are archived and accessible in original form through each datasets accession link

## Database and Map Portal

- Limited fields are accessed in the map portal
- Data fields are harmonized for unified display

## Current Database & Map Portal Units

Sample Parameter	Data Units
Date	Numeric Day.Month.Year (e.g. 25.01.2023 for January 25, 2023)
Location	Latitude & Longitude in decimal degrees
Equipment	e.g. grab bottle, neuston net, manta net, bongo net, or plankton net
Microplastic Concentration Value	Pieces of plastics / m <sup>3</sup>

# NCEI Marine Microplastics Website Overview



National Centers for  
Environmental Information  
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

Home Products Services Resources News About Contact

Search NCEI



Home / Products / Marine Microplastics

## Marine Microplastics

<https://www.ncei.noaa.gov/products/microplastics>

Launched July 2021

Updated August 2022

### Homepage:

- Background information
- NOAA Policy & Approach
- Access to
  - Data submission information
  - Microplastic Data Archive
  - ArcGIS Map Viewer



Microplastics  
Homepage



# NCEI Marine Microplastics Data Map Portal Overview

**NOAA National Centers for Environmental Information**  
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

**Marine Microplastics** [User Guide and Help](#)

Data Information    Display Filters  
Map Viewer    Data Table

Click to view the metadata for the Microplastics data.

Visible Features: 9,784

Select Features in the Map to Review their Attributes

**Microplastics Map Portal**

**Legend**

**Marine Microplastics**

Concentration Class

- Very High : Greater than 10 pieces/m<sup>3</sup>
- High : 1-10 pieces/m<sup>3</sup>
- Medium : 0.005-1 pieces/m<sup>3</sup>
- Low : 0.0005-0.005 pieces/m<sup>3</sup>
- Very Low: Less than 0.0005 pieces/m<sup>3</sup>

2000 km  
1000 mi

General Bathymetric Chart of the Oceans (GEBCO); NOAA National Oceanic and Atmospheric Administration. Powered by Esri

Selected features: 0

Legend

# Map Portal Overview: *Selecting a Group of Records*

**NOAA** National Centers for Environmental Information  
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

Marine Microplastics

Help Document → User Guide and Help

Data Information Display Filters

Map Viewer Data Table

Click to view the metadata for the Microplastics data.

< 1 of 958 >

Date	5/16/2002
Latitude	32.57
Longitude	-151.69
Number of records	Pacific Ocean
Microplastics Measurement (density)	0.351280
Unit	pieces/m <sup>3</sup>
Density Class Range	0.005-1
Density Class	Medium
Sampling Method	Neuston net
Short Reference	Law et al.2014
Long Reference	Law, K.L, S.K. Morét-Ferguson, D.S. Goodwin, E.R. Zettler, E. DeForce, T. Kukulka, et al. 2014. Distribution of surface plastic debris in the eastern Pacific Ocean from an 11-year data set. Environ Sci Technol. 48(9):4732-8.

Visible Features: 9,932

Selected records

Selection Tool

Number of records by Selection tool settings

Selected features: 958

2000 km  
1000 mi

General Bathymetric Chart of the Oceans (GEBCO); NOAA National Centers for E... Powered by Esri



# Current Use of Database & Future Target Audience

## ★ Research Scientists

- Example: AI Moonshot Challenge proposal - AI & MP sensing International collaboration - data for development of remote sensing capabilities

## ★ U.S. and International Students

- Example: Data requests to support Ph.D. dissertation and Undergraduate thesis projects

## ★ U.S. State Environmental managers and Policy makers

- Example: Texas Commission on Environmental Quality - data to support state microplastic water quality policy

Plans to engage **future target audiences:**

*Fisheries managers, Tourism organizations, Media, General public*



# Thank You!

Microplastics Homepage



**Questions?**

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**Macroplastics:**

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MDMAP Homepage

