



Center for Marine
Debris Research



Large marine debris reporting, dispatching, documenting platform

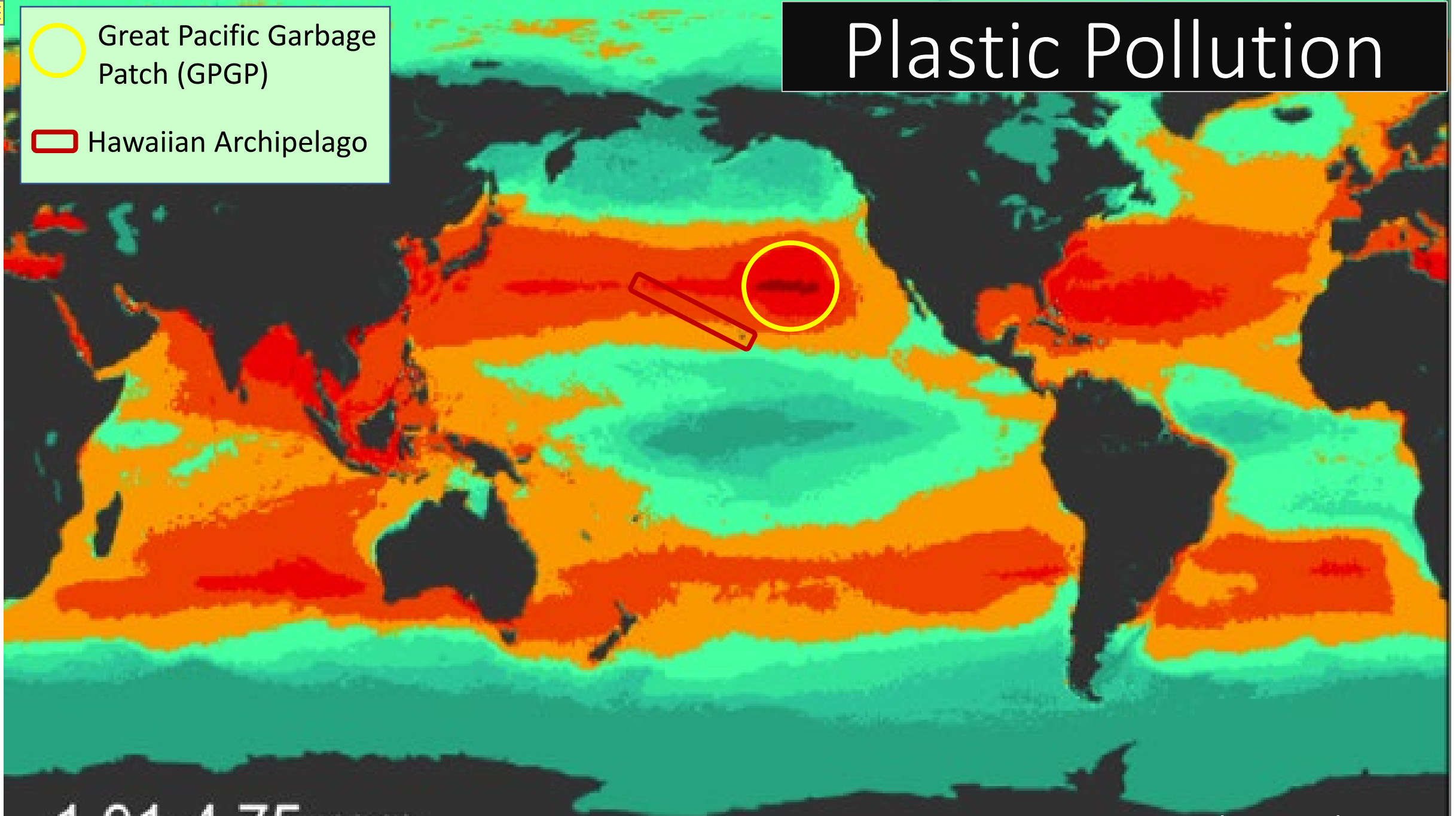
Jennifer Lynch, Ph.D.

October 20, 2023

Plastic Pollution

○ Great Pacific Garbage Patch (GPGP)

▭ Hawaiian Archipelago



1.01-4.75 mm

Eriksen et al. 2014

Impacts of Plastic in the Ocean



Ecological



Physiological





Toxicological





Economic

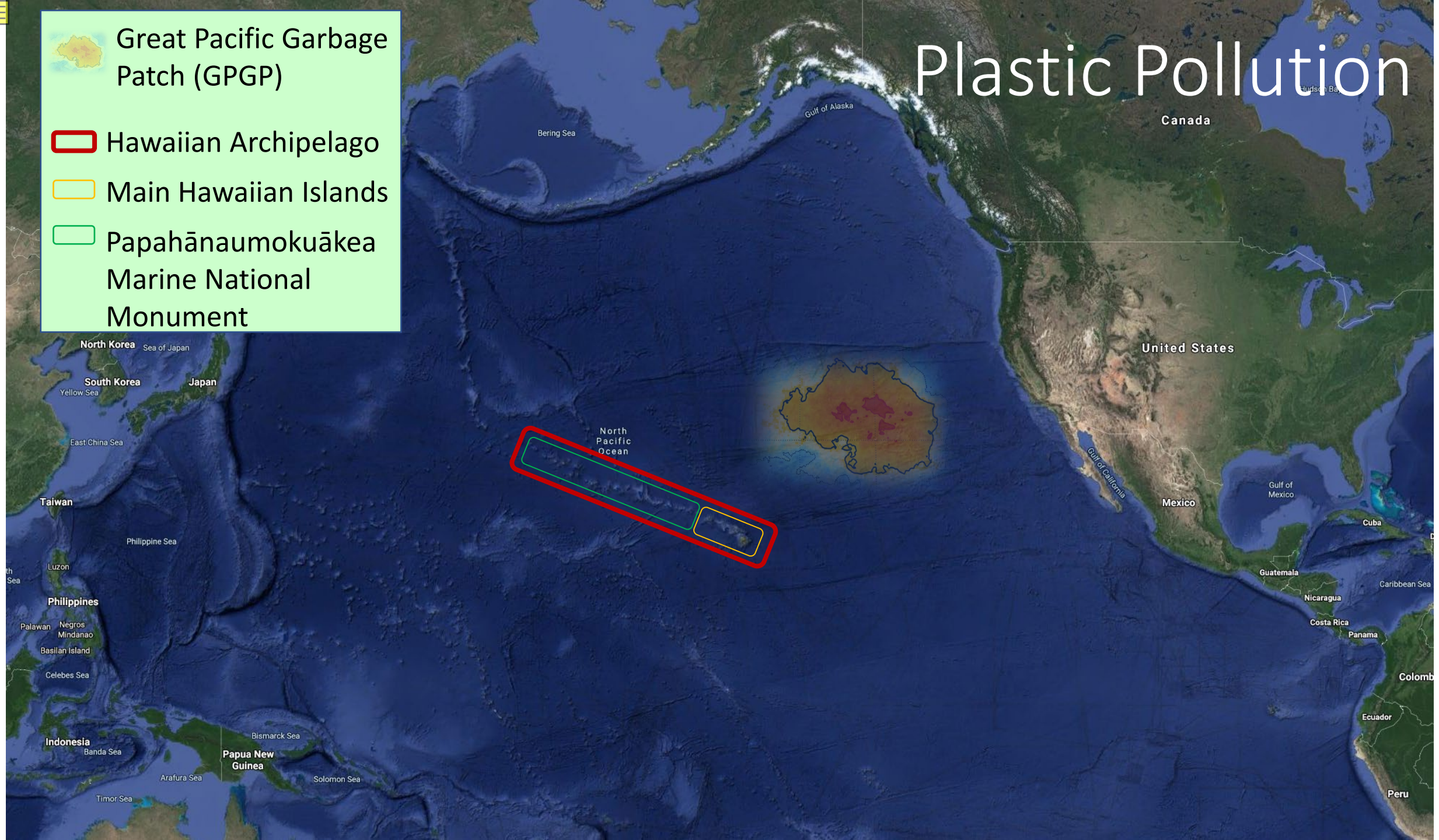
Plastic Pollution

 Great Pacific Garbage Patch (GPGP)

 Hawaiian Archipelago

 Main Hawaiian Islands

 Papahānaumokuākea Marine National Monument





Marine Debris in Hawaii





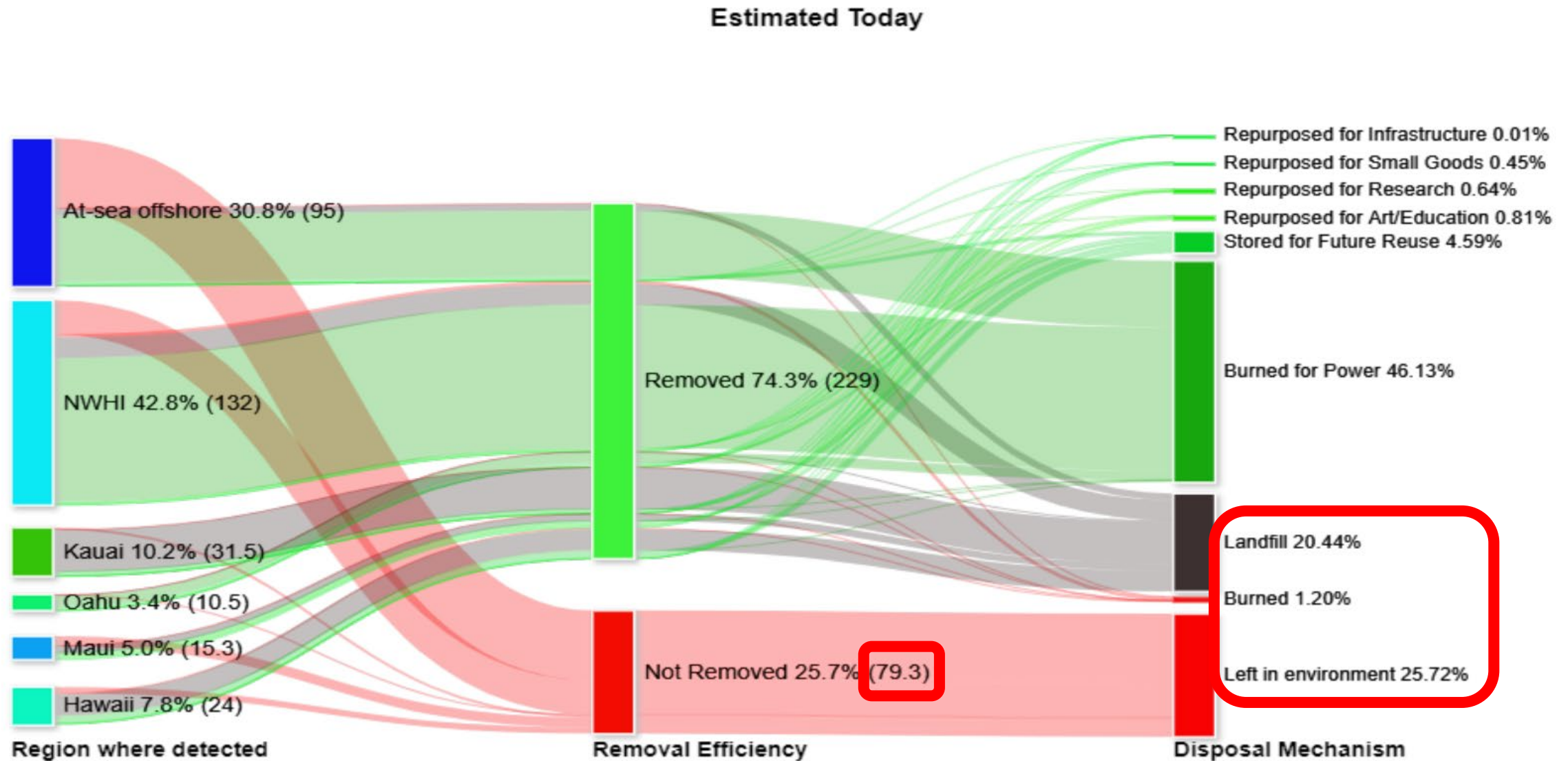
Hawaii Non-Profits Routinely Remove Marine Debris

Region	Metric tons/year	Organization
At-Sea	50	HPU CMDR
NWHI	110	PMDP
Kaua'i	30	HWF/Kaua'i Surfrider
Hawai'i	20	HWF
Maui	9	SHARKastics
O'ahu	10	4Ocean
Total	229	6 organizations

Today: Ballpark estimates. Next year: Accurately reported weights.



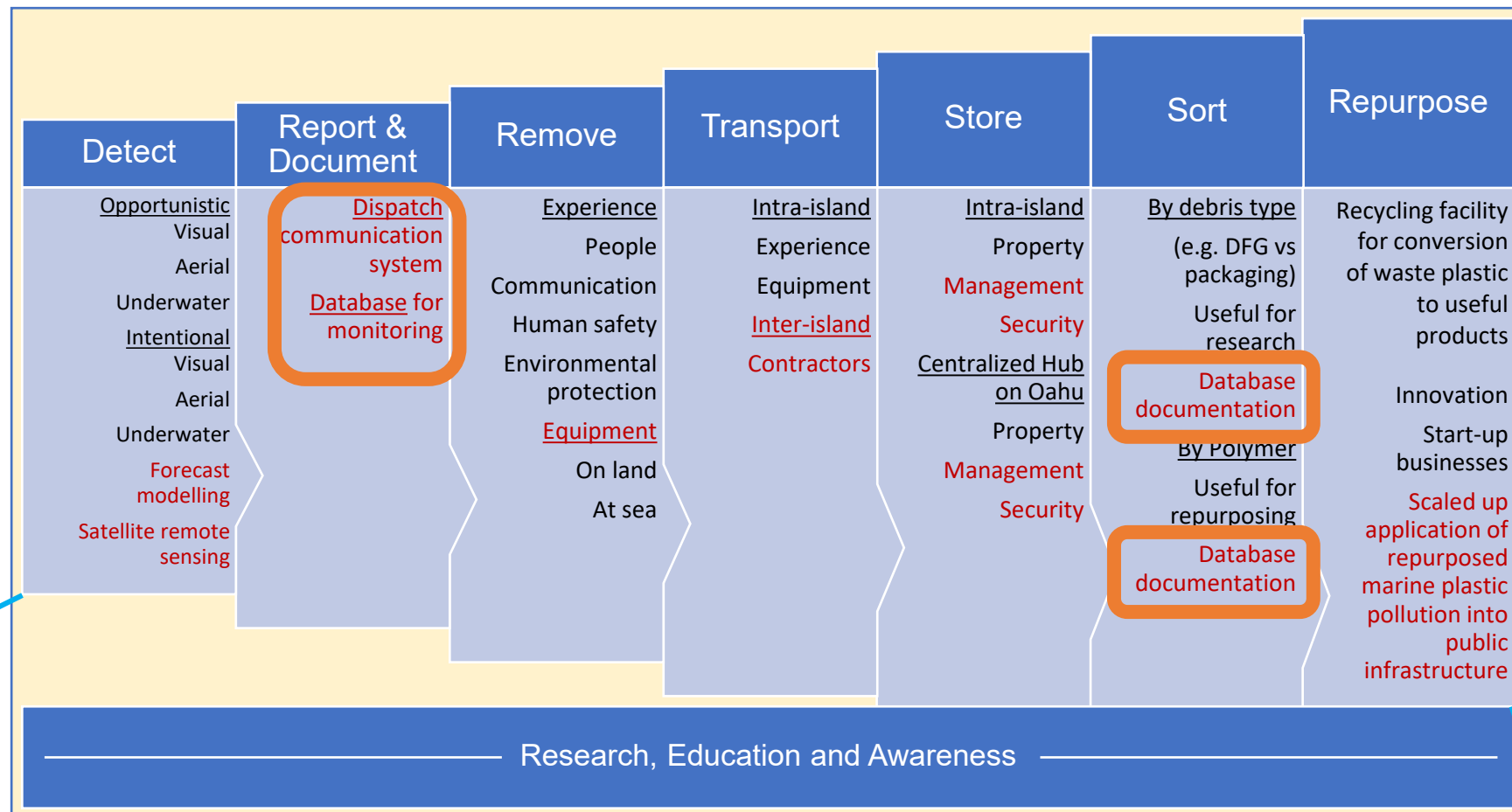
Guesstimate of Removal and Disposal Activities





Sea Grant Funding: Nets to Roads

All 7 steps are necessary to increase marine debris removal and mechanical recycling into local infrastructure.

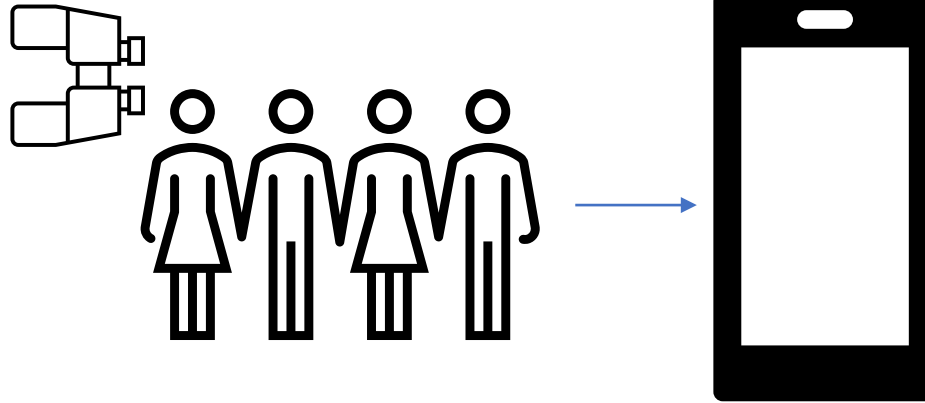


One Deliverable

Create centralized database and dispatch system - real-time public-access, dispatch communication tools, and a cradle to grave database to capture data at all 7 steps. Database should report debris amounts and proportions by mapped location, over time, removal efficiency, debris type, polymer type, and disposal mechanism.



Steps 1-2: Detect and report large marine debris



Today at least three reporting options exist:

1. Call hot-line (DAR)
2. Online form (DOBOR)
3. Call/text dedicated cell (CMDR)

1.)



2.)

Department of Land and Natural Resources
Division of Boating and Ocean Recreation

Announcements Boating Registration & Titling Commercial Ocean Use

Home » Report Marine Debris

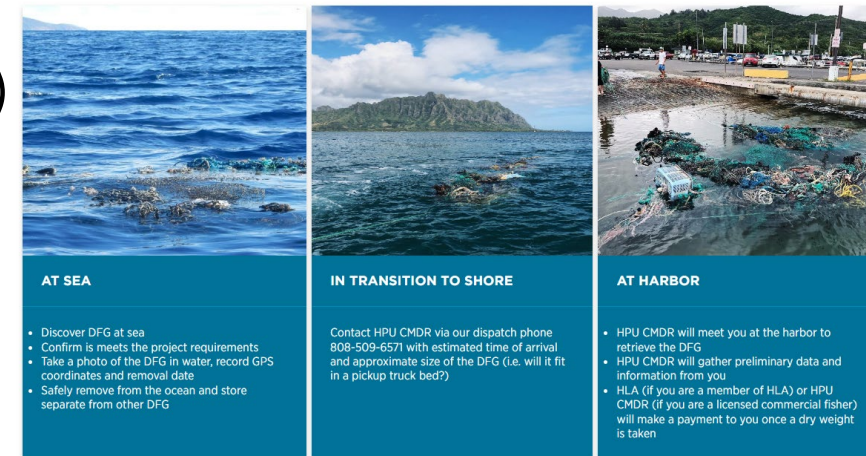
REPORT MARINE DEBRIS

Use this form if you found marine debris you cannot remove by yourself that is:

- 1) drifting in State waters or washed up on the shoreline,
- 2) removed from the water and is secured on land, or
- 3) so large or heavy that you need DLNR's help to remove it.

<https://dlnr.hawaii.gov/dobor/reportmarinedebrishawaii/>

3.)



<https://www.hpu.edu/cncs/cmdr/research/dfg-bounty.html>

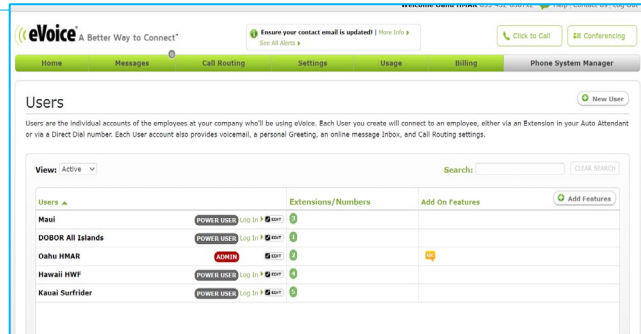
Steps 2-3: Report and Dispatch for Removal

1.)



Automated phone system

- Press 1: Abandoned vessel or shipping container
- Press 2, 3, 4, 5, 6: Derelict fishing gear or other large marine debris depending on which island



Answered by state-contracted non-profit removal organizations on respective island.

2.) DOBOR online form

MARINE DEBRIS RESPONSE AND REMOVAL REPORTING FORM

By filling out and submitting this form, multiple divisions in DLNR will receive your report. Fields with an asterisk (*) are required.

I FOUND/LOCATED THE FOLLOWING *

- ☐ A mass of netting and/or fishing gear
- ☐ An abandoned/derelict boat
- ☐ A container/drum/cylinder
- ☐ A large concentration of plastics
- ☐ Potential Japan tsunami marine debris
- ☐ A large concentration of miscellaneous trash
- ☐ Other - describe below

Where is the debris situated in relation to the landmark you provided (i.e. 200 feet north, etc.)

0 of 120 max characters

THE DEBRIS IS BEST DESCRIBED AS: *

- ☐ caught on the reef or is partially buried in sand
- ☐ loose in the shore break or on the shoreline and could go back out to sea
- ☐ trapped in a tide pool and cannot escape
- ☐ loose on the shore but caught in the vegetation line
- ☐ tied to a fixed object so it cannot be swept away
- ☐ pushed inland above the high wash of the waves so it cannot be swept away
- ☐ Other - please explain how urgent recovery/removal is

ENTER MY OWN DESCRIPTION

IF YOU CAN TAKE A PHOTOGRAPH, PLEASE TURN ON THE LOCATOR/GPS OF YOUR DEVICE, TAKE THE PICTURE AND ATTACH IT (Six image/30MB maximum)

Drop files here or

Select files

YOUR LAST NAME *

0 of 40 max characters

YOUR FIRST NAME *

0 of 30 max characters

YOUR E-MAIL ADDRESS *

YOUR PHONE NUMBER (with area code) *

0 of 12 max characters

Captcha

☐ I'm not a robot



Submit

Emails 25 officials and removal organizations.

3.) HPU CMDR Bounty Cell

Registered fishers call or text the CMDR cell phone.



Answered by CMDR staff or students monitoring the dedicated cell phone. Information is gathered for HPU to meet the fisher at the dock to receive the marine debris.



Steps 2-3: Dispatch and Remove improvement ideas

WANTED:

Standardize and streamline the communication tools across multiple reporting options.
Automatically enter the data into a centralized database at CMDR.

1.)



Each contracted organization stores reported data separately and submits spreadsheet reports to DAR.

Date	Location	Debris In Water?	Location Notes	Debris Type	Responded by HMAR?	Responder Notified if not removed by HMAR	Pounds removed
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WANTED:

Organizations to enter standardized detection and removal data (e.g. GPS coordinates, environmental damage) into a centralized database.

2.) DOBOR form

THIS DEBRIS IS LOCATED

On the beach ABOVE the high wash of the waves

If on land or in the nearshore waters - indicate which island

Oahu

All 25 people across the state are emailed regardless of island location. Removal organization chatter happens in “reply all” emails. DOBOR keeps a spreadsheet of detection reports, removal is not always reported.

WANTED:

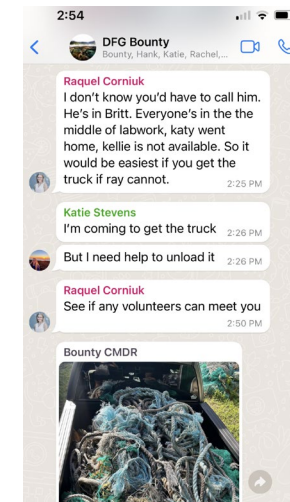
Public to upload a pinned location.
Form to automatically email people on respective island or need to know.

Move removal operation chatter to What’s Ap-like platform to:

- Coordinate efficient removal
- Reduce redundant response
- Capture data details that organizations may forget to report (CMDR data manager has access to all)

3.) HPU CMDR Bounty

What’s Ap used for coordination.
Datasheet captures removal data at dock. Data entered into Google Sheet.



Initials: <i>BNV</i>	Date(s): <i>4/12/2023</i>
DFG Event ID	<i>NPG 74</i>
Date First Detected (yyyy-mm-dd)	<i>April 6 2023</i>
Time First Detected (military)	<i>Time removed 11am</i>
Detected Latitude (N) (decimal degrees)	<i>29.52</i>
Detected Longitude (W) (decimal degrees)	<i>161.57</i>
Environment detected	<i>Floating at sea</i>
Water depth where detected (m)	<i>Surface 0m</i>
Name of person who detected	
Contact info of person who detected	
Date Removed (yyyy-mm-dd)	<i>April 6 2023</i>
Time Removed (military)	<i>11 am</i>
Removed Latitude (N) (decimal degrees)	
Removed Longitude (W) (decimal degrees)	

WANTED:

Two-dimensional spreadsheet turned into the centralized relational database.



Steps 3-5: Remove, Transport, Store

WANTED:

Removal partners enter their removal, transport and storage data for each event into the centralized database.



Removers to label and store each debris event at their node storage spaces on neighbor islands.

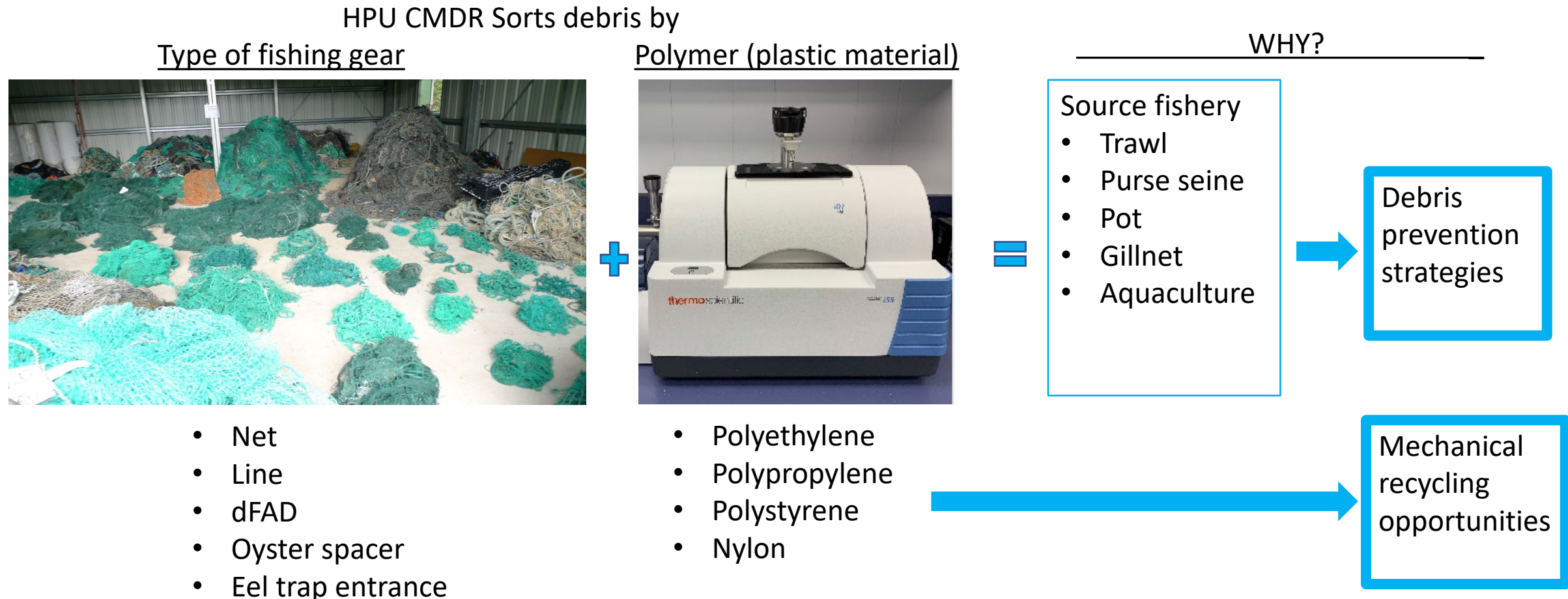
Once or twice a year the debris is shipped to the CMDR hub on Oahu



Step 6: Sort Debris by type and polymer

WANTED:

Removal partners at nodes and/or CMDR at the hub enter standardized data about debris type within each event into the centralized database.





Step 7: Dispose ↗ Recycle Debris into Products

WANTED:

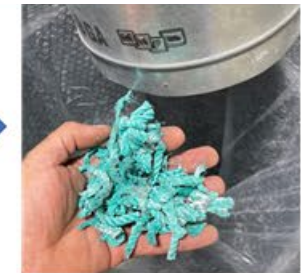
Removal partners at nodes and/or CMDR at the hub enter standardized data about disposal options used for each event into the centralized database.

Options from best to worst:

1. Recycled plastic products
2. Sampled for recycling research
3. Stored for future recycling
4. Burned for electricity
5. Landfill
6. Incinerated

Future Oahu Hub: Plastic Recycling Research Facility (PRRF)

1. Shredder



2. Extruder with

- Compounder
- Pelletizer



Hopper

Twin-screw extruder

Compounder

Twin-screw extruder

Water cooling bath

Pelletizer



Pellet storage





Summary of Tool(s) Wanted

Examples



Communication

Tools

Event Reported in **standardized** way with photos (if possible), dispatched to multiple people for multiple reasons (authority, removal, **documentation**)

Removal operations coordinated efficiently and not redundantly (**automatically notify What's App-like groups, remind removal organizations to enter their successes**)

Centralized database accessible to federal and state agencies, universities, partners with intuitive reporting tools. Some reporting options (e.g. maps) should be made available on public websites.

Centralized

database

Event Detected & Reported

Detection Date
Detection Location
Environmental damage
Debris Type
Debris Approx Size

Event Removal & Temp Storage

Removal organization
Removal Date
Removal Location
Environmental damage
Debris Type
Debris Size & Mass
Storage location

Multi-event Transport

Shipment Date
Shipment from/to Locations
Total Debris Size & Mass
Event ID #s

Event Sorting

Event ID
Event type
Event mass
Component types (float, net)
Component masses
Component polymers

Component Disposing

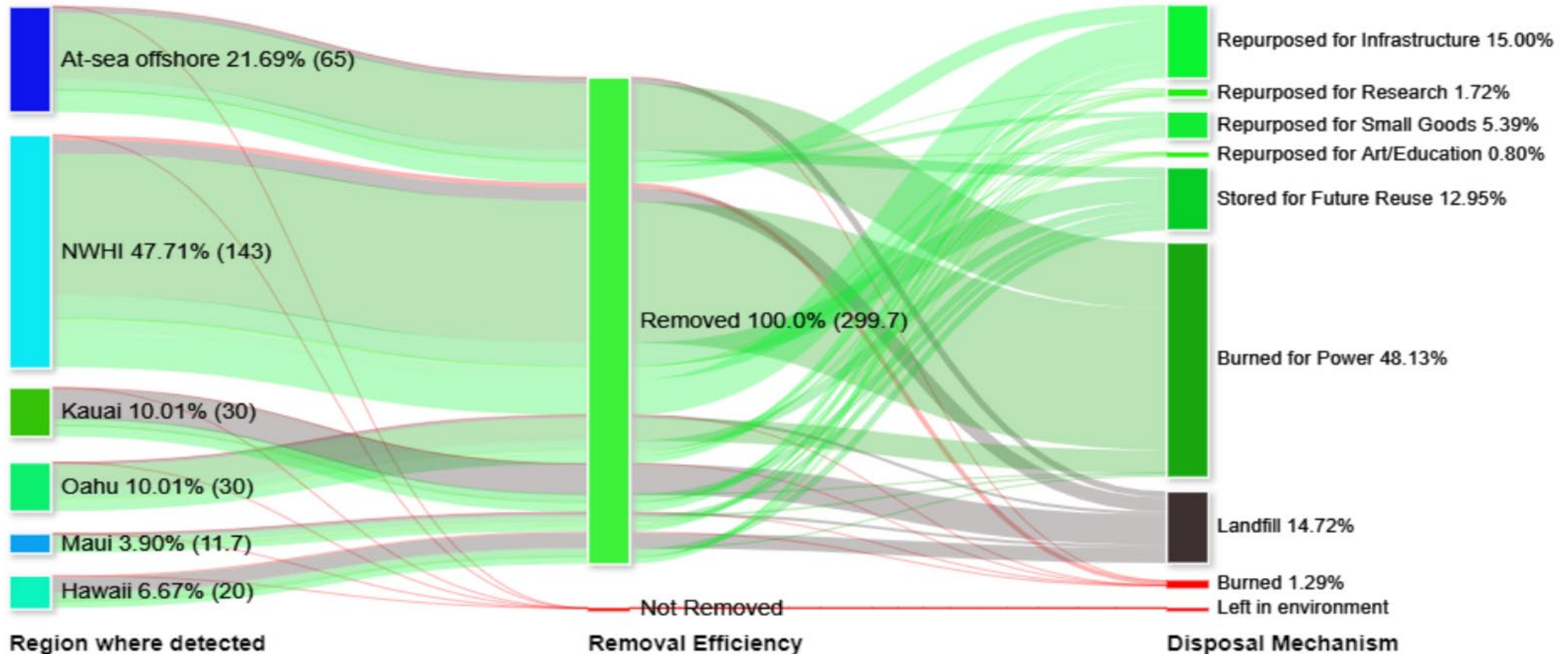
Disposal mass by component type and polymer
Disposal date
Disposal mechanism



Ultimate Goal: Report accurate debris quantities, types, removal efficiency, and disposal mechanisms

Three-Year Goal

WANTED: Tools that allow us to make this Sankey Chart with accurate data.





Relational database

Event # from one island

1



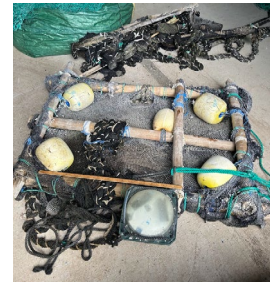
2



Multi-Event Shipment



Event Sorting to Components



Component Disposal

% recycled
% burned for power
% landfilled

% recycled
% burned for power
% landfilled

% recycled
% burned for power
% landfilled



Relational database

NWHI

Event # from one island

Multi-Event Shipment

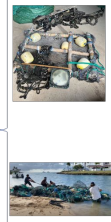


- Reused
- Burn for power
- Landfill

Kauai

Event # from one island

Multi-Event Shipment



- Burn for power
- Recycled

Oahu

Event # from one island

Multi-Event Shipment



- Recycled

Event Sorting to Components

Likely Disposal

Reporting

Metrics:

- Masses or number of events
- Masses or number of debris types
- Masses of each polymer
- Proportion of totals

By:

- Mapped locations for detection and removal of events (make public)

- Debris type and polymer by island, month, year, etc.

- Disposal mechanisms by island, year, debris type, polymer combination

Learn More



Visit our website:

<https://www.hpu.edu/cncs/cmdr/index.html>

Email: cmdr@hpu.edu



Get involved: submit this form for practicum or volunteer opportunities



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