Marine Debris Monitoring & Detection

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Nancy Wallace, Director
Hillary Burgess, Monitoring Coordinator
Steve Morrison, International Activities & Partnerships

National Oceanic and Atmospheric Administration
Marine Debris Program

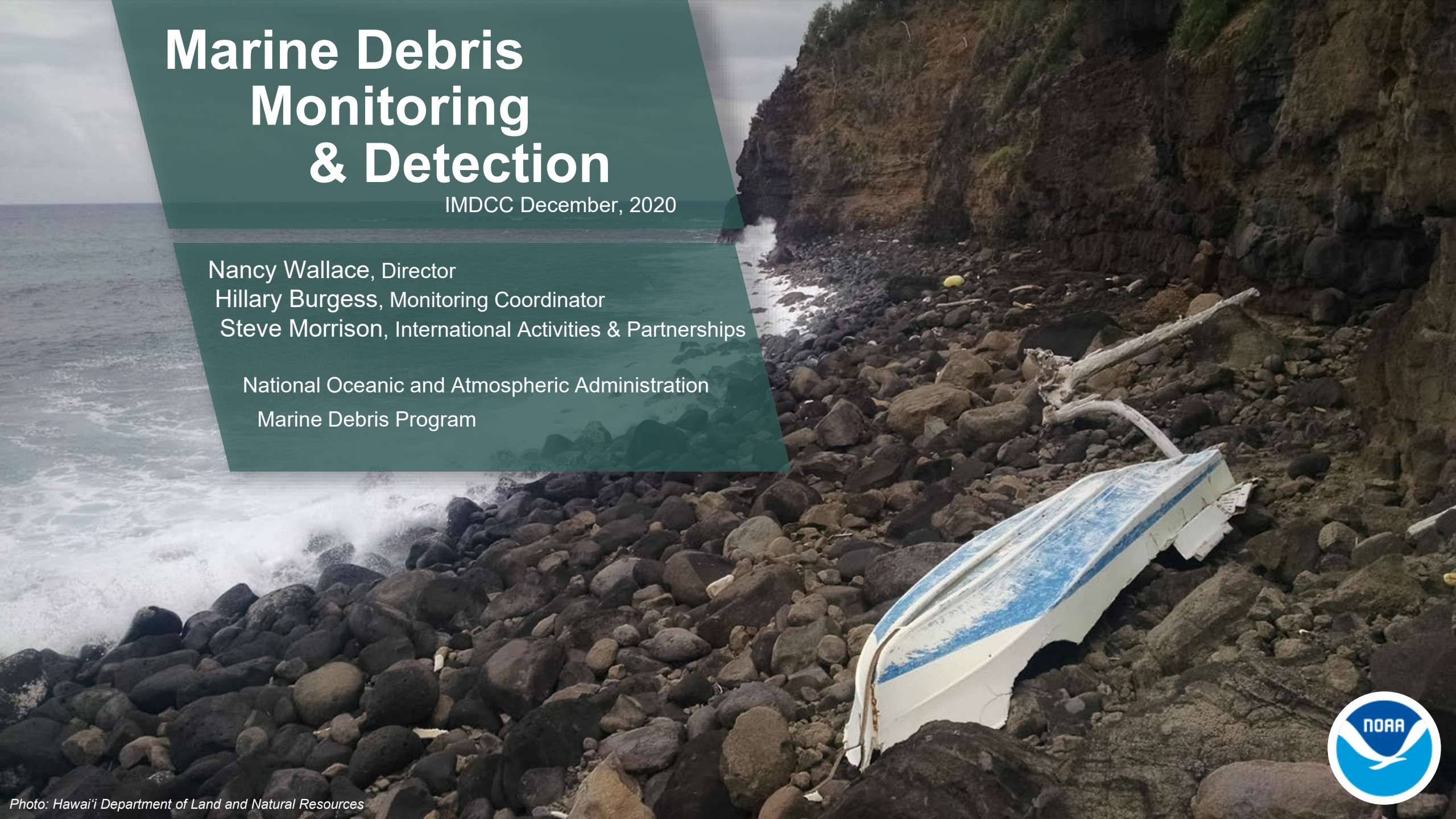


Photo: Hawai'i Department of Land and Natural Resources

Photo: NOAA

NOAA MARINE DEBRIS PROGRAM PILLARS

- Prevention
- Removal
- Research
- Emergency Response
- Regional Coordination
- **Monitoring & Detection**

Photo: NOAA

Marine Debris Monitoring & Assessment Project (MDMAP)

Shoreline monitoring focused on macrodebris

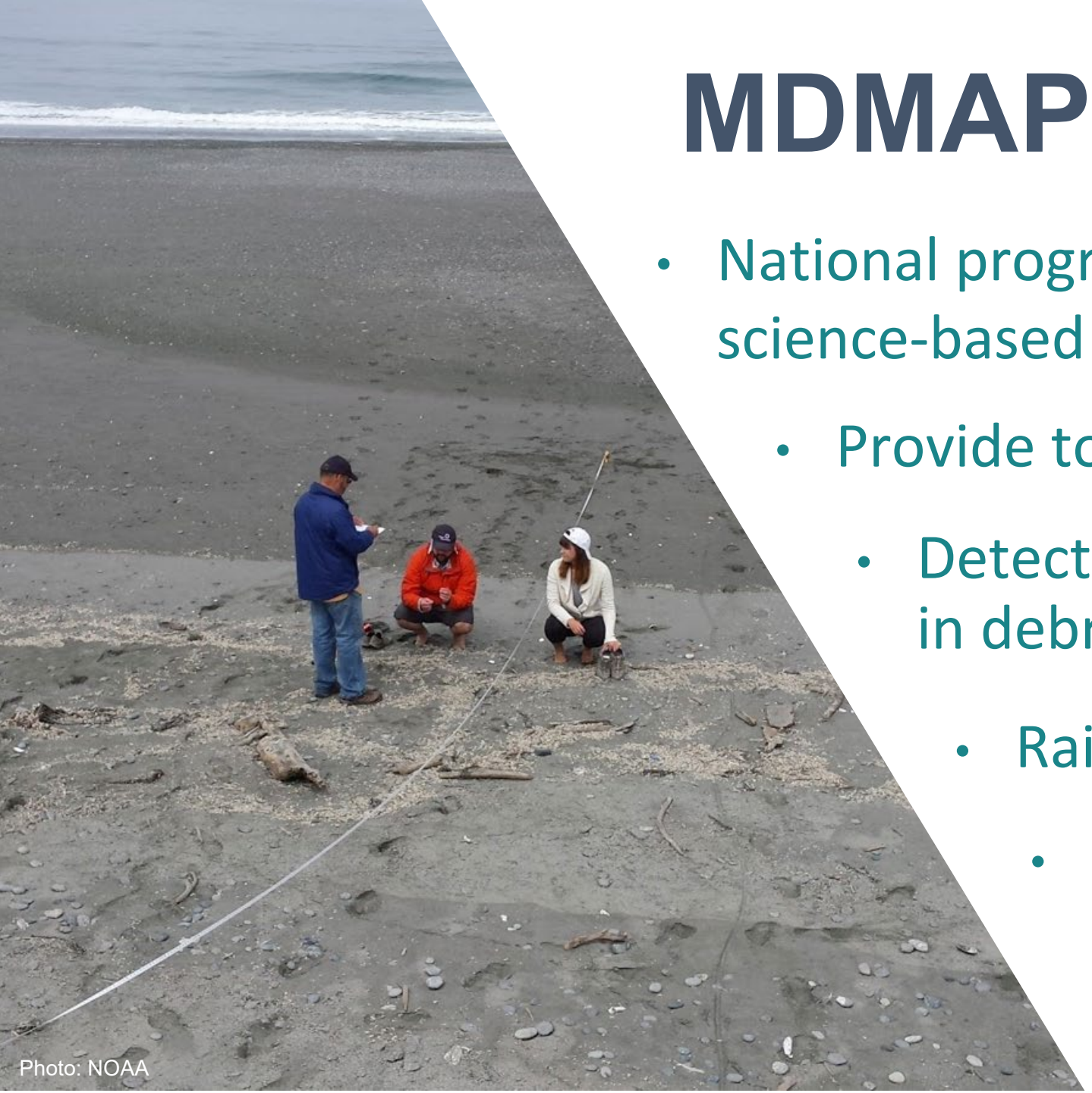


Photo: NOAA

MDMAP GOALS

- National program to support research and science-based policies
  - Provide tools to partners
    - Detect spatial and temporal changes in debris loads by **material and type**
      - Raise awareness
        - Guide and evaluate **prevention**

MDMAP HISTORY

- 2009-2012: development + testing
- 2011: Japan Tsunami
- 2012: *Shoreline Field Guide*, recruited partners, launched database
- 2016: Get Started Toolbox launched
- 2017 OC/CSIRO National Assessment
- 2018: Examining Observer Bias study
- 2019: Partner feedback

443 sites
9,055 surveys
21 US States + PR
9 Countries

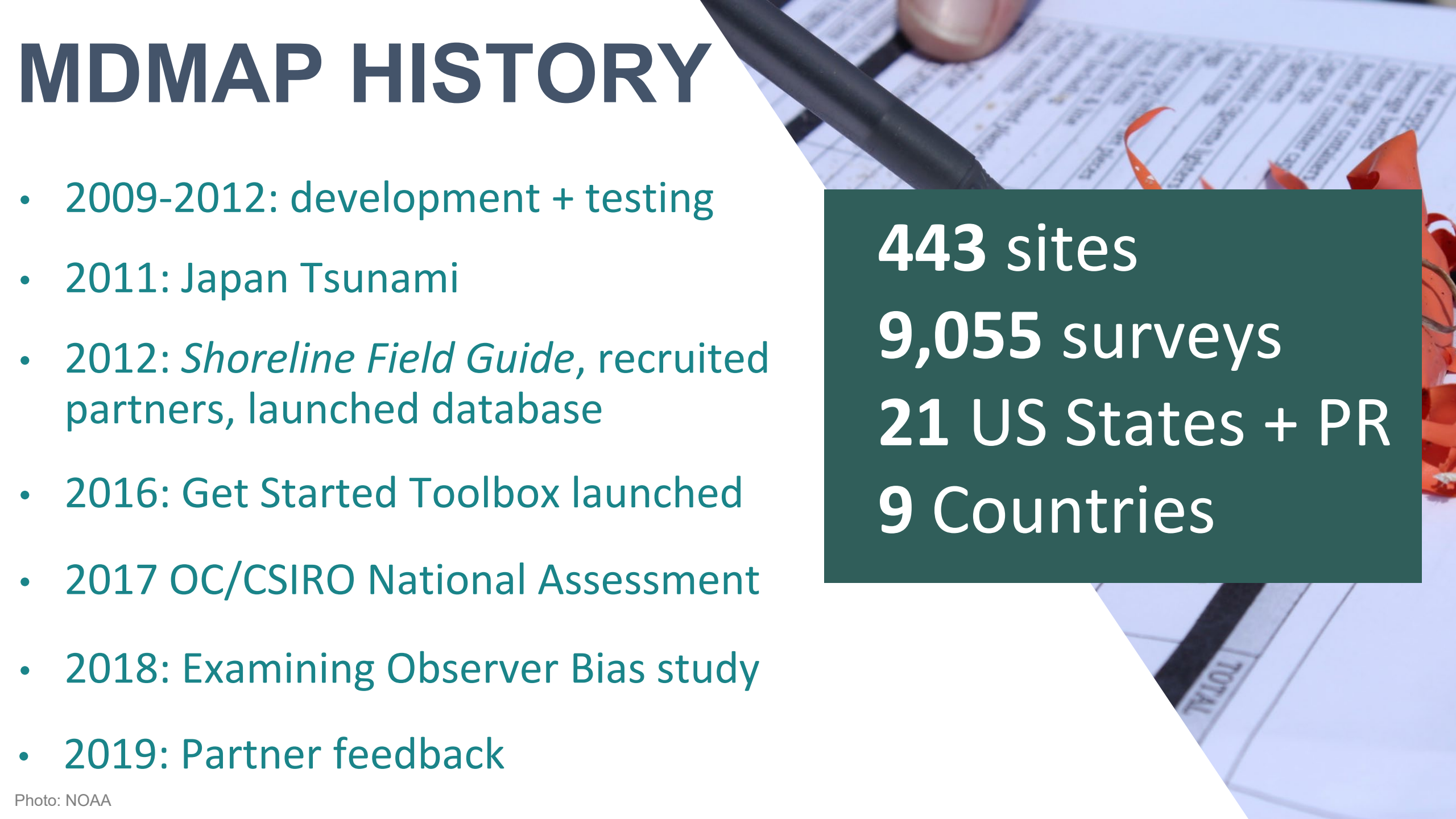
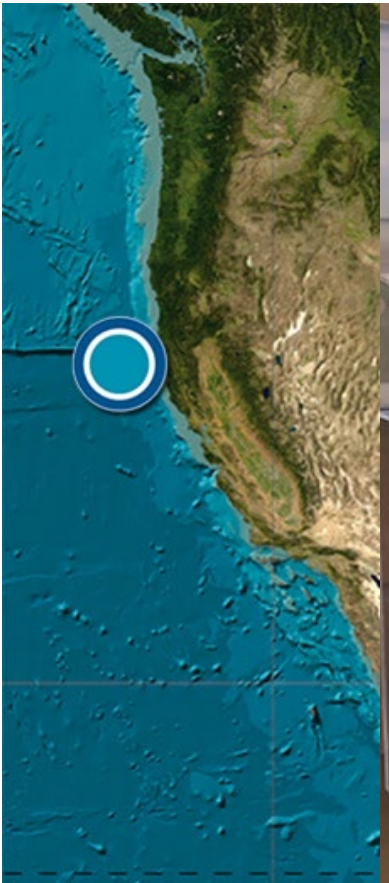


Photo: NOAA

Virginia Coastal Zone
MANAGEMENT PROGRAM

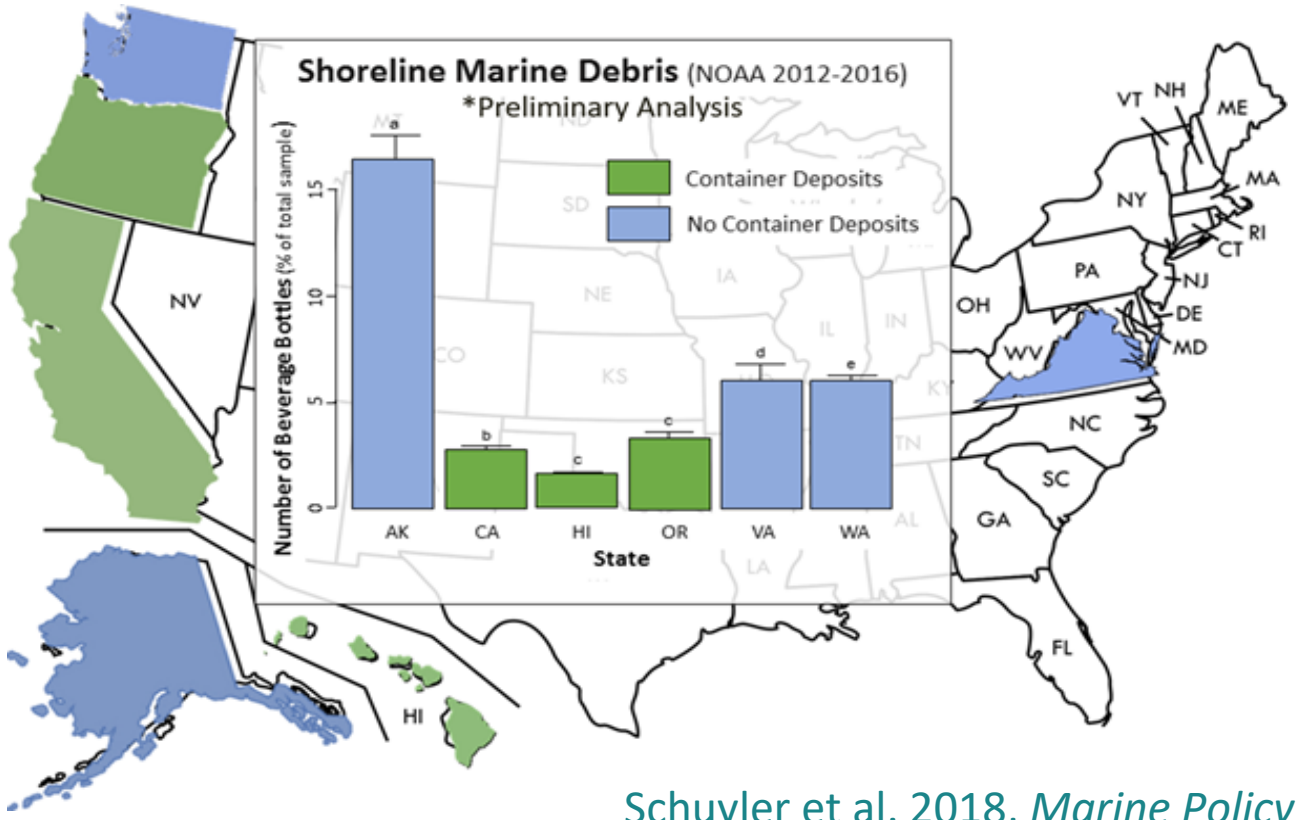
Outcomes

Local

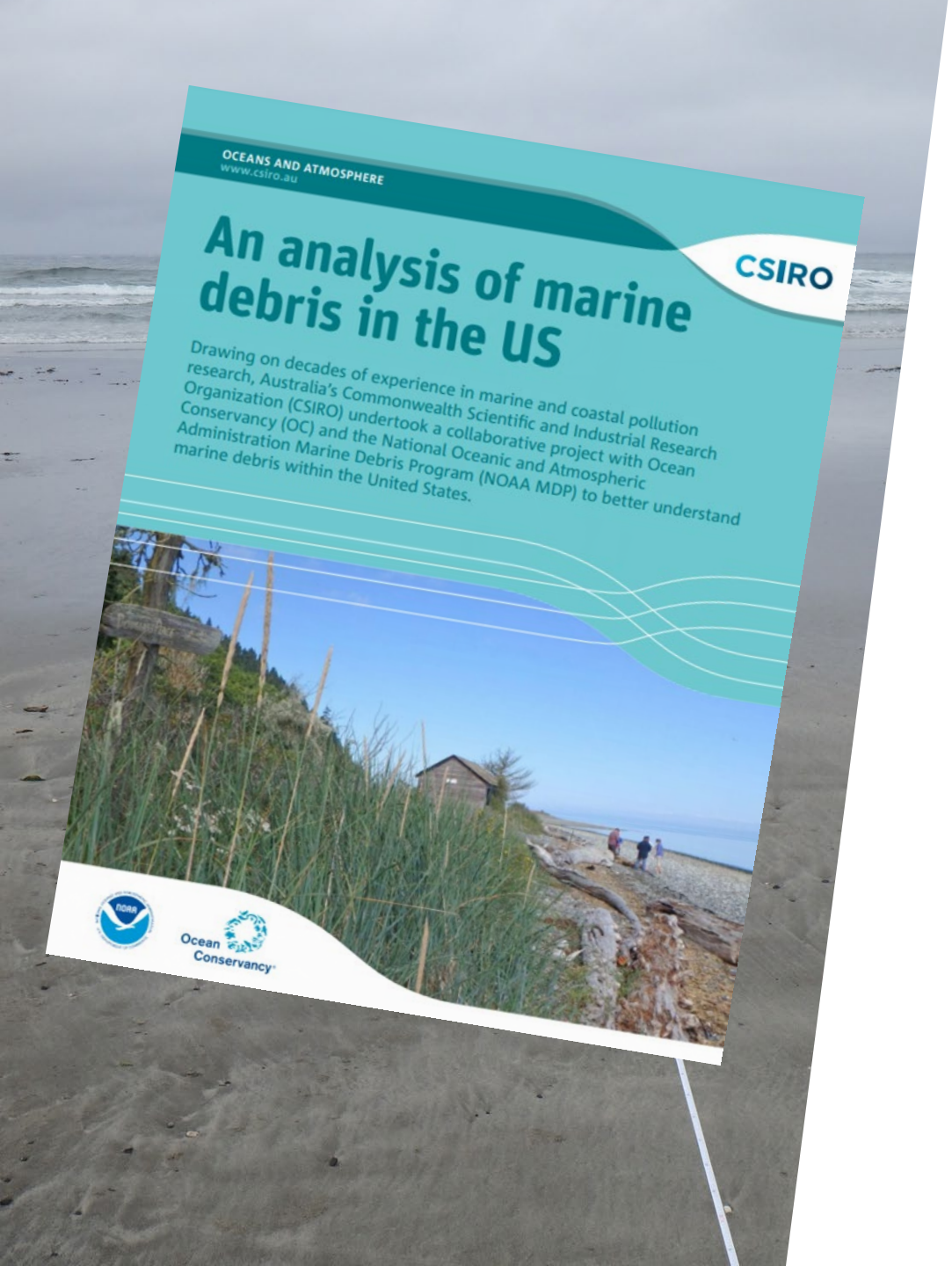


Kate Brimrose

National



Schuyler et al. 2018, *Marine Policy*



Analysis of Marine Debris Datasets

- Partners: Ocean Conservancy, CSIRO
- Analyzed US monitoring data
- Identified hotspots, drivers
- Compared methods

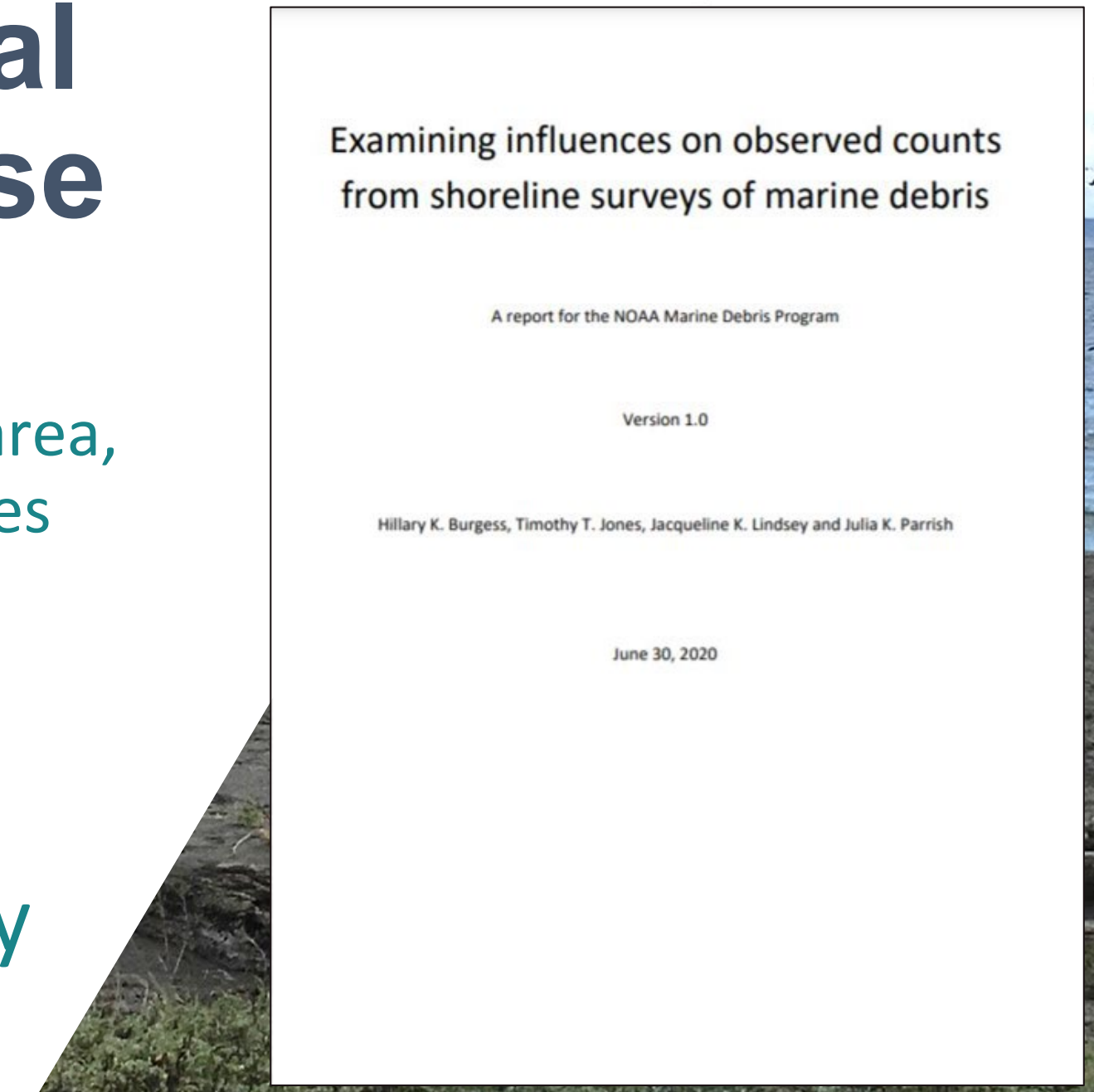
Seeing the signal through the noise

- Partner: COASST
- Number of people, search area, walking patterns, debris sizes

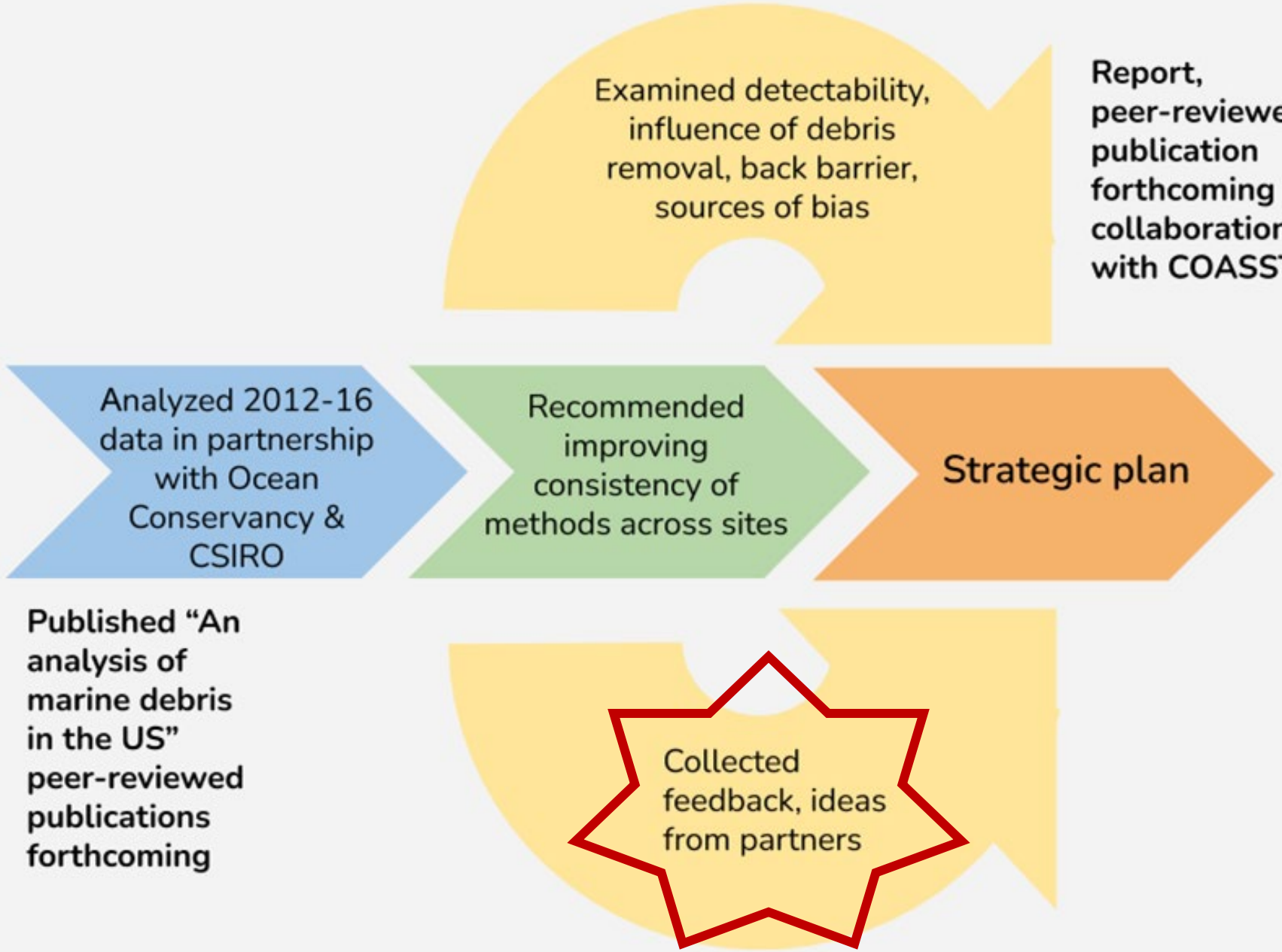
...and more

influence the data

➡ Consistency is key



ADAPTIVE MANAGEMENT



- Unified protocol
- Dedicated coordinator
- Upgraded database interface, API
- Data visualization
- Updated/upgraded toolbox
- Expanded training resources

One Protocol, Two Approaches

Citizen/ Community Science

- Volunteer, partner led
- Monthly
- Assess local trends

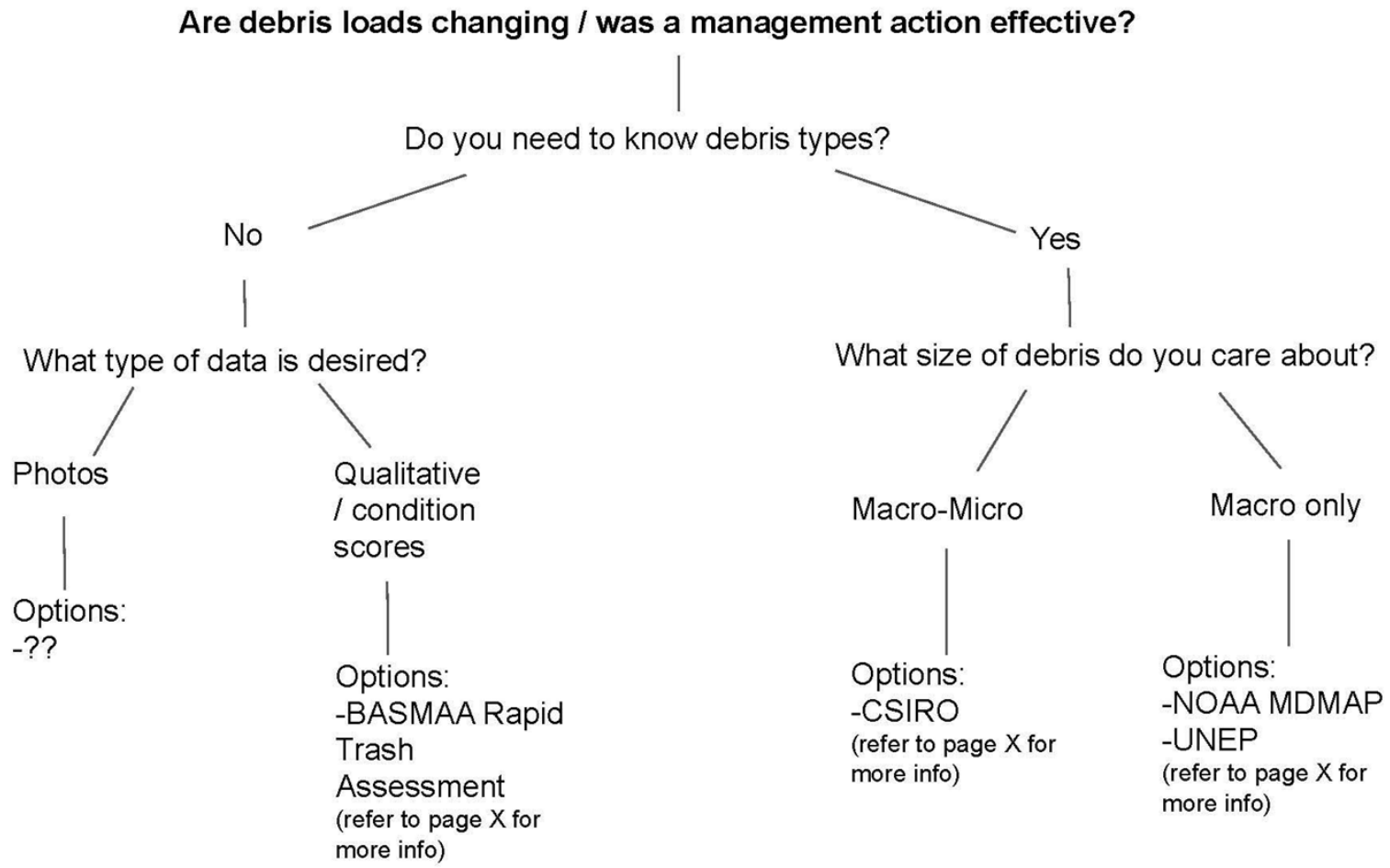
National Survey

- Contracted
- Every ~5 years
- Fill spatial gaps

SHORELINE DEBRIS MONITORING DECISION FRAMEWORK

- Asia Pacific Economic Cooperation (APEC) forum project
- Development of ‘decision framework’
  - Tool to assist in shoreline debris monitoring
- Building off 2019 GESAMP guidelines

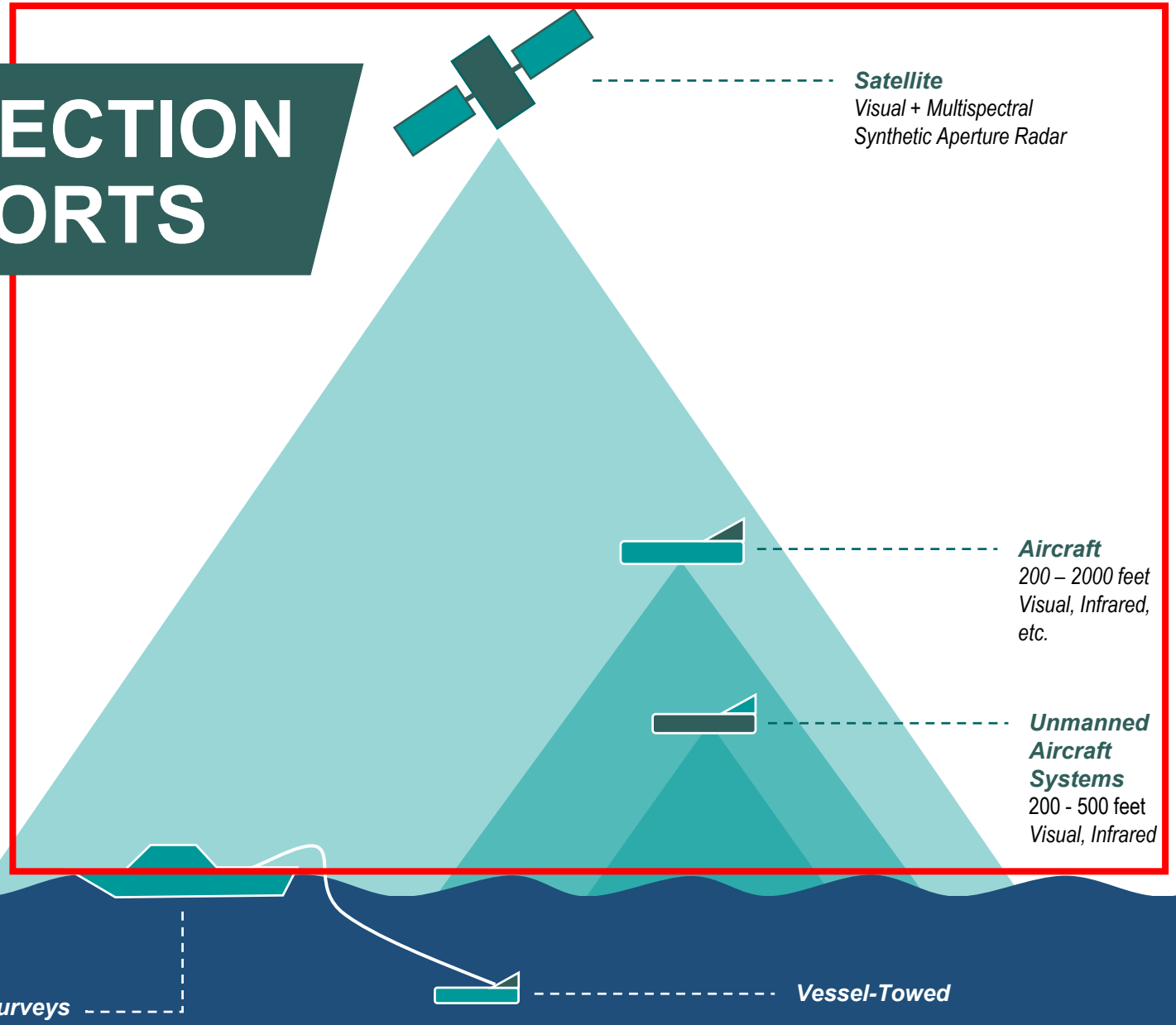
SHORELINE DEBRIS MONITORING DECISION FRAMEWORK



DECISION FRAMEWORK: EXAMPLE SCENARIO

- A group of volunteers affiliated with a local community organization are concerned about debris loads, and want to start collecting data to present to city council.
- The decision framework walks the user through a series of questions:
  - Primary question to be addressed: types, hotspots, changes over time (effectiveness)
  - Resources available: # participants / frequency of survey events, funding, supplies
  - Debris units / data type: counts, weights, volumes, qualitative scores, photos
  - Debris size: macro, meso, micro, all?
  - Habitat: river/stream, shoreline (< 100m), shoreline (> 100m), etc.
  - Other requirements: centralized open database, training, mobile app, built-in visualizations
- Decision framework suggests the Marine Debris Tracker App

DETECTION EFFORTS



- Satellite Surveys
- Aerial Surveys
- Unmanned Aircraft Systems Surveys
- Surface Surveys
  - Vessel
- Vessel-Towed
  - Sonar
  - Video
  - Diver
- Autonomous Underwater Vehicle

CHALLENGES OF DETECTION

Low encounter rate

Varied debris size and composition

Debris visibility

Debris Identification

Resolution vs. Coverage

SATELLITE

Provides ability to access remote areas

Tsunami debris satellite detection

Mission definition, ongoing testing

- Identified nets in the Northwestern Hawaiian Islands
- Worked with NASA on new Planet Labs data sources and post-processing for debris assessment

Photo: NOAA

Photo: State of Alaska/Airborne Technologies, Inc.

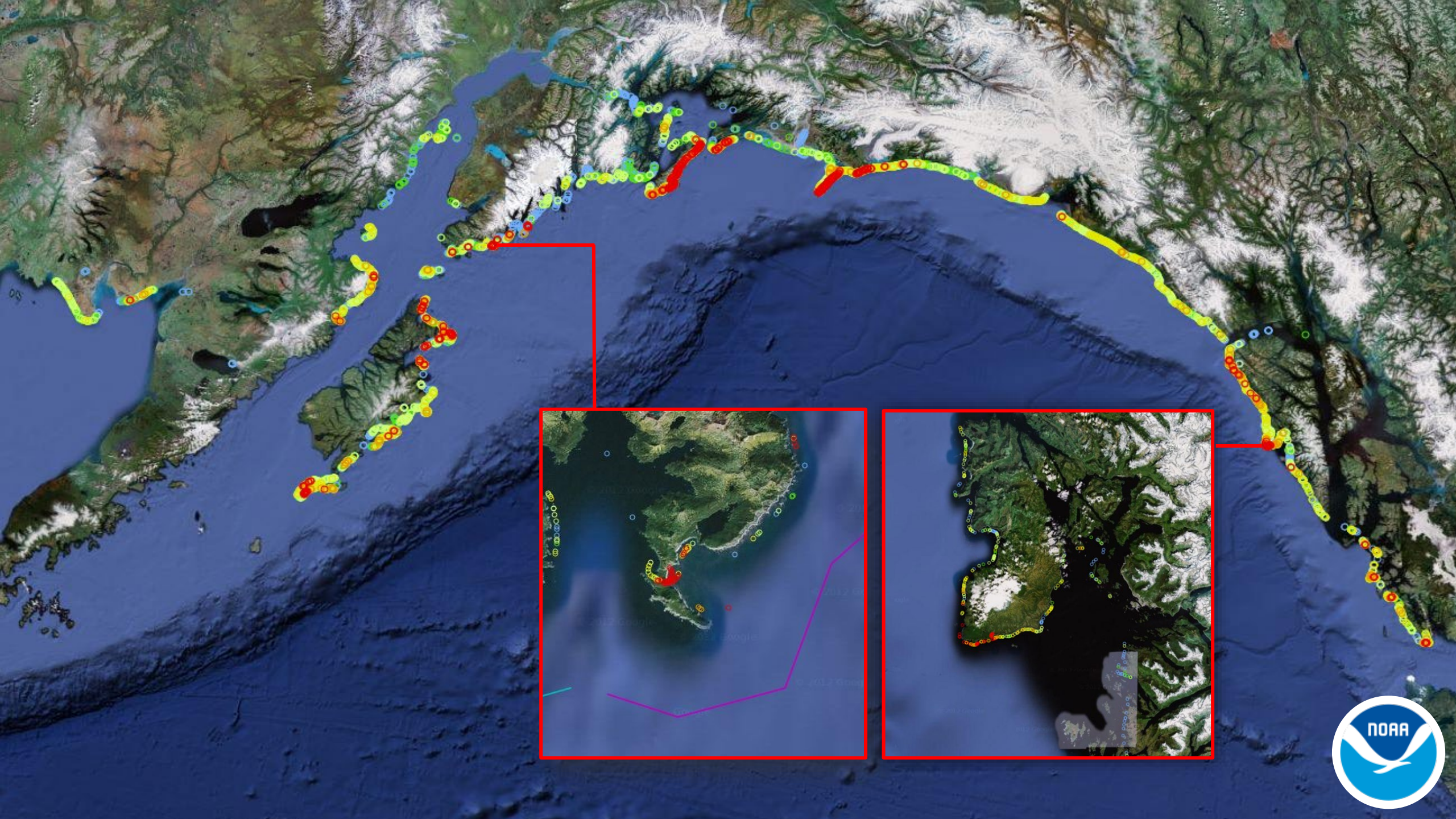
MANNED AIRCRAFT

Most consistent and reliable method

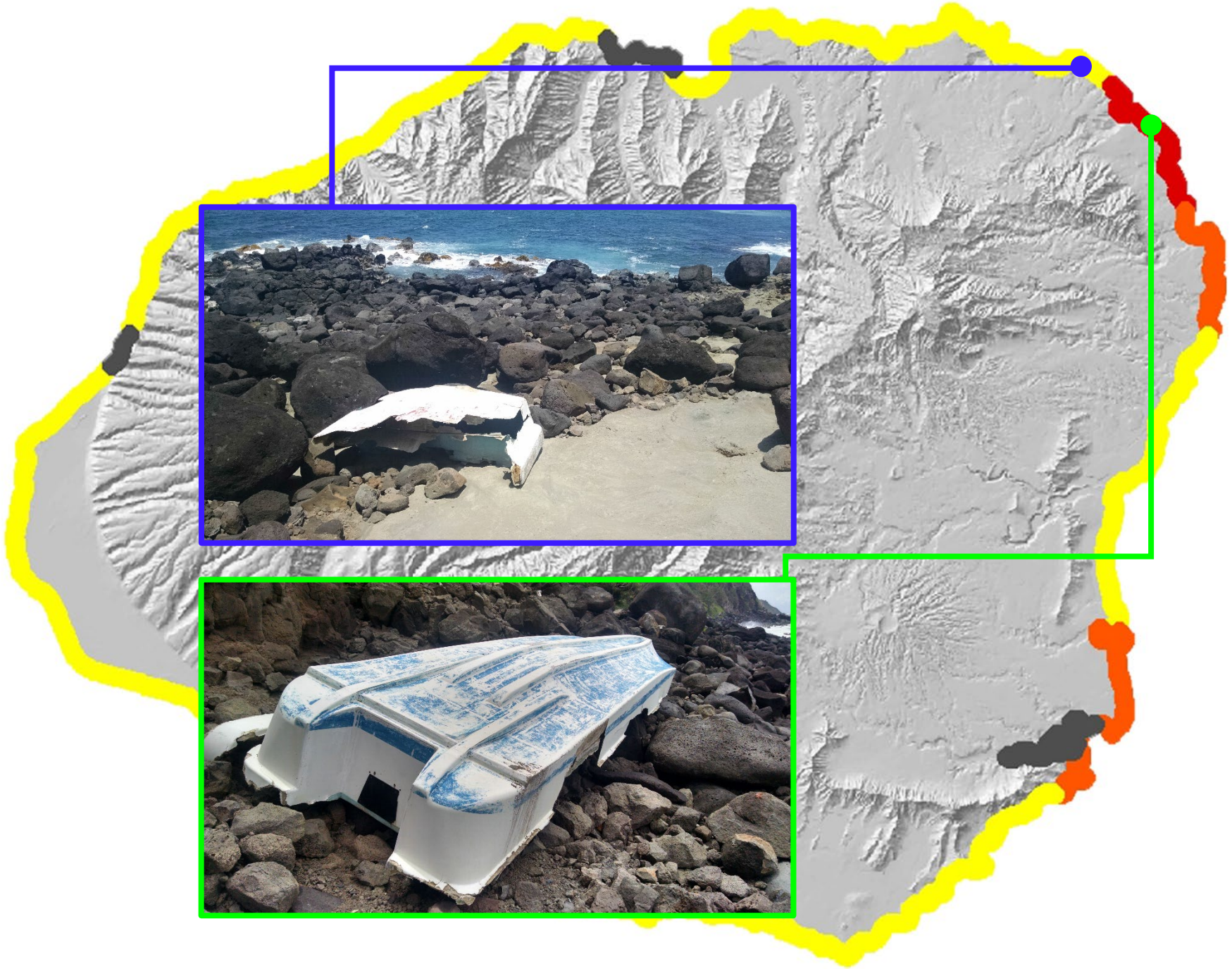
New and promising automation for classification of marine debris

Used in Alaska to identify Japan Tsunami Marine Debris

Carried out an aerial shoreline survey of all 8 main Hawaiian Islands


NOAA

Kaua‘i



UNMANNED AERIAL SYSTEMS

Unmanned Aerial Systems are an emerging tool for debris detection

Useful in remote, dangerous, or sensitive areas

Helpful in the Northwestern Hawaiian Islands

Integrating into cleanups and shoreline monitoring in grant projects

Photo: State of Alaska/Airborne Technologies, Inc.

EMERGING TECHNOLOGY & TECHNIQUES

Automated Processing and Sensor Development

Advanced Processing

Increase in the use of UAS

THANK YOU

Photo: NOAA