# Lessons Learned from the 2017 Long Island Sound and 2021 Rhode Island Tier 1 Eelgrass Surveys: Steps Toward a Comprehensive Monitoring Strategy

**Mike Bradley**

University of Rhode Island
Environmental Data Center

**Michael_Bradley@uri.edu**

Long Island Sound Eelgrass Collaborative Meeting
December 12th 2023

THE
UNIVERSITY
OF RHODE ISLAND

Long Island Sound Study
A Partnership to Restore and Protect the Sound

U.S. FISH & WILDLIFE SERVICE
DEPARTMENT OF THE INTERIOR

USGS
science for a changing world

CRMC
COASTAL RESOURCES MANAGEMENT COUNCIL

Narragansett Bay
Research Reserve

# 2021 Rhode Island Tier 1 Eelgrass Survey

- Tier 1 Survey: From Neckles et al. 2012; smallest scale; uses digital orthophotograpy as a basemap

- Utilizes extensive boat surveys with GPS and underwater video

- Goals: Comprehensive survey of all RI's coastal water in one calendar year; examine trends

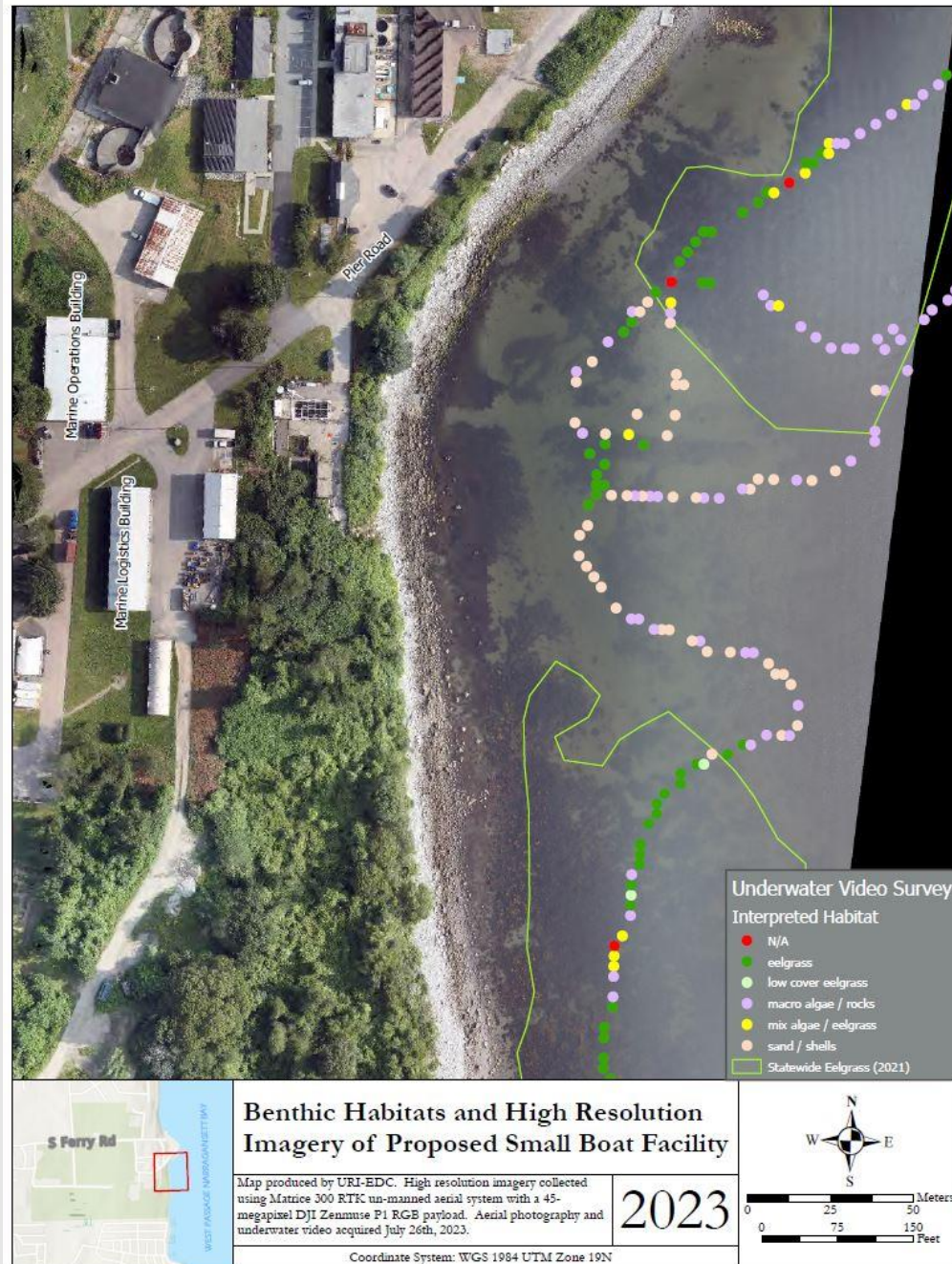# 2006 - 2021 Rhode Island Eelgrass Trends

- **Steady declines in all RI since 2012**

- **Narragansett Bay acreage is holding (for now)**

- **Declines are mostly in the enclosed basins (Coastal Ponds, Narrow River)**
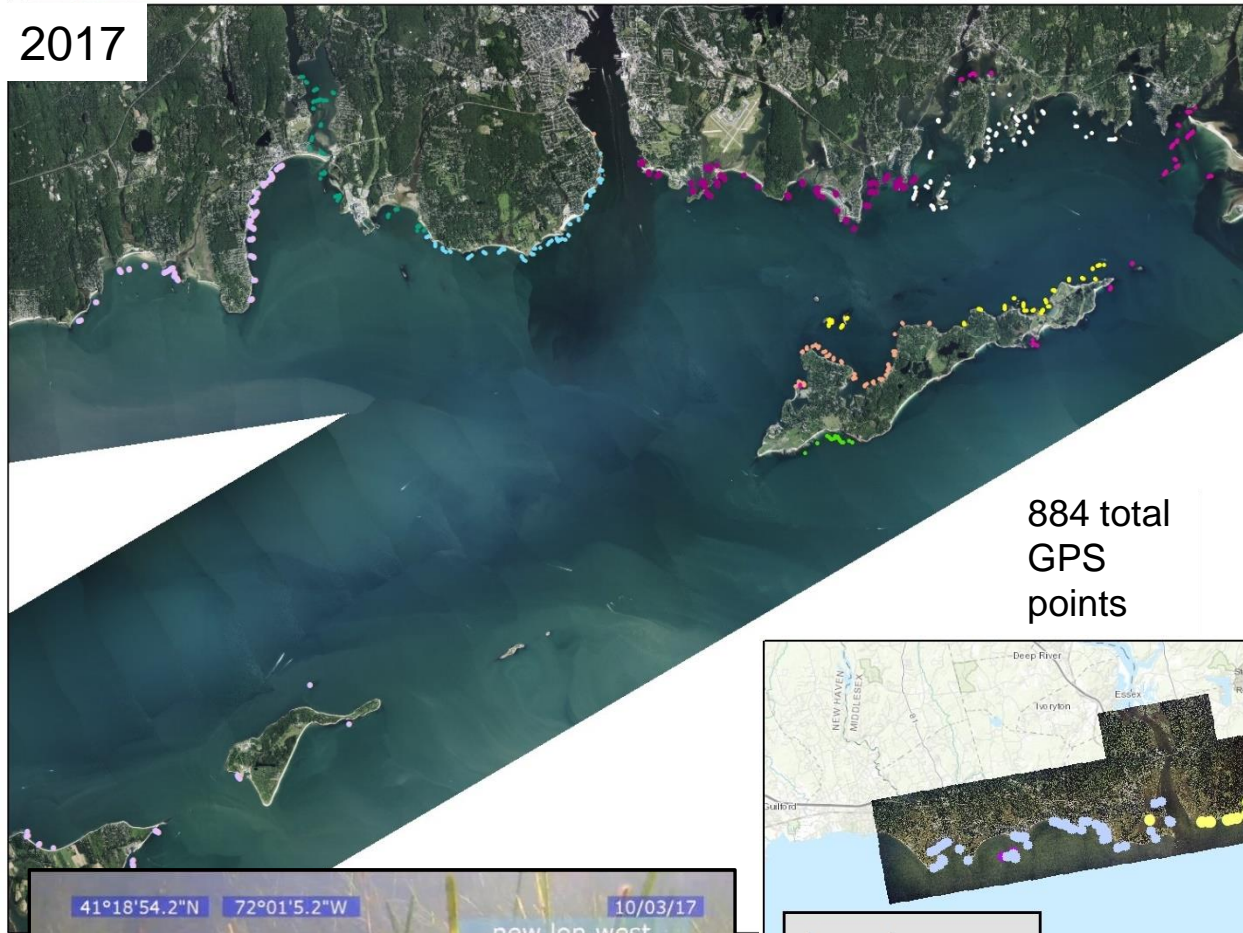


http://www.crmc.ri.gov/sav.html
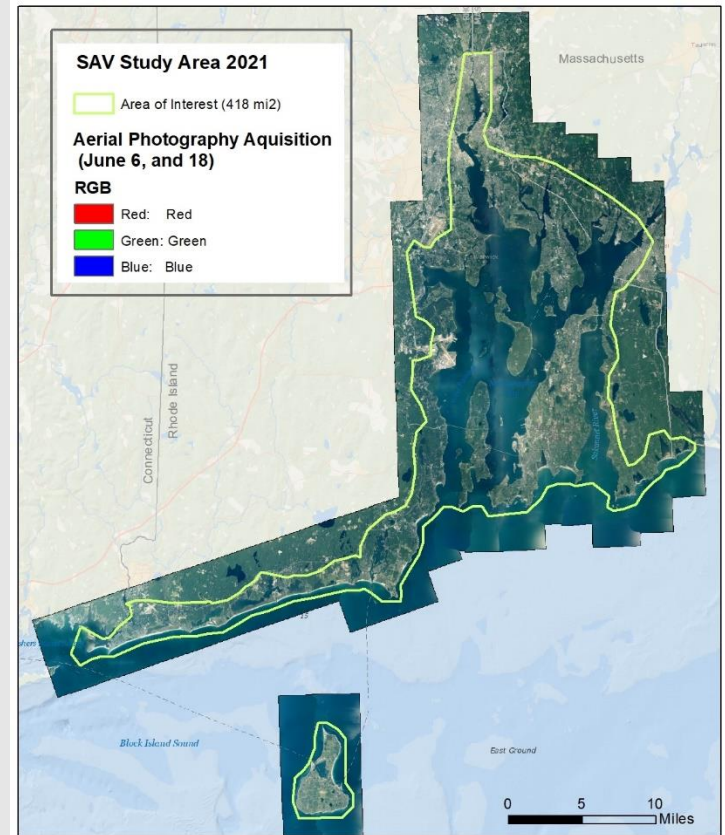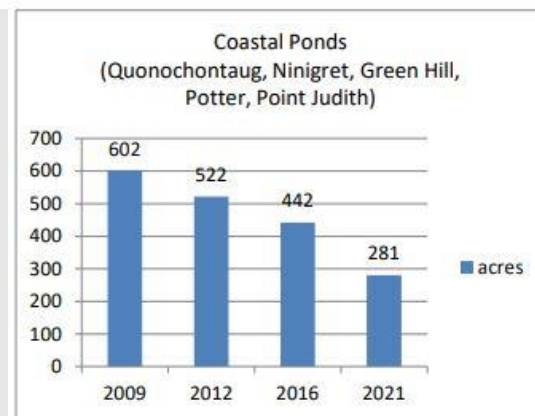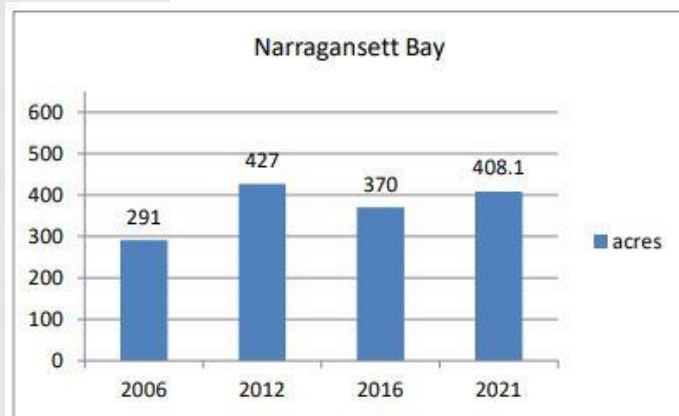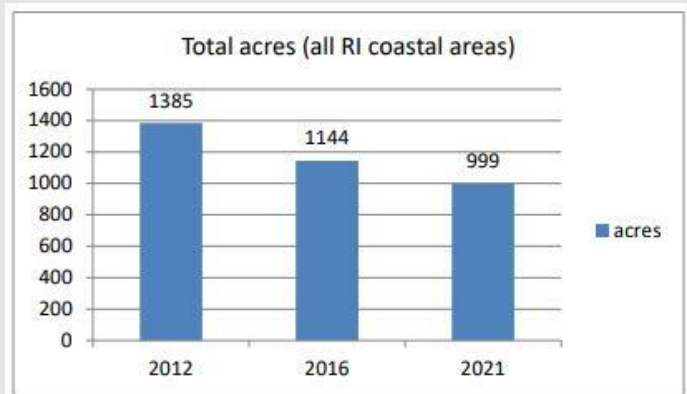
# Lessons Learned from 2021 Mapping effort

- **Record and archive underwater video tracks**

- **Developed python script (character recognition) to manage underwater video**

- **Consistent video interpretation classes**



41°35'6.7"N   71°20'8.5"W          09/13/21
prudence



Underwater Video Survey
Interpreted Habitat
- N/A
- eelgrass
- low cover eelgrass
- macro algae / rocks
- mix algae / eelgrass
- sand / shells
- Statewide Eelgrass (2021)

Benthic Habitats and High Resolution Imagery of Proposed Small Boat Facility

Map produced by URI-EDC. High resolution imagery collected using Matrice 300 RTK un-manned aerial system with a 45-megapixel DJI Zenmuse P1 RGB payload. Aerial photography and underwater video acquired July 26th, 2023.

2023

Coordinate System: WGS 1984 UTM Zone 19N

# Review of LIS Tier 1 Surveys


2017


2017

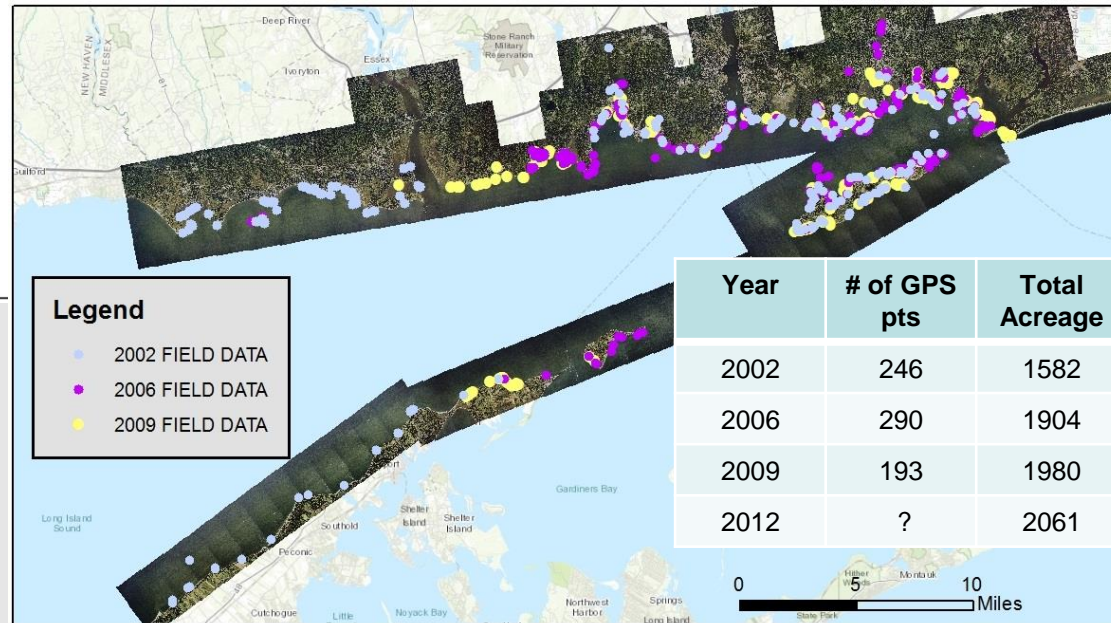884 total GPS points


2017

41°18'54.2"N  72°01'5.2"W  10/03/17
new lon west

**Legend**

- 2002 FIELD DATA
- 2006 FIELD DATA
- 2009 FIELD DATA

| Year | # of GPS pts | Total Acreage |
|------|--------------|---------------|
| 2002 | 246 | 1582 |
| 2006 | 290 | 1904 |
| 2009 | 193 | 1980 |
| 2012 | ? | 2061 |

0    5    10 Miles

# 2017 Tier 1 Results

- **Final GIS database created with 169 polygons of eelgrass (49% field visited)**

- **1,581 total acres of eelgrass in LIS for 2017 (87% field visited)**
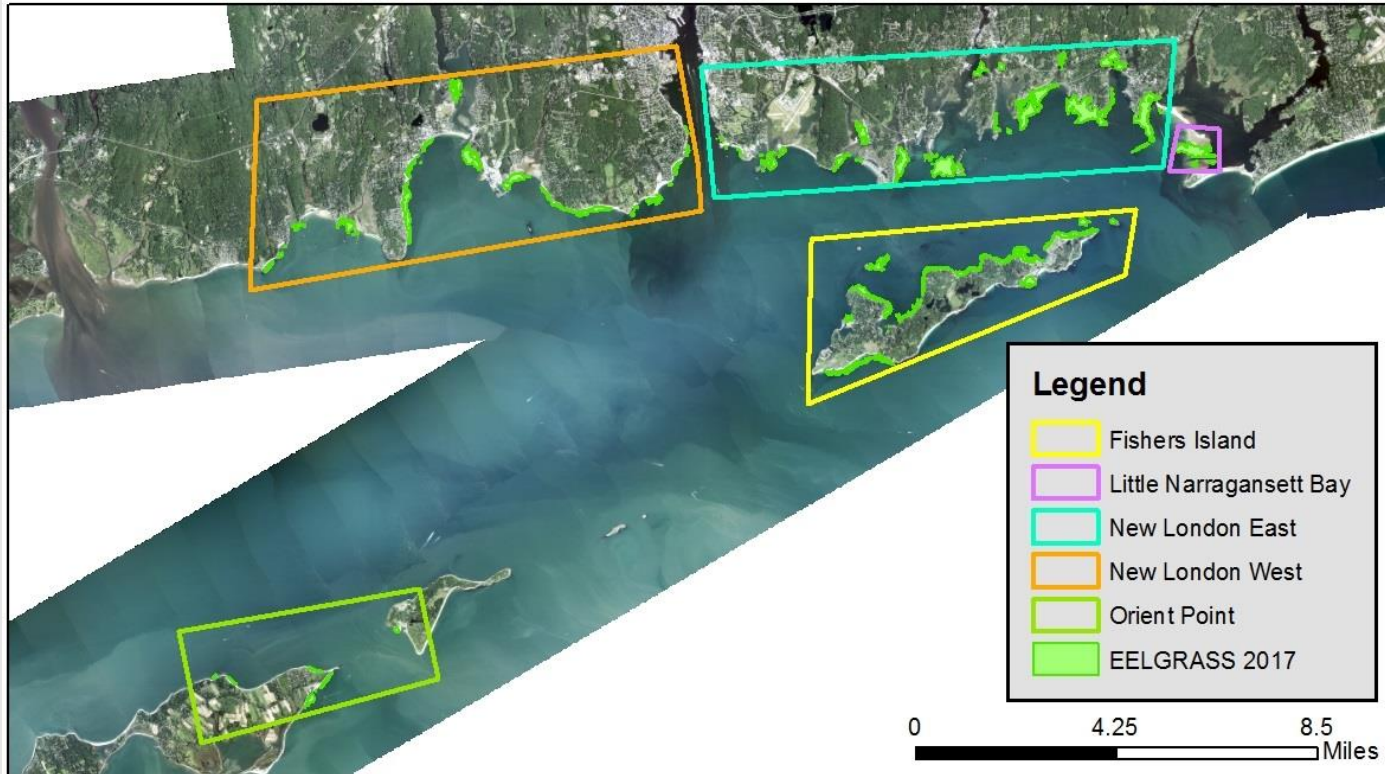


| Site Name | Acres |
|---|---|
| New London East | 766 |
| Fishers Island | 347 |
| New London West | 338 |
| Little Nar. Bay | 93 |
| Orient Point | 39 |

Total 1,581 acres

# 2017 Tier 1 Change Analysis (2012 – 2017)

**Decrease of 480 acres from 2012 (2061) to 2017 (1581)?  Probably not**

• **Union of 2012 and 2017 polygons; added fields to the database**

• **Sorted the table by the largest polygons and assessed for change by comparing against the 2012 imagery and data**

• **Systematically assessed all polygons >= 3 acres (n = 216; 87% of the total area)**

| | | 2017 | |
|---|---|---|---|
| | | Yes | No |
| 2012 | Yes | 1191 | 871 |
| | No | 390 | xx |
| Total area of change between the 2 years | | 1261 | |

Yes = eelgrass mapped in that year

| Type of Change | Acres |
|---|---|
| Probably Gain | 103 |
| Probably Loss | 254 |
| Uncertain | 575 |
| Not Assessed | 328 |
| Total | 1260 |

**151 acre** decrease more likely

# Lessons Learned from 2017 Mapping effort



- **Need a more standardized approach (i.e record all video, field work, and Little Narragansett Bay (?))**

- **Eelgrass mapping Taskforce RI (2009)**

- **Historical imagery needs to be available**

- **Need an accuracy assessment of the Tier 1 survey method**
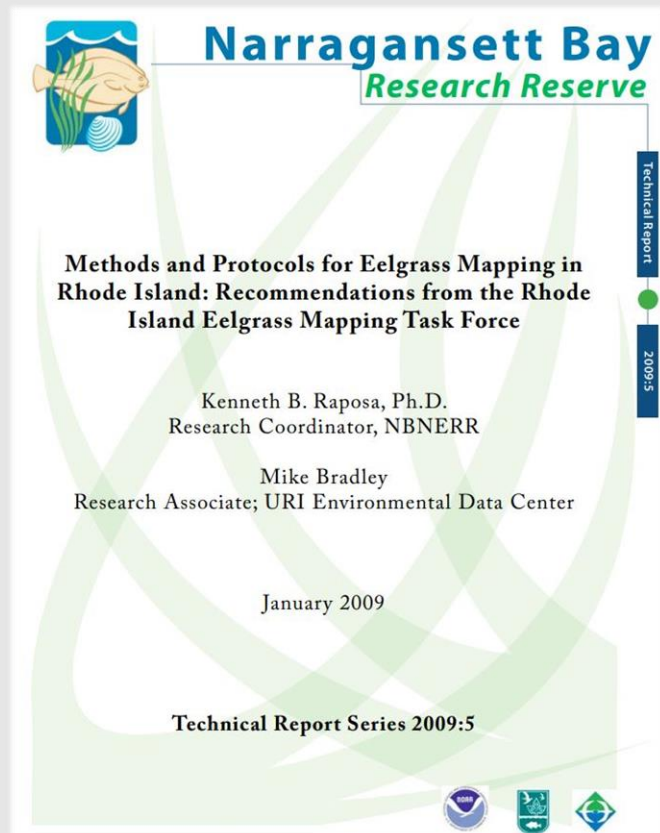
Task Force Members:

Peter V. August – URI Coastal Institute
Mike Bradley – URI Environmental Data Center
Caitlin Chaffee – RI Coastal Resources Management Council
Giancarlo Cicchetti – USEPA
Marci Cole – Save The Bay
Chris Deacutis – Narragansett Bay Estuary Program
Janet Freedmen – RI Coastal Resources Management Council
Rob Hudson – Save The Bay
Charles LaBash – Director, URI Environmental Data Center
Andy Lipsky – USDA Natural Resources Conservation Service
Chris Powell – Fish & Habitat Biologist
Bob Stankelis – Narragansett Bay National Estuarine Research Reserve
Kenny Raposa – Narragansett Bay National Estuarine Research Reserve
Sue Tuxbury – NOAA National Marine Fisheries Service

# Tier 1 Accuracy Assessments

• **Accuracy assessments were conducted in 2017 and 2021 for surveys in R.I.**

• **Based on Users versus Producers Accuracy Matrix (Congalton, 1991)**

• **Random points were selected to survey within "suitable" potential eelgrass habitat (Short et al., 2002)**
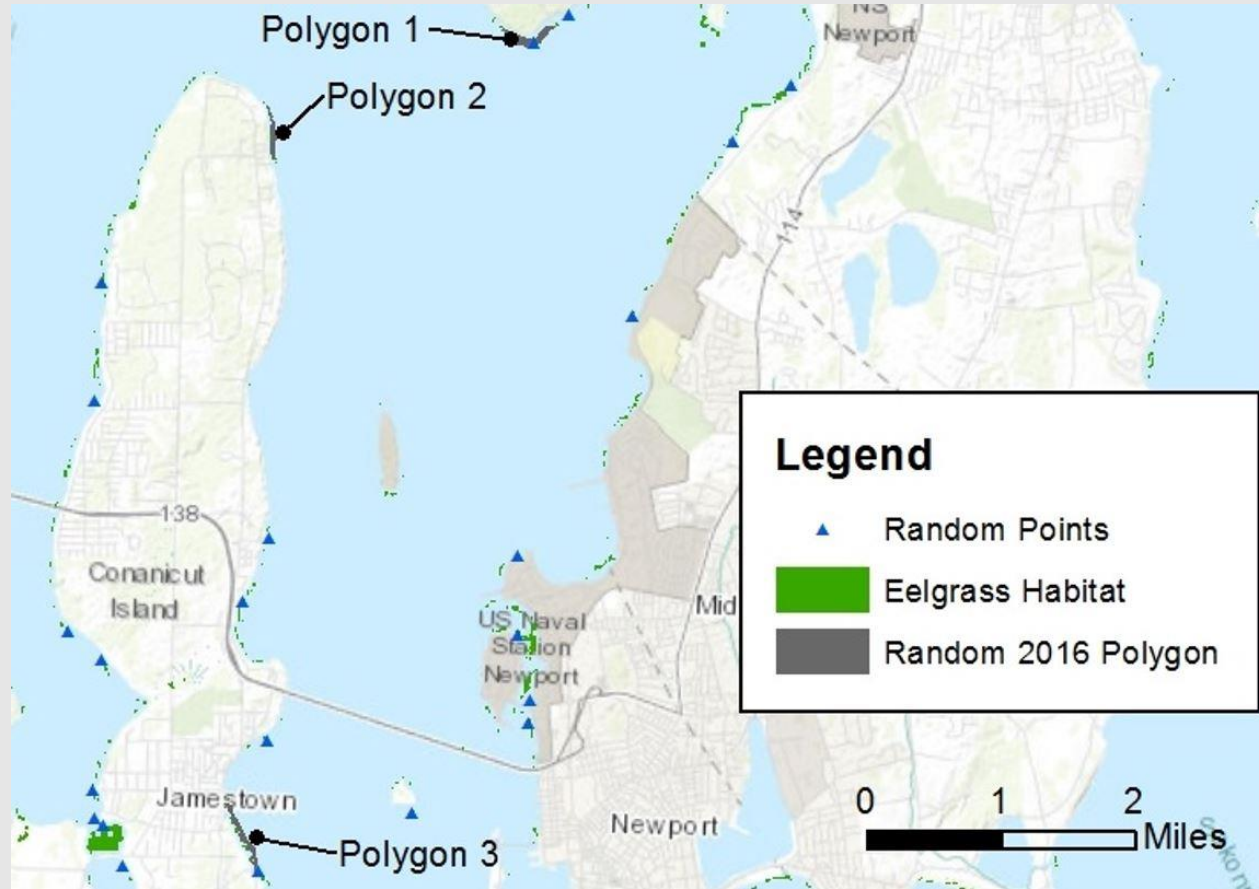


A total of 121 video locations were withheld (reference data) to identify errors during the photointerpretation and delineation process (classified data). The overall user's accuracy is for the **2021** mapping is **83%**.

**2016 Classified Data**

|  | eelgrass | not eelgrass |
|---|---|---|
| eelgrass | 62 | 14 |
| not eelgrass | 9 | 130 |

2017 Reference Data

Overall Users accuracy = 89% (n=215)

**Classified Data**

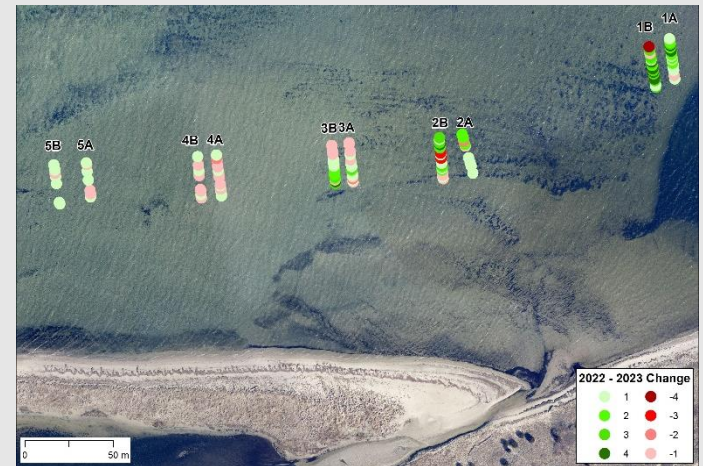|  | eelgrass | not eelgrass |
|---|---|---|
| eelgrass | 45 | 10 |
| not eelgrass | 10 | 56 |

Reference data

# Tier 2 Efforts

- **Hexagonal approach (Neckles et al., 2012)**
- **Underwater video transects (Quonchontaug Pond, RI)**
- **Summary: first survey is great; the rest? Not so much. Too much spatial variability**
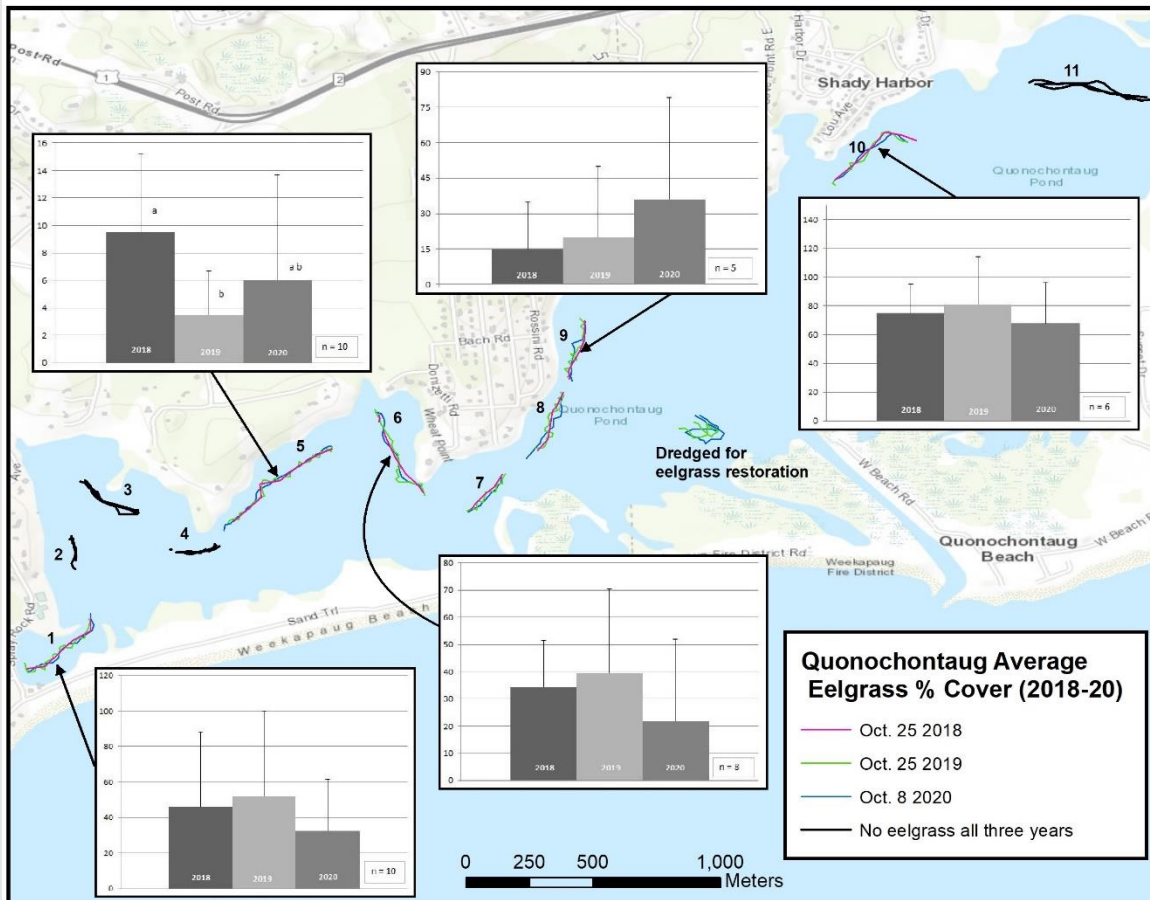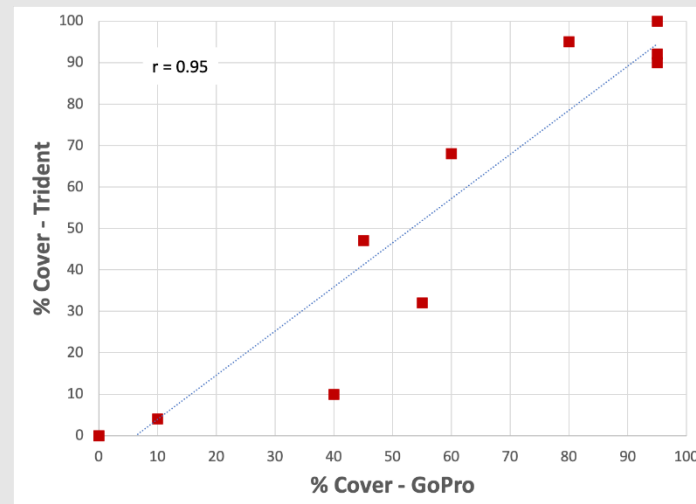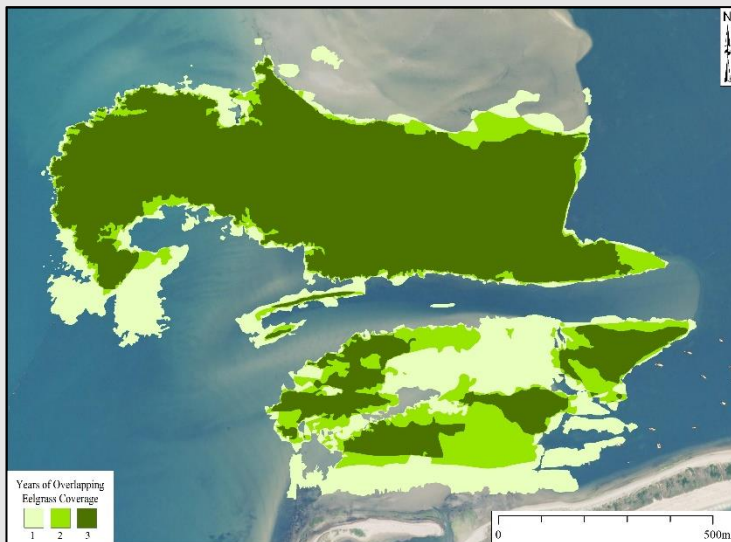
# Tier 2 Efforts – Little Narragansett Bay

- **Lead by the Watch Hill Conservancy, Eastern Connecticut University, and URI-EDC**

- **RTK Transects (wading and snorkel)**

- **Side scan sonar surveys**

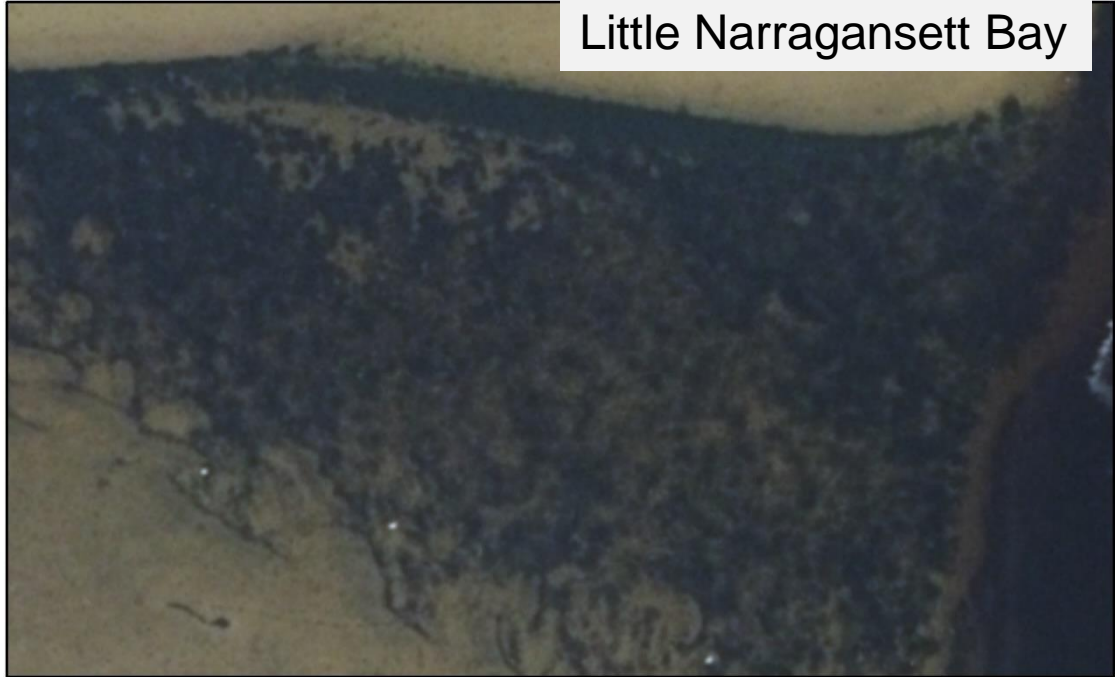- **Underwater video plots (20 m circles) – diver (GoPro) vs tethered underwater drone**
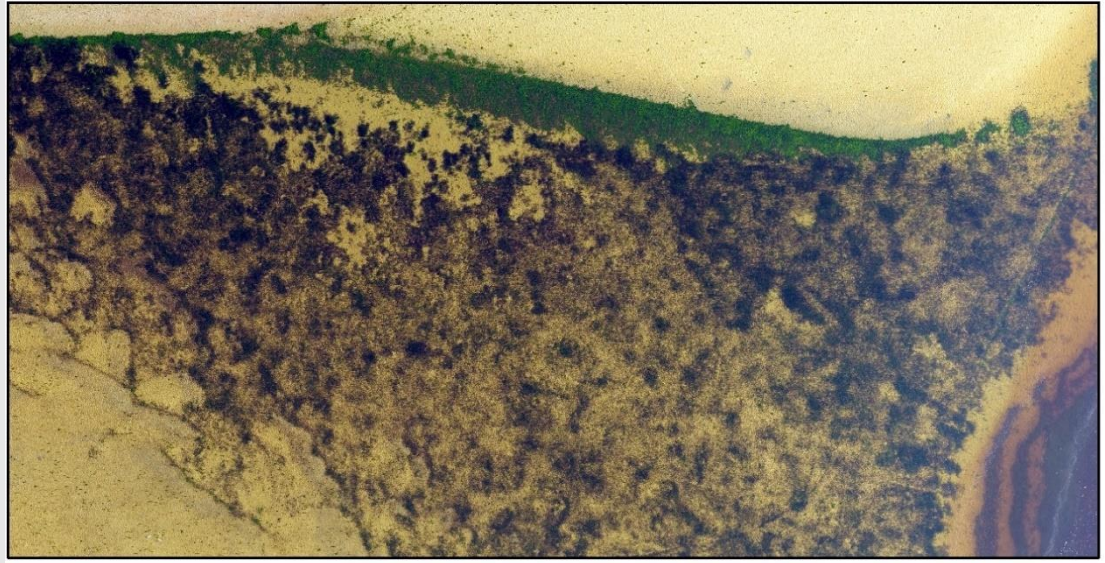
Surveys 2019, 2021, 2022



Courtesy of Dr. Bryan Oakley and E. Watling, ECSU

August et al., 2019

# UAS (drone) Imagery Collection June 18th 2017



Little Narragansett Bay

Photo acquisition altitude = 16,000 ft AGL

Photo acquisition altitude = 400 ft AGL

# UAS (drone) Imagery Collection

URI Bay Campus (Narragansett, RI) July 26th 2023



Photo acquisition altitude = 400 ft AGL

# Summary and Recommendations

• Tier 1 surveys can determine regional trends but more detailed approaches and data (Tier 2 and 3) are needed

## Recommendations

1. Tier 1 surveys every 2-3 years

2. LIS Collaborative could develop mapping and monitoring approaches (SOP?) in a technical report or publication

3. Drone imagery and plot assessments (20 m) for Tier 2 at selected sites;  These data and reports need a central repository

4. Satellite imagery should be explored for yearly assessments