

Mobile mapping: A new tool for eelgrass monitoring around Mount Desert Island

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Background

For the past decade, staff, students, and volunteers of the Community Lab at MDI Biological Laboratory have been mapping eelgrass (*Zostera marina*) populations around Mount Desert Island (MDI), Maine as part of the mission of the Community Lab to monitor, study, and conserve these essential habitats, with a focus on nine study sites around MDI (Figure 1).

Eelgrass has declined statewide, and knowing where populations are and how they are changing are important factors in conservation efforts. The Department of Marine Resources and Maine Office of GIS previously mapped and published two statewide datasets of eelgrass distribution, one in 1997 and one in 2010 (MEDMR). Each dataset took multiple years to compile and complete. In the 2010 dataset, the Mount Desert Island region was mapped in 2008, which was the last formal state-led assessment of eelgrass in the region. Aside from anecdotal observations, there have not been formalized calculations of the distribution of the remaining eelgrass populations in the region since then. Recognizing the need to maximize efficiency and utilize advancing technologies, the Community Lab began using new mobile tools to map eelgrass with updated and improved mapping systems, resulting in highly accurate maps of eelgrass in several of the nine study sites, which could then be compared to historic eelgrass beds.



Figure 1. Community Lab eelgrass study sites.

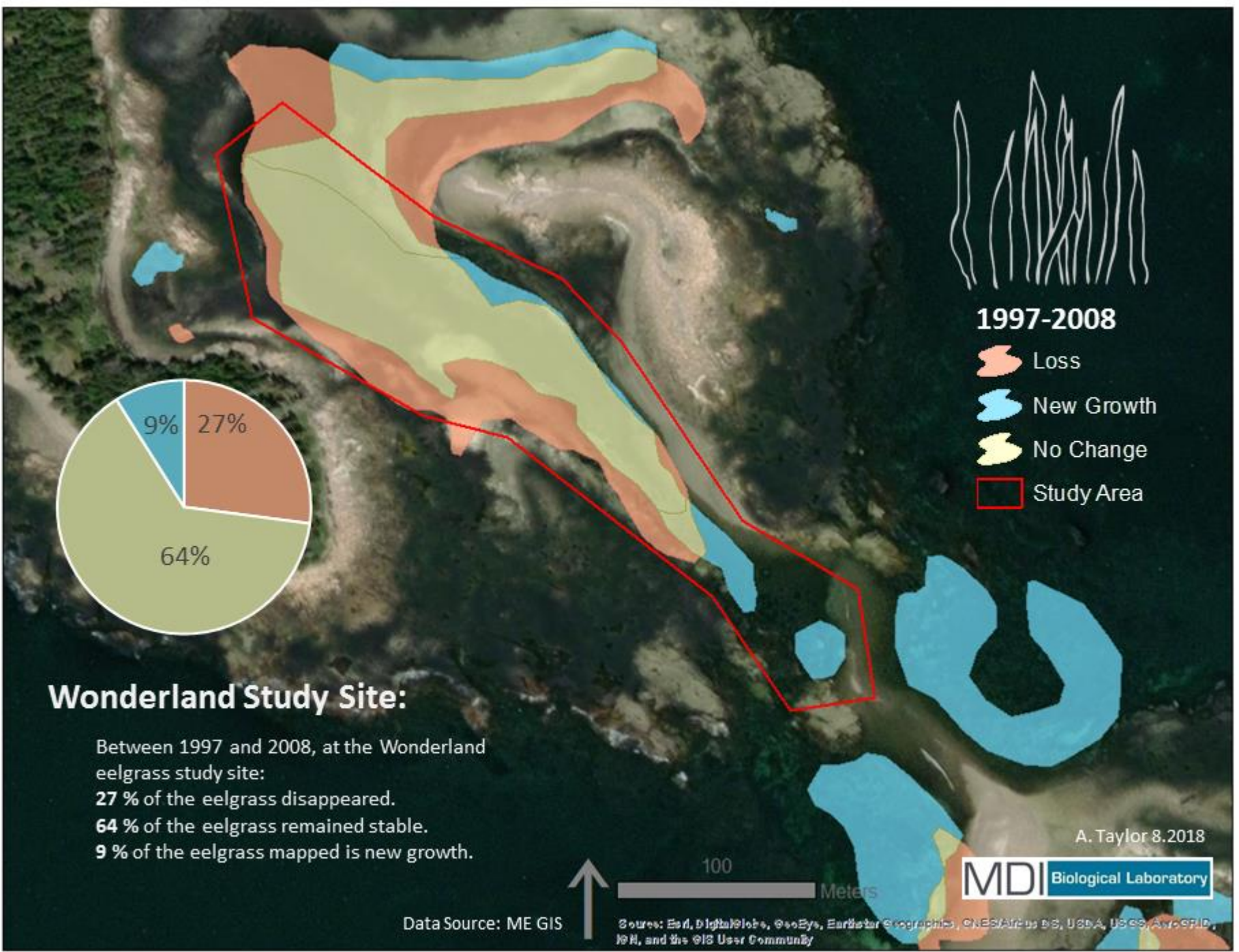
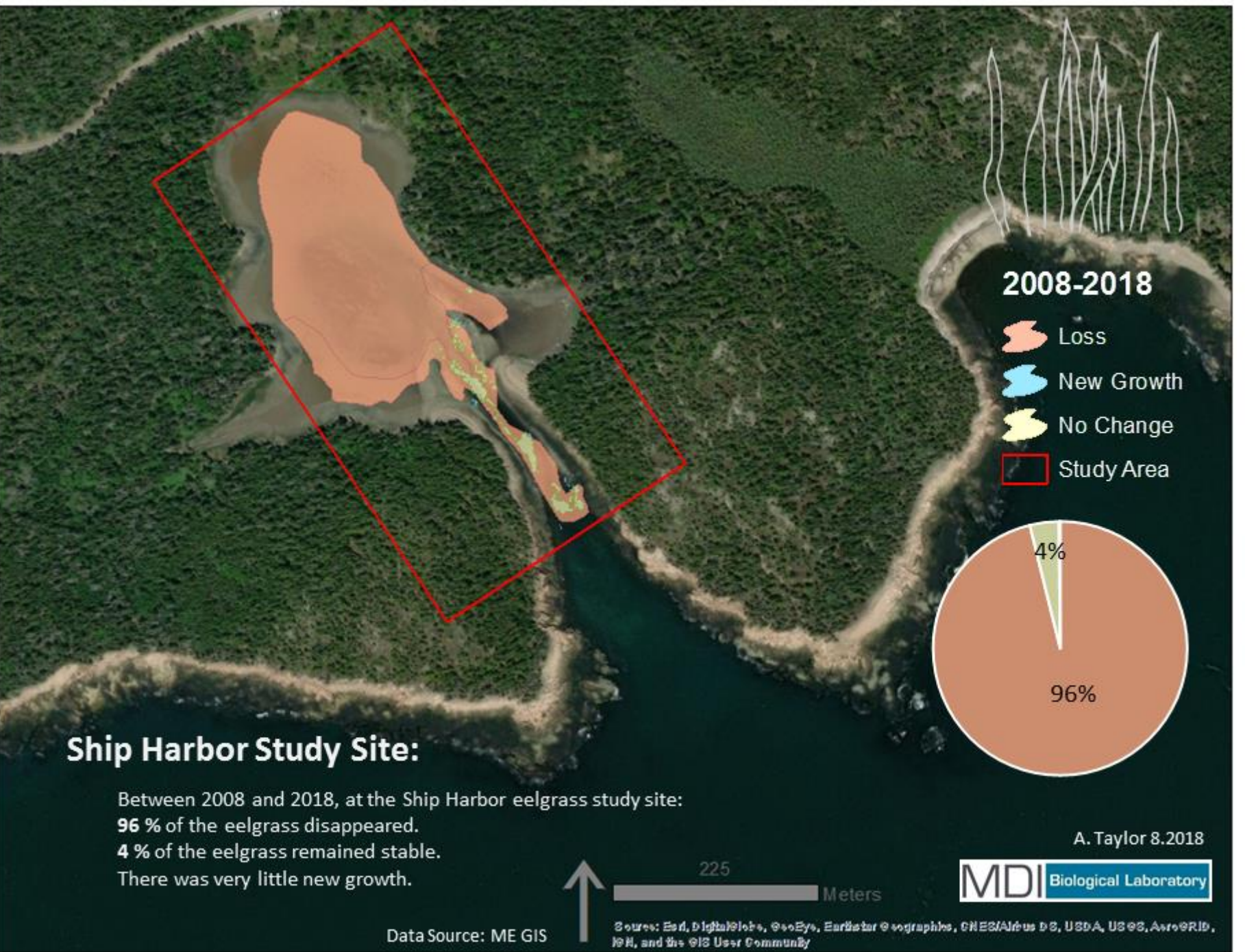
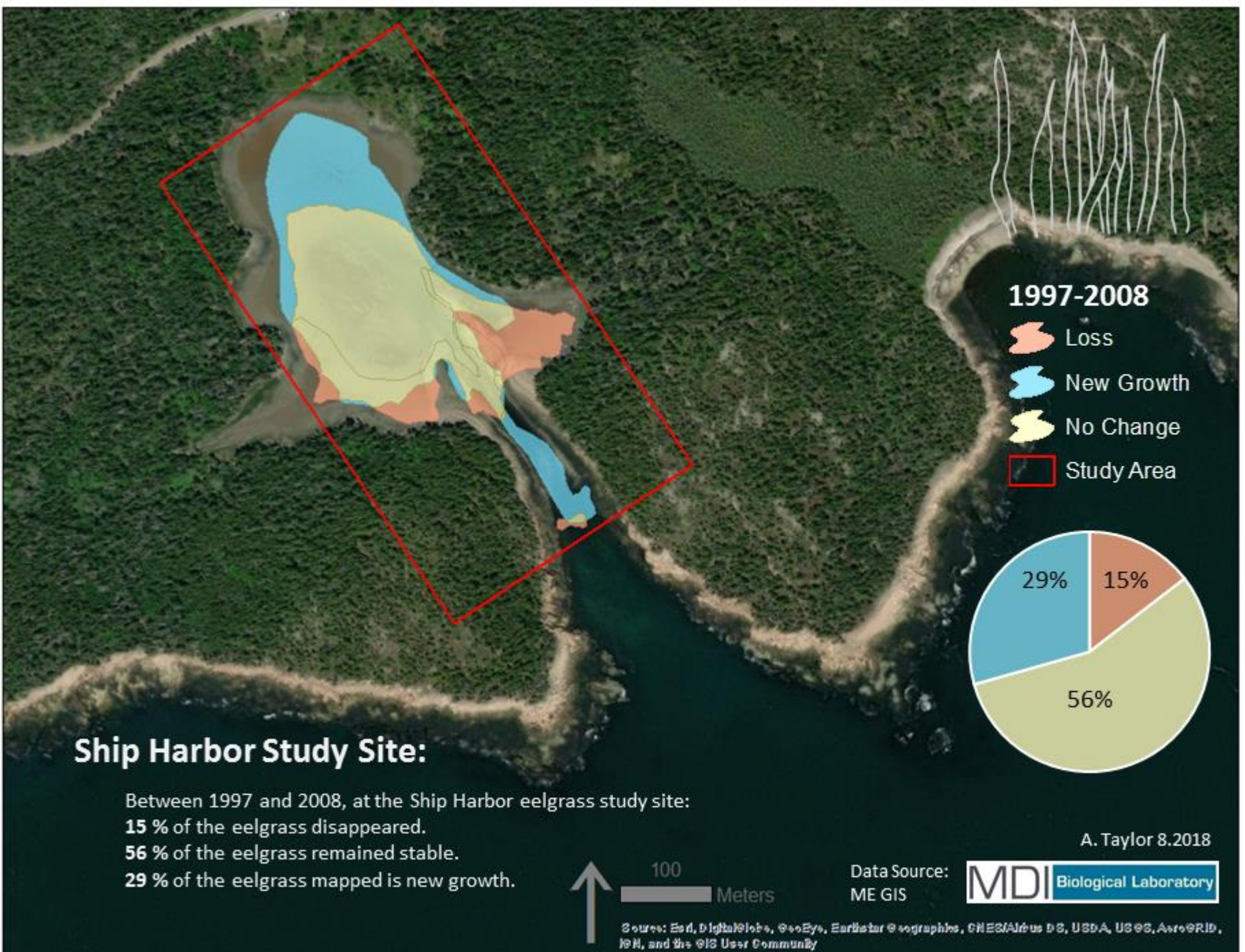
Results

Between 1997 and 2008 when the Mount Desert Island region eelgrass population was surveyed and mapped, eelgrass declined region-wide by 58%.

Since we do not have a comprehensive and widespread map of eelgrass in the region after 2008, a similar comparison is not impossible. However, we can look at the eelgrass population change within our study sites, comparing 2008 to 2018, and with that we see that two sites completely collapsed and one completely rebounded. The more stable sites between 1997 and 2008, Stave Island and Wonderland, have still declined by 59% and 60% respectively by 2018 (Table 1).

Site	1997-2008 Study Site Change	2008-2018 Study Site Change
Bar Island East	81% decrease	39% decrease
Bar Island West	57% decrease	100% decrease
Bar Tide Pool	100% decrease	100% increase
Berry Cove	99% decrease	85% decrease
Hadley Point East	53% decrease	93% decrease
Hadley Point West	83% decrease	100% decrease
Ship Harbor	21% increase	96% decrease
Stave Island	4% decrease	59% decrease
Wonderland	58% decrease	60% decrease

Table 1. Eelgrass change at Community Lab study sites.



Methods

During the 2018 field season, the Community Lab trialed a mobile GIS (Geographic Information System) solution that utilizes Bluetooth technology and a Trimble R1 GNSS receiver to capture high accuracy geospatial data.

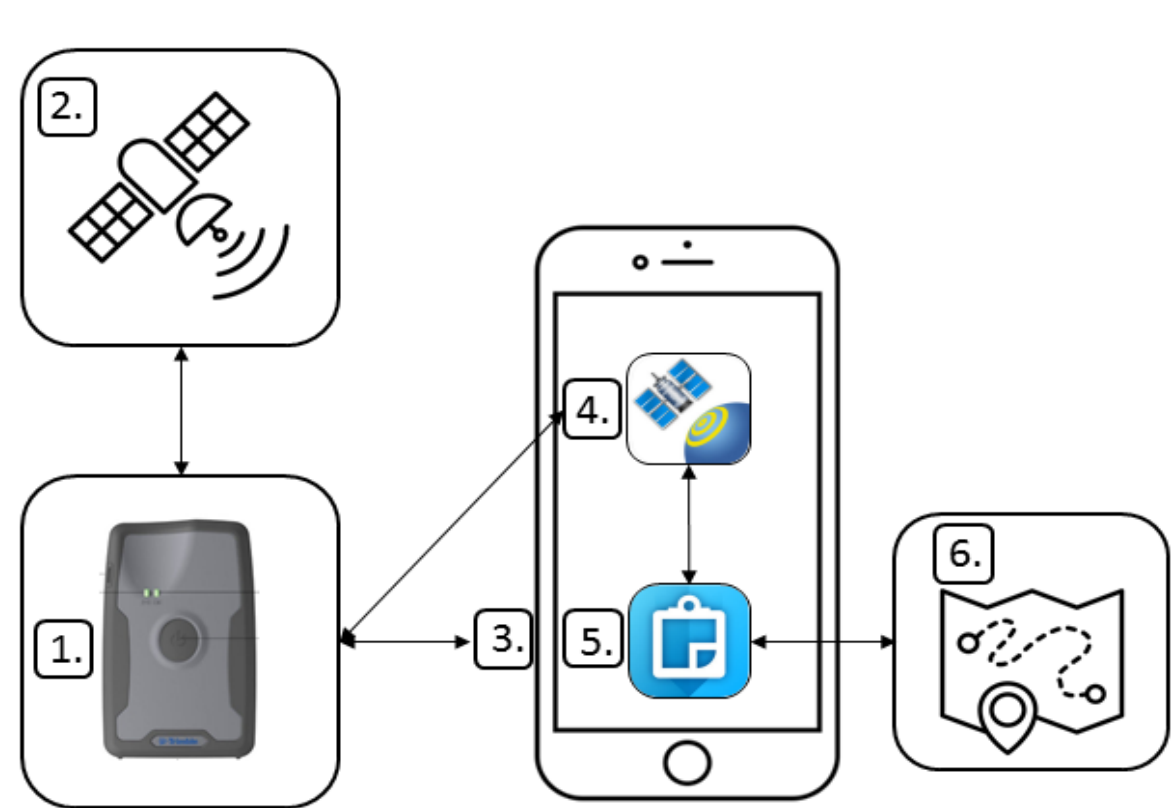


Figure 2. Diagram of the mobile GIS solution.

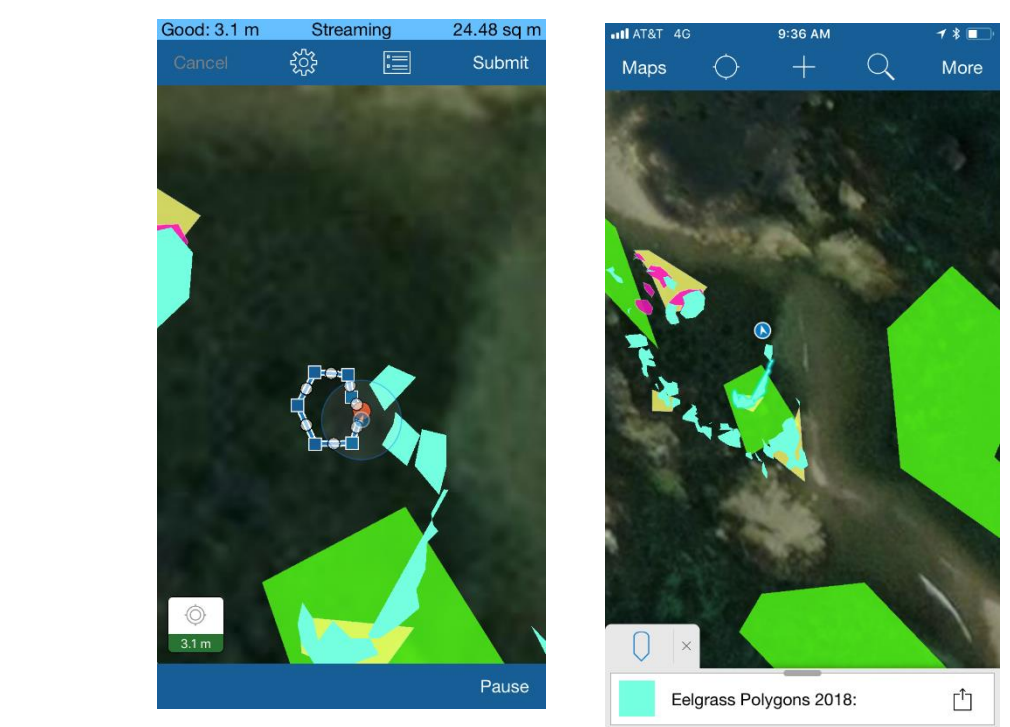


Figure 3. Historic shapefiles in ArcCollector provide reference in the field.

The mobile GIS solution is comprised of six parts: 1) Trimble R1 GNSS Receiver, 2) Satellites, 3) Smart Phone, 4) Trimble GNSS App, 5) Esri ArcCollector App, 6) ArcOnline maps.

In the field we used ArcCollector’s streaming function to track our movements as we walked the perimeter of eelgrass beds in our study areas. The eelgrass bed polygons’ associated attribute table was then populated using a custom field data collection form that had prepopulated dropdown menus for site name and automatically generated date and polygon acreage. Upon saving the polygon in the app, the data were synced with our Esri account and automatically appeared in our ArcOnline eelgrass map. This new method saved staff 3 hours of time collecting and processing data per site.

To calculate the acreages, percent change in the MDI region and within study sites, and to compare accuracy of the new technology, the two historic Maine GIS shapefiles, Eelgrass 1997 and Eelgrass 2010, and two Community Lab shapefiles, Eelgrass 2017 and 2018 were used in our GIS analysis.

A mask shapefile of the MDI region was generated and the Eelgrass 1997 and Eelgrass 2010 files were clipped to that. The Union geoprocessing tool was used on the MDI 1997 eelgrass layer and MDI 2010 eelgrass layer to create one ‘97_and_08’ shapefile. Using a shapefile of our study areas and the Union geoprocessing tool we were able to create the ‘97_and_08_final’ layer. Two fields, EG_Status and EG_Acres were added. Using the Select by Attributes function and the Field Calculator, the fields were populated accordingly: present in 1997 only, EG_Status = ‘Loss’; present in 1997 and 2008, EG_Status= ‘No Change’; and present in 2008 only, EG_Status = ‘New Growth’. The area in acres for each polygon was generated with the Calculate Geometry tool for the EG_Acres field. This process was repeated for 2008 to 2018 and 2017 to 2018.

Next Steps

With support from Maine Coast Heritage Trust, a drone survey collecting high resolution infrared aerial imagery was conducted at the Stave Island study site in September 2018. The UAV was able to capture 500 acres of imagery in one low-tide cycle. A remote sensing analysis will be completed this winter. This methodology will hopefully provide a high accuracy way to map larger areas of the surrounding region, especially areas outside of the current study sites.

Acknowledgments

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Citations

Maine Department of Marine Resources. *Maine Eelgrass Distribution, 2001-2010*. 2012-05-24
Maine Department of Marine Resources. *Eelgrass97*.

