Examining changes in abundance and distribution of Zostera marina (eelgrass) within the San Juan islands, Washington

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Introduction

Zostera marina (eelgrass) supports an integral estuarine and coastal ecosystem throughout the Salish Sea region of Western Washington state. However, eelgrass meadows have been shown to be negatively affected by many factors including increasingly extreme summer temperatures, eelgrass wasting disease, and declining water clarity. As global surface temperatures continue to rise and other environmental conditions worsen, eelgrass meadows and their associated ecosystems may decline. We seek to help quantify changes in eelgrass distribution by observing four sites in the San Juan Archipelago region of the Salish Sea: Shallow Bay of Sucia Island, Shoal Bay of Lopez Island, Picnic Cove of Shaw Island and False Bay of San Juan Island. Remotely acquired data in combination with shoot density counts were used to uncover trends not readily apparent using the techniques separately.

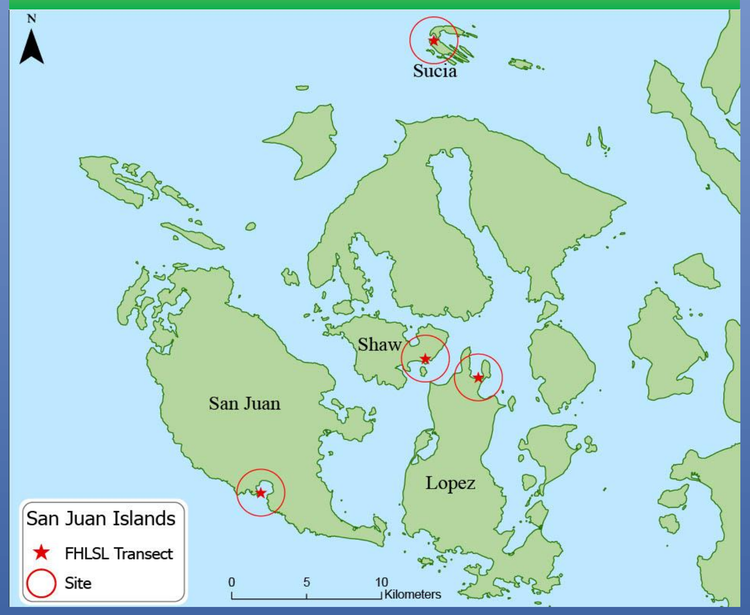
Methods

1.) Aerial imagery was acquired from the Washington State Department of Ecology Coastal Atlas Map as well as Google Earth Archive and georeferenced into ArcGIS.
2.) Transect data was sourced from WADNR Submerged Vegetation Monitoring Project and overlayed over previously obtained aerial imagery.
3.) Transect coordinates with corresponding shoot density data obtained by the Seagrass Lab, Friday Harbor Laboratories was georeferenced and compared with WADNR transect data.
4.) Eelgrass upper edges were traced in ArcGIS for relevant years using transect data from both FHL Seagrass Lab and WADNR as visual aids and for ground truthing.
5.) False Bay data was further analyzed to quantify extent and total area of eelgrass meadows within the shallow subtidal zone. Modern beds (2021) were personally ground truthed using GPS-paired shallow water dives

---------- Limitations ----------

- Quality and availability of useful remote imagery varies greatly between study sites. False bay eelgrass can be clearly observed via aerial imagery due to the relatively shallow shore incline angle and sediment type while Shoal bay eelgrass was unquantifiable using these methods.
- Eelgrass creates dark signatures in aerial imagery which can be mistaken for rocks, shadows, algae, and shellfish aggregations or vice versa.
- Ground-truthing (verifying classifications with real world observations) outside of transect-overlapping areas was only performed in False bay.

Sites Examined



Acknowledgments

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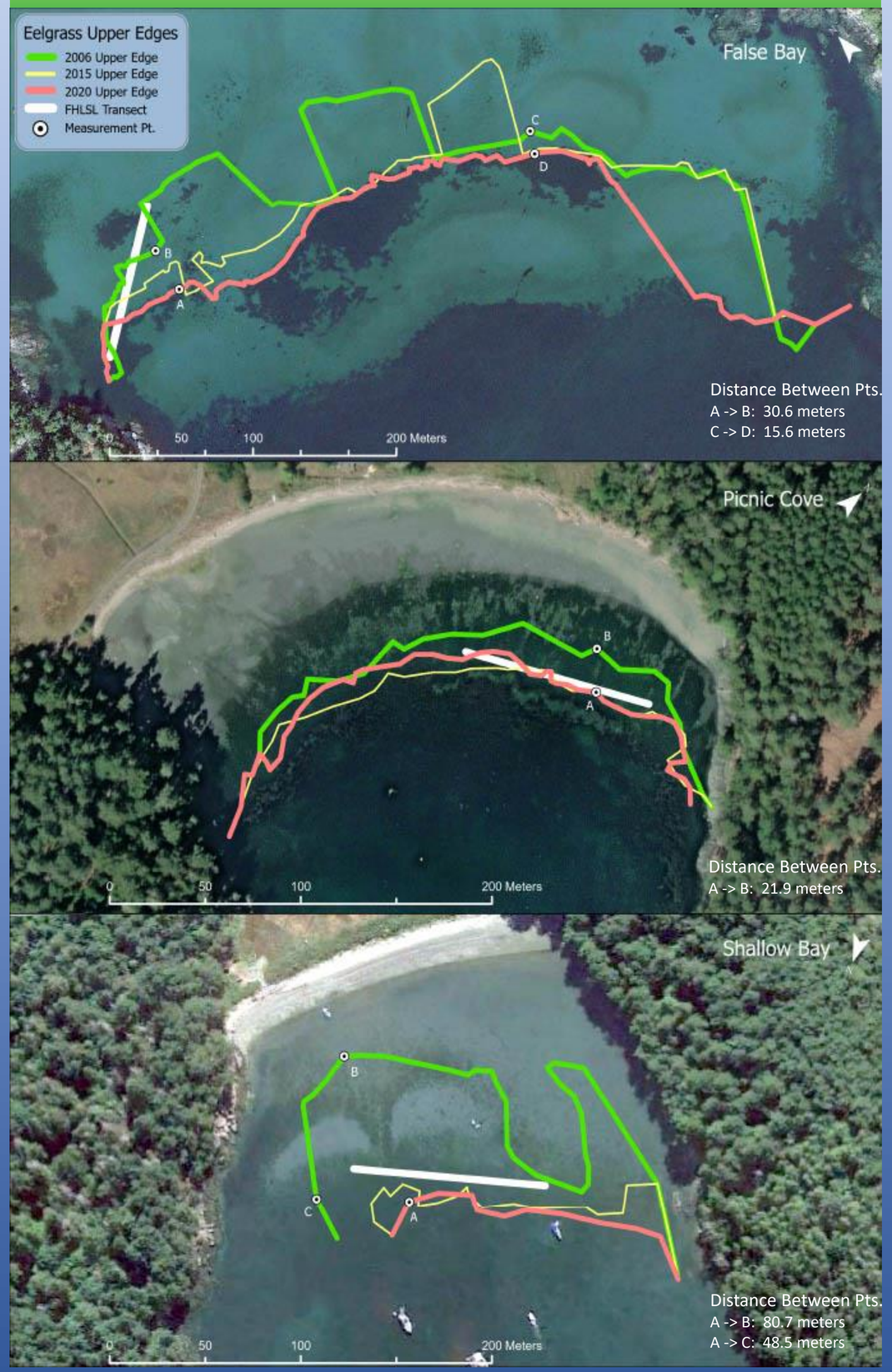
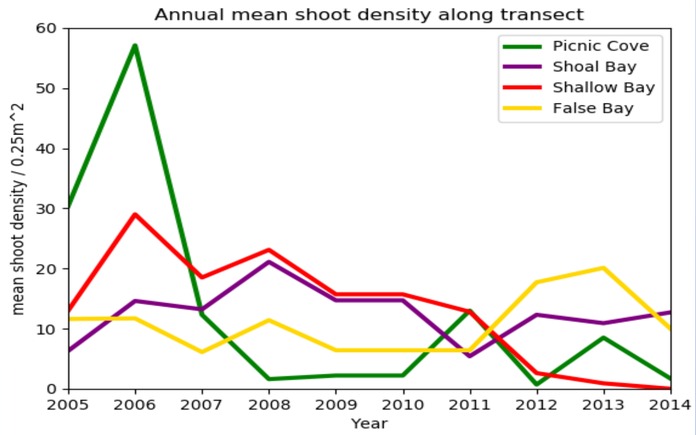
Upper Edge Retreat of San Juan Archipelago Eelgrass



UW FHL Seagrass Lab Transect Data



- 100 meter transect, location selected for consistent depth of -1m MLLW (Mean Lower Low Water) for all sites.
- Eelgrass shoots (both flowering and sterile) counted per 0.25m^2 area. Meter mark count-sites randomly selected using random number generator.
- Dataset missing 2010 counts for all sites, and 2011 in False Bay, represented on graph as unchanged densities.

WADNR Seagrass Monitoring Data

WADNR graphs are pulled directly from Puget Sound Eelgrass Monitoring Data Viewer, https://wadnr.maps.arcgis.com/apps/webappviewer/index.html?id=83b8389234454abc8725827b49272a31, & visually edited

False Bay Shallow Subtidal Eelgrass Changes