Long-term Spatial-temporal Eelgrass Habitat Change

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Introduction

Aerial photography is a valuable tool for monitoring landscape and ecosystem change. Archived air photos may date back as far as the 1920s, providing the longest available time series in remote sensing data. Aerial photography has high spatial resolution and tonal detail making it suitable for mapping temporal change in small habitat units such as seagrass meadows. In the Salish Sea, eelgrass is a critical juvenile rearing habitat of the economically, culturally, and ecologically important Pacific Salmon.

The objective of this analysis is to assess the spatial-temporal changes in eelgrass area coverage using historic aerial photography (1932 – 2010) and contemporary UAV imagery (2016). Further, factors contributing to eelgrass loss are characterized through the concept of Landscape Level Coastal Environmental Indicators (Klemas, 2001), specifically watershed land cover and shoreline alterations/activities.

Methods

Site selection based on:

- Protection from wave action
- Perennial freshwater stream input
- Quality of available aerial photography
- Local ground-based community mapping

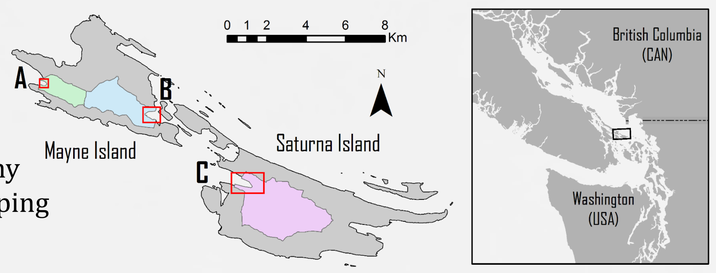


Fig 1. Study sites. Coloured polygons denote watershed.

Spatial-temporal Eelgrass Mapping

- Mapping extent based on 2016 UAV mapping
- Linear enhancement, HSV, PCA
- Photointerpretation
- Eelgrass area (ha) / mapping extent = % cover

Table 1. Year and resolution (m) of air photo dataset

Year	1932	1950	1975	1980	2004	2010	2016
Res (m)	0.50	0.50	0.20	0.92	0.10	0.15	0.02

Landscape-Level Coastal Environmental Indicators

- Parks Canada land cover classification
- 1932, 1950, 1975, 2002
- Forest type, Agriculture, Rural residential
- Counted instances of shoreline activity:
  - Docks, log booms, bulkhead, groyne, boat ramp, boats

Results

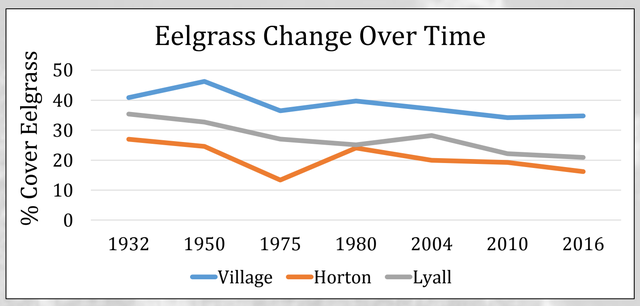


Fig 2. % cover change in eelgrass area shows slight downward trend

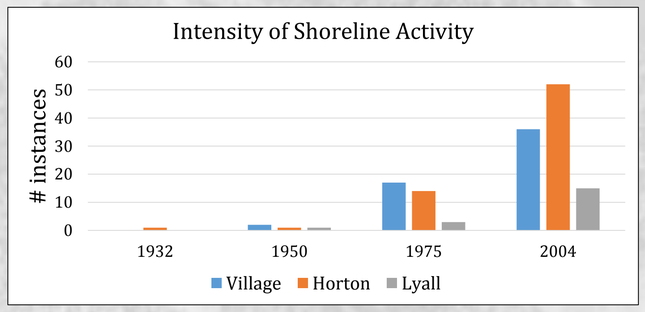


Fig 4. Intensity of shoreline activity increases dramatically as rural residential housing increases

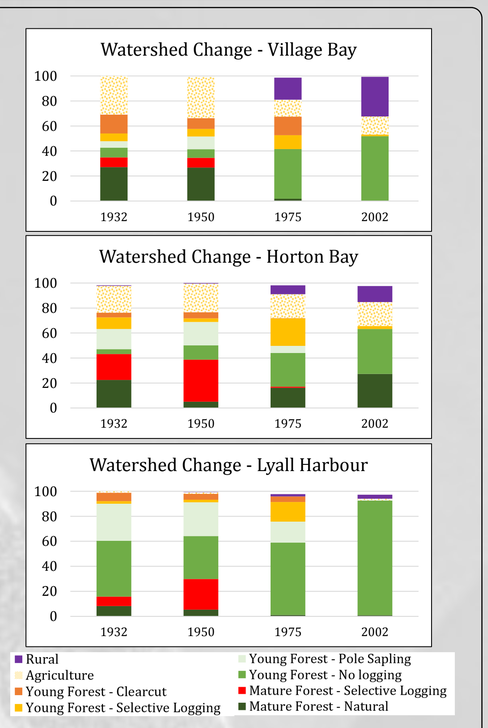


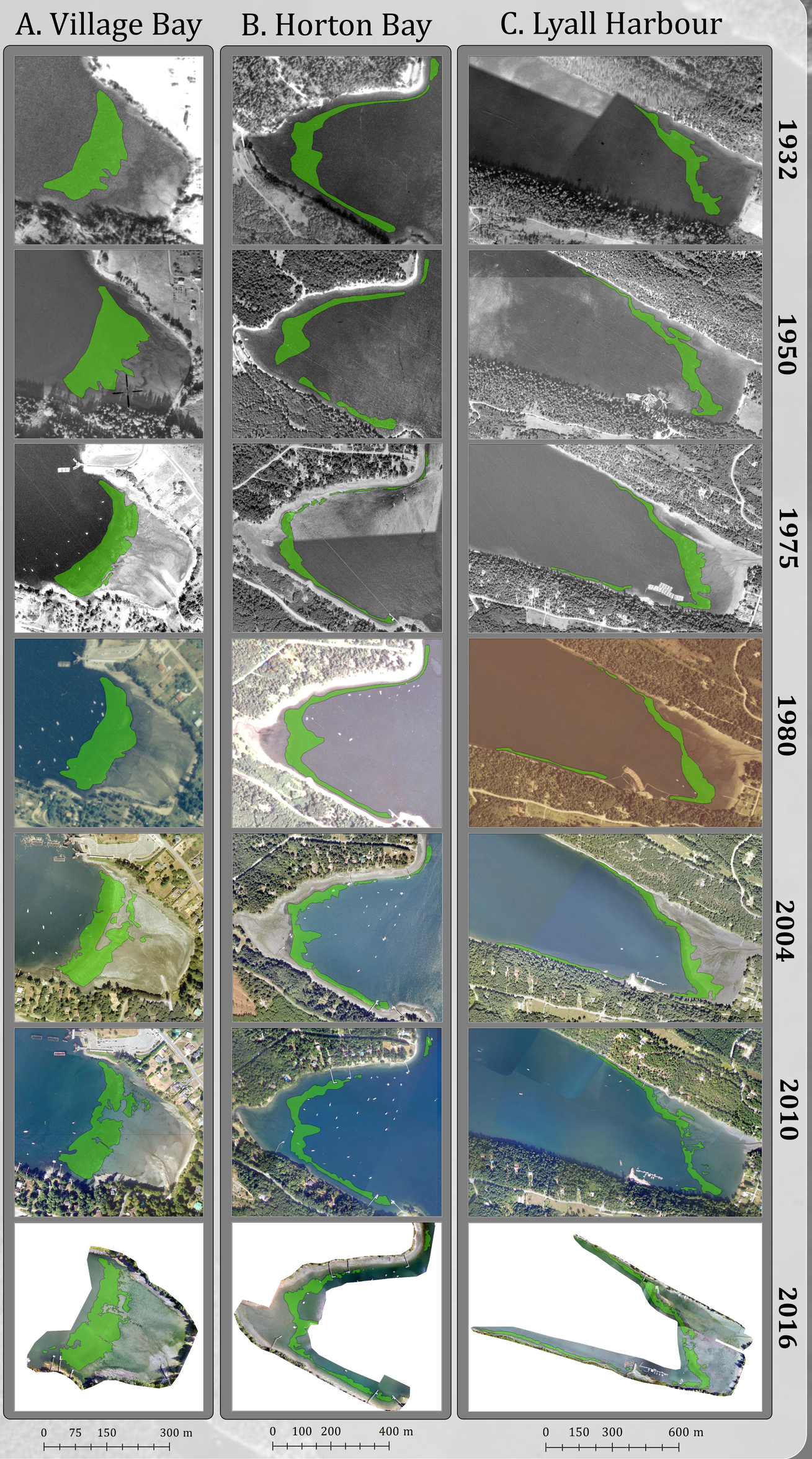
Fig 3. Watersheds exhibit shift from timber harvest to rural residential with preserved forest areas

Discussion

Spatial-temporal eelgrass % cover (Fig 2) shows slight downward trend from 1932 to 2016. When interpreting this trend, it is important to condition the changing quality of the air photos in terms of environmental conditions and visual interpretability.

Watershed land cover (Fig 3) shows a shift from significant forest harvest, which indicates higher rates of stream sedimentation and eelgrass scouring by log booms, to rural residential housing, which has been shown to increase nutrient inputs to streams and as a result, lead to loss of seagrass due to epiphyte smothering.

Shoreline activity (Fig 4) is seen to increase dramatically in the 1970's when rural residential land cover begins to increase. Localized fragmentation occurring in direct proximity to built structures and boat moorage likely play a role in the downward trend in eelgrass observed.



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