Eelgrass Measurement Studies in Island County

IC Marine Resource Committee

Island County Department of Health

Gregg Ridder 4/4/2017

Ecology of Eelgrass

SUBMERGED
Subtidal and
Intertidal

MARINE
Low Salinity to
Ocean Water

FLOWERING
Pollination, Fruits, Seeds

DISTRIBUTION
Temperate to Arctic

NUTRIENT CYCLING
In Sediment and
In Water Column

ESTUARINE FILTRATION
Nutrients and
Sediments

FOOD RESOURCE
Waterfowl
Invertebrates

HABITAT
Breeding
Nursery
Feeding
Protection

INDICATOR
Ecosystem Stress
Pollution
Environmental Health

WASHINGTON STATE DEPARTMENT OF
Natural Resources
www.dnr.wa.gov

The Eelgrass Meadow
A World of Microhabitats

1. zooplankton
2. larval crab
3. salmon
4. herring
5. epiphytic macroalgae
6. epiphytic microalgae, hydozoa, and bryozoa
7. sea cucumber
8. dungeness crab
9. octopus
10. sand dollars
11. clams and cockles
12. pacific spiny lumpsucker
13. caprellid amphipod
14. stalked jellyfish
15. eelgrass isopod
16. juvenile salmon
17. bubble shell
18. opalescent nudibranch
19. perch
20. juvenile kelp crab
21. alabaster nudibranch
22. scallop
23. gunnel
24. bay pipefish
25. sea urchin
26. juvenile sculpin
27. decorator crab
28. juvenile clams
29. juvenile flounder and sole
30. juvenile crab
31. geoduck
32. sediment microfauna
33. snail and snail eggs
34. juvenile cod, tomcod and wall-eyed pollock
35. herring eggs
36. jellyfish
37. larval fish
38. meliba - hooded nudibranch
39. tubesnout
40. shrimp
41. brooding anemone
42. prickleback
43. sculpin
44. bacteria on detritus
45. moonsnail
46. sunflower seastar
47. sea pen
48. red rock crab
49. hermit crab
50. worms
51. ghost shrimp
52. sand lance
53. black brant
54. Canada goose
55. bufflehead

This is a reproduction from the interpretive display of the Port Townsend Marine Science Center's Eelgrass Exhibit.
For more information, call, write or visit the Port Townsend Marine Science Center, Fort Worden State Park, Port Townsend, WA 98368 – (206) 385-5582.

Background

- Jeff Gaeckle (WADNR) > Fred Short > Bart Christiaen - Submerged Vegetation Monitoring Program 2000 - 2017; Methods for underwater videography; Scope is all of Puget Sound; Developing Site scale monitoring.

- Sandy Wyllie-Echeverria (Friday Harbor Labs) - Eelgrass plant physiology, Population relationships, History, Underwater Videography. Studying wasting disease in SJA.

- Jan Holmes and Don Meehan: 2000 Survey by Land Owners

- IC MRC: 2000 -1 Contracted Studies for Island County to Jim Norris and Sandy Wyllie-Echeverria

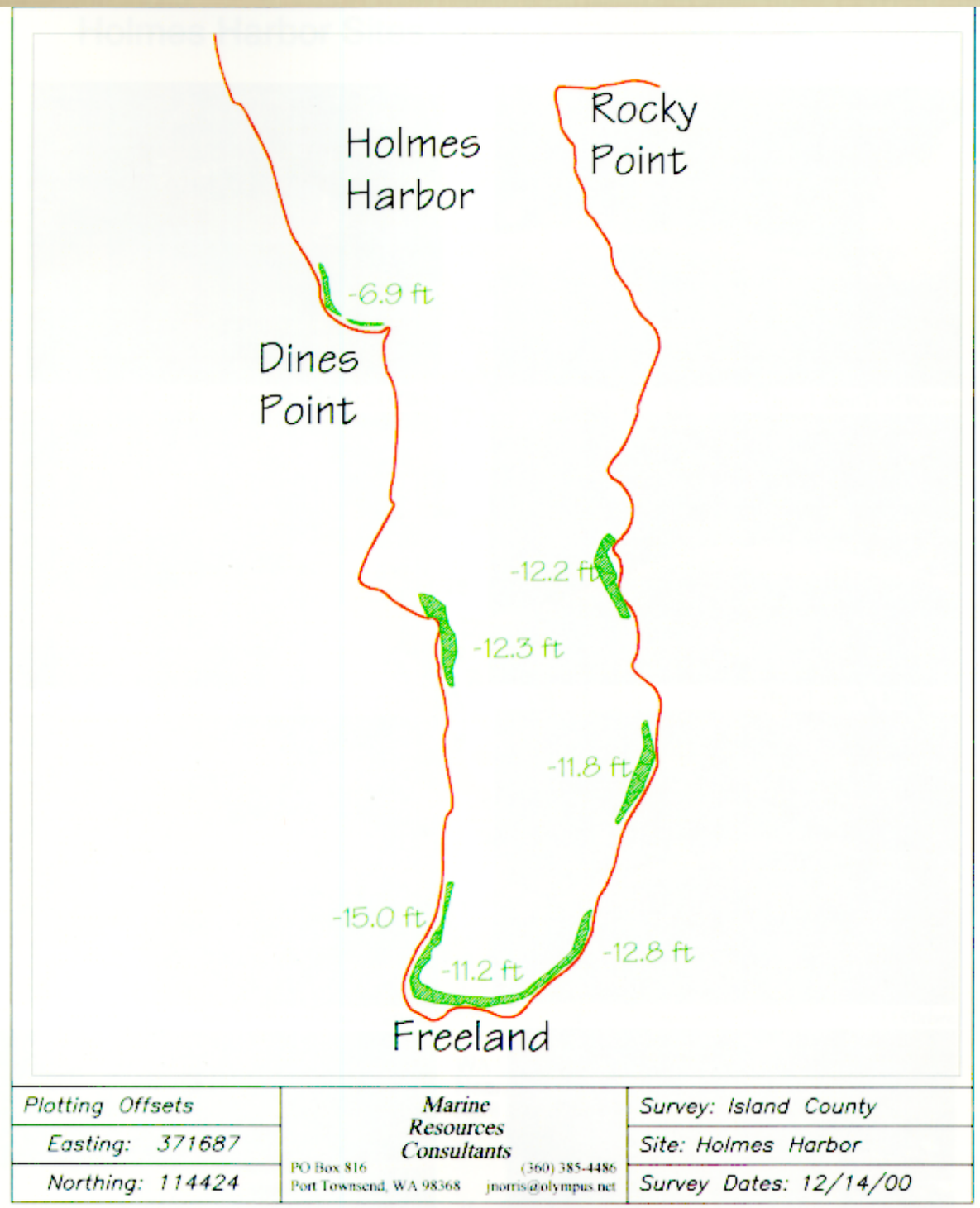
- Suzanne Shull (Padilla Bay) - Aerial Photography and GPS Ground-Truthing

- Loss of Eelgrass in Holmes Harbor in 2007; Nichols Bros launch

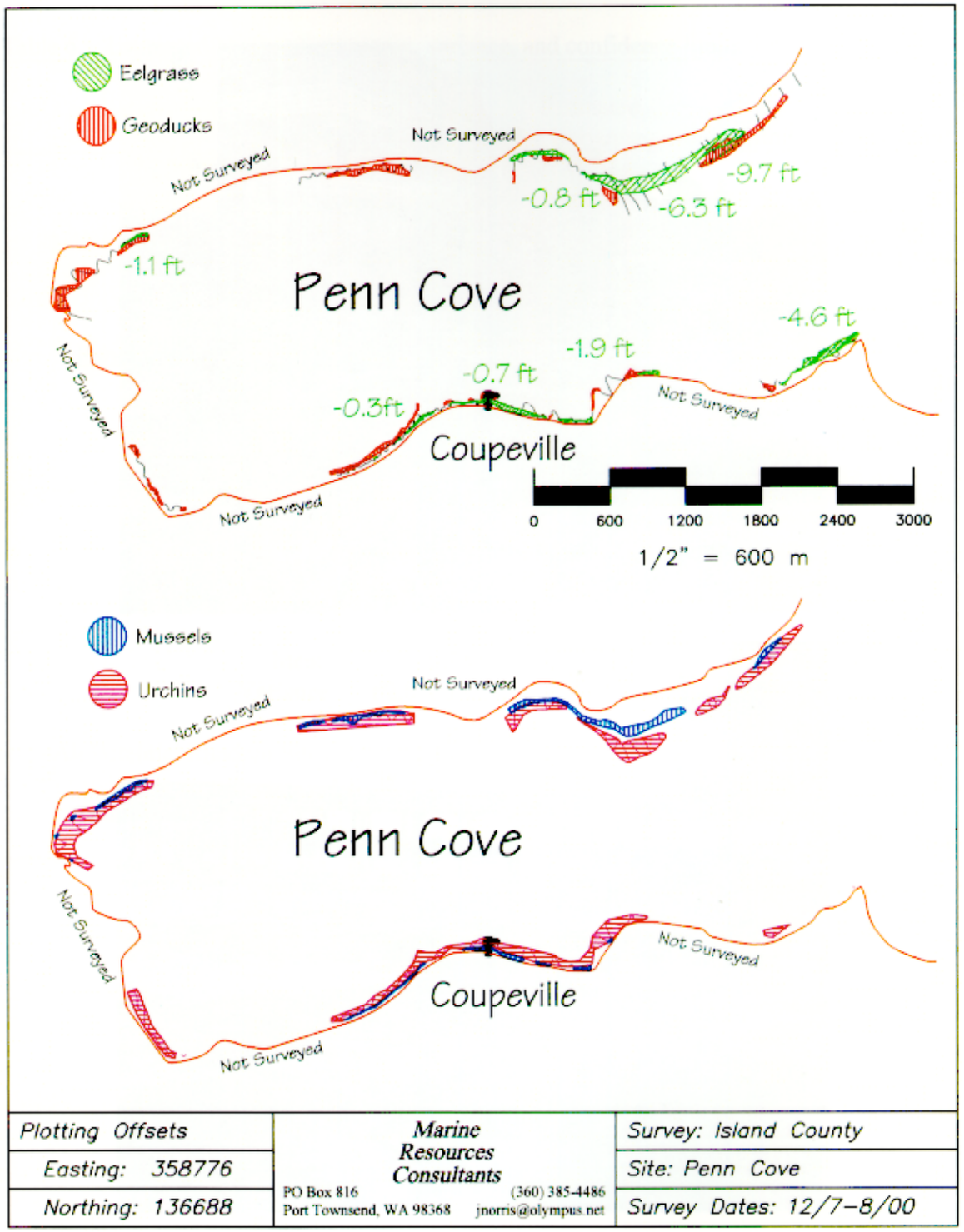
- NWStraits/NOAA/MRC Funded our eelgrass studies in 2008

- Side-Scan Sonar in 2016 by Albert Foster

2000 Survey of IC Eelgrass



Plotting Offsets	Marine Resources Consultants	Survey: Island County
Easting: 371687	PO Box 816 (360) 385-4486	Site: Holmes Harbor
Northing: 114424	Port Townsend, WA 98368 jnorris@olympus.net	Survey Dates: 12/14/00



Plotting Offsets	Marine Resources Consultants	Survey: Island County
Easting: 358776	PO Box 816 (360) 385-4486	Site: Penn Cove
Northing: 136688	Port Townsend, WA 98368 jnorris@olympus.net	Survey Dates: 12/7-8/00

NATURAL RESOURCE

Puget Sound Submerged Vegetation Monitoring Program

2010-2013 Report

February 27, 2015

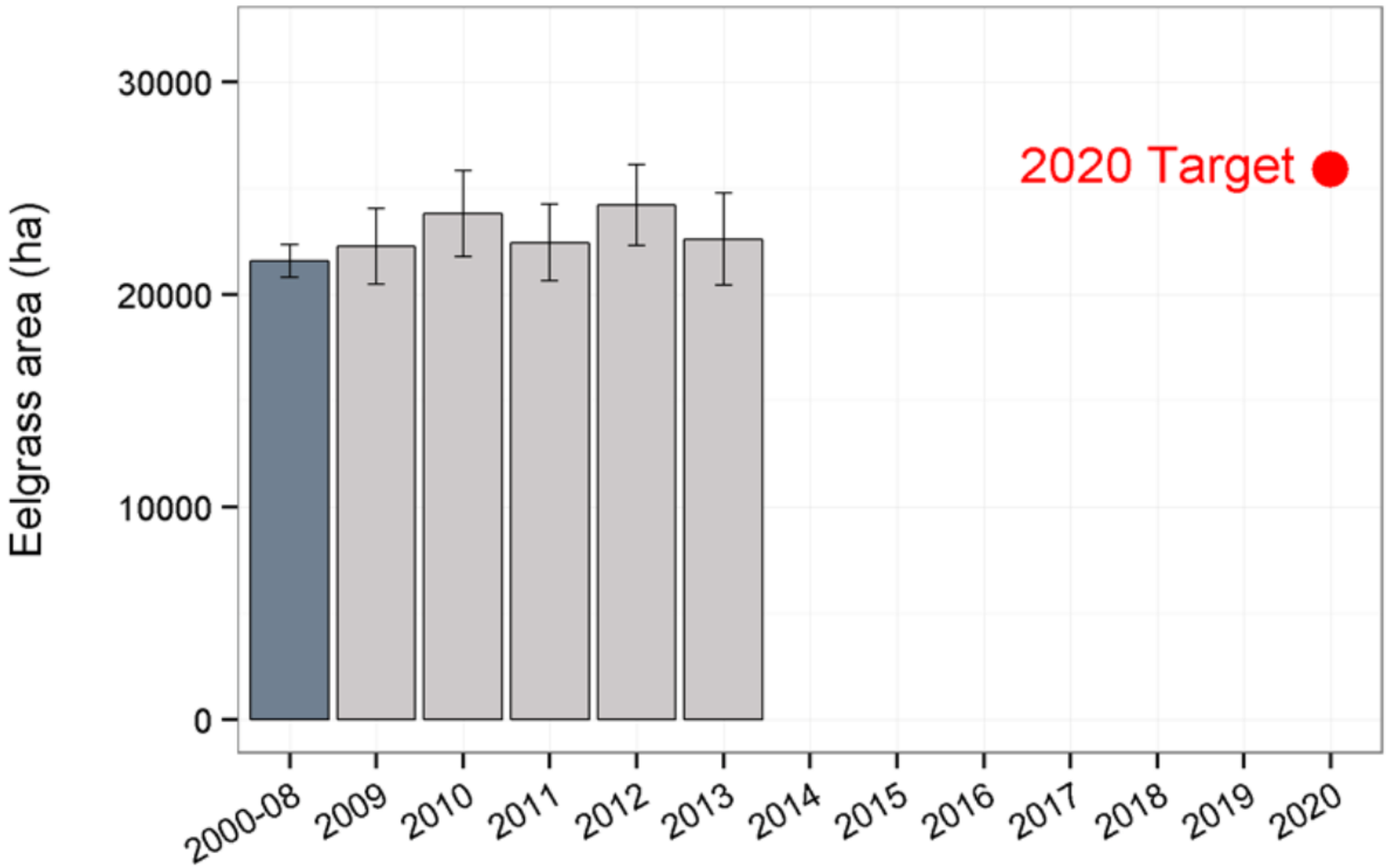
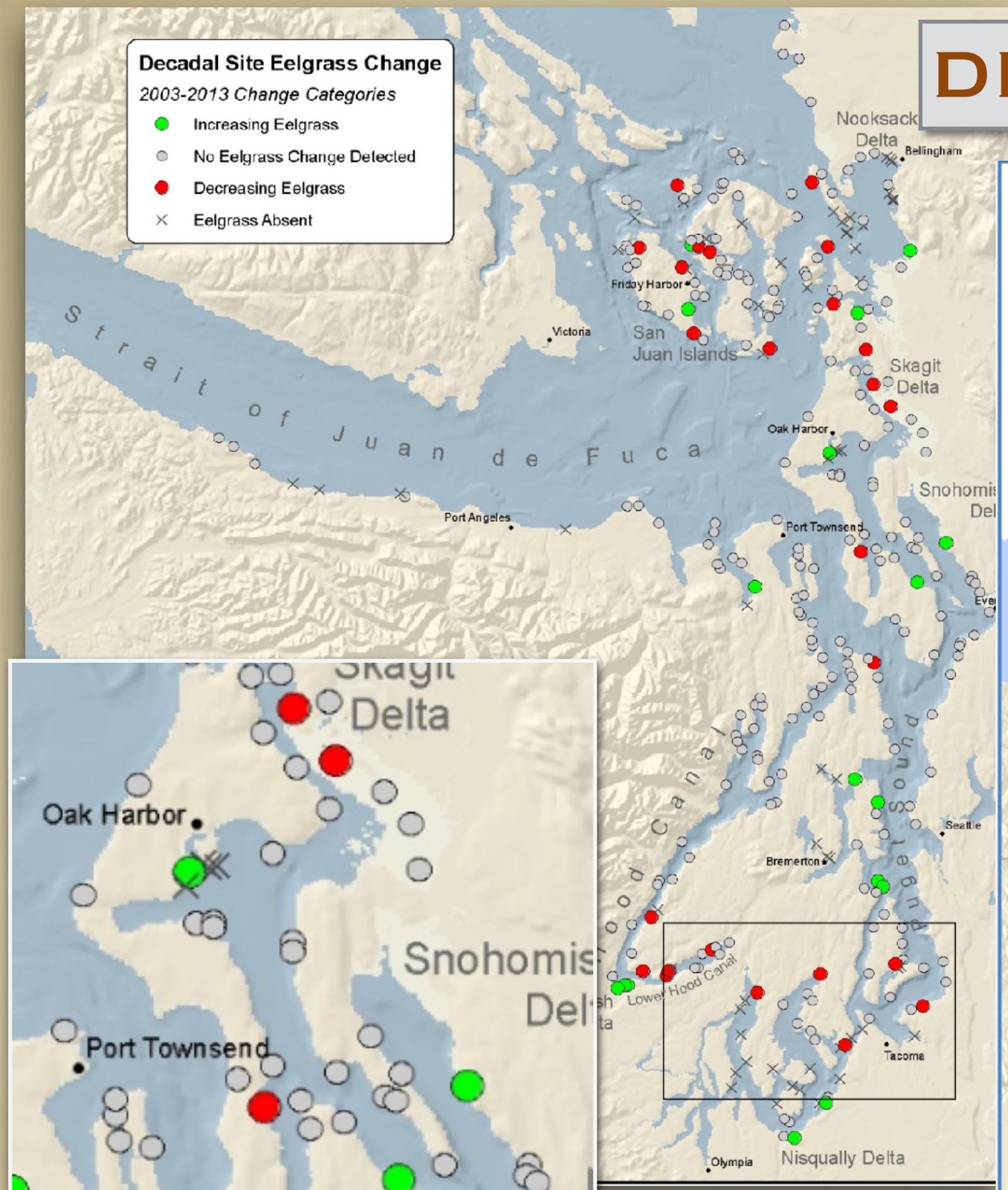
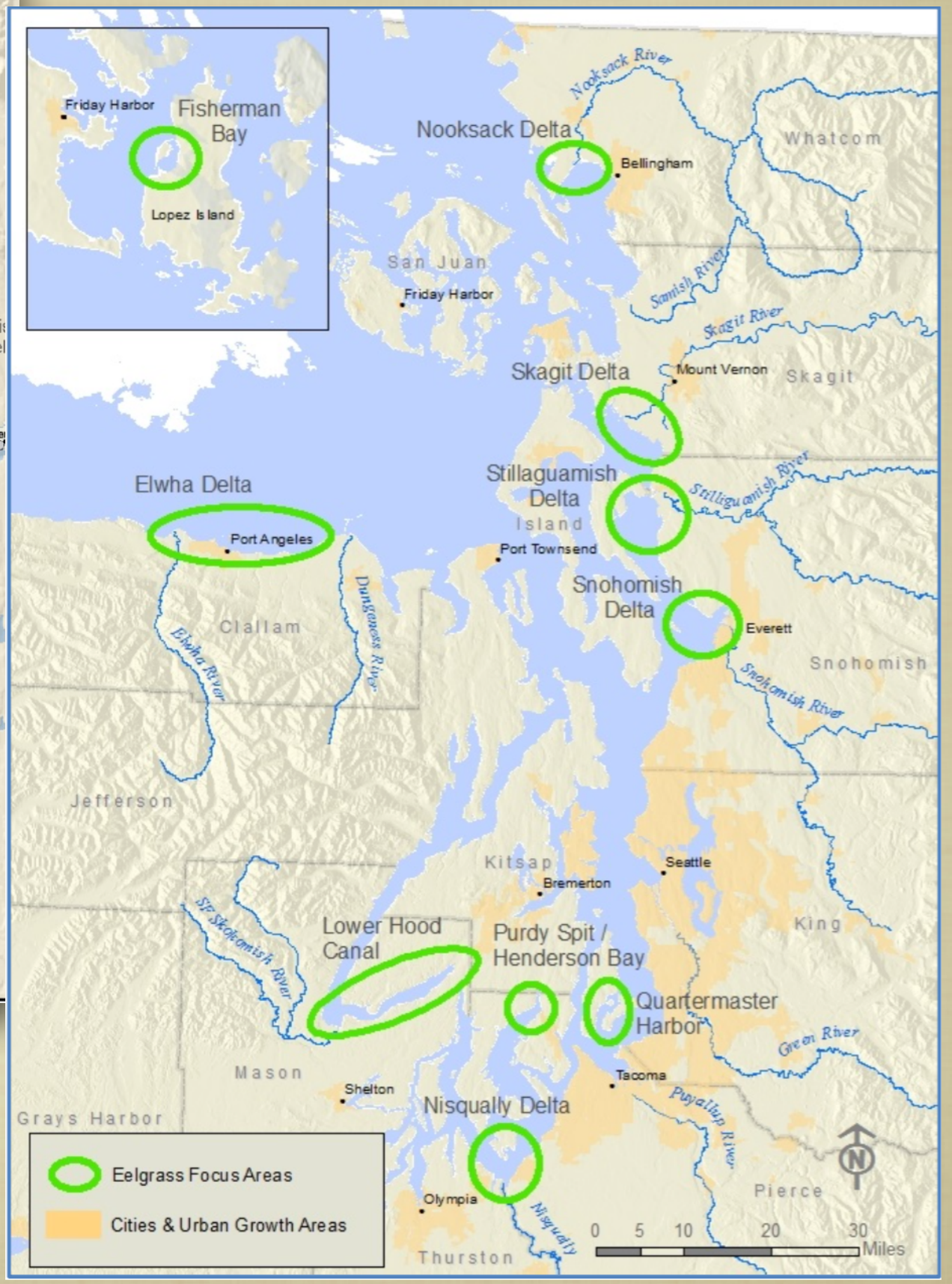


Figure 1. Soundwide native seagrass area estimates for 2009-2013, based on methods presented by Skalski (2003). The baseline value represents the mean seagrass abundance from 2000-2008. The red dot represents the 2020 target of a 20% increase. Error bars represent standard error.

DNR - Data & Priorities





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Journal of Ecology

BRITISH ECOLOGICAL SOCIETY

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Forty years of seagrass population stability and resilience in an urbanizing estuary

Andrew O. Shelton[1,2*], Tessa B. Francis[3], Blake E. Feist[1], Gregory D. Williams[4], Adam Lindquist[5] and Philip S. Levin[1,6,7]

[1]Conservation Biology Division, Northwest Fisheries Science Center, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, 2725 Montlake Blvd. E, Seattle, WA 98112, USA; [2]Earth Resources Technology, Inc., 14401 Sweitzer Lane Suite 300, Laurel, MD 20707, USA; [3]Tacoma, Puget Sound Institute, University of Washington, 326 East D Street, Tacoma, WA 98421, USA; [4]Pacific States Marine Fisheries Commission (Under contract to the Northwest Fisheries Science Center), NOAA Fisheries, 2725 Montlake Blvd E, Seattle, WA 98112, USA; [5]Washington Department of Fish and Wildlife, 1111 Washington St SE, Olympia, WA 98504-3150, USA; [6]The Nature Conservancy, Washington Field Office, 74 Wall St., Seattle, WA 98121, USA; and [7]School of Environmental and Forest Sciences, University of Washington, Seattle, WA 98195, USA

Summary

1. Coasts and estuaries contain among the most productive and ecologically important habitats in the world and face intense pressure from current and projected human activities, including coastal development. Seagrasses are a key habitat feature in many estuaries perceived to be in widespread decline owing to human actions.

2. We use spatio-temporal models and a 41-year time series from 100s of km of shoreline which includes over 160 000 observations from Puget Sound, Washington, USA, to examine multiscale trends and drivers of eelgrass (*Zostera* spp.) change in an urbanizing estuary.

3. At whole estuary scale (100s of km), we find a stable and resilient eelgrass population despite a more than doubling of human population density and multiple major climactic stressors (e.g. ENSO events) over the period. However, the aggregate trend is not reflected at the site scale (10s of km), where some sites persistently increase while others decline.

4. Site trends were spatially asynchronous; adjacent sites sometimes exhibited opposite trends over the same period. Substantial change in eelgrass occurred at the subsite (0·1 km) scale, including both complete local loss and dramatic increase of eelgrass.

5. Metrics of local human development including shoreline armouring, upland development (imperviousness) and human density provide no explanatory power for eelgrass population change at any spatial scale.

6. Our results suggest that the appropriate scale for understanding eelgrass change is smaller than typically assumed (approximately 1- to 3-km scale) and contrasts strongly with previous work.

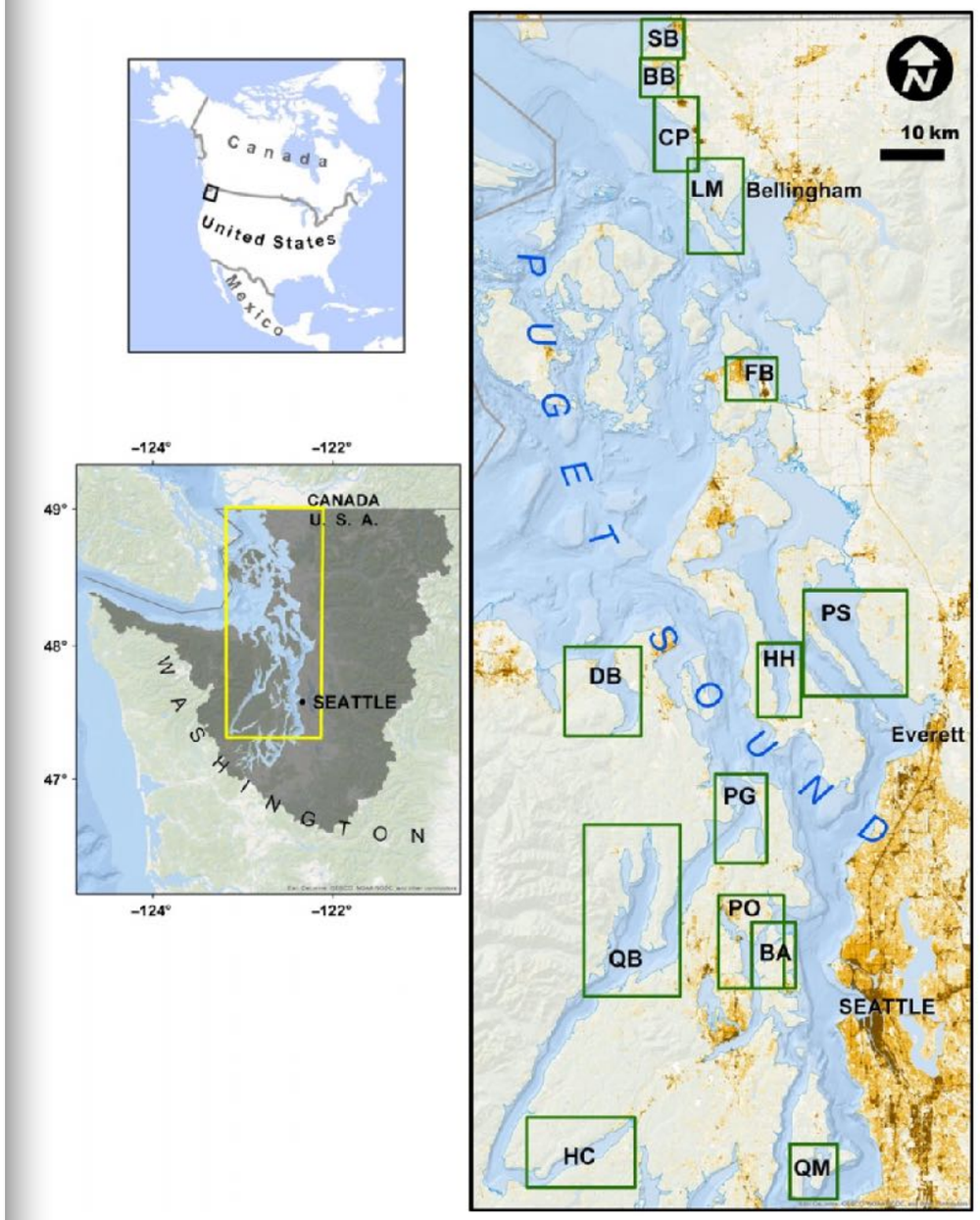
7. *Synthesis*. Despite ongoing conservation concern over seagrasses world-wide, eelgrass in Puget Sound has been highly resilient to both anthropogenic and environmental change over four decades. Our work provides general methods that can be applied to understand spatial and temporal scales of change and can be used to assess hypothesized drivers of change.

Key-words: coastal development, eelgrass, Puget Sound, resilience, shoreline armouring, spatio-temporal models, urbanization, *Zostera*

Introduction

Nearly 40% of the world's population lives within 100 km of a coast (Sale *et al.* 2014), most of the world's major cities are located in coastal zones (Timmerman & White 1997; Small & Nicholls 2003), and future population expansion will increase disproportionately in the world's coastal zones (Seto, Güneralp & Hutyra 2012; Sale *et al.* 2014; Neumann *et al.* 2015). Human development and activities in coastal regions place enormous stress on natural systems and have negatively affected the structure and function of many nearshore and coastal ecosystems (Imhoff *et al.* 2004; Lotze *et al.* 2006;

*Correspondence author. E-mail: ole.shelton@noaa.gov



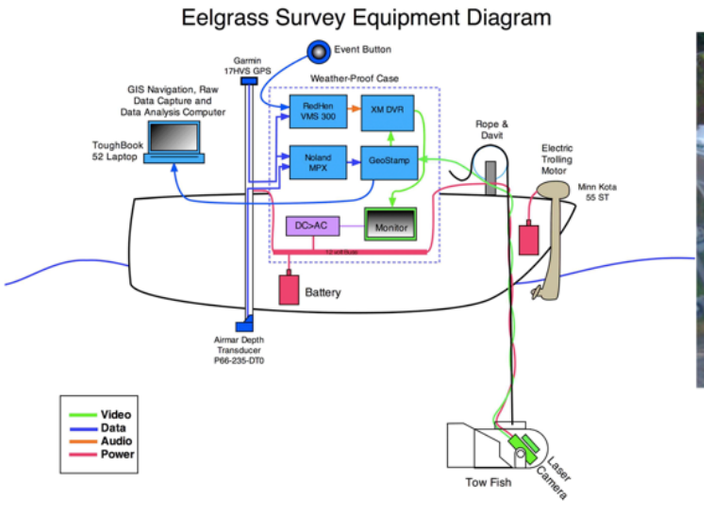
Methods

- Underwater Videography
- Aerial Photography
- Sonar survey

IC Methods for Eelgrass Surveys

UNDERWATER VIDEO

Beach Watchers follow the Washington State Department of Natural Resources Submerged Vegetation Project's video mapping protocols using portable mapping and power components on volunteer owned and operated skiffs. A crew is made up of three volunteers: boat captain, towfish operator, and electronics technician.



Text File of GPS, Depth

MPEG2 Movies

AERIAL PHOTOGRAPHY

Vertical photographs of shorelines at extremely low tides were collected from 2000' using a remote controlled, wing-mounted camera that transmitted images to an iPad in the cockpit of a Cessna 177RG.

Boat Envy

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Geo-Register Aerial Images

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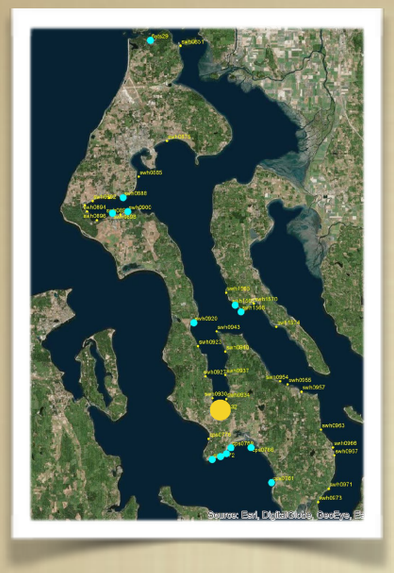
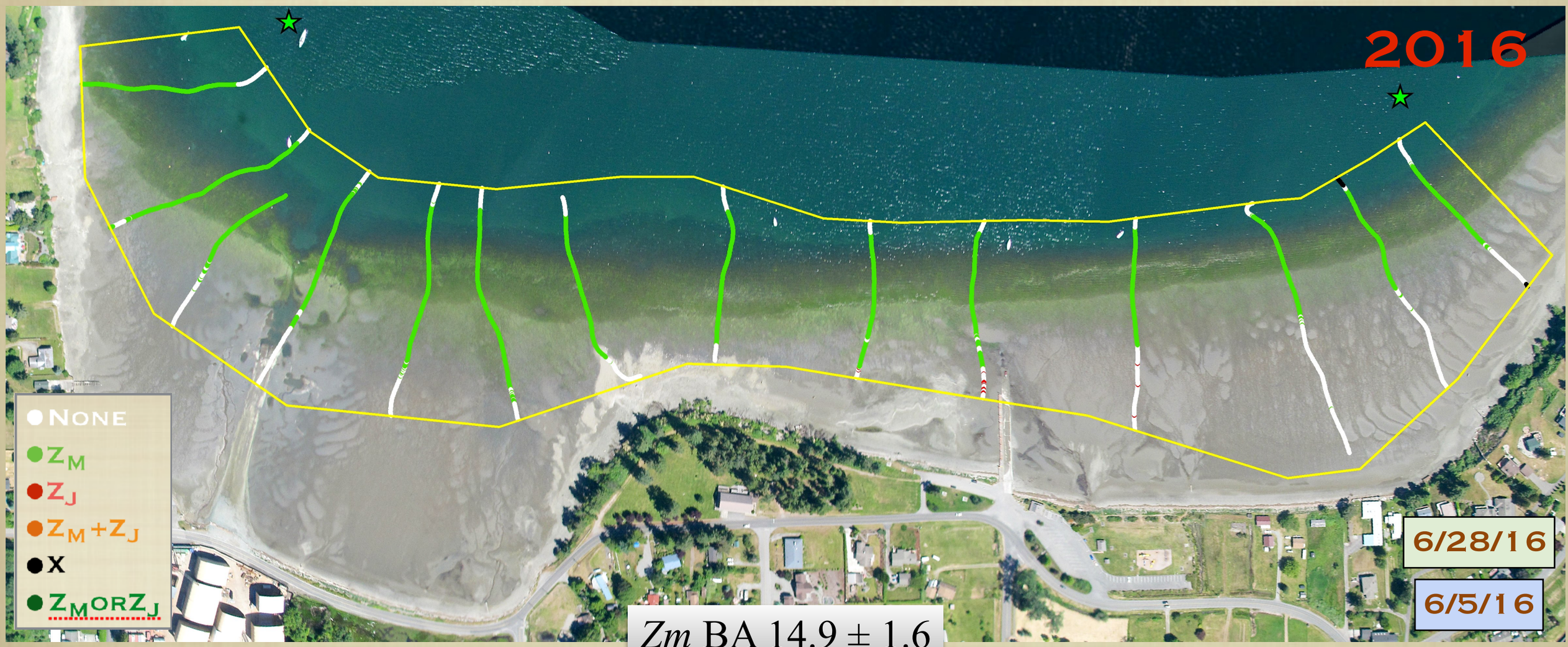


swh0932 - Freeland Park

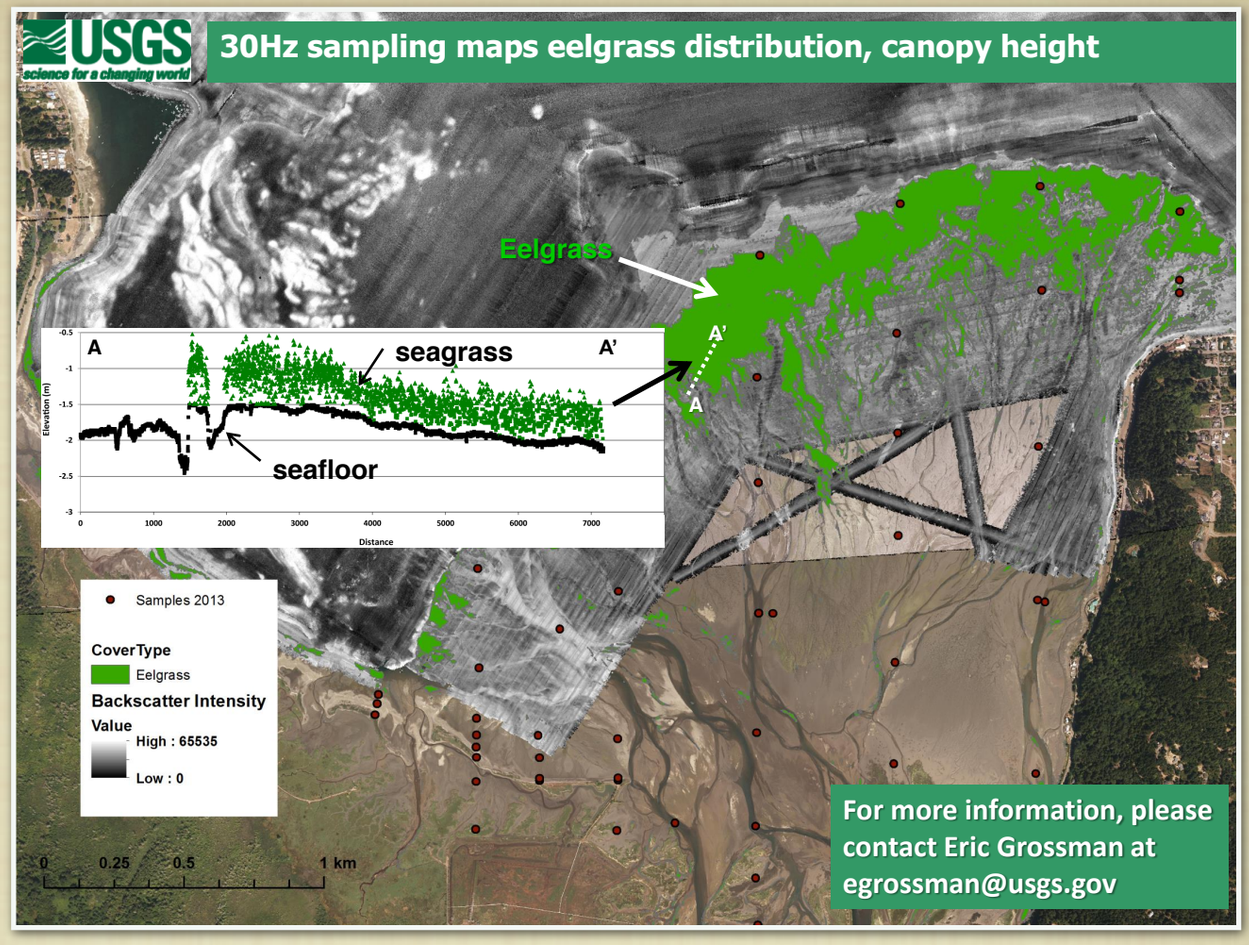


Process/Timeline

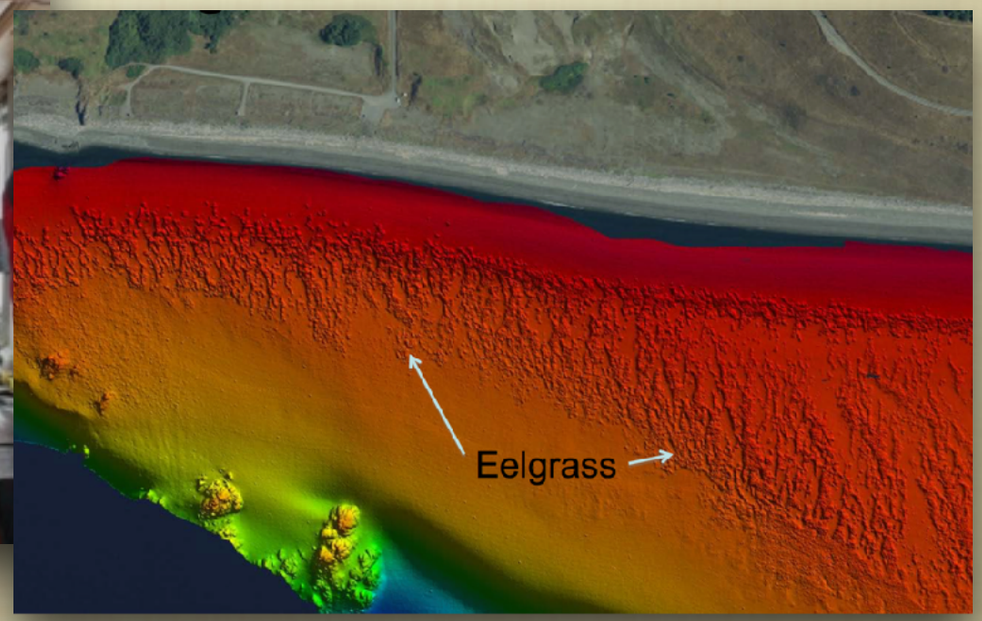
- March - May
  - Present last year's data to MRC; Discuss Sites for this year
  - Upgrade / Repair Equipment & Software
  - Get Transect point coordinates from DNR
  - Create Navigation Maps and transect lines
  - Schedule Crew and Volunteers
  - Do a Shake-down Run
- June - August
  - Collect Underwater Video (weather, tides, Crew)
  - Store tracklog and video data
  - Map tracklog and record notes in Quick Report
  - Collect Aerial Photos at low tide days
  - Create final MRC/NOAA report on last year's Results
- September - November
  - Make Spreadsheets from Tracklog; Burn video DVDs
  - Analyze video for eelgrass presence/absence
  - Map results of analysis and edit sample polygons
  - Georeference aerials onto maps
  - Send spreadsheets to DNR for Bed Area Measurments
- December - February
  - Create interim report for MRC/NOAA of this Year's Data
  - Present Results at Conferences/Meetings
  - Transfer results to MRC Archive; SoundIQ

Use of Sonar to Measure Eelgrass Beds

Eric Grossman
USGS
Bellingham

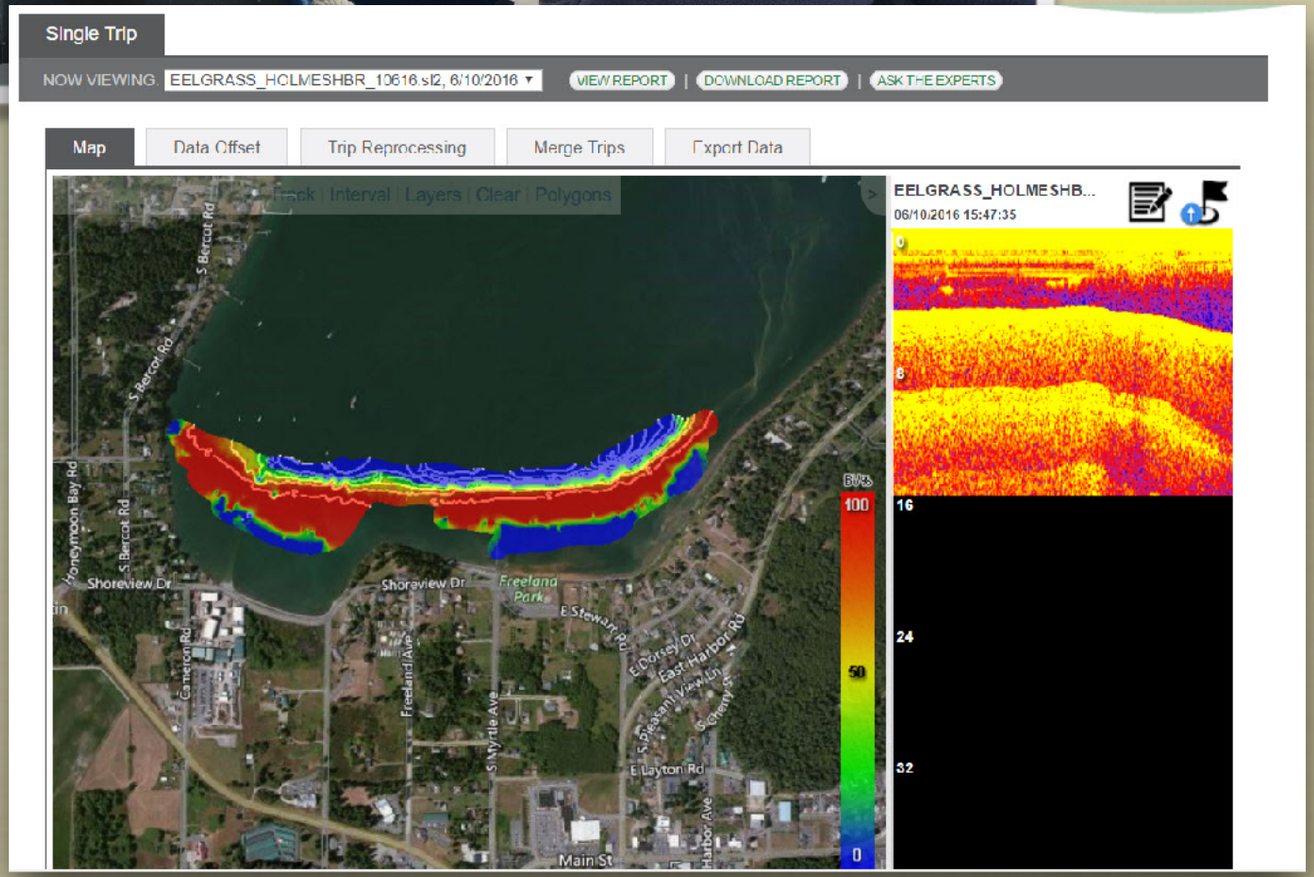


Gary Greene Tombolo San Juan



Use of Sonar to Measure Eelgrass Beds

Albert Foster
SWS ‘16
Whidbey



Sampling Sites for Underwater Videography

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2009 Sites


flats29
swh0875
swh0885
swh0890
swh0893
swh0892
swh0900
swh0894
swh0899
swh0896
swh1565
swh1570
swh0943
swh0923
swh0940
swh0927
swh0937
swh0957
swh0930
swh0934
swh0932
swh0966
swh0967
cps0761
swh0973
Sources: Esri, DigitalGlobe, GeoEye, Earthstar, U
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Source: Esri, DigitalGlobe, GeoEye, i-cube
USGS, AEX, Getmapping, Aerogrid, IGN,

2015 Sites


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