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Apr 26th, 11:30 AM - 1:00 PM

Assessing the viability of mapping bull kelp in Puget Sound using aerial imaging platforms


Tyler Cowdrey

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Assessing the viability of mapping bull kelp in Puget Sound using aerial imaging platforms

Tyler Cowdrey & Helen Berry
Nearshore Habitat Program
WA State Dept. of Natural Resources
April 26, 2022



WASHINGTON STATE DEPT OF
**NATURAL
RESOURCES**





NATURAL RESOURCES

Bull Kelp Monitoring in South Puget Sound in 2017 and 2018

June 10, 2019





Puget Sound Kelp Conservation and Recovery Plan

May 2020

Prepared by the Northwest Straits Commission, NOAA's National Marine Fisheries Service, Puget Sound Restoration Fund, Washington State Department of Natural Resources, and Marine Agronomics.



Strategic goal #3: “Describe Kelp Distribution and Trends”

More data is still needed in much of Puget Sound to conduct short- and long-term trend analyses

Floating kelp canopy area added to the newly revised “Beaches and Marine Vegetation Vital Sign
Currently being developed via a collaborative public process



See Dr. Wendel Raymond talk in this session @ 12:15pm for more on the VS development process



Two primary platforms were chosen to compare UAV and fixed-wing aerial imagery

DJI Phantom 4 Multispectral UAV



Captures 5 bands
(Blue, Green, Red, Red-Edge, Near-Infrared)

Typical altitude: 80-120m

Resolution: 4.2-6.3 cm/pixel

Coverage: ~100-120 hectares max
within survey window

MAPIR Survey3W NGB – Cessna Cardinal 177



Captures 3 bands
(Near-Infrared, Green, Blue)

Typical altitude: 1,500-2,000 ft

Resolution: 21-28 cm/pixel

Coverage: over 100 of km of shoreline
possible in survey window



Point Whitehorn
Alden Bank
Cherry Point

Point Partridge
North Beach
Polnell Point
Ebey's Landing

Possession Point
Edmonds

2021 IAA Report Sites

- Fixed-wing only
- UAV & Fixed-wing

0 25 50 Km

Basemap: County of Kitsap, Esri, HERE, Garmin, FAO, NOAA, USGS, EPA, CHS, Esri, GEBCO, DeLorme, NaturalVue

17 surveys attempted across 9 sites from early July to late September 2021

- 6 UAV
- 11 manned fixed-wing aircraft

Three failed due to inclement weather and camera malfunctions

Tradeoff between platforms: spatial coverage vs image resolution

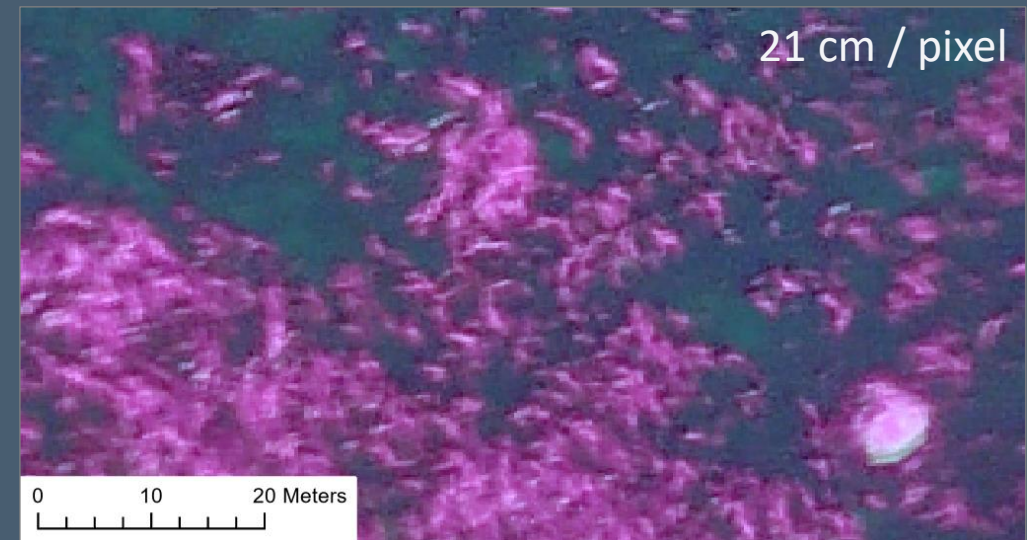
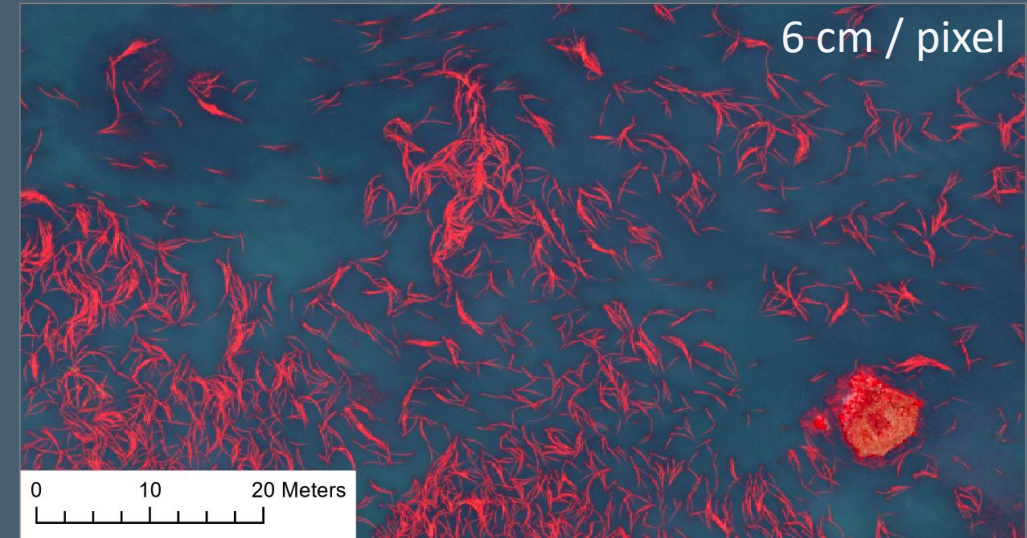
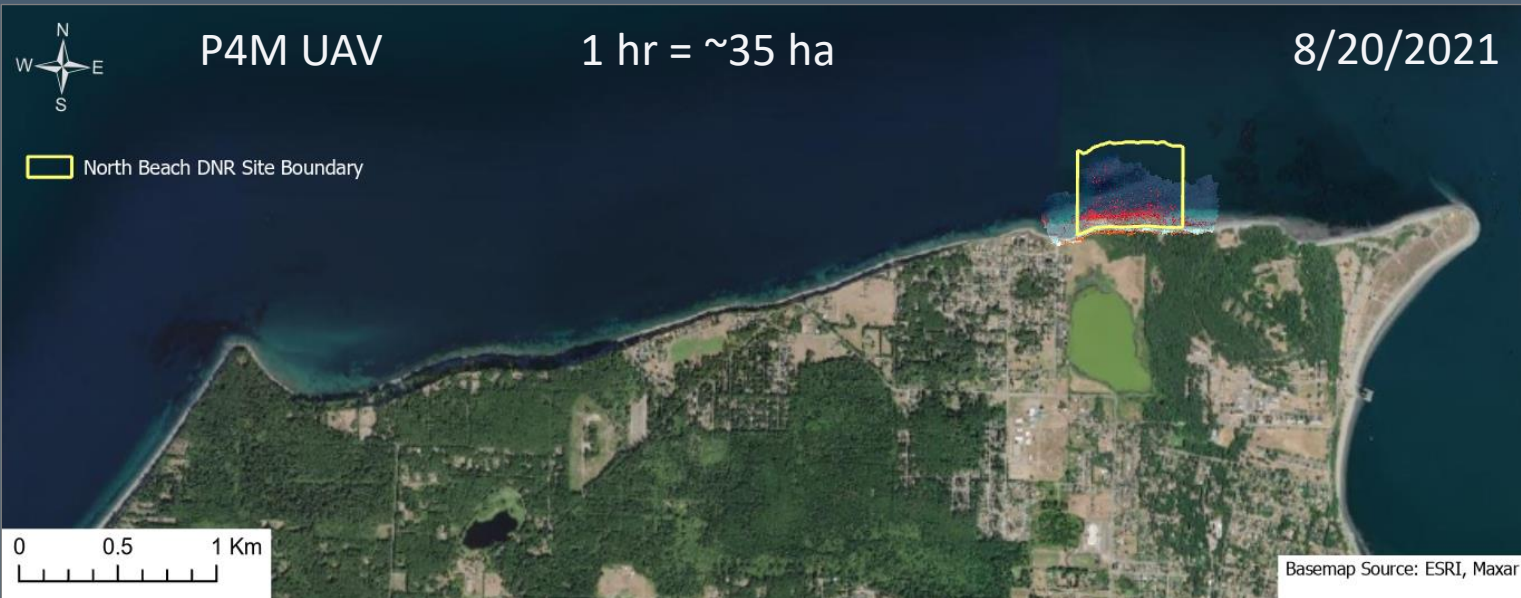
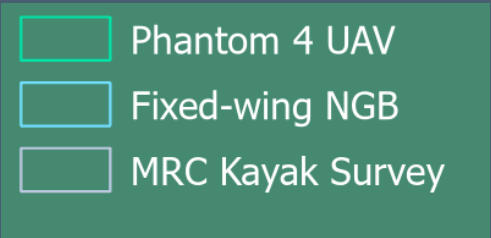
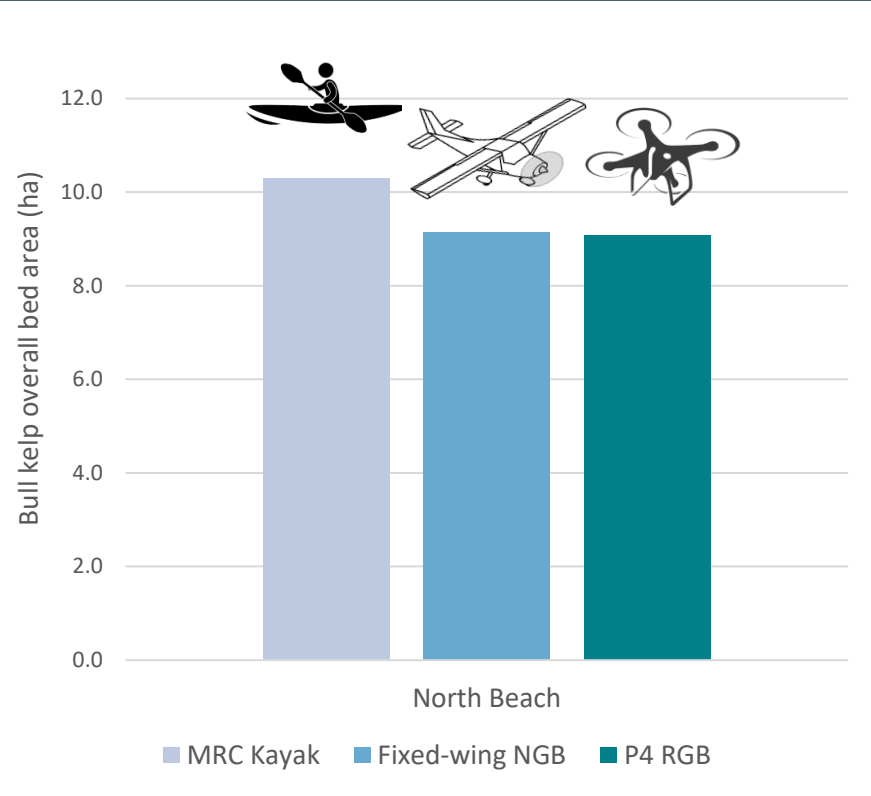


Image-based delineation of forest boundary and volunteer kayak perimeters agreed more at North Beach



North Beach site – NGB aircraft base imagery – 8/24/2020

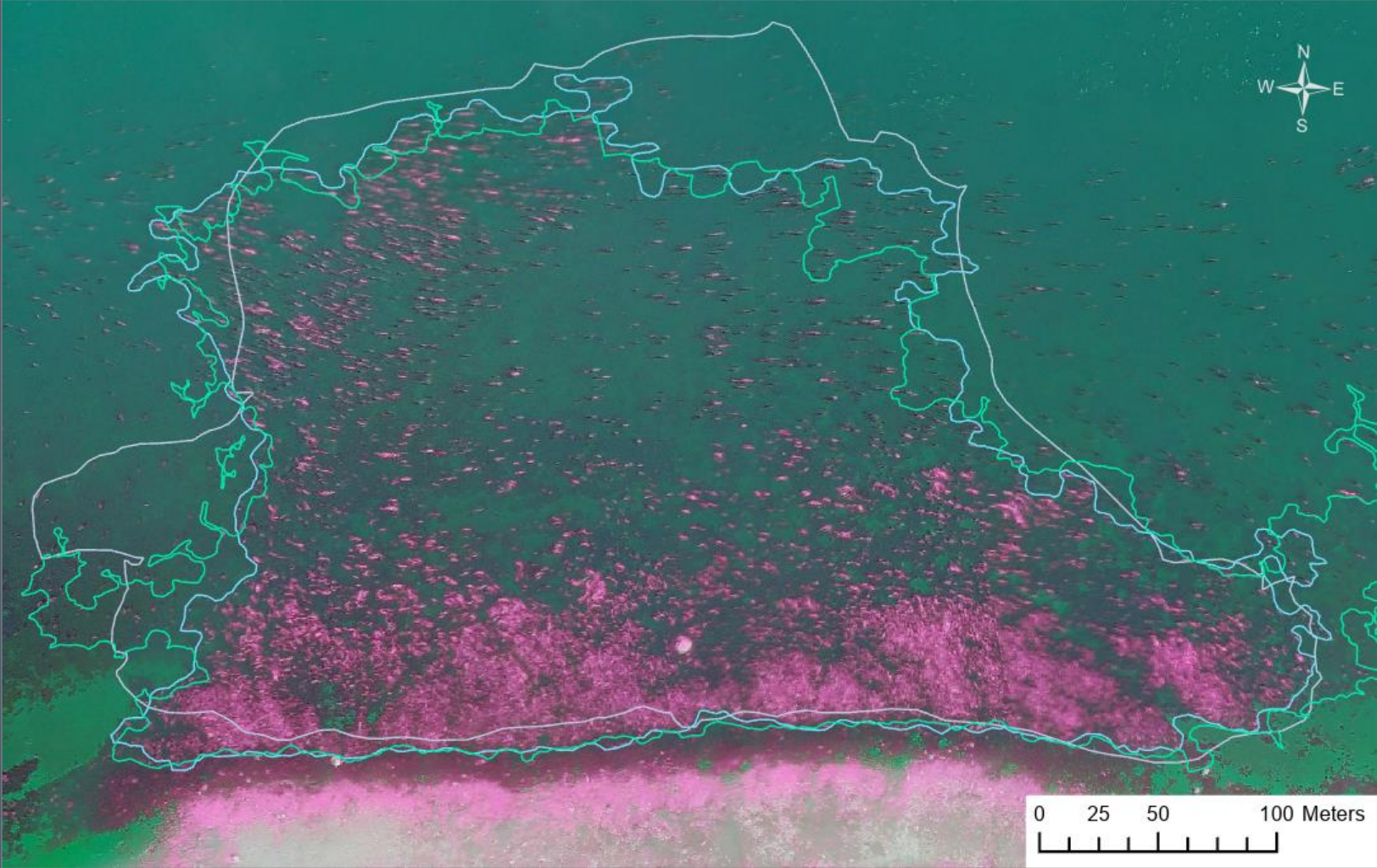
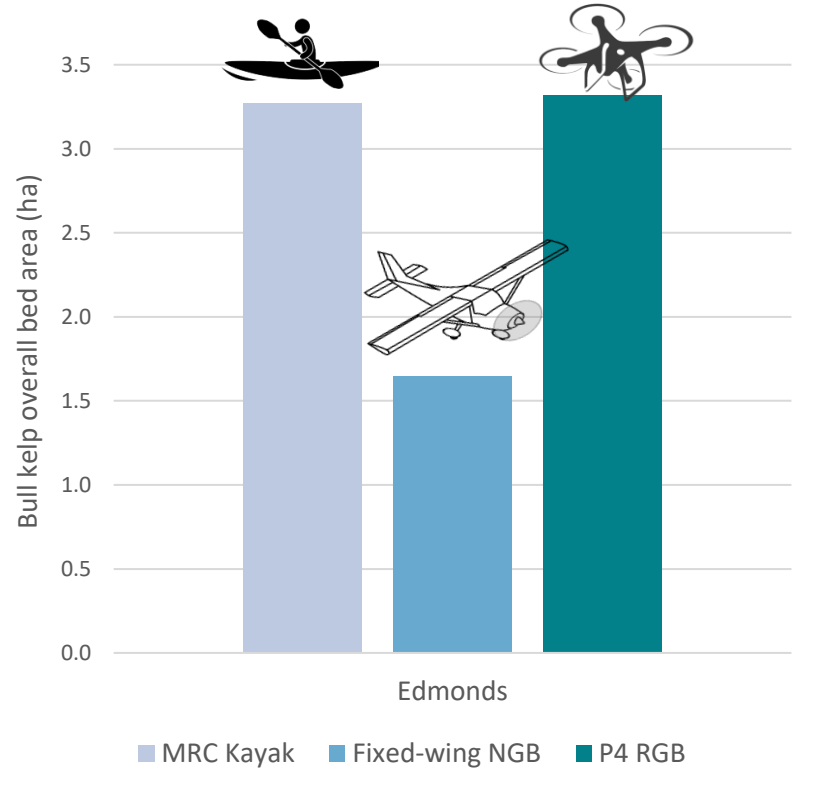


Image-based delineation of forest boundary and volunteer kayak perimeters agreed less at Edmonds

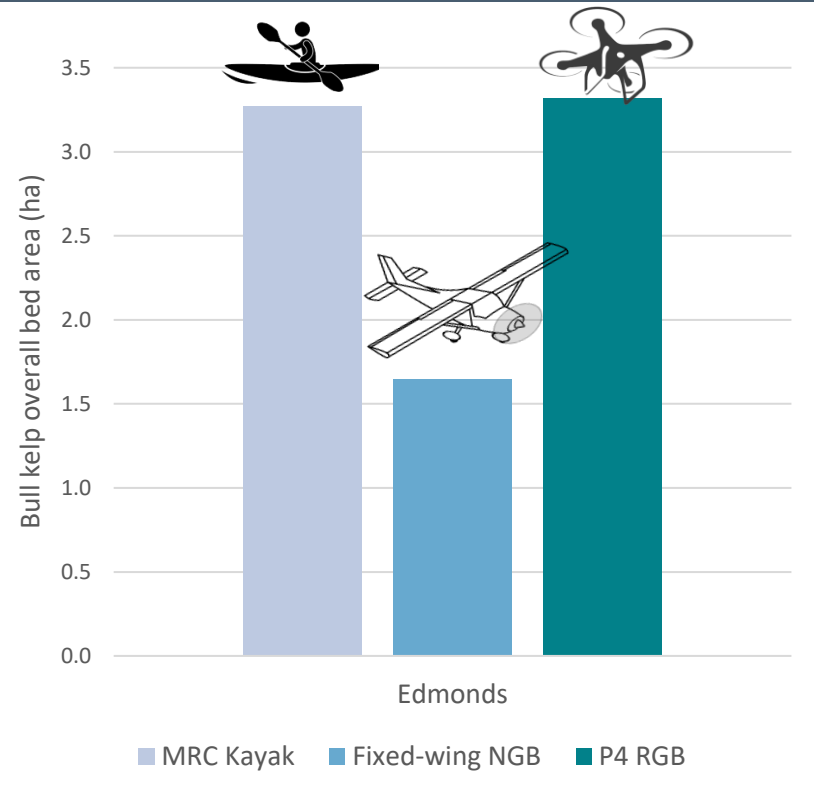


Edmonds site – NGB aircraft base imagery

- Phantom 4 UAV
- Fixed-wing NGB
- MRC Kayak Survey



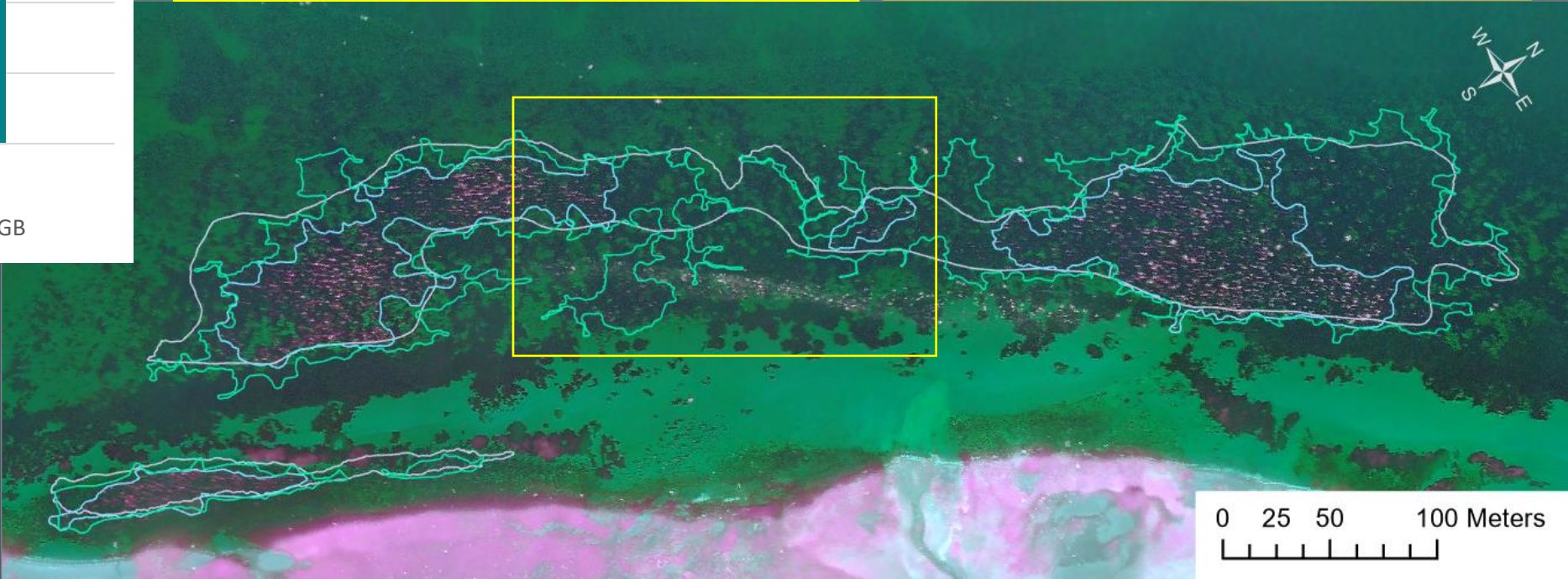
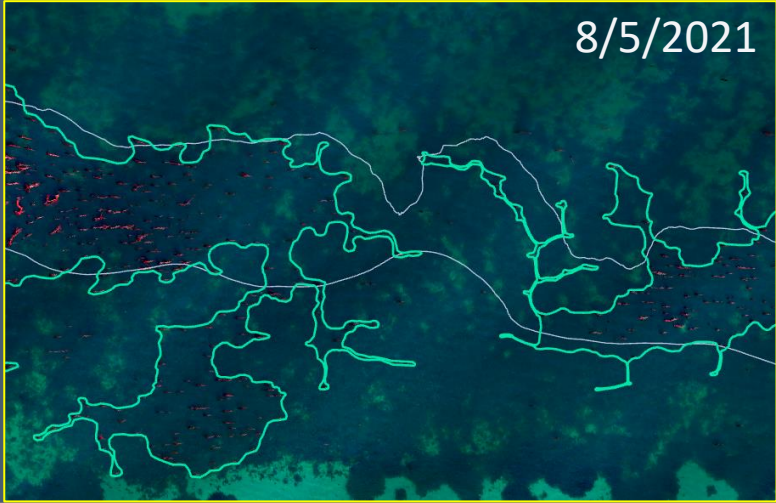
Image-based delineation of forest boundary and volunteer kayak perimeters agreed less at Edmonds



NGB aircraft

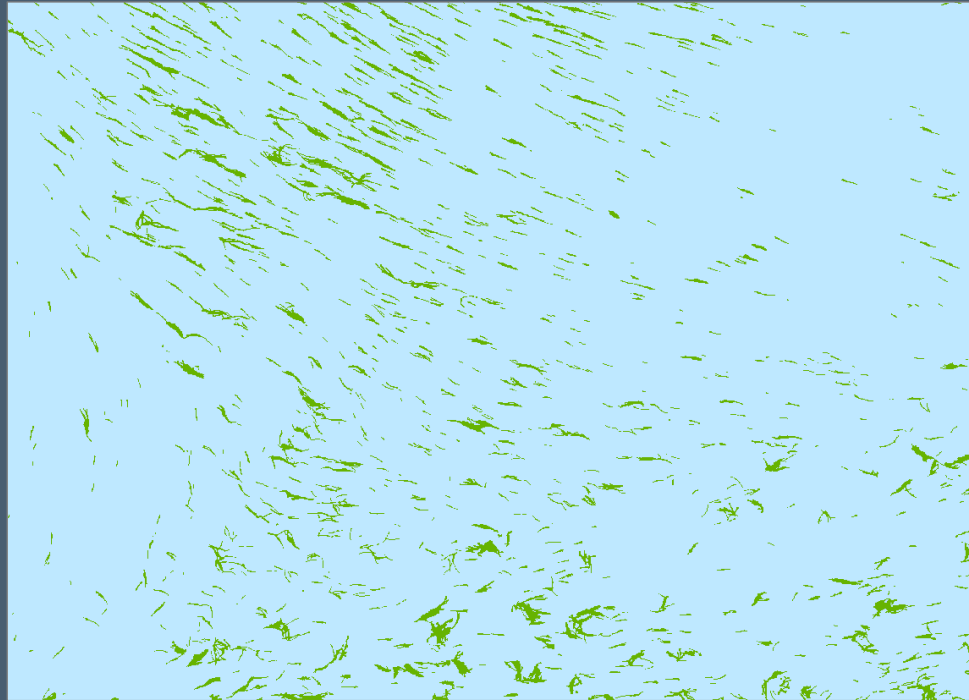


Multispectral UAV



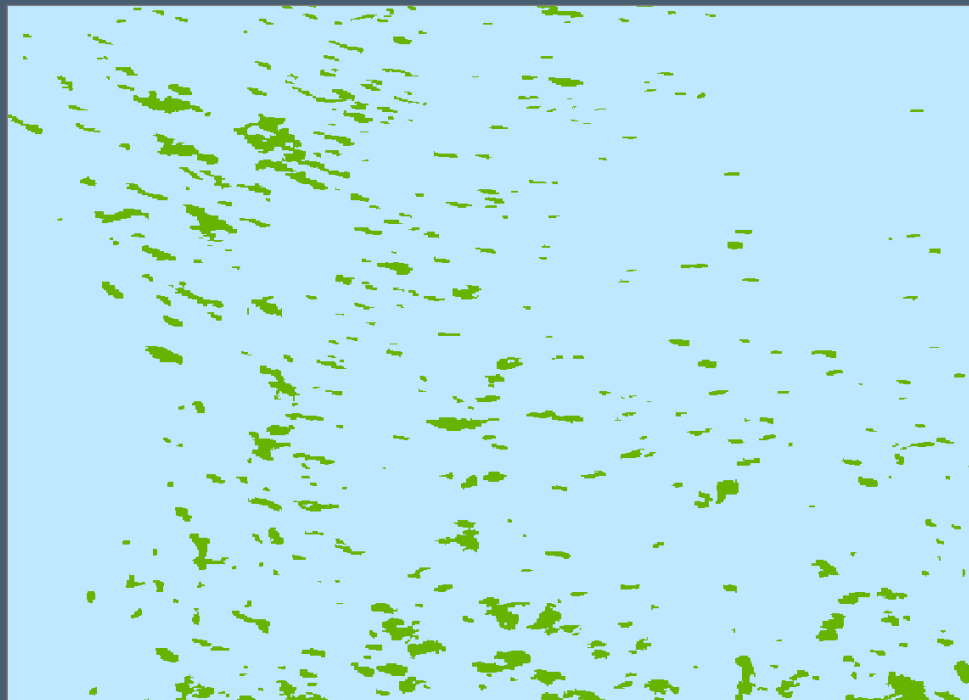
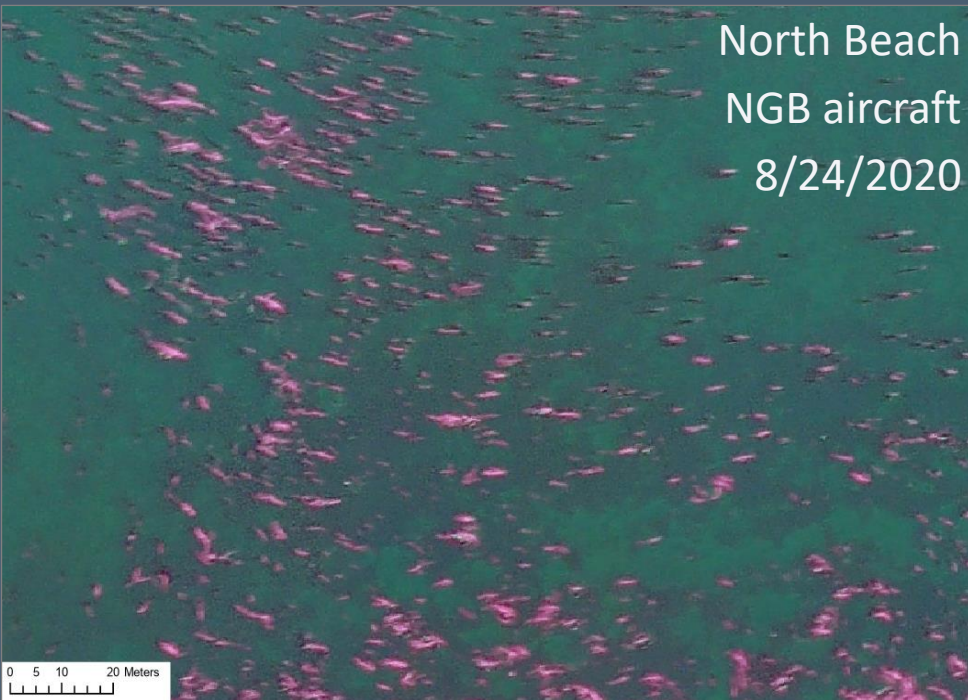
- Phantom 4 UAV
- Fixed-wing NGB
- MRC Kayak Survey

North Beach
Multispectral UAV
8/20/2020



Classified floating canopy maps showed distinct differences between platforms

North Beach
NGB aircraft
8/24/2020



Class_name

Water

Floating Kelp Canopy

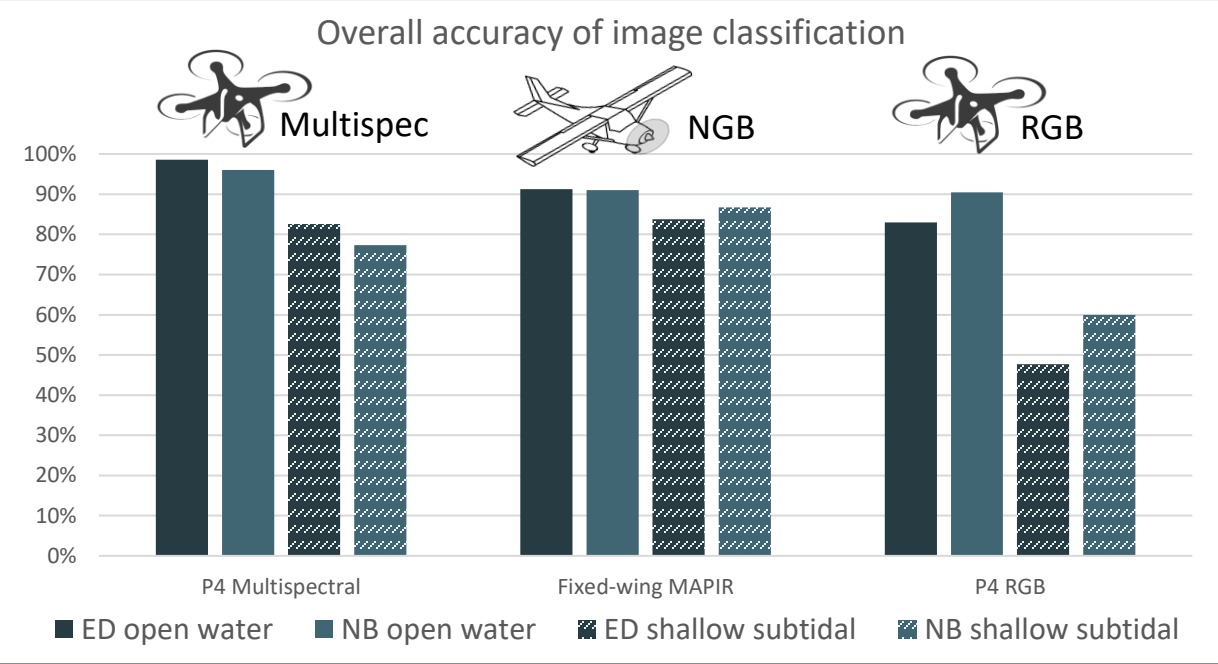
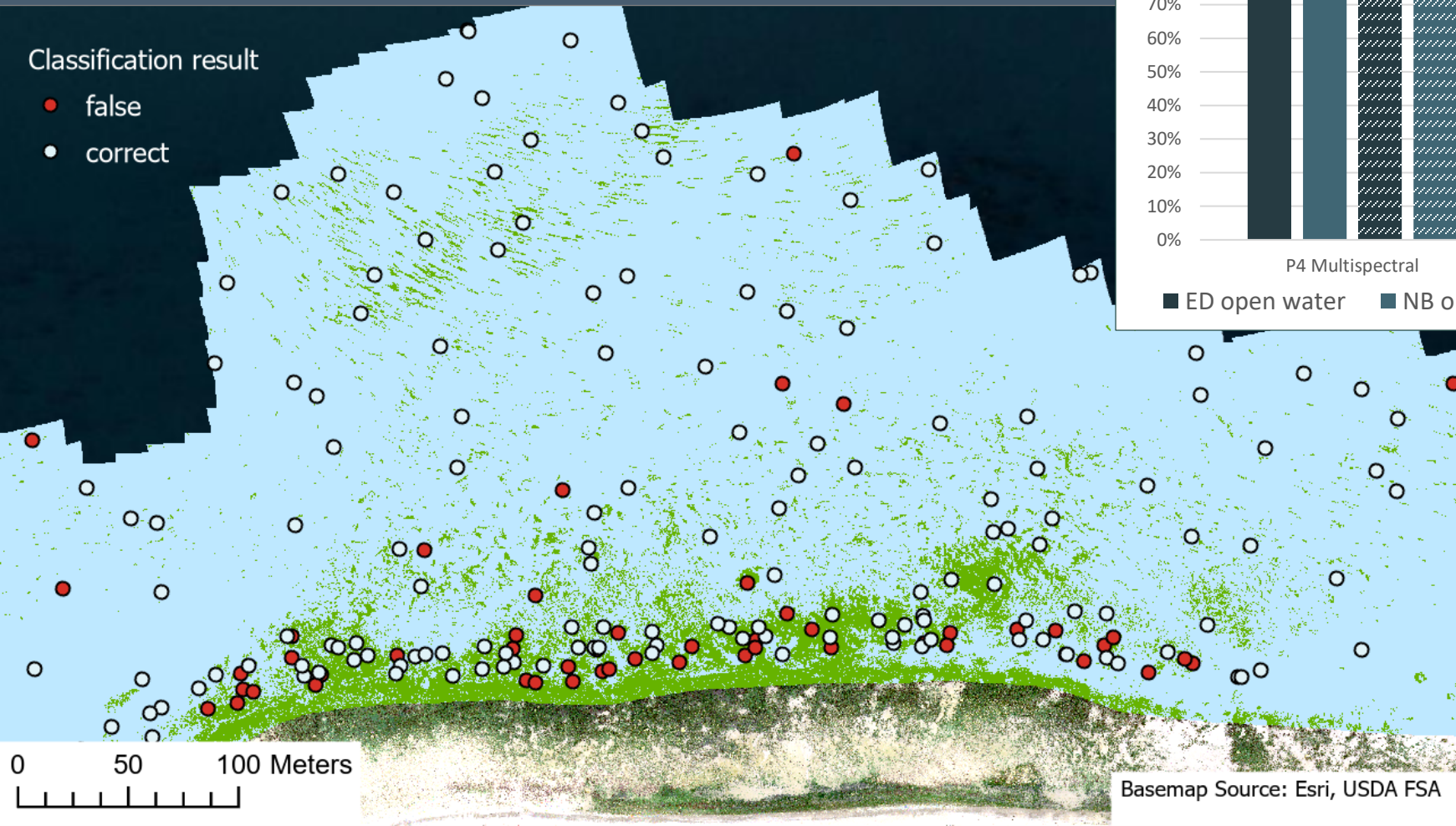
Classification in open water was more accurate than in shallow subtidal areas

RGB UAV results were least accurate

North Beach – classified RGB UAV

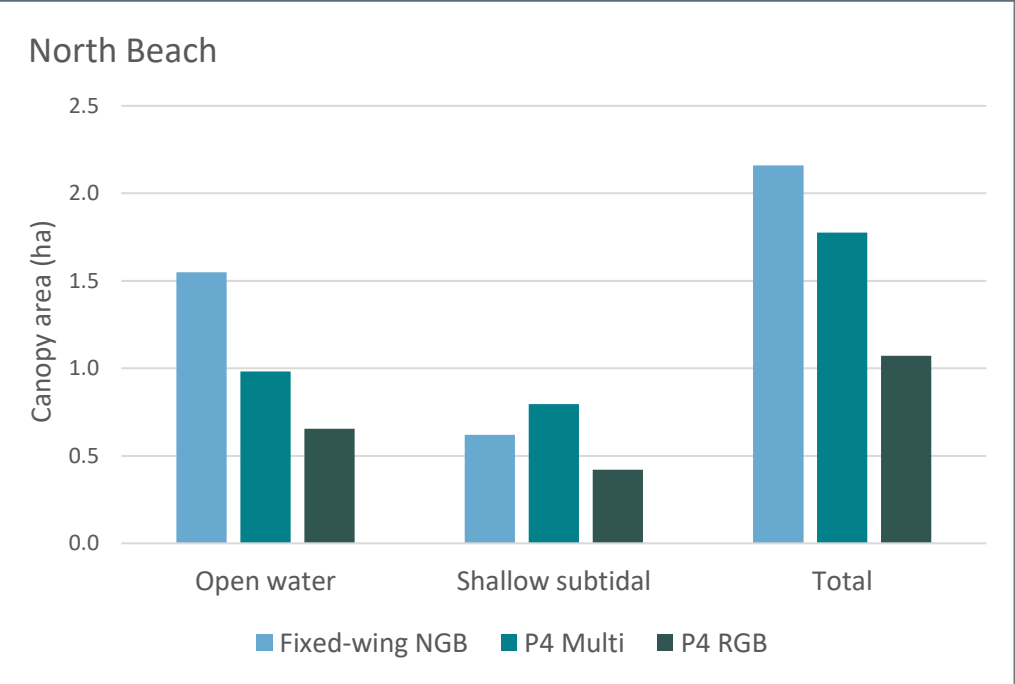
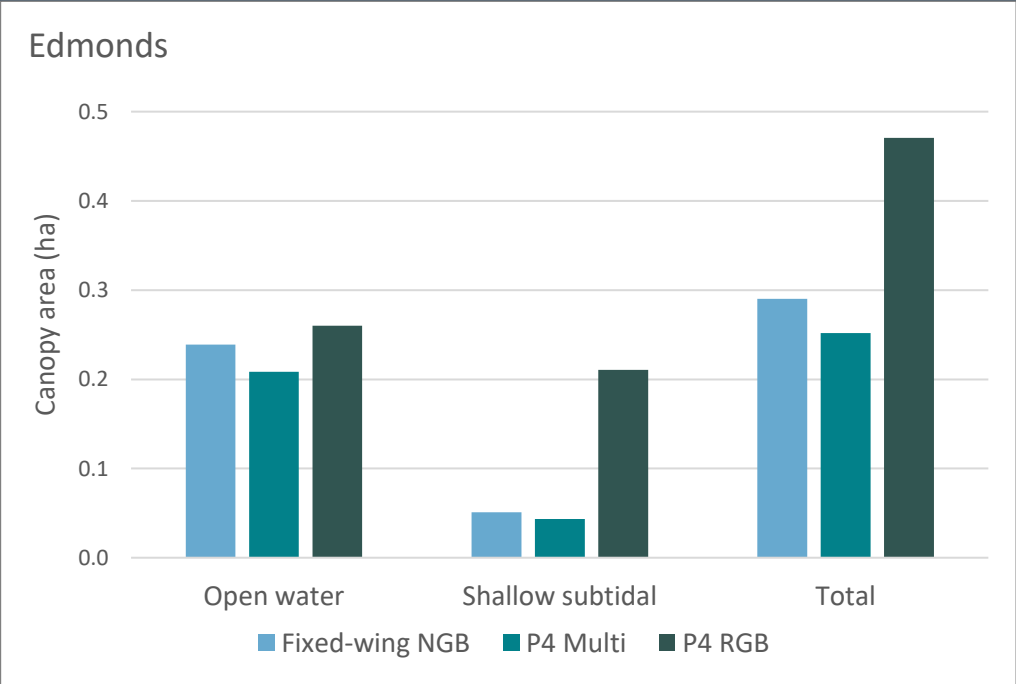
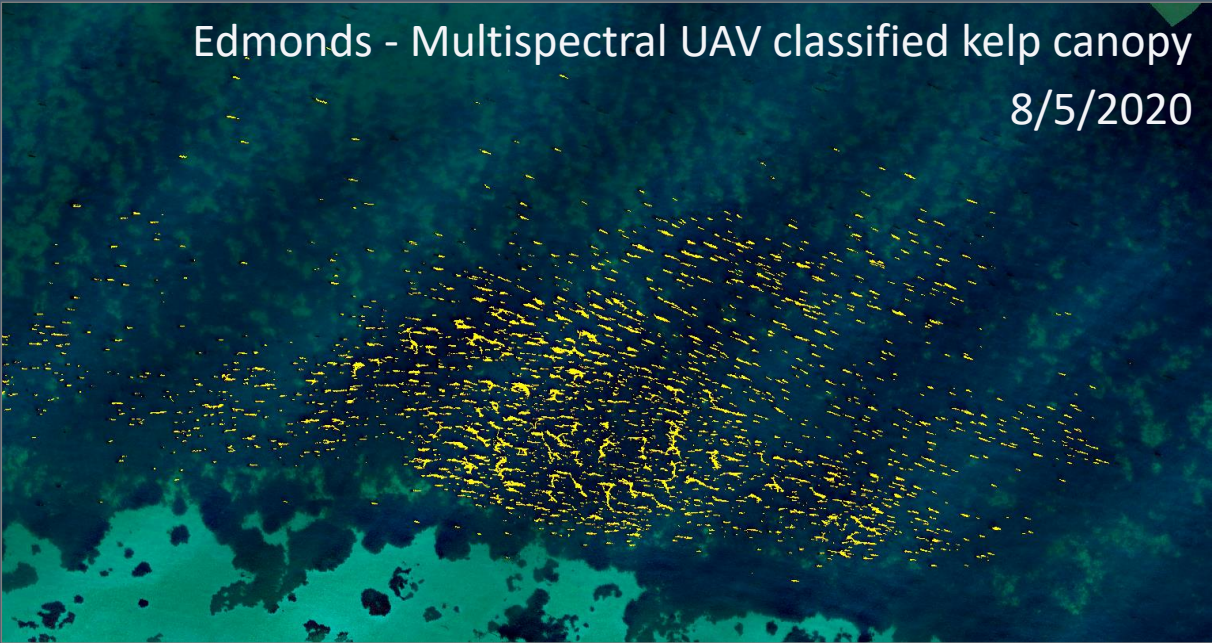
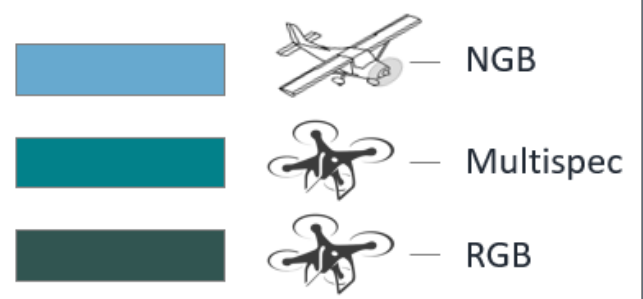
Classification result

- false
- correct



Floating canopy area estimate consistency varied between sites

RGB imagery was the least consistent



Conclusions & future work

- Both UAV and manned aircraft were successful at mapping bull kelp forests, albeit with tradeoffs
- Further refinement of image classification methods to generate consistent results across platforms is ongoing
- Assessing appropriate use for each platform based on outcome of VS Indicator development process
- Expanding manned fixed-wing aerial surveys in 2022 to larger area w/ 4-band imagery



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SB 5619 | HB 1661

Kelp Forest and Eelgrass Meadow Health and Conservation

The Kelp Forest and Eelgrass Meadow Health and Conservation initiative responds to recent severe losses, and proactively identifies actions to improve future resilience of these critical nearshore habitats.

- Conserving and restoring at least 10,000 acres of kelp forests and eelgrass meadows by 2040.

See our ArcGIS StoryMap!

Search terms: "kelp, WA DNR, aerial"

<https://www.dnr.wa.gov/programs-and-services/aquatics/aquatic-science/kelp-monitoring>

contact: tyler.cowdrey@dnr.wa.gov

