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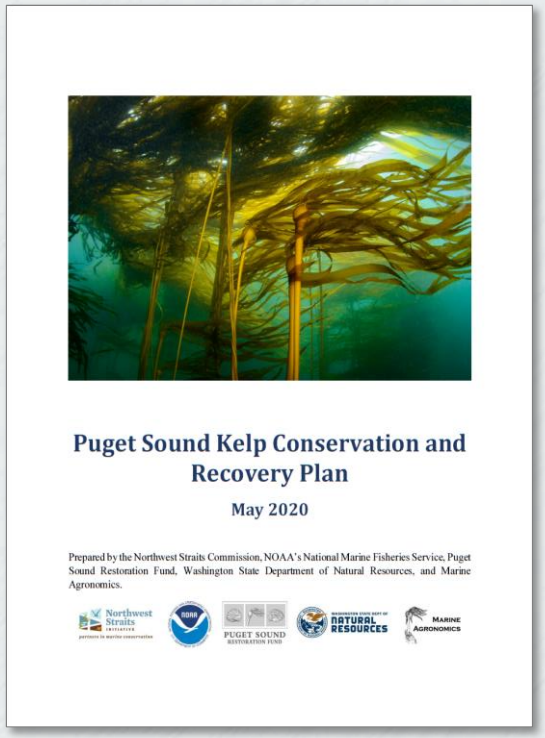
Tyler Cowdrey & Helen Berry
Nearshore Habitat Program
WA State Dept. of Natural Resources
April 26, 2022

WASHINGTON STATE DEPT OF NATURAL RESOURCES

Northwest Straits COMMISSION
partners in marine conservation



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

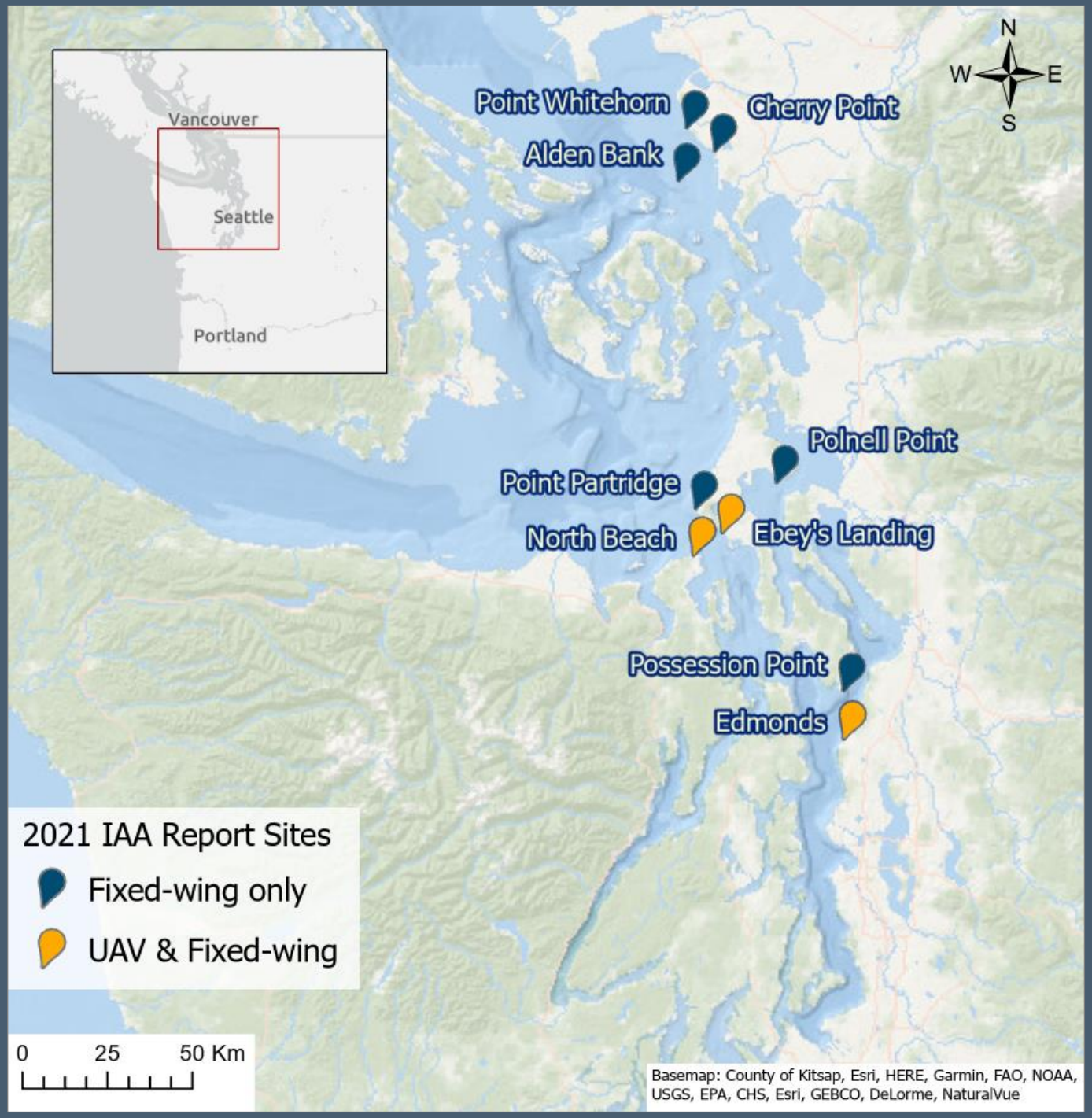
MAPIR Survey3W NGB – Cessna Cardinal 177

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

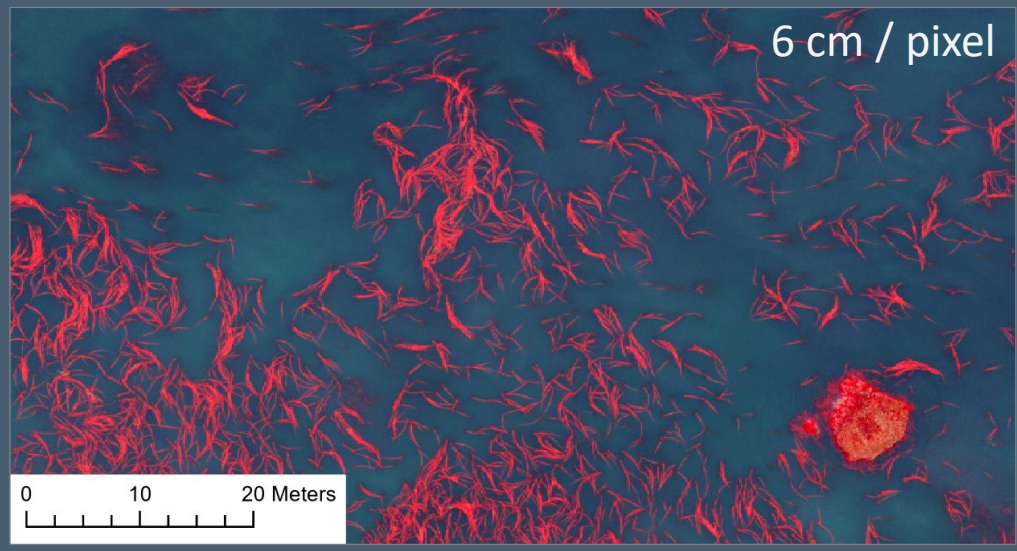


17 surveys attempted across 9 sites from early July to late September 2021

- 6 UAV
- 11 manned fixed-wing aircraft

Three failed due to inclement weather and camera malfunctions

Tradeoff between platforms: spatial coverage vs image resolution



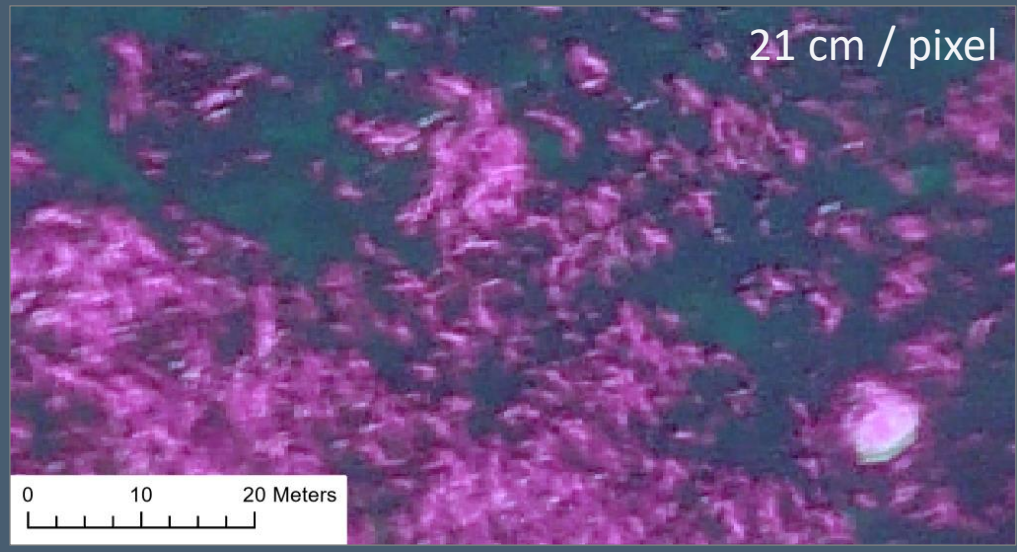
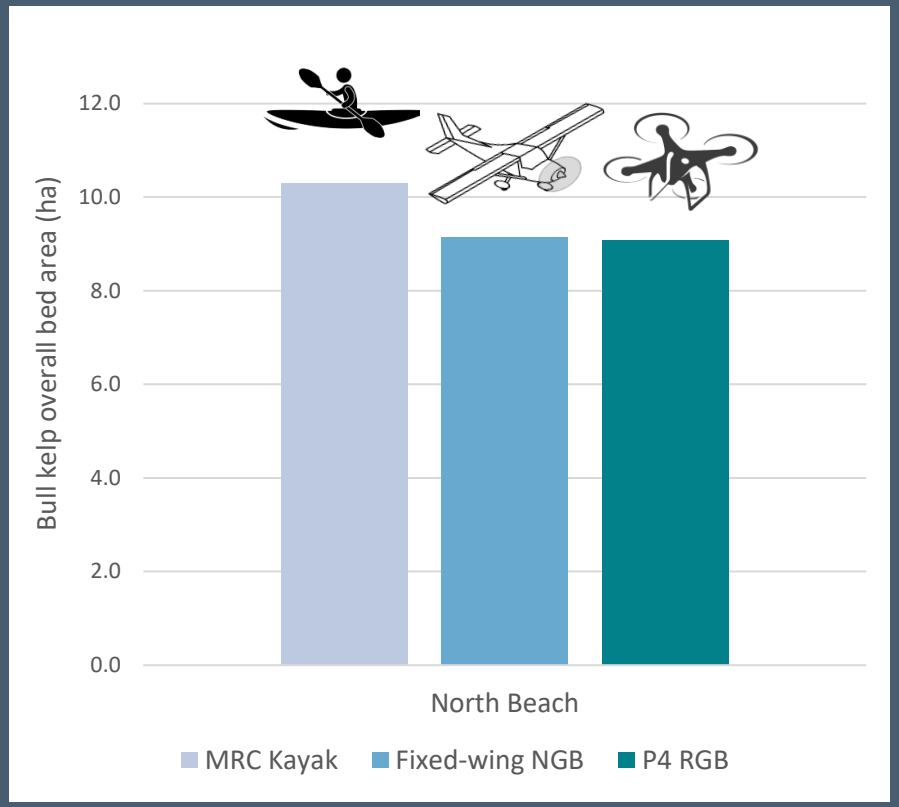
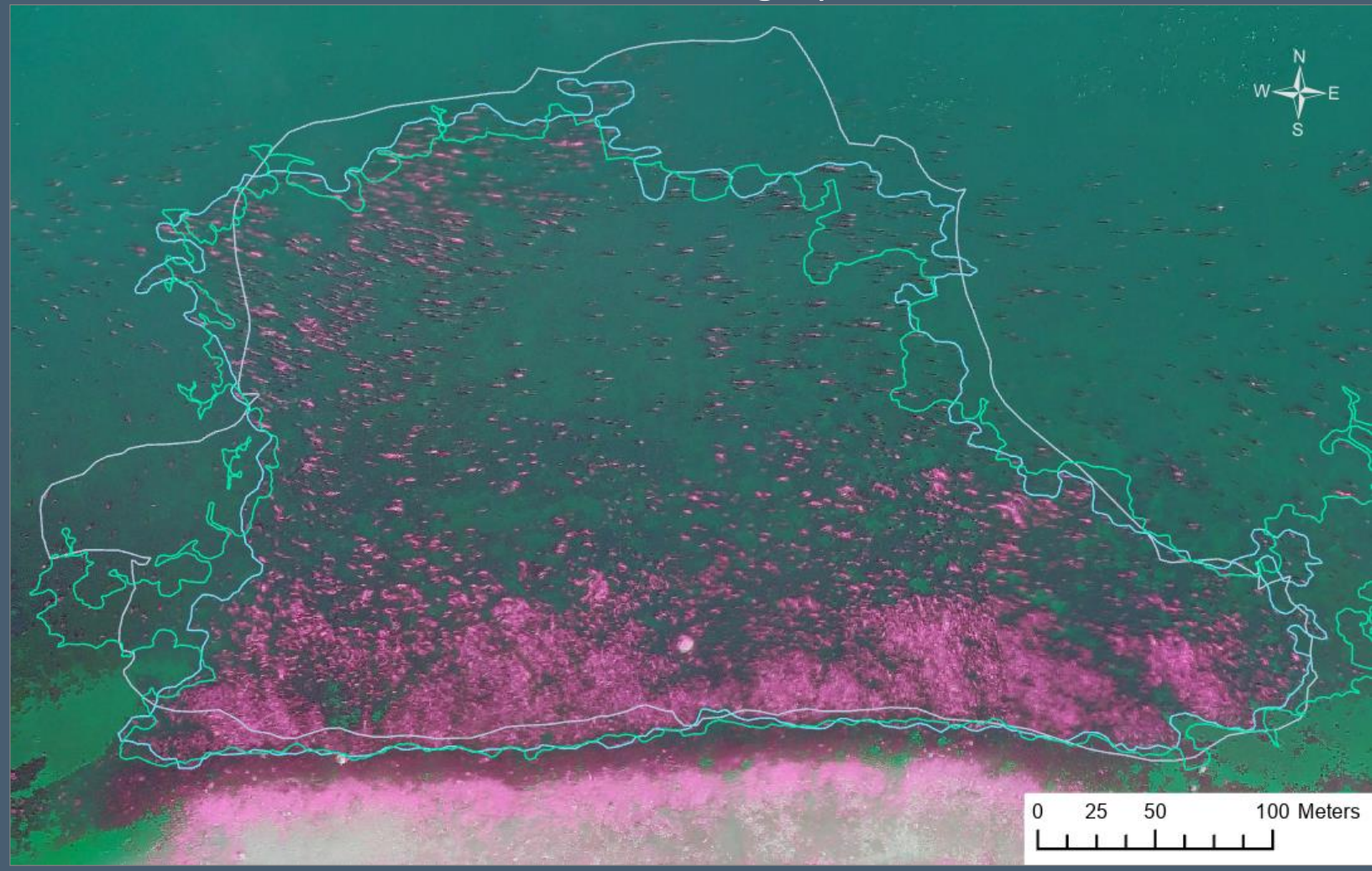


Image-based delineation of forest boundary and volunteer kayak perimeters agreed more at North Beach



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

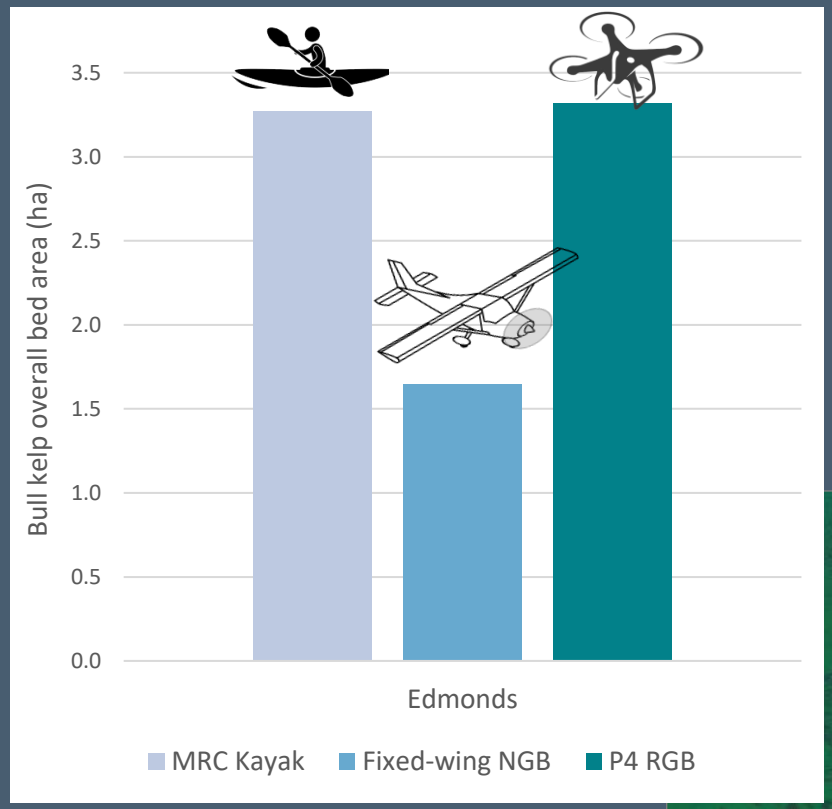


Phantom 4 UAV

Fixed-wing NGB

MRC Kayak Survey

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



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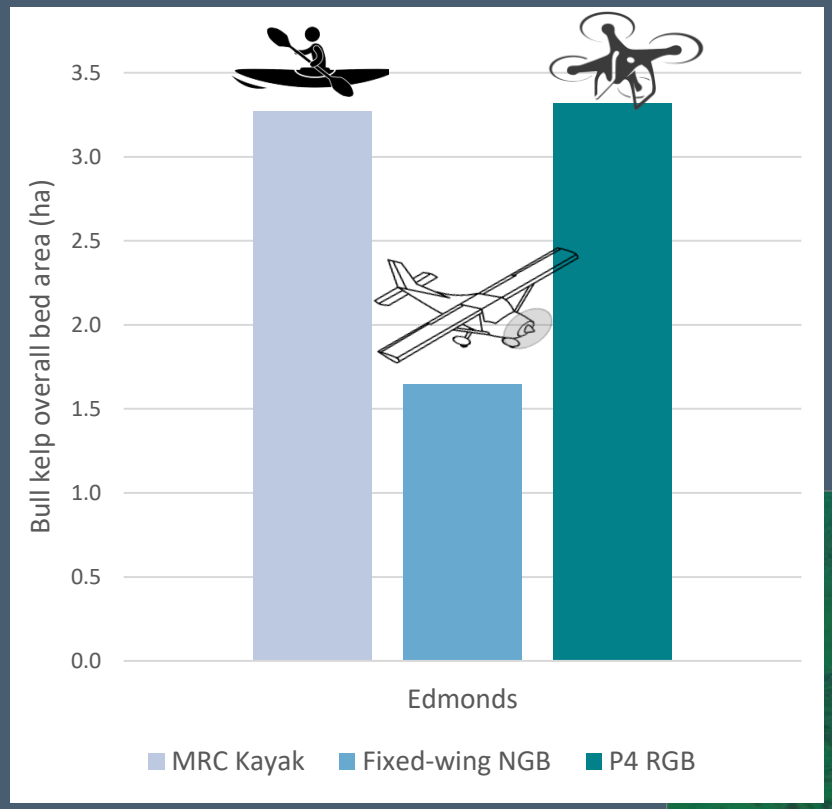
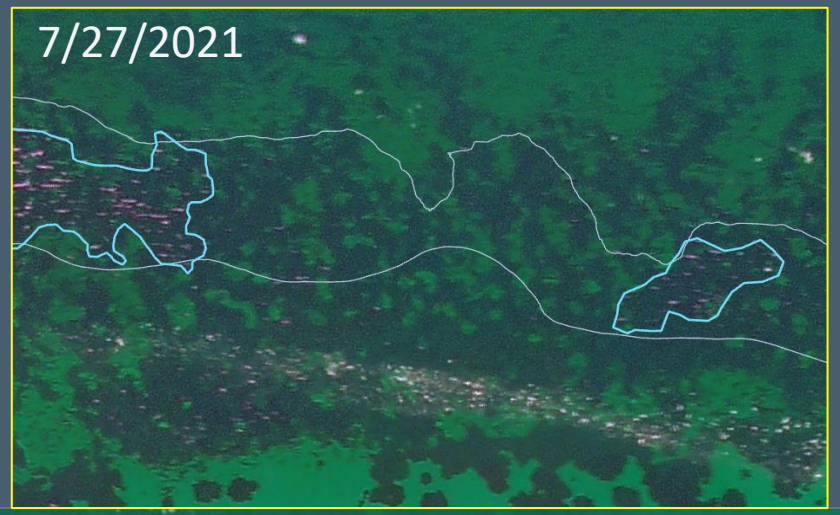
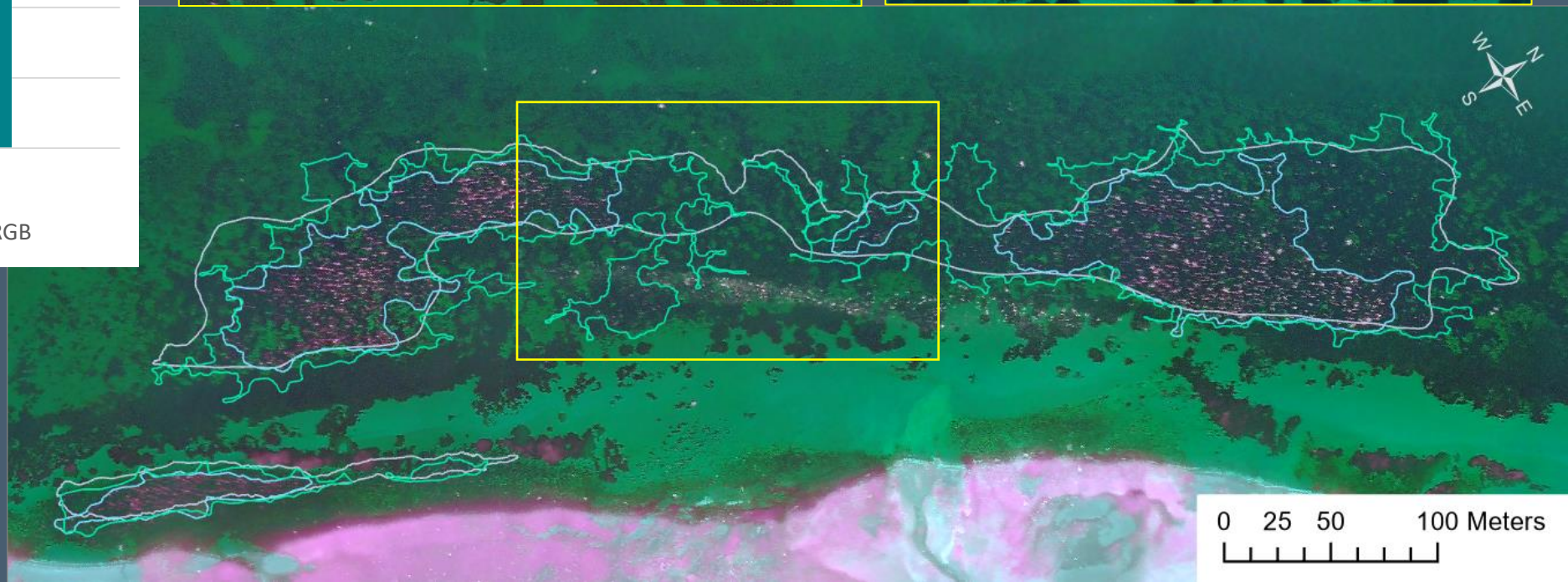
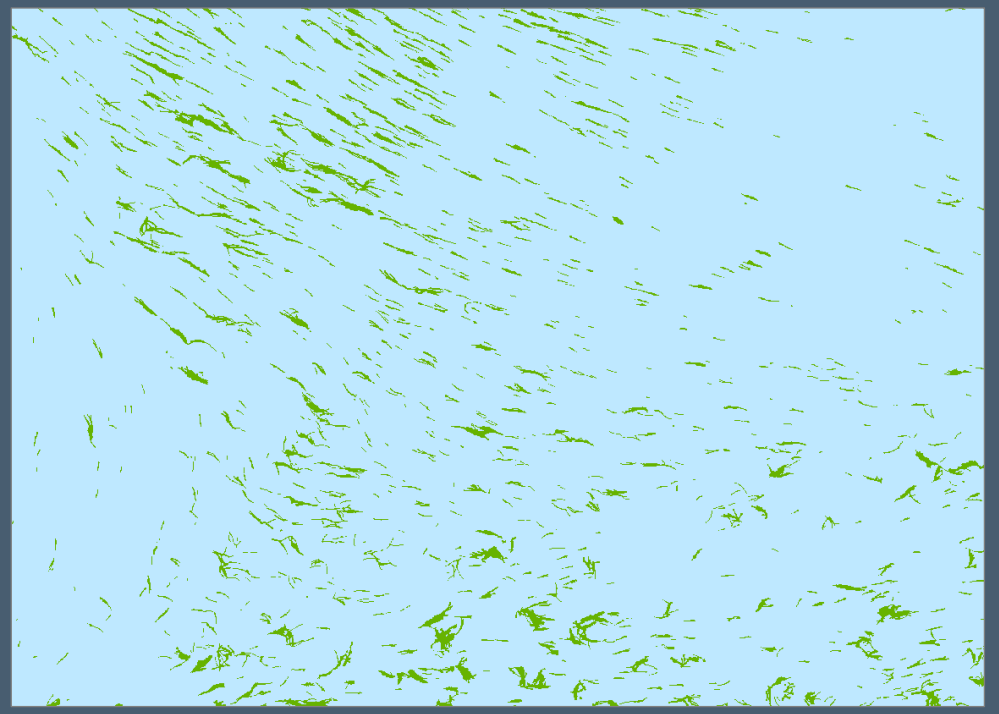


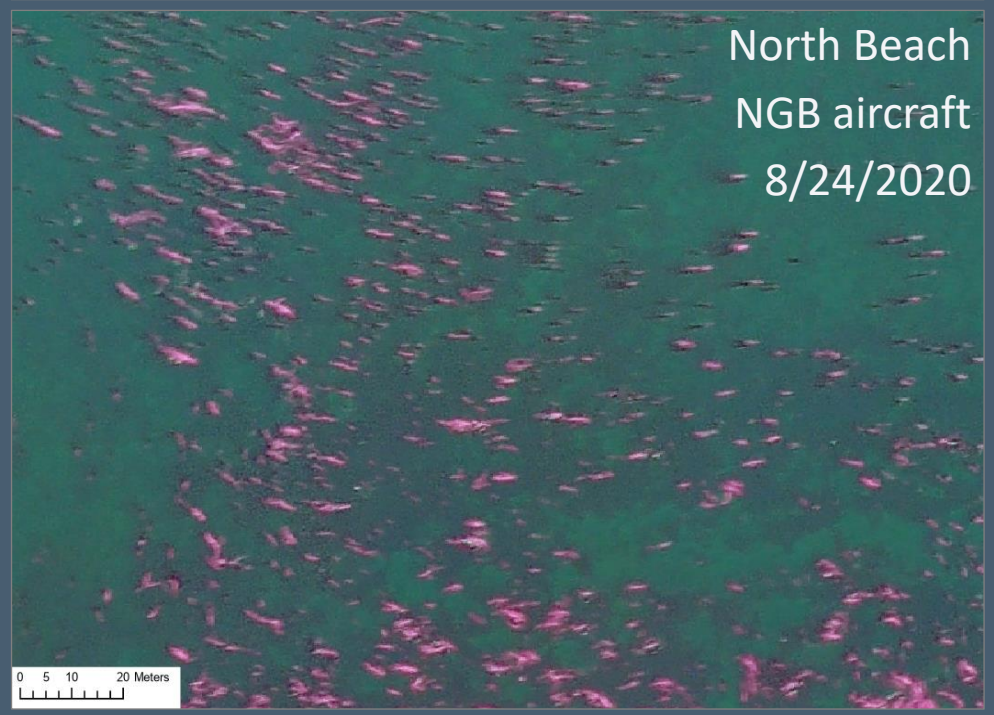
NGB aircraft

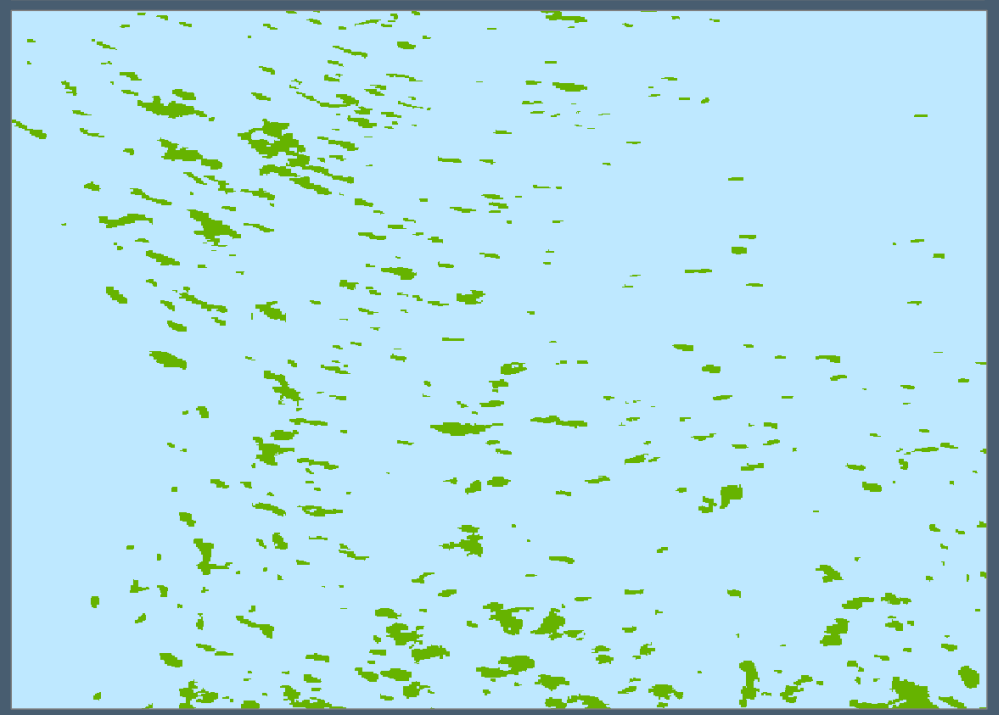


Multispectral UAV

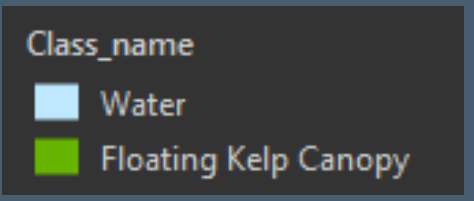






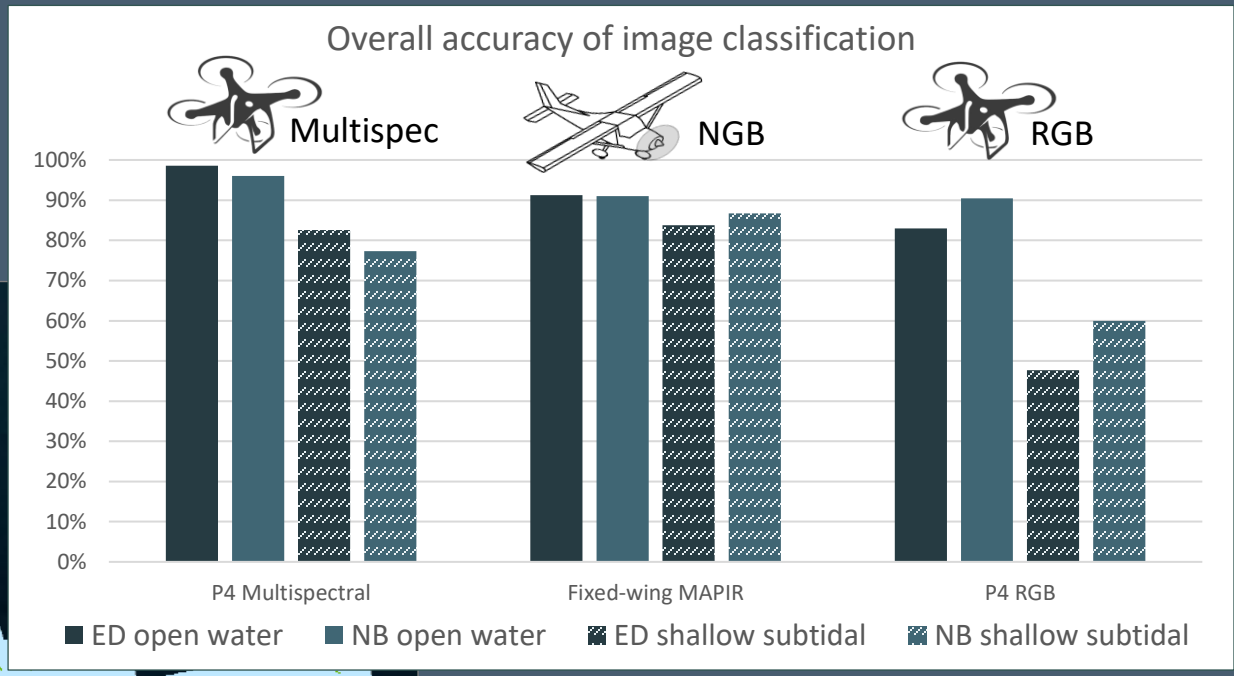


Classified floating canopy maps showed distinct differences between platforms

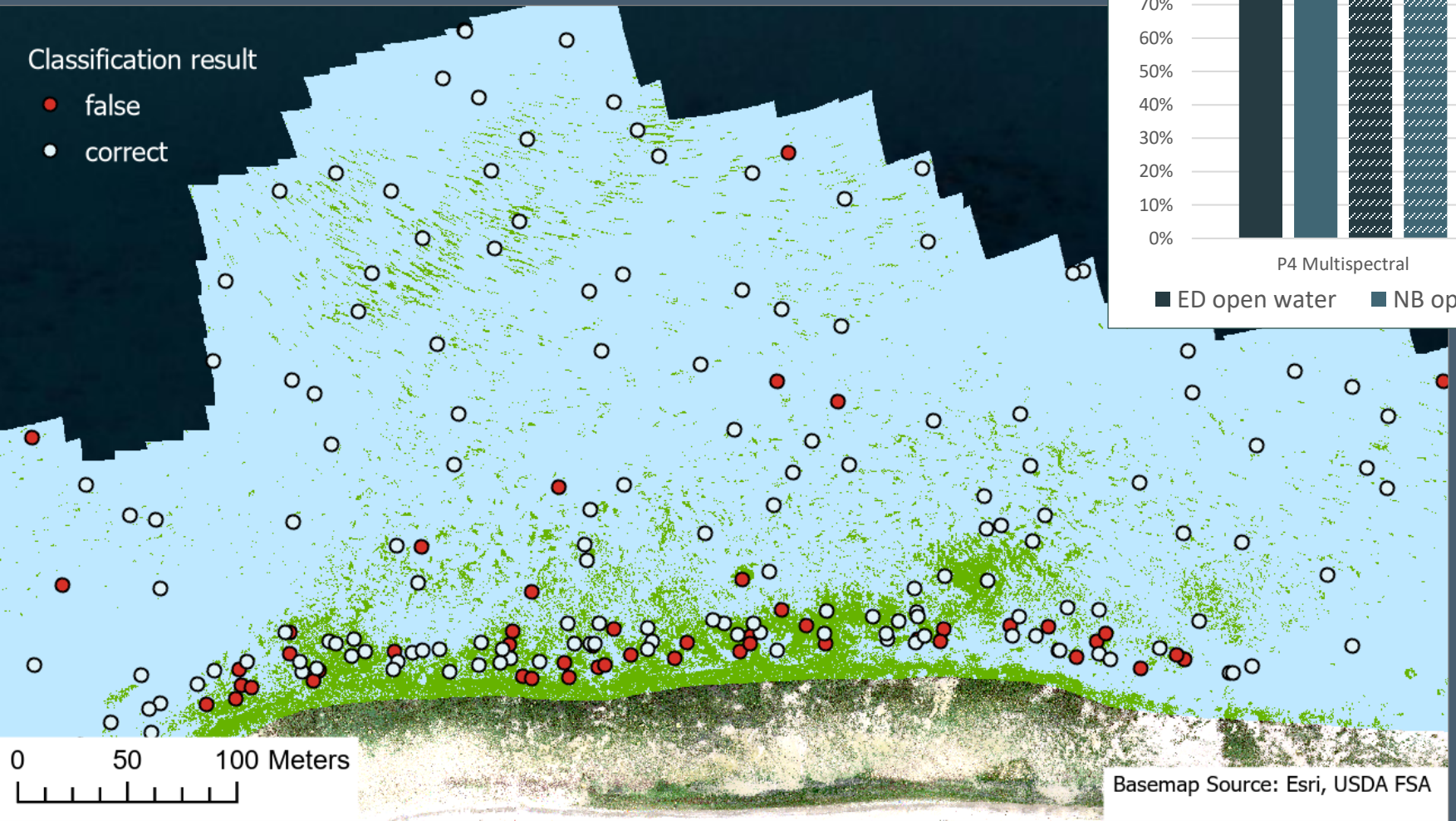


Classification in open water was more accurate than in shallow subtidal areas

RGB UAV results were least accurate

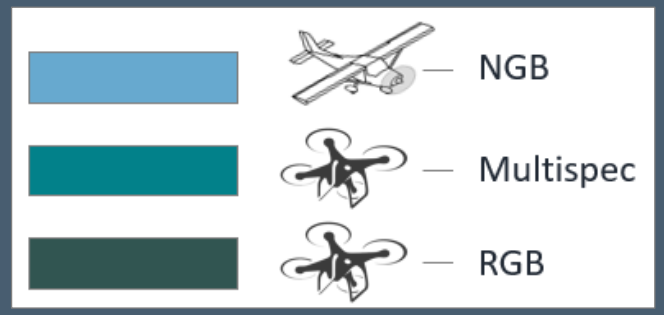


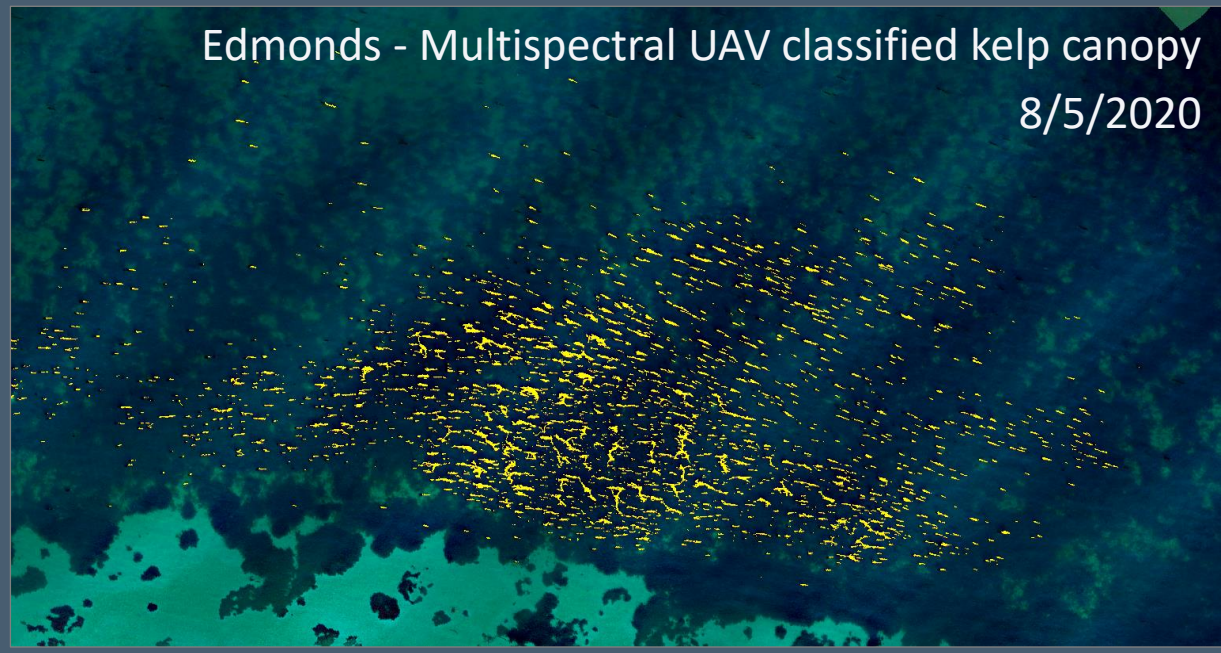
North Beach – classified RGB UAV

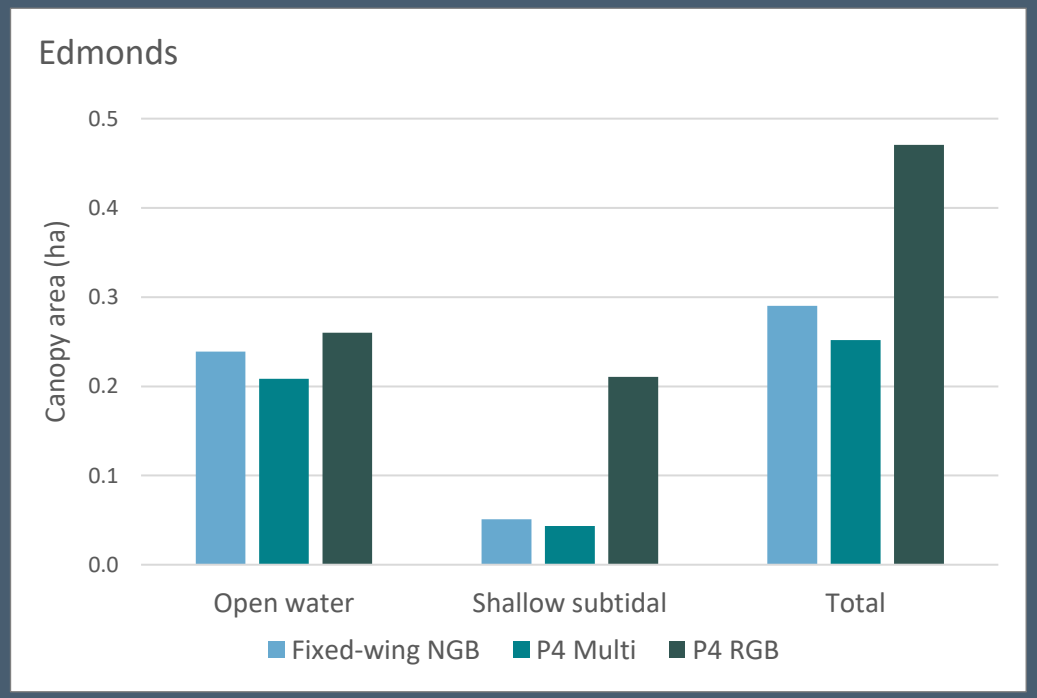


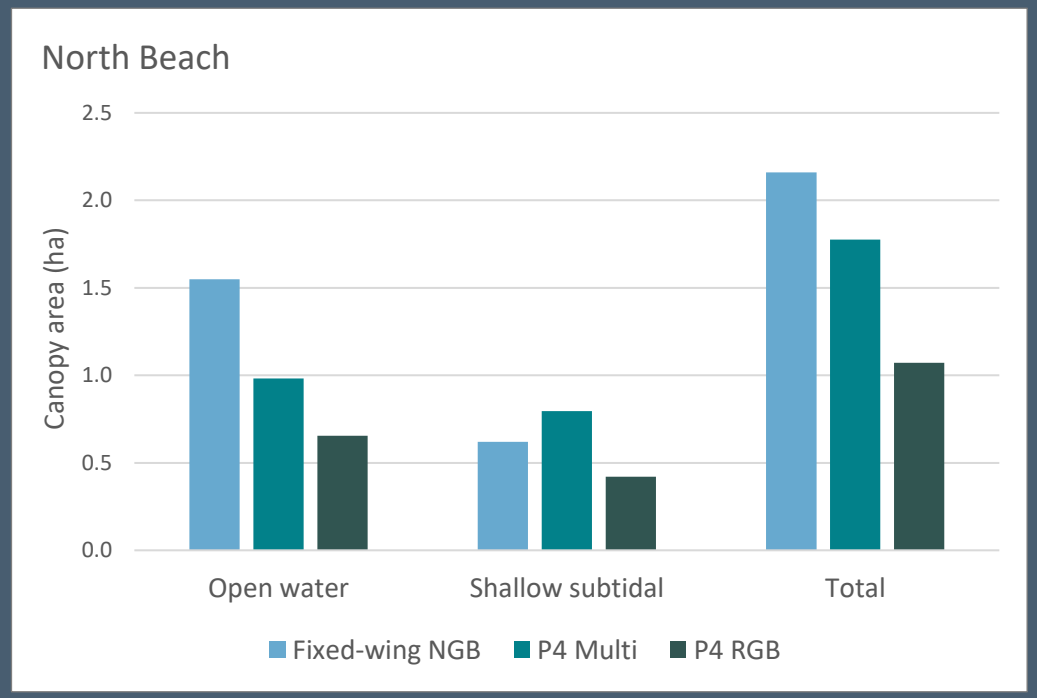
Floating canopy area estimate consistency varied between sites

RGB imagery was the least consistent



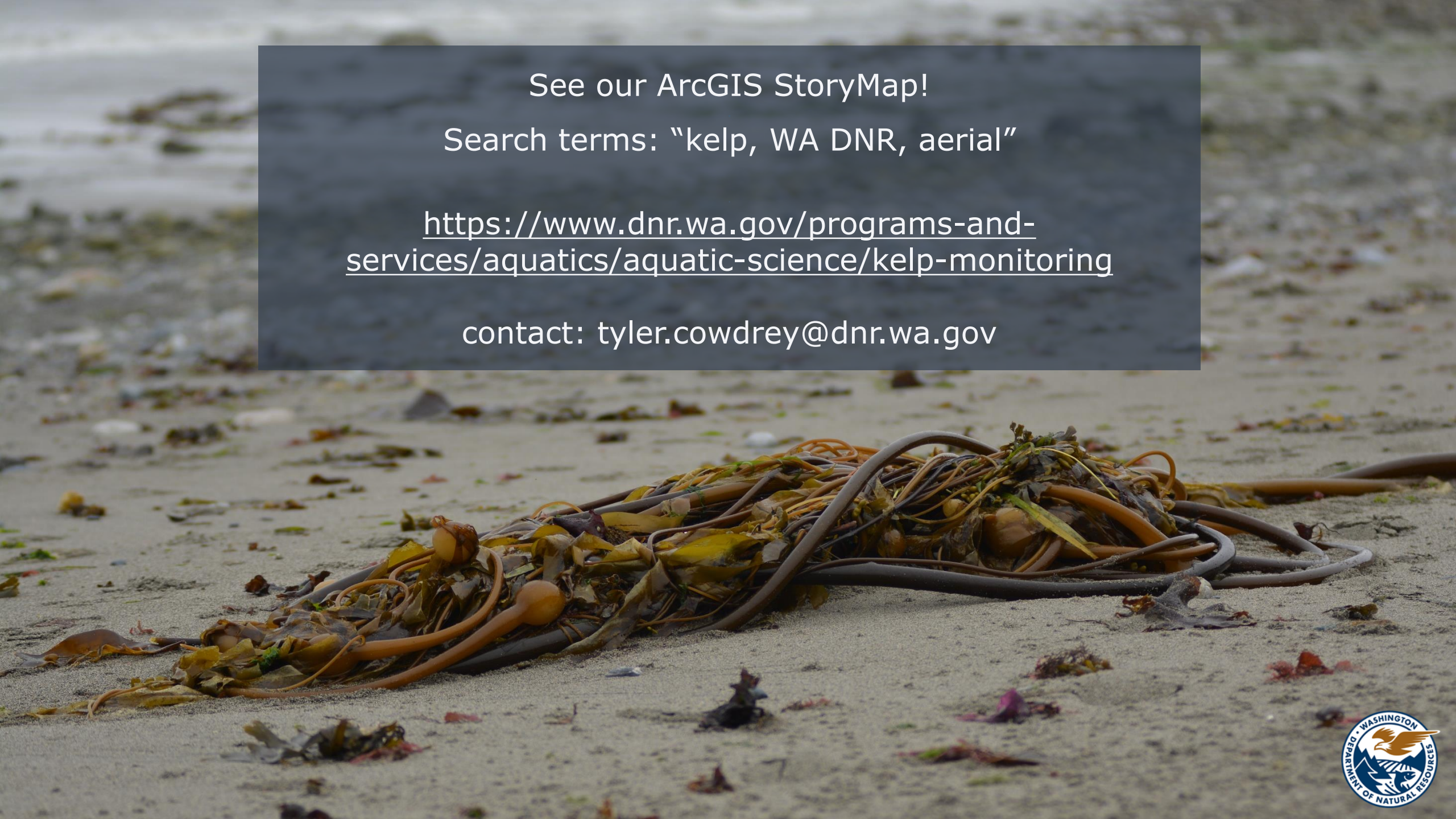






Conclusions & future work

- 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



See our ArcGIS StoryMap!

Search terms: “kelp, WA DNR, aerial”

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

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