



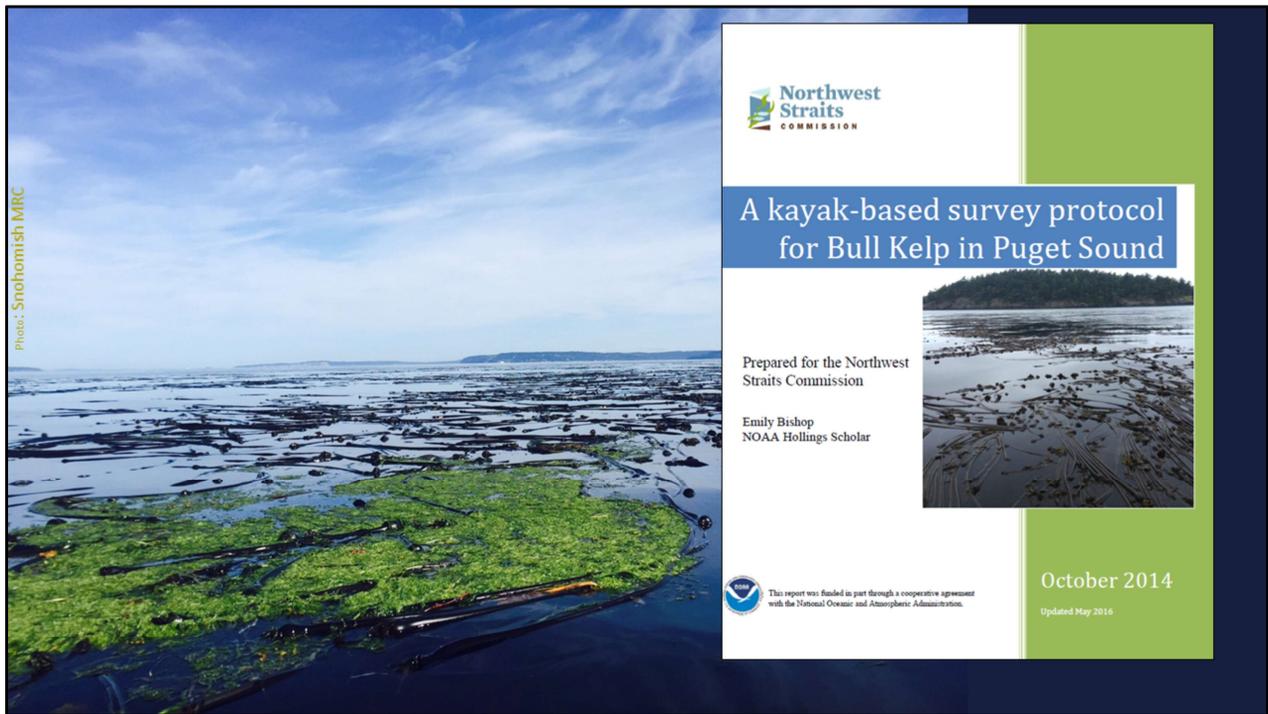
MRC Presentation – May 9, 2018

Thanks to the brilliance of Helen Berry's analysis (she's with WDNR)
we were able to present the preliminary results of the MRC kelp canopy monitoring
project
in a kelp session at the Salish Sea Ecosystem Conference in Seattle (April 2018)

.



Bull kelp (*Nereocystis*) provides critically important ecosystem services as food and shelter for many spp
And like eelgrass it is protected under WA State law
BUT statewide monitoring is limited
And because it is naturally highly variable from year to year (growing from spore to mature plant in one season)
Fine scale monitoring is necessary

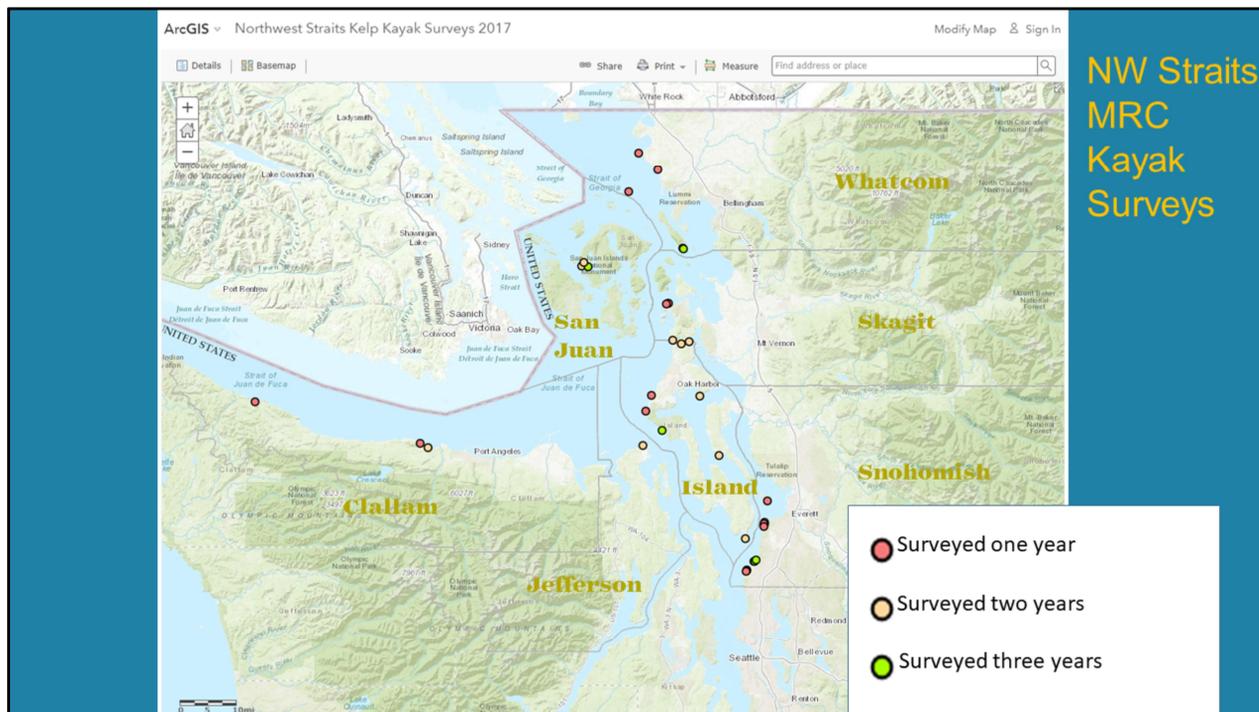


The NWS Initiative, a grass roots organization, helps to organize Marine Resource Committees (MRCs) of citizen scientists to monitor Bull kelp canopies in NW WA

During the summer months of June-Sept citizen scientists kayak the perimeter of their local kelp beds with a GPS, datasheet, camera, thermometer and depth gauge.

Surveyors are trained based on a field tested, boat-based protocol developed by Holling's Scholar – Emily Bishop with guidance from state kelp scientists

I've been working with the NWSI to compile a regional database on kelp distribution.



Volunteers have now collected more than 200 tracks at more than 40 sites in 7 counties between 2015-2017

The sites have been opportunistically chosen based on accessibility and interest.

The data is being made available from ArcGIS Online webmaps and NWS mapping application SIQ (search arcgis online for Northwest Straits kelp)

Variability

- Human Interpretation
- Tides & Currents
- GPS
- Seasonality

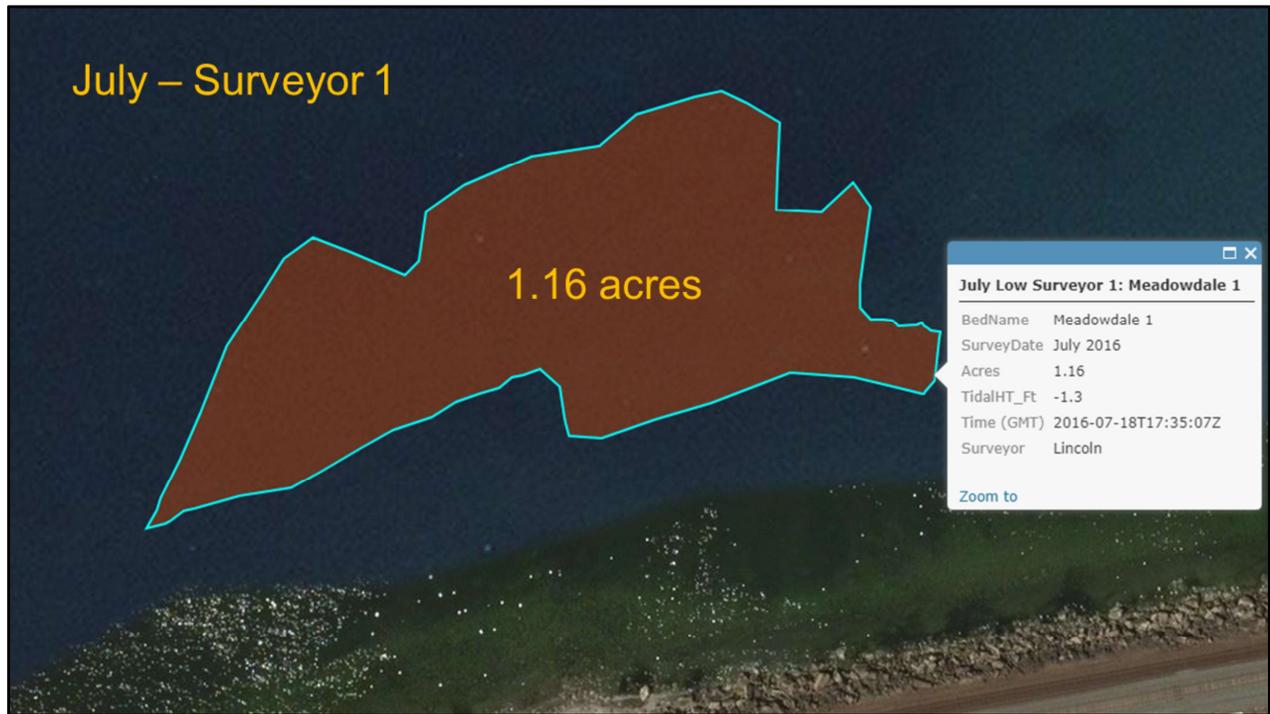


Even with a rigid protocol, variability is inherent in the data:

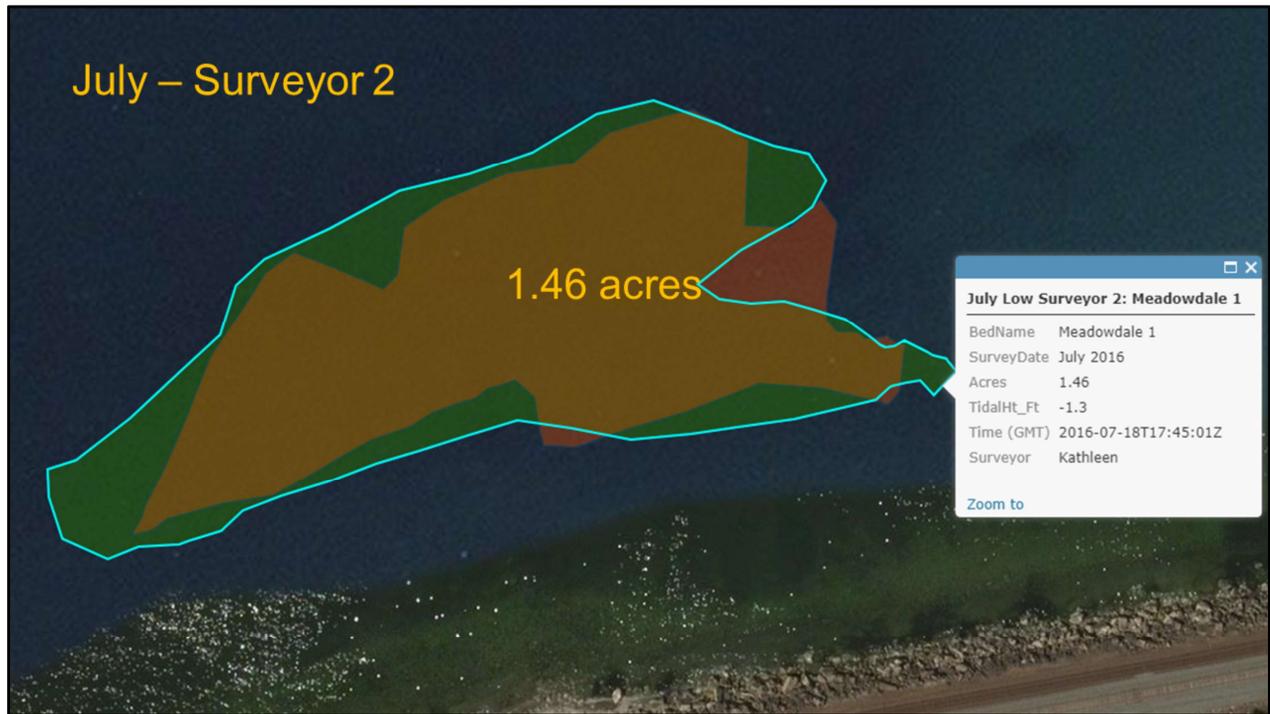
Surveyor differences in interpretation, skill and/or length of time it takes to circumnavigate a bed

Tides can submerge fronds (underestimating full canopy coverage) and/or shift the bed

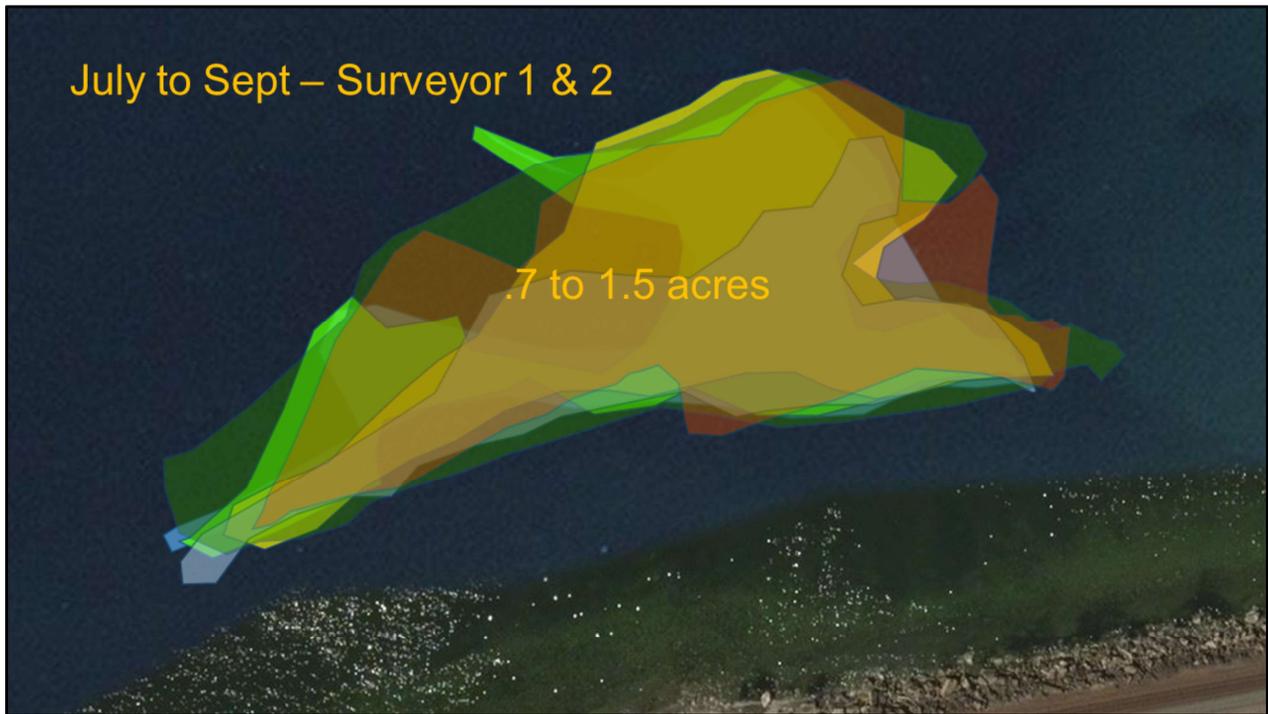
Currents can dramatically change the shape



The first couple of years of this study focused on measuring the variability in the methods. For example, this site was delineated six times during the summer of 2016. 2 surveyors on same day same tide:
This is a low tide in July - Surveyor 1 measured 1.16 acres

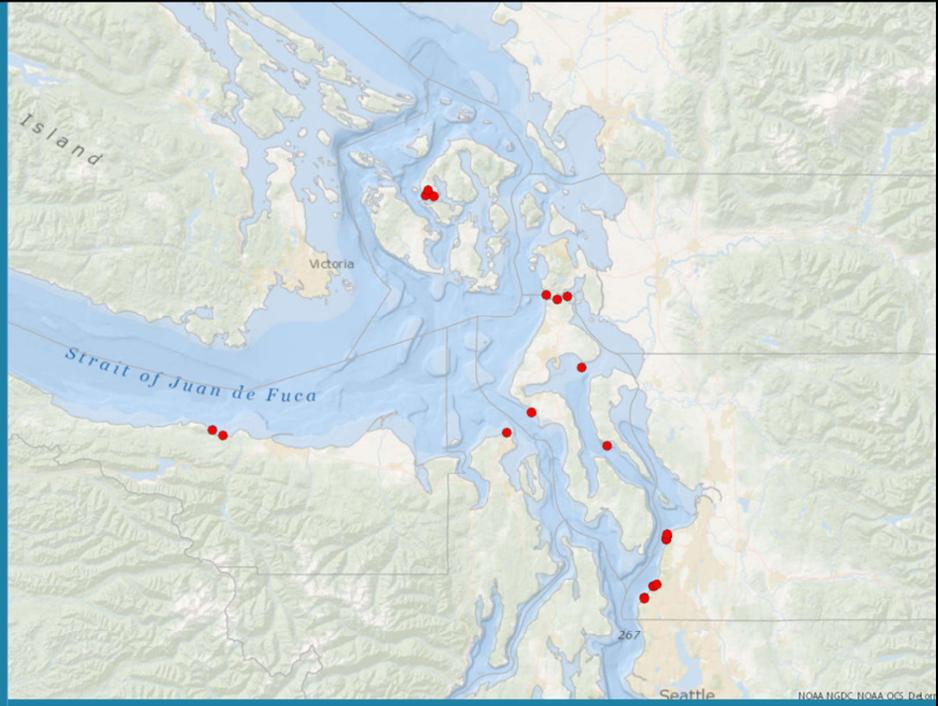


Surveyor 2 (same day/same tide)=1.46 acres



All surveys from 2 surveyors/month for 3 months. (.7 to 1.5 acres)
So – **Is this data so variable that it is not useful?**

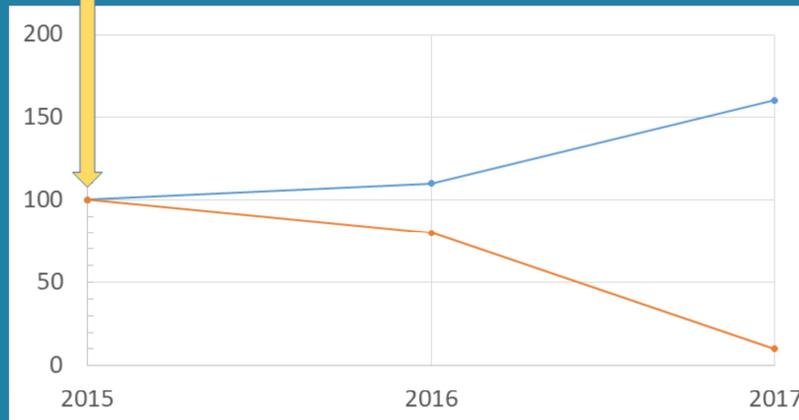
21 Multi-year Sites



We now have multi-year surveys at 21 sites!

For the analysis, we used the largest bed extent from each year surveyed (independent of month) and averaged bed areas with multiple surveyors on same day same tidal ht.

Change – percent change in max extent from first year



Since the sites vary greatly in size from a fraction of an acre (.02 acres 80 sq meters) to hundreds of acres (169 acres 680k sqm), area is standardized by setting the first year's area to 100% and calculating the percent change in area from the first year in subsequent years.

Change – real change is greater than 30% (gain or loss)



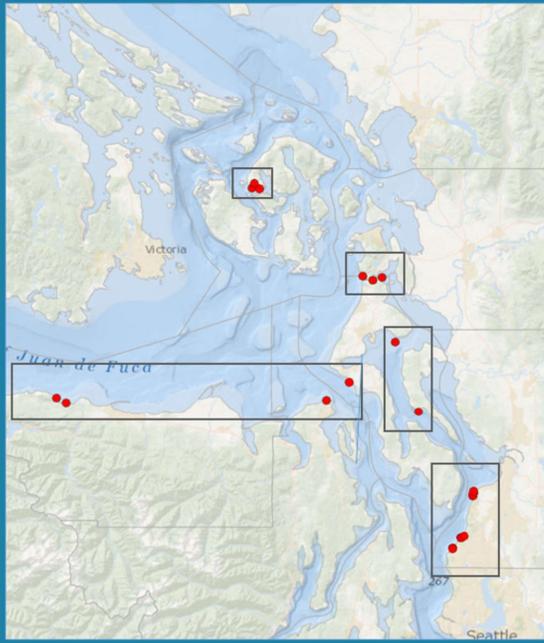
And given the variation in the area estimates, due to different tide levels, currents and observers

and that we do not have precise uncertainty estimates, to separate signal to noise.

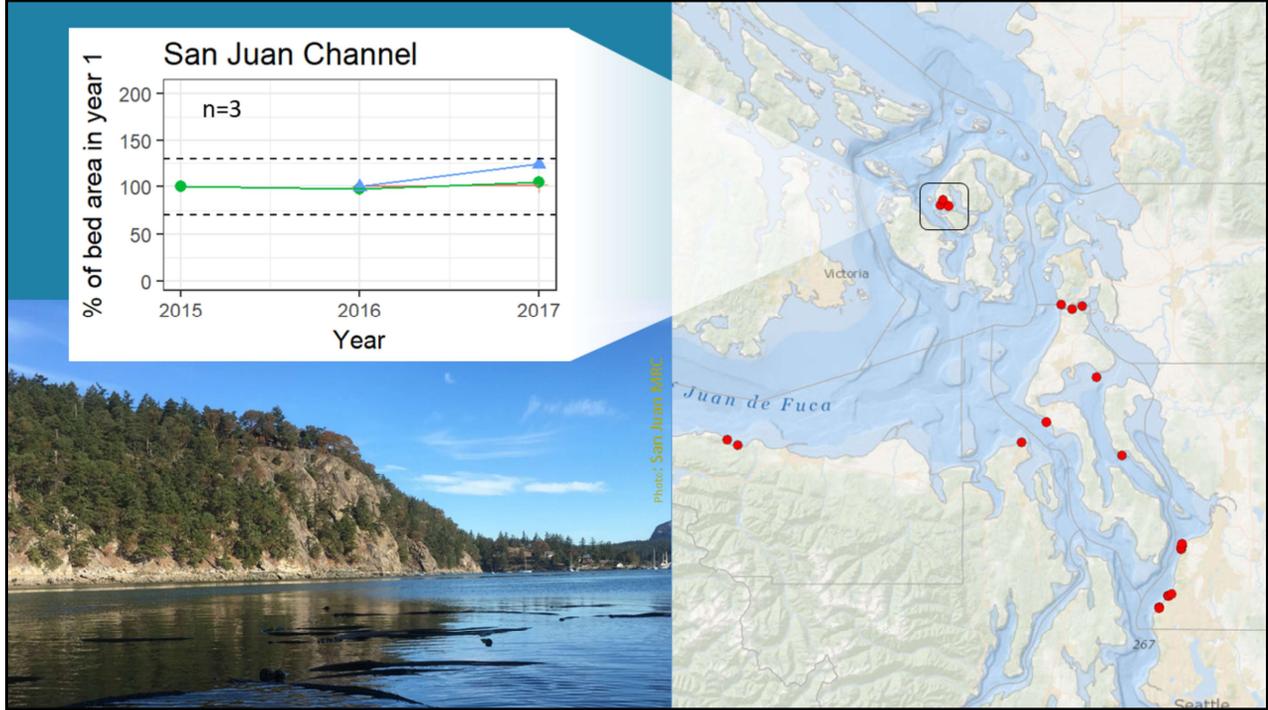
We established **as a starting point** a 30% rule...anything above or below the dashed lines represent real change

Changes in site area that stay within the dashed lines may be due to sampling differences

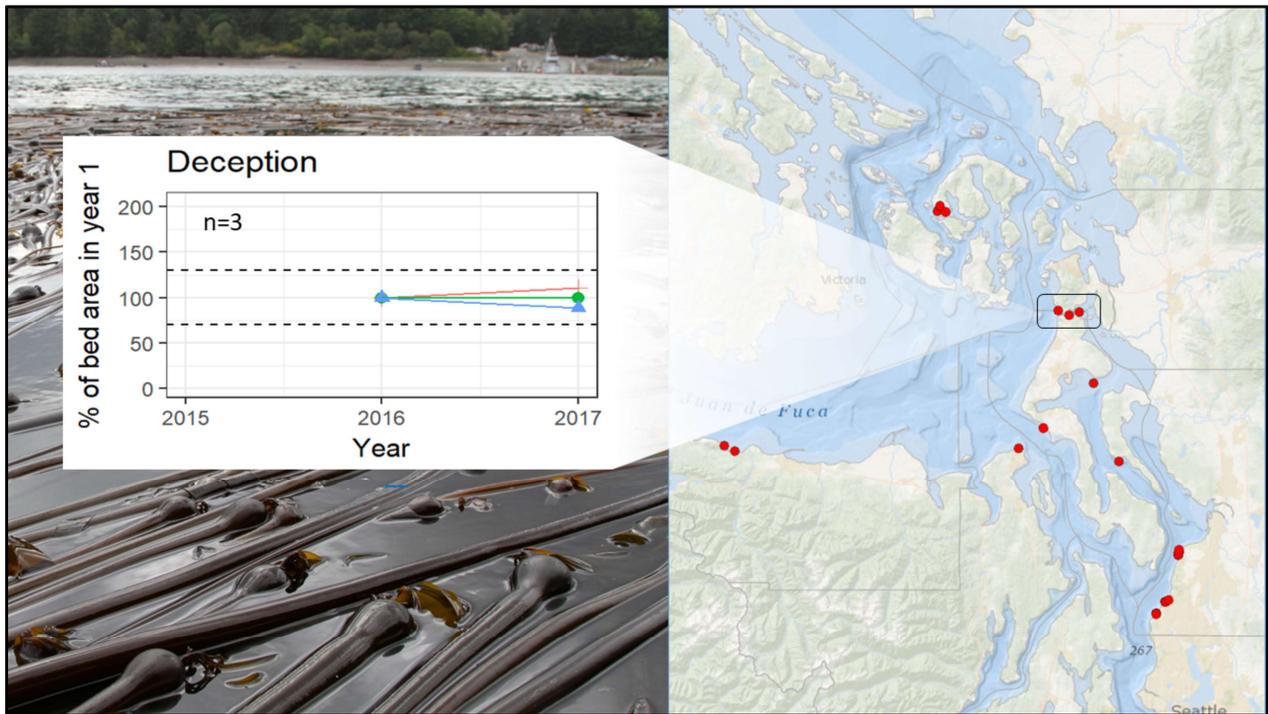
Grouping



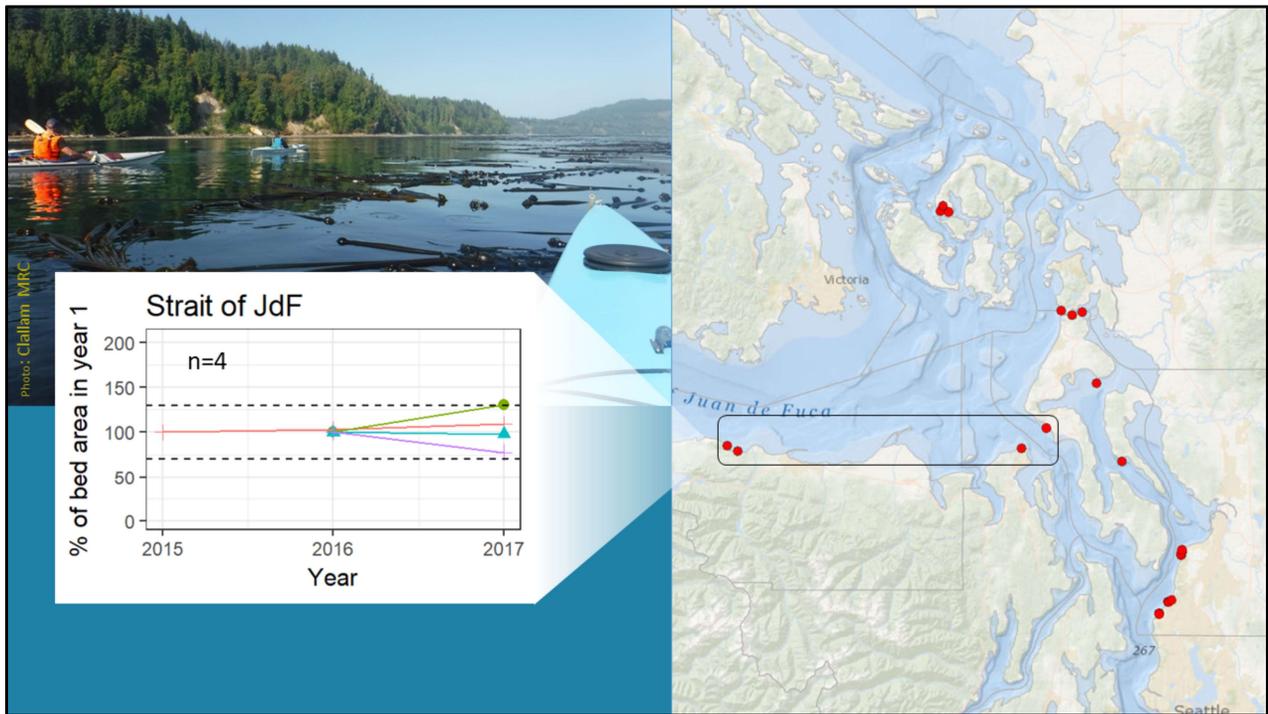
21 sites aggregated into 5 geographic groupings of similar water body types



the San Juan Channel, the first year of multiyear samples was 2015, and the 3 sites showed slight increases, but all fell within the dashed lines, so within 30%. No measurable change (note that on a seasonal scale the beds at Fawn Island separated from one into 3 beds through the summer).

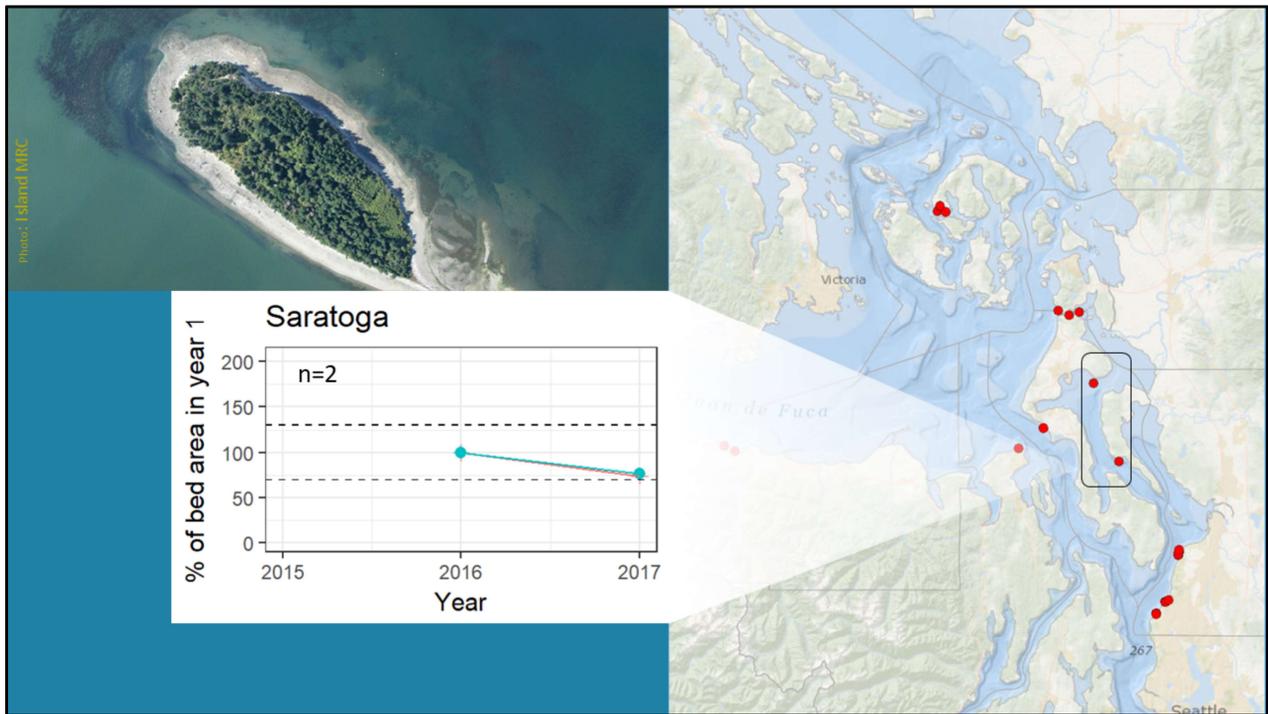


In Deception Pass, the first year of multiyear samples was 2016, and the 3 sites showed slight increases and decreases, but all fell within the dashed lines, so within 30%. Coffin Rocks, Ben Ure and Hoypus Point

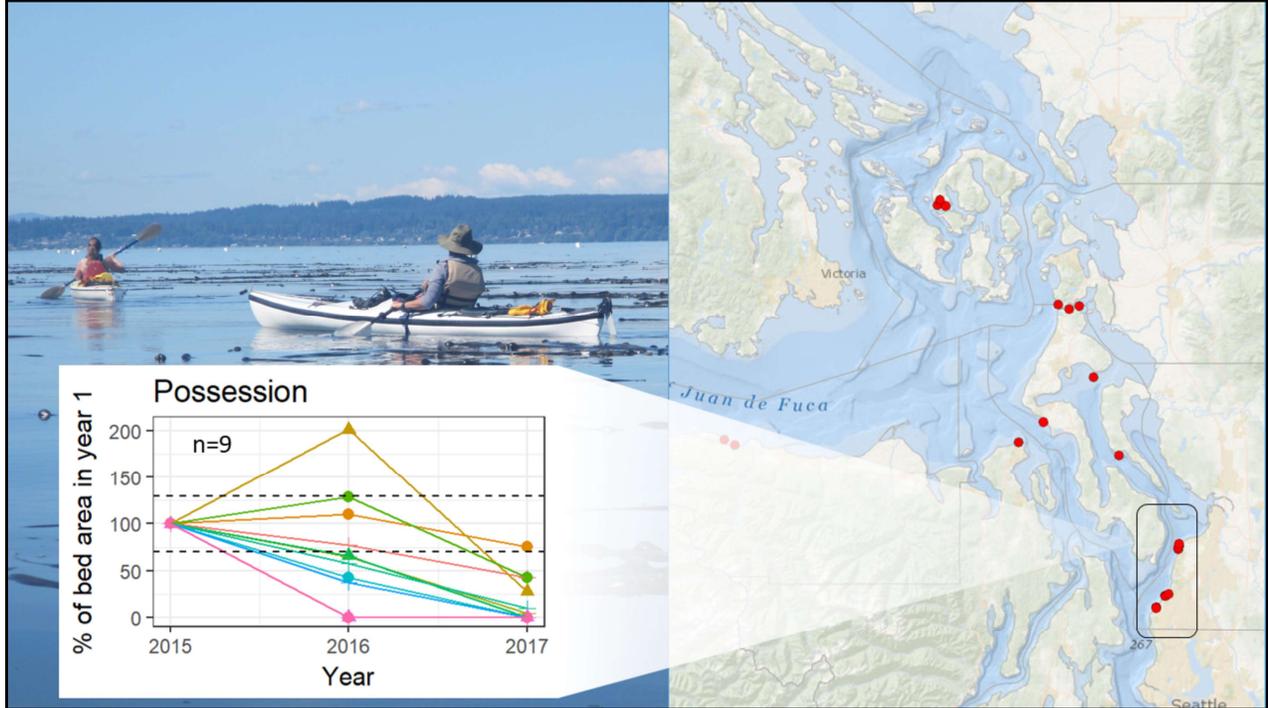


In the strait of Strait of Juan de Fuca, the first year of multiyear samples was 2015 at Ebey's Landing, and the 4 sites showed slight increases and decreases, but all fell within the dashed lines, so within 30%.

Freshwater Bay 1 & 2, North Beach, and Ebey's Landing



Saratoga Passage, the first year of multiyear samples was 2016, and the 2 sites showed decreases, but all fell within the dashed lines, so within 30%.
Polnell and Camano Island State Park (Lowell)



This area – the entrance to Possession Sound has been mentioned as an area of concern by others. It's more sheltered, warmed and more urbanized.

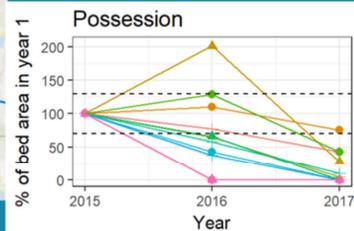
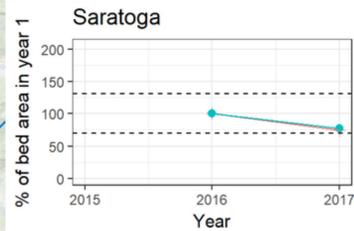
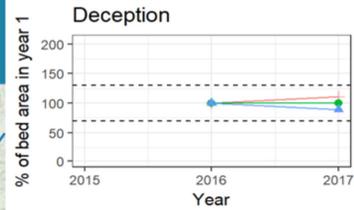
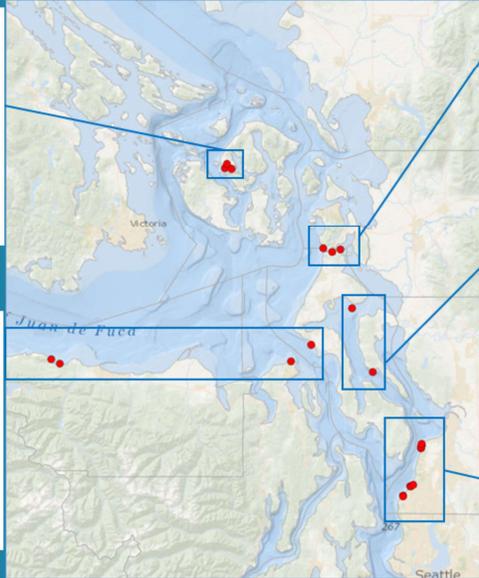
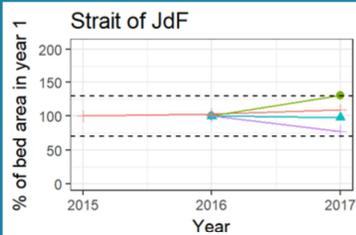
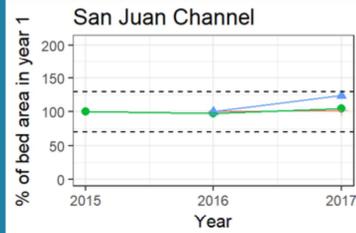
Helen's notes...In general, the pattern is really similar in all the other areas. Sites fall within 30% of the first year measurement, except for one cluster of sites, but here at the entrance to Possession Sound, near Mukilteo and Edmonds, 8 out of 9 sites in this cluster decreased more than 50% in year 3.

Some decreased to 0, no kelp remaining.

There was one wonky measurement at year2 at edmonds3 that showed a 200% increase, but even that site area fell in year 3 relative to year 1.

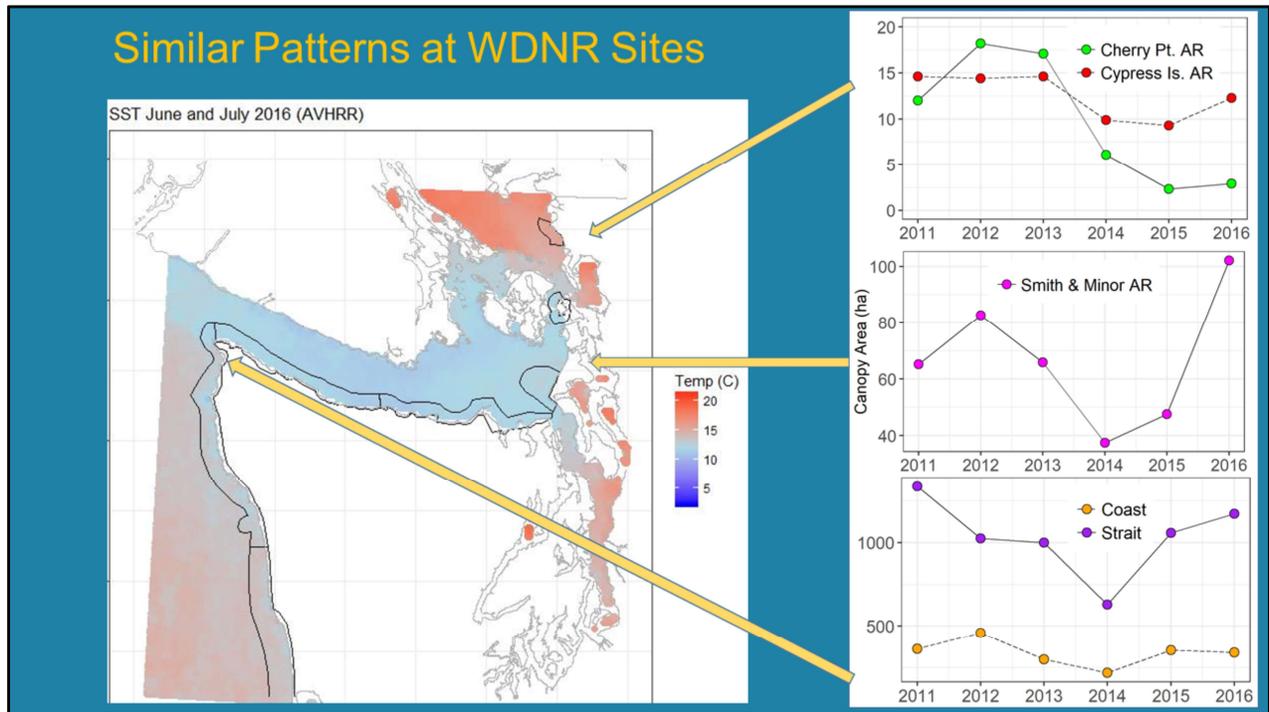
The one big surprise for me (Helen) from these results was Saratoga. I expected these sites to behave like the Possession sites, but they didn't show massive decreases.

Grouping



All are stable (within 30% gain or loss) except one area.

Our results reveal a clear pattern, linked to reports from other areas, of stability in geographic areas of mixed cooler temperature water regimes and losses in the inner basin, protected area of Possession Sound.



From Helen Berry...Here's a map of sea surface temperature in June and July in 2016.

If we think of temperature as a proxy for floating kelp conditions, the areas with cooler temperatures all recovered quickly from the 2014 high temperatures.

In contrast, Cherry Point is squarely in the area of elevated temperatures, in the northern Salish Sea, more distant from oceanic influence and mixing. We're now doing a detailed analysis of the temperature and kelp data from these areas during this time span.



In conclusion – the data is useful!

Like the Christmas bird counts, these volunteer kelp surveys could contribute to our understanding of spatial patterns over time if they're consistent and long-term.

Contribute to regional database for Kelp Recovery Plan for Rock fish

Feed back to MRCs - **Consistency is key.**

2018 Temperatures have been cooler – kelp recovery?

Acknowledgements

- Marine Resources Committees
- Helen Berry
- Caroline Gibson
- Emily Bishop
- Zoe Zilz, Brittany Jones
- Tom Mumford
- Padilla Bay Reserve
- WA Dept of Ecology
- WA DNR



Other data products: GROUND TRUTHING AERIAL/SATELLITE IMAGERY



Data Access

Story Maps & Web Maps

A story map esri

NWSI Kelp Story Map

No issues detected

Aerial Photography

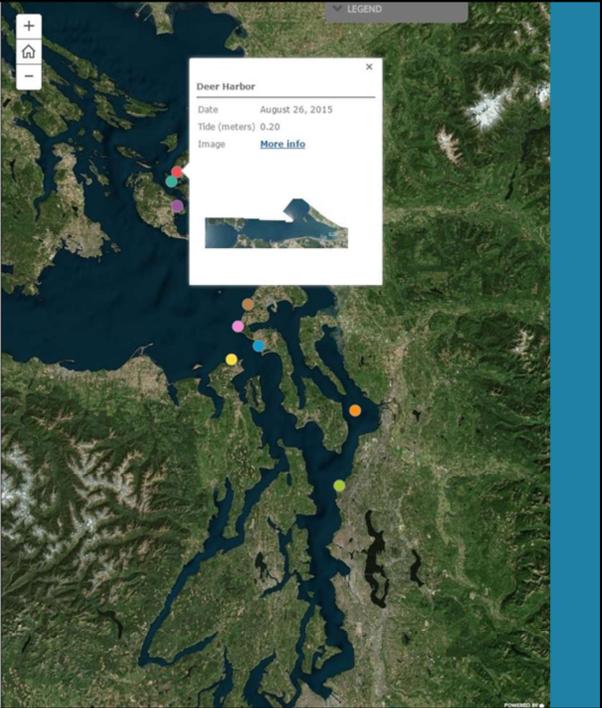


Aerial Photography has provided us with a birds eye view of Bull kelp beds located across 4 different counties. Multiple fly overs of these individual beds annually are helping to provide a baseline for future monitoring in these areas. These are just a handful of beds that the Marine Resource Committees (MRCs) are monitoring through the Salish Sea.

Clicking on the colored dots will provide you with the location of an individual bed, as well as the date and tide height at which it was photographed. Click "more info" to view an expanded photo of the bed.

In San Juan County these include Yellow Island, Friday Harbor, and Deer Harbor. Island County includes West Beach, Point Partridge, and Fort Ebey. Snohomish County encompasses two locations in Edmonds and Hat Island, and Jefferson County has one in North Beach

What Actions Are We Taking For Kelp?



Search ArcGIS Online for Northwest Straits kelp