

COUNTY: Island

Grant Number: SEANWS-2021-IsCoPH-00001

PROJECT TITLE: Island County Marine Resources Committee Operations and Projects

TASK NUMBER: 2.2 - Summary report on year two bull kelp monitoring activities

PERIOD COVERED: Oct 2022-Sep 2023

DATE SUBMITTED: 09/25/2023.



This project has been funded wholly or in part by the United States Environmental Protection Agency. The contents of this document do not necessarily reflect the views and policies of the Environmental Protection Agency under Assistance Agreement [CE-01J65401]. The contents of this document do not necessarily reflect the views and policies of the Environmental Protection Agency, nor does mention of trade names or commercial products constitute endorsement or recommendation for use

Bull Kelp Survey 2022-2023:

Island County Marine Resources Committee

Summary and Observations for 2023

- All beds from 2022 were fully surveyed in 2023.
- It was a good year for kelp in Island County. The maximum surface area of most beds was greater than it was in 2022.
- It was also a good year for pink salmon as local fishers utilized the Ebey kelp bed edges to advantage.
- New MRC lead was brought on board.
- 20 volunteers reported 287.25 hours for this project.
- All data recorded into Kobo Toolbox.
- Temperature logging at multiple depths was conducted at all sites.

Introduction

Kelp forests represent significant habitat for a wide variety of invertebrate and vertebrate species in the marine environment and influence/are influenced by other submerged aquatic vegetation. In addition to providing structural habitat, primary productivities are very high as they are a significant store of carbon, which is ultimately distributed to deep and nearshore environments. In Washington State, two species of kelp are dominant: giant kelp (*Macrocystis integrifolia*) and bull kelp (*Nereocystis luetkeana*). While both species occur along Washington's outer coast and the coastal Strait of Juan de Fuca, bull kelp is the species predominately found along shorelines of the inner Salish Sea.

Bull kelp is intertwined with Salish Sea ecosystems, native culture, fishing, and recreation. It is the most visible and charismatic of the regional algae and has been the subject of multiple environmental and human-interest stories. A recent example ([An Amazon Rainforest of the sea fights for survival beneath Puget Sound](#)) underscores the importance of this work.

Following a state-wide moratorium of commercial harvest of wild kelp and seaweeds in 1988, Washington State Department of Natural Resources (WDNR) initiated annual aerial surveys of coastal aquatic vegetation from Port Townsend Bay to the Columbia River. These surveys have continued nearly every year, and in 2010 surveys were extended to include the resources of the Smith and Minor Island Aquatic Reserve (SMIAR), which is contained entirely within Island County. In the latest analysis of coastal kelp from 2013 to 2014 (excluding SMIAR), a decline in planimeter area of bull kelp around Port Townsend was recorded as ~14%, and range-wide decline in planimeter area of both kelps was 38% (Van Wagenen 2015).

Focused *in situ* surveys of bull kelp beds in South Puget Sound have uncovered disturbing trends of progressive shrinkage of bed areas (Berry, 2017; Berry, 2019). In addition to loss of canopy area, maximum depth for beds decreased and condition of individual kelp appeared poor, with an abundance of epiphytes, endophytes, and kelp crab. Whether or not these disturbing patterns occur in other parts of Puget Sound is unknown but does raise concerns about the status of bull kelp throughout the region.

The earliest comprehensive evaluation of kelp resources was conducted in 1911, when over half of the total tonnage of bull kelp in the American portion of the Salish Sea was estimated to be located within the jurisdiction of modern Island County (Rigg 1915). Uncertainty about the distribution of bull kelp in areas not monitored by WDNR along with anticipated changes in marine conditions attributable to climate impacts are motivations to conduct an inventory and assessment of this resource in Island County. The Island County Marine Resources Committee (MRC) considered this an important activity to conduct under its sponsorship. Efforts were initiated in 2015 to select kelp beds and test a kayak-based survey protocol. Those efforts were expanded in 2016 and have continued through 2023.

Scope and Objectives

This report describes the project for fiscal year 2023. Surveys occur from June through September.

1. Collect data from previously surveyed kelp beds by boat-based surveys to extend historical observations.
2. Initiate new volunteers and ensure coverage for all sites.
3. Utilize the Kobo toolbox application for all data entry.
4. Utilize temperature loggers for measuring temperatures at multiple depths.
5. Investigate integration of Smith Island monitoring to round out Island County beds.

Project Progress

Bull kelp is distributed widely within Island County (Figure 1), mostly on the western side of Whidbey Island. In 2019, the estimate of the amount of shoreline with associated bull kelp was ~ 12.7 miles, which is approximately 6.5% of Island County's shoreline.

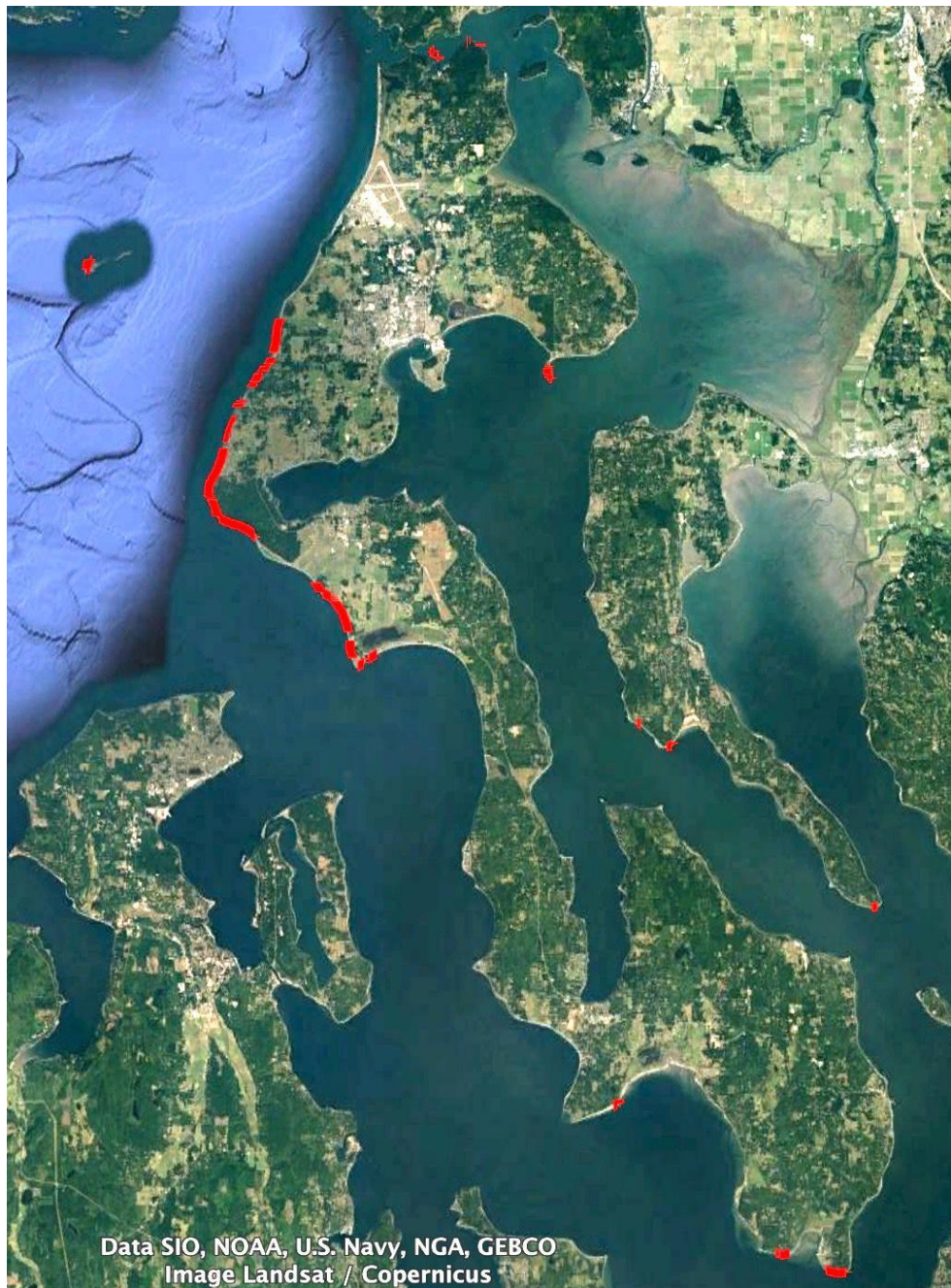


Figure 1. Map of Island County with associated bull kelp beds (highlighted in red) in 2019.

Surveys are conducted within the five most prominent bull kelp beds on Whidbey and Camano Islands. Those beds (Figure 2) provide coverage for all sides of Whidbey Island with two locations in Saratoga Passage. Descriptions of each site are provided later in this report.



Figure 2. Locations of kelp beds surveyed in 2023.

Survey Summary

Five sites were surveyed in the 2023 season (Figure 3). The primary objective is to measure surface area (SA) and surface temperature of the bed throughout the season, as well as maximum SA for the year. Maximum SA usually occurs in August. Water temperature, depth throughout the bed, reproductive status of the plants, and occurrence of animals associated with the bed are also recorded.

year	2023											
month	6			7			8			9		
	Date	Temp	SA	Date	Temp	SA	Date	Temp	SA	Date	Temp	SA
Hoypus Point	22	12.9	8.07	20	12.7	11.07	14	13.7		28	12.4	9.8
Ebey's Landing							13	12.2	121.1			
Polnell Point							14	15.4	156.6			
Lowell Point	19	13.9	3.9	15	15.9	17.9	14	19.6	79	weather		
Possession Point	29	15.7	12.4	weather			13	17.6	344.8	weather		
				Key:			sampled in month					
					Date		day in month sampled					
					15		Temp - surface temperature C - outer edge					
					122		SA - area of bed (units of 1000 m2)					
					weather		Unable to safely survey					

Figure 3. 2023 Sampling months (green) overlaid with temperature and surface area for Island County bull kelp sites. One data record is not available by the report date.

Historical Trends

The primary goal of this work is to understand the long-term dynamics of these beds and enable the integration of Island County data into the regional picture in collaboration with other MRCs and government agencies. Annual snapshot surveys allow for the compilation of data over time to observe status and trends.

The historical summary since program inception in 2015 (Figure 4) is updated through 2023 and clear trends in SA are evident. Detailed interpretation of these and regional data is out of scope for this annual report but is available on the [WDNR's bull kelp monitoring page](#).

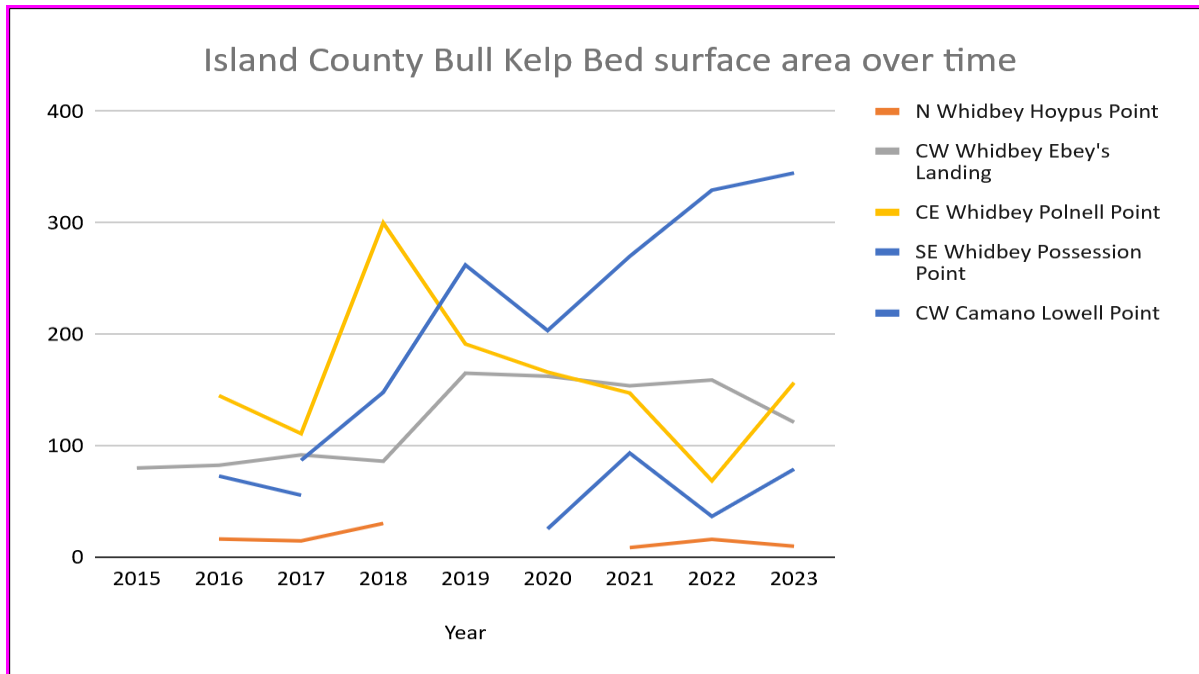


Figure 4. Graph of sampling and maximum Surface Area for Island County bull kelp sites since program start.

Program Leadership Changes

Ron Beier has continued in his role as the lead volunteer for this project. He has done a phenomenal job being a resource for all our volunteers. MRC member, Ken Collins, stepped into a co-lead role with Ron to help with some of the annual tasks.

Terrific Volunteers

It takes a special sort of person to volunteer for this work, and we cannot be prouder of the volunteers committed to seeing the work done well and with enthusiasm. Beyond the scientific skills to record quality data in a dynamic, wet, and often windy environment, it takes a certain level of enthusiasm, grace, and curiosity to be effective. We are very lucky to have a great group of volunteers.

Many of our volunteers came from Sound Water Stewards, and we are very appreciative of their partnership and help. It has truly been a collaborative effort.

Project participants

Project lead: Ron Beier, Ken Collins

Kayak surveys: Elaine Andrews, Gayle Austin, Ron Beier, Barbara Bennett, Theo Brandon, Vernon Brisley, Barbara Brock, Maddie Bryant, Ken Collins, David Davis, Debbie Engblom, Don Engblom, Barbara Hardman, Nancy Hotter, Bill Meyer, Bill Meyer, Linda Rhodes, Jenny Roman, Ellyn Thoreen, Carter Webb.

Temperature logger surveys: All sites adopted taking regular temperature readings at different depths. We used a combination of Hobo arrays (Possession, Hoypus, Lowell) and a YSI probe (Ebey and Polnell). This was in addition to the normal surface temperature readings.

Discussion

Temperature loggers and protocols to measure surface, mid-water, and bottom temperatures were developed in 2020 and are now used for all sites. Analysis of those data is outside the scope of this report but will be added as an appendix after year-end data is collected.

A glimpse of the heterogeneity of temperature is evident in Figure 3. With roughly synchronous sampling in August, there was a 7.4 C range across the measured sites, from 12.2 at Ebey's landing to 19.6 at Lowell.

Temperature extremes are evident. At 20 C, bull kelp is not viewed as viable. We measured temperature in that range, and water quality monitoring (separate MRC project) measured spikes over 20 C at 20' depth in Holmes Harbor,

Most beds surveyed in Island County were larger than measured in 2022. Additionally, there were observations of beds where there were none viewed before, such as west of Hoypus. These were often outside of the survey boundaries. Water Quality team members noted kelp in areas (Greenbank) that it has not been seen before as well. In that case holdfasts occurred on shell and derelict crab gear. We expect to integrate our kelp data with that from Smith Island for a more comprehensive picture of Island County, but do not have those data yet.

Looking Forward

As we think through better understanding drivers of bull kelp abundance and density, a number of areas for more detailed and systematic surveys come to mind. We will work with the Northwest Straits Commission (NWSC) and stakeholders to plan and test what we can apply in the 2024 season.

1. Improved temperature logging. We anticipate the need for better accuracy, ease of use, and consistency of protocol. With temperature assumed to be a key driver, we would like to develop a more systematic and consistent strategy for our surveys. We hope to implement a more detailed temperature logging process that would replace the legacy "surface temperature only" approach.
2. Integration with the MRC water quality project. Sampling the surface water four times a year does not provide data valuable for analysis. We envision integrating data collected by others to refine our view. We also are considering selective monitoring of beds year-round.

Site Descriptions

Hoypus Point

“Small but influential” may be the best description for the Hoypus Point bed. Located 0.5 km east of Hoypus Point (Figure 5), this bed sits on the boundary of the funnel of water flowing in and out of Saratoga Passage through Deception Pass.



Figure 5. Undated image of the Hoypus Point kelp bed. (Google Earth)

The bed sits adjacent to large sand bars and what appear to be shallow beds of sugar kelp. The bed reached maximum expression on the surface in August. With tremendous mixing of “fresh” ocean water from Deception Pass and large amounts of fresh water from the east, and high currents, we look forward to analysis of a bed that should be a “hybrid” personality between the western and eastern sides of Whidbey Island.

Surface temperature data at Hoypus tracks closely to Ebey’s, which makes sense given its location near Deception Pass and the large amount of mixing here.

With five years of records, Hoypus is now included in the data that comprise the Puget Sound Vital Signs. It is thought the upper size of the Hoypus bed is constrained by large sandy areas to the north and south. This may make it a poor proxy for trends. We will look for advice on how to truly represent growth in the Hoypus area.

Ebey's Landing

The Ebey's Landing bed is located in Admiralty Inlet and receives full marine influence from the Strait of Juan de Fuca.



Figure 6. Near infra-red image of Ebey's Landing bull kelp bed in August 2019. (G. Ridder and V. Brisley)

In 2020 and 2021, bed merger occurred again, suggesting this may be a persistent expansion. Although data were collected into the adjacent bed, a southeast limit was established for bed area calculations.

Surface temperatures at the Ebey's Landing bed tend to be relatively low and consistent across the months, probably due to the strong marine influence from the Strait of Juan de Fuca.

Polnell Point

The Polnell Point bed is located at the head of Saratoga Passage, between Whidbey and Camano Islands, at the eastern end of Crescent Harbor and approximately 13 km from the south fork of the Skagit River. The bed is within the influence of this large freshwater influx.

Aerial images and surveys over time indicate this bed is strongly expressed at the surface by the end of August (Figure 7). Because of this, the bed is not surveyed in June or July.

Temperature here is noticeably higher than Ebey or Hoypus, reflecting the location and proximity to other sources such as rivers.



Figure 7. Polnell Point bull kelp bed on August 28, 2019, showing the large area of the bed. (G. Ridder and V. Brisley)

Lowell Point

Lowell Point is located in Saratoga Passage, along the western shore of Camano Island immediately south of Camano Island State Park. This bed receives freshwater from the Skagit, Skykomish, and Snohomish Rivers. Due to the proximity of the State Park, crabbing and fishing are common activities near the bed, and there is frequent small boat traffic. The bed is comma-shaped, following the shallower underwater shelf around the point (Figure 8).



Figure 8. Lowell Point and bull kelp bed. (Google Maps)

Possession Point

The Possession Point bed is located at the confluence of Admiralty Inlet, Possession Sound, and the Central Basin of Puget Sound. It receives both marine and riverine influences, as well as potential anthropogenic effects from the Central Basin. Possession Point is an extremely popular fishing location and diving area, which may be due in part to its kelp bed and nearby artificial reef.

Although aerial assessment has identified kelp beds on either side of the Cultus Bay outflow, the surveyed bed is located to the east of the outflow and bounded by a stationary aid to navigation (Figure 9).

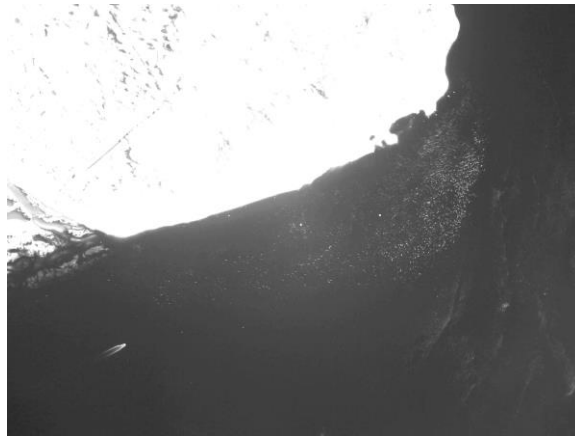


Figure 9. Near infra-red image of the Possession Point bull kelp bed on August 28, 2019. (G. Ridder and V. Brisley)

Surface temperatures at the Possession Point bed are typically higher than the Ebey's Landing bed. Temperature and salinity fluctuate in a manner consistent with Possession Point receiving freshwater from river sources (e.g., Snohomish River) that are warmer in summer months.

Photos

Top left by Linda Rhodes, top right by Amy Collins, bottom left by Ron Beier



References

Berry, H. 2017. Assessment of Bull Kelp at Squaxin Island in 2013, 2014 and 2016. Washington State Department of Natural Resources.

https://www.dnr.wa.gov/publications/aqr_nrsh_squaxin_bullkelp_1217.pdf?83ofk2

Berry, H., M. Calloway, J. Ledbetter. 2019. Bull Kelp Monitoring in South Puget Sound in 2017 and 2018. Washington State Department of Natural Resources.

https://www.dnr.wa.gov/publications/aqr_nrsh_bullkelp_sps_2019.pdf?c5eyo9

Rigg, G.B. 1915. The kelp beds of Puget Sound. IN: Potash from Kelp. F.K. Cameron, ed. U.S. Department of Agriculture report no. 100. April 10, 1915.

Van Wagenen, R.F. 2015. Washington Coastal Kelp Resources: Port Townsend to the Columbia River, Summer 2014. Contract report to Washington Department of Natural Resources, Nearshore Habitat Program. Last accessed September 5, 2016. URL:

http://file.dnr.wa.gov/publications/aqr_nrsh_vanwagenen_2015_kelp_tables.pdf

Additional Resources

Graham, M.H., J.A. Vasquez, A.H. Bushmann. 2007. Global ecology of the giant kelp *Macrocystis*: from ecotypes to ecosystems. *Ocean. Mar. Biol Ann. Rev.* 45:39-88.

Mumford, T.F. 2007. Kelp and eelgrass in Puget Sound. Puget Sound Nearshore Partnership Report No. 2007-05. Seattle District, U.S. Army Corps of Engineers, Seattle, WA. Last accessed September 5, 2016. URL:

http://www.pugetsoundnearshore.org/technical_papers/kelp.pdf