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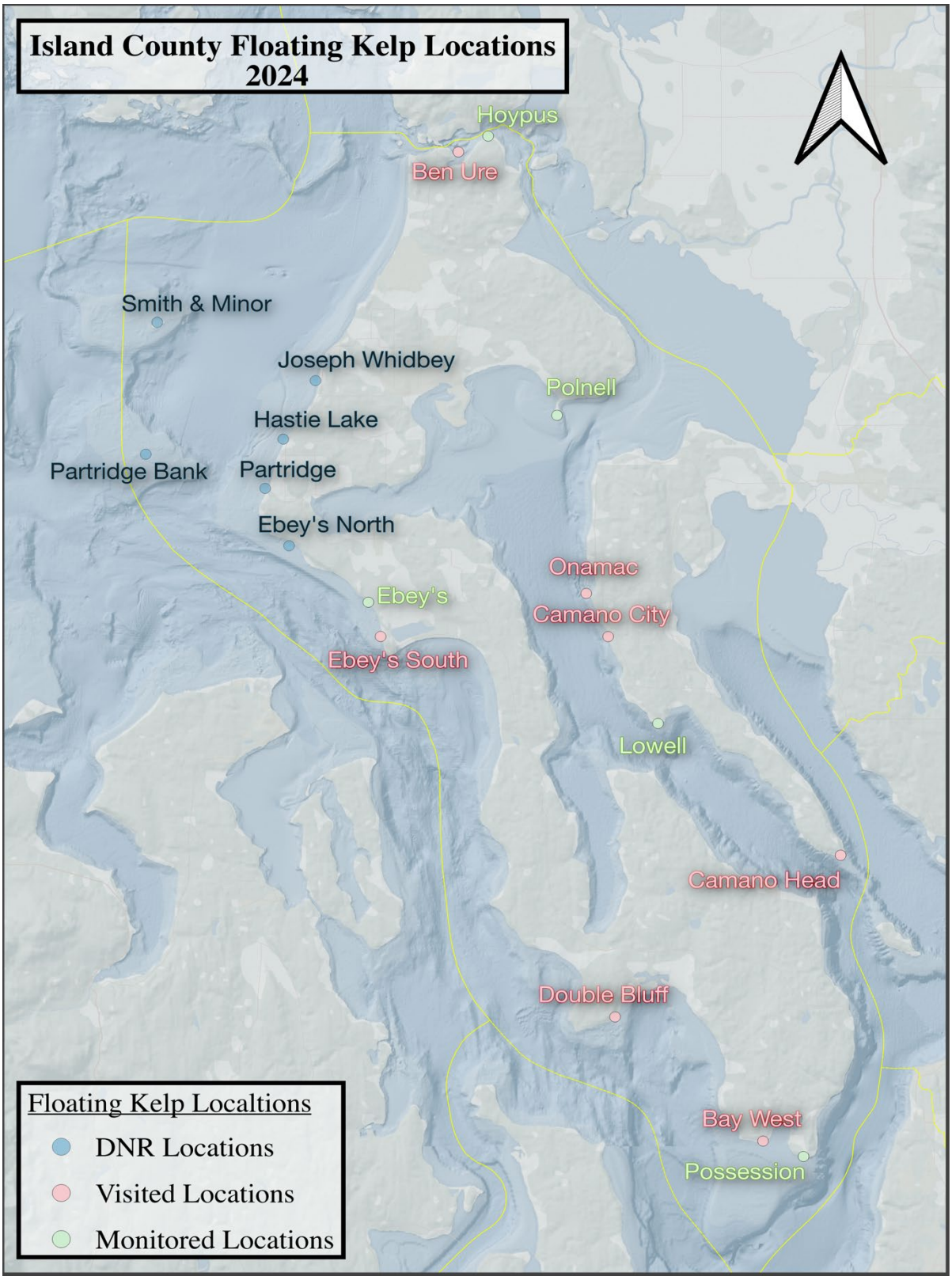


Fig 1. In this figure, Beds of Floating Bull Kelp Expression within Whidbey Basin/Island County are depicted. These beds have been determined by a combination of aerial imagery and community anecdotal knowledge.

1. Abstract

Island County's Floating Kelp Monitoring Project utilizes local volunteers and government employees to monitor the expression of Bull Kelp. These surveys function as the main indicator of Bull Kelp health in Island County, and thus Whidbey Basin, since 2015. This report summarizes findings from the 2024 monitoring season and their comparison to select historical data.

The Floating Kelp Monitoring Project measures the surface area expression of 5 kelp beds in Whidbey Basin. This is accomplished using in-situ GPS tracks created by volunteers who utilize sea kayaks and paddleboards to access the survey sites and kelp beds themselves. The Island County MRC (IC MRC) uses a protocol developed by the Northwest Straits Commission (NWSC) and aims to run monthly surveys from June-September. In 2024, volunteers successfully surveyed all 5 scheduled beds.

After processing these GPS files our report suggests that a maximum surface expression of ~170 acres of kelp between all 5 beds was present in the month of August. While this was an overall decrease in Island County kelp expression from the 2023 season, it remains the second largest expression recorded to date for this project.

This year, Island County also piloted the use of 2 new pieces of equipment. Firstly, the EcoSense 300A, a Conductivity, Temperature, & Dissolved Solid (CTD) Monitor. Its deployment goal is to enhance the understanding of temperature and salinity changes not just at the surface, but throughout the water column. Secondly, the Garmin Striker Cast GPS, a small sonar depth finder, deployed with the aim to map the bathymetry of Island County Kelp Beds. These devices were piloted with mixed results, but overall were assessed as effective tools to be used in the future.

The 2024 monitoring season indicates a healthy kelp season though questions remain. While changes in kelp density were observed this season, Island County remains unable to effectively quantify these changes within the bed perimeter. Additionally, extra planning for unpredictable weather events, while not necessary in the 2024 season, would have benefited monitoring efforts in previous season and should be addressed.

2. Project Goals

Generally, the goal of the Island County Floating Kelp Monitoring project is to work with local volunteers, partners, and stakeholders to assess the health of floating kelp, specifically Bull Kelp, in Island County. As we find out more about the nature of floating kelp here in Whidbey Basin, we aim to take advantage of opportunities laid before us to improve our understanding of the hydrodynamics, anthropogenic effects, and seasonal changes that affect Bull Kelp.

It is important to remember, however, we are just one of 7 MRCs participating in the Floating Kelp Monitoring Project. As we evolve our data collection practices, we must prioritize the maintenance of backwards compatibility with not only our historical data set, but with other MRC. We shall also aim to evolve protocols that can be easily recreated at other MRCs and beyond.

We had several goals for 2024:

1. Measure the Maximum Surface Expression of 5 kelp beds in Island County/Whidbey Basin. Those bed sites were:

- Hoypus Point
- Polnell Point
- Lowell Point
- Ebey's Landing
- Possession Point

2. Assess the efficacy of 2 new pieces of monitoring equipment; the EcoSense 300a, a YSI Conductivity, Temperature, and Dissolved Solid (CTD) Monitor; and the Garmin Striker Cast GPS, a handheld depth sonar device.

3. Collaborate with Jefferson County MRC on their efforts to innovate new equipment and participate in health assessment of the North Beach Bull Kelp bed.

4. Create a rich experience through engagement of existing and new volunteers and through outreach to the public.

These goals were met.

3. Project Engagement

This project functions as a pillar of eco-literacy efforts within Island County. In monitoring a uniquely biodiverse habitat, a Floating Kelp Monitoring Volunteer, inherently needs to consider a wide range of species, environmental processes, and communities. From forage fish and sea stars to bluff erosion and local neighbors; this is an active place of ecological discovery in Island County. What we learn as a group is then passed on not just organically from volunteers to our communities, but also through public speaking events such as Sound Water Stewards University. Though it doesn't stop there, we now further integrate these lessons back into the Salish Wide community through engagement in NWSC and WA State MRC's Floating Kelp Workgroup.

Moreover, this project's necessitation for strong safety skills on the water provides long-time paddlers and first-time paddlers alike with safety education and refreshment they may not have otherwise had the opportunity or intent to seek.

3.1. Partners/Organizations

- Partners
  - NWSC
  - NWSF
  - SWS
- Breakdown
  - Lead: MRC
  - Role of MRC: Recruit and coordinate volunteers, conduct kelp surveys, share data with NWSC
  - Role of NWSC: Provide regional coordination and support among MRCs
  - Role of NWSF: Provide training and volunteer liability coverage
  - Role of SWS: Recruit volunteers from their pool of members.

3.2. Participants

<u>2024 Project participants</u>
MRC Project lead: Ken Collins

Kayak surveys: Ron Beier, Steve Boskovich, Vernon Brisley, Barbara Brock, Ken Collins, Debbie Engblom, Don Engblom, Dan Hale, Wendi Hale, Jennifer Hickey, Doug Palm, Bill Meyer, Linda Rhodes, Michele Rushworth, Erica Sutehall, Kathryn Tooker, Carter Webb, Kelly Webb.

Overall, the 2024 IC Floating Kelp Monitoring project enlisted 17 volunteers. To start the season, we added an additional 5 volunteers, 2 of which are regular paddle boarders, a first for our project. While safety issues with this fact were considered, a paddle boarders' ability to conduct safe and accurate community science was proven this year. For this reason, their use will continue. Of the 5 2024 additions, 3 dropped out early for a range of reasons from lack of necessary gear to seasonal work scheduling. Compared to last year's volunteer total of 22, our project saw an overall decrease in participation, though data collection procedures saw no decline in standards.

A good benchmark for future participation is that of Lowell Point, Camano Island. Their volunteer structure and numbers allow for greater flexibility in date selection, protocol allotment, and potential expansion of methodologies. It would be ideal to have a minimum of 6 active volunteers at each site.

Additionally, this year saw a change in leadership participation. Ron Beier, the Project Lead in 2022 & 23, accepted the new role of *Expansion Lead* with aims at identifying and exploring unmonitored beds and protocols for Island County. The position of *Project Lead* was then accepted by Carter Webb, who worked in close consultation with Ron Beier, Ken Collins (MRC Science Lead), and Kelly Zupich (MRC Coordinator) to ensure a smooth transition. Moreover, Carter Webb participated as an inaugural member of the Northwest Straits Floating Kelp Monitoring Workgroup which sources representatives from all participating MRCs to facilitate data and information sharing across county lines.

4. Project Methods/Actions

The Island County Floating Kelp Monitoring Project follows generalized NWSC established protocol. These protocols can be reviewed on the NWS Website here. The core structure of these protocols has remained the same since 2014 in an effort to maintain data compatibility across years and MRCs alike.

As of the start of September 2024, IC Floating Kelp Monitoring has successfully monitored all 5 beds for all scheduled dates in the monitoring window between June-August. 3 of those beds (Hoypus, Lowell, & Possession) were monitored monthly during the seasonal window. Alternatively, the remaining 2 (Ebey's & Polnell) were monitored during the month of August, a time that is thought to be the bed's month of maximum expression. Figure 4 shows a detailed breakdown of the 2024 survey schedule.

Once a given survey is complete a GPS track is produced using the NWSC established protocols. The GPS track is then imported as a GPX file into 2 geographic imaging software, Google Earth Pro (Method 1) & Quantum Geographic Information Software (QGIS) (Method 2).

Polygons are then created inside of each track, for method 1 this is done by hand, for method 2 this is done using software. The area of this polygon is then recorded and compared across methods 1 & 2. These measurements are typically expressed in the units of meters squared and are multiplied by the conversion factor of 0.000247105 to obtain measurements in the unit of acreage. See figure 5 in Results for the processed data.

These data are estimations, and each method has their limitations and thus should be treated as such. It should be noted that in previous reports, method 1 was the only utilized method to calculate sea surface expression. Additional representations of the data will be processed by NWSC and are assumed to be more accurate and certainly consistent across MRC's. Those results will be presented at the annual Data Review.

2024 Island County Floating Kelp Monitoring Schedule Breakdown

Location	Survey Month	Date Scheduled	Weather Alternate(s)		# IC Volunteers	Notes
	If Surveyed	If Used	If Used			
Hoypus	June	19-Jun	18-Jun		4	CTD & GS Gps Used
Total Surveys	July	18-Jul	17-Jul	25-Jul	4	GS GPS
	August	16-Aug	17-Jul	21-Jul	3	
3	September	16-Sep	15-Sep	17-Sep		
Lowell	June	19-Jun	22-Jun		4	
Total Surveys	July	18-Jul	19-Jul		4	
	August	30-Aug	31-Aug		7	CTD & GS Gps Used
3	September	15-Sep	16-Sep	17-Sep		
Possession	June	18-Jun	27-Jun		2	CTD & GS Gps Used
Total Surveys	July	17-Jul	30-Jul		2	
	August	16-Aug	29-Aug	30-Aug	2	CTD & GS Gps Used
3	September	14-Sep	15-Sep	17-Sep		
Polnell	June	N/A	N/A		N/A	
Total Surveys	July	N/A	N/A		N/A	
	August	21-Aug	N/A		2	
1	September	N/A	16-Sep		N/A	
Ebey's	June	N/A	N/A		N/A	
Total Surveys	July	N/A	N/A		N/A	
	August	20-Aug	N/A		3	CTD Used
1	September	N/A	17-Sep		N/A	

Fig 2. In this figure, a detailed breakdown of each site's monitoring schedule for the 2024 season can be seen. If the bed was monitored in a given month, the month's cell will be highlighted green. If the original date scheduled for that month was used, its cell will also be highlighted green. However, if a weather alternate for that month was used its cell will be highlighted red. If new equipment were used in a survey, it will be listed as CTD (EcoSense 300a CTD) or GS (Garmin Striker Cast GPS Sonar)

5. Results

Bull Kelp in Island County saw a marked reduction in maximum sea surface expression in 2024. Results showed a reduction in ~7 to 8 acres when comparing survey results from August of 2023 & 2024. A notable decrease was seen at Possession Point, which saw a reduction of ~10 acres from 2023-24. On the other hand, Lowell Point saw a notable increase of roughly ~3 acres and the appearance of a new bed within the survey area. (See Appendices 1-5 for more information)

5.1. Data Summary

All data in the following summary are averages across Methods 1 and 2 unless otherwise specified.

This August, the IC MRC Floating Kelp Monitoring Project surveyed a total of ~170 acres of Bull Kelp Forest. This is compared to last year's ~178 acres of forest.

Beds that saw increases in maximum surface expression were:

- Lowell Point ~ +2.94 acres
- Ebey's Landing ~ +2.95 acres

Beds that saw decreases were:

- Possession Point ~ -10.0 acres
- Hoypus Point ~ -0.05 acres
- Polnell Point: ~ -3.38 acres

Data is presented in Figures 4 and 5, in 2 separate methods. method 1 uses Google Pro polygon creation to calculate sea surface area expression. While method 2 uses QGIS polygon creation to calculate sea surface area expression. Both methods can be seen to produce similar maximum expression data from the month of August 2023-24.

A deeper look into Figures 4 and 5 shows Methods 1 and 2 produce largely the same maximum area expression metrics across all beds, except for that of Ebey's Landing. Method 1 has Google Earth showing an increase of 3.81 acres, while Method 2 has QGIS showing an increase in only 2.08 acres. This discrepancy at Ebey's Landing accounts for a large portion of the difference in Island County's total bed area change from the 2023-2024 season.

Ebey's Landing has experienced large geo-spatial changes between the 2023 season and 2024 season. Shifting beds and the appearance and disappearance of *donut holes,* large areas of no kelp expression within the bed, have made for challenging polygon creation and

arithmetic. (See Appendix 4) For this reason, we urge readers to view the NWSC 2024 Data Review in the coming months for more precise calculations from GIS experts.

Overall, questions about reduction in kelp density at core sites like Possession and Ebey's have been raised. For this reason, it is possible that the data in this report undersells the true severity of kelp loss in 2024. The project is currently in conversation with representatives from NWSC and DNR to brainstorm a plan to begin addressing this gap in our knowledge. See Next Steps for how this project will begin to take action.

August Surface Expression Area Calculations Using Google Earth Pro: Method 1

Bed	2024 (m^2)	2023 (m^2)	Change (m^2)	Change (Acres)	Change (%)
Hoypus	13,785	14000	-215	-0.05	-1.54
Polnell	141,428	156600	-15172	-3.75	-9.69
Lowell	91,128	79000	12128	3.00	15.35
Ebey's	136,524	121100	15424	3.81	12.74
Possession	304,343	344800	-40457	-10.00	-11.73
Totals					
m^2	687,208	715500	-28292		-3.95
Acres	170	177		-6.94	-3.95

Fig 3. In this figure, using method 1, Google Earth Pro area calculations, we compare the 2024 Maximum Sea Surface Area Expression to that of 2023 for all 5 monitored beds in Island County

August Surface Expression Area Calculations Using QGIS: Method 2

Bed	2024 (m^2)	2023 (m^2)	Change (m^2)	Change (Acres)	Change (%)
Hoypus	13770	14014	-244	-0.06	-1.74
Polnell	144538	156757	-12218	-3.02	-7.79
Lowell	91550	79902	11648	2.88	14.58
Ebey's	134385	125962	8423	2.08	6.69
Possession	307104	347483	-40379	-9.98	-11.62
Totals					
m^2	691347	724119	-32772		-4.53
Acres	171	179		-8.04	-4.53

Fig 4. In this figure, using method 2, QGIS area calculations, we compare the 2024 Maximum Sea Surface Area Expression to that of 2023 for all 5 monitored beds in Island County

5.2. Outcomes

- Island County MRC and NWSC saw an increased focus on safety skills and equipment this season.
    - Resulting in
        - 1 on the water safety course hosted by NWSC
        - 1 Goss Lake safety review hosted by Carter Webb
        - 24+ volunteer hours dedicated to on the water safety
- The 5 historically monitored beds in Island County were successfully surveyed during all scheduled dates in the 2024 season.
- Data from completed surveys have been:
    - Successfully Entered into Kobo Toolbox.
    - Compared to selective historical data.
- The 2 piloted equipment, the EcoSense 300a and Garmin Striker Cast GPS, were deemed effective enough for integration into current monitoring protocol.

5.3. Outputs

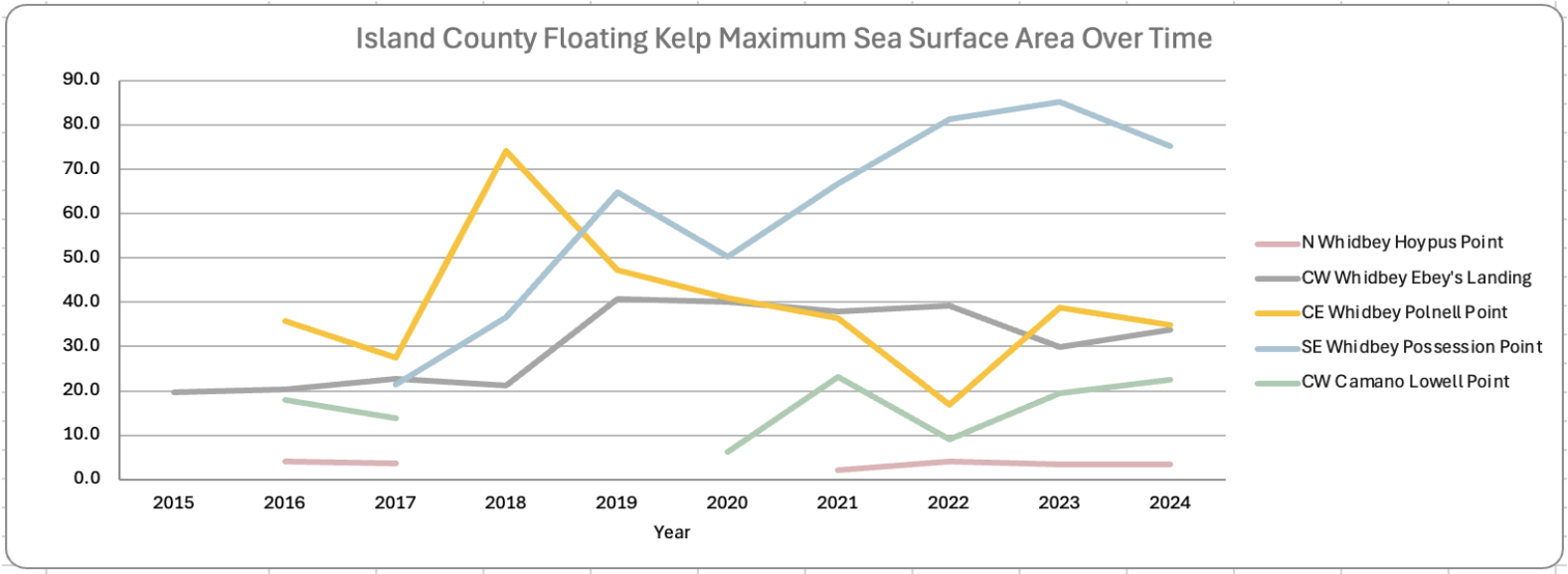
- List of active volunteers.
- Data from completed surveys.

5.4. Results in context

Island County Maximum Sea Surface Area Calculations to Date Using Google Earth: Method 1

Site	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Hoypus Point		4.0	3.6				2.1	4.0	3.5	3.4
Ebey's Landing	19.8	20.4	22.7	21.3	40.8	40.1	38.0	39.3	29.9	33.7
Polnell Point		35.8	27.4	74.1	47.3	41.0	36.4	17.0	38.7	34.9
Possession Point			21.5	36.6	64.8	50.3	66.7	81.4	85.2	75.2
Lowell Point		18.0	13.7			6.3	23.1	9.0	19.5	22.5
Totals	19.8	78.2	88.9	132.0	152.9	137.7	166.3	150.6	176.8	169.8

18	Sampled in Year and Max Sea Surface Expression (acres)
88.9	Sea Surface Expression When All Beds are Sample in Year (acres)



Figures 5 & 6 compare the Maximum Sea Surface Expression of each bed within a monitoring season from 2015 – 2024 in table and graph form. All numbers are expressed in acreage.

6. 2024 Equipment Pilot Program Highlights

YSI EcoSense 300a CTD

Pros

- Enhanced Temp & Salinity Monitoring
- Low Maintenance
- Easy Calibration Compared to Other Water Quality Devices

Cons

- Housing Quality
- No Floatation
- Calibration Sensitivity

During the 2024 Floating Kelp Monitoring Season, Island County MRC ordered 1 EcoSense 300a CTD monitor and 1 10m monitor cable. In tandem, these two items allow teams to measure temperature and salinity gradients from sea surface to sea floor. Volunteers and Leads alike found the device easy to understand and deploy, with especial ease from paddle boards.

The device was deployed 4 times at 3 beds (with a privately owned CTD of different specs deployed at Ebey's as it has in years past). The EcoSense 300a, when checked against historically used thermometers, returned similar readings on the sea surface. Further investigation will be made next season.

The EcoSense 300a needs regular calibrations, while simple in comparison to other water quality monitoring devices, further training for leads should be considered. If the device is intentionally calibrated with minor changes to protocol, data produced can be far from accurate.

Garmin Striker Cast GPS

Pros

- Improved Efficiency for Depth Data Collection
- Easy Deployment
- Quickdraw Contour Maps

Cons

- File Type Prohibits Analysis
- Data Must be Collected Under Speeds of 2kt

During the 2024 Floating Kelp Monitoring Season, Island County MRC ordered 1 Garmin Striker Cast GPS. This device was used a total of 5 times across 3 beds with the long-term goal to build detailed bathymetric maps of our kelp beds. The device allows for more efficient and safe depth data collection than that of the rock sock, while maintaining similar accuracy. It also allows for the creation of Bathymetric Contour Maps within the Garmin Ecosystem that can be shared across Garmin users through the Quickdraw Community. These Quickdraw Contour

Maps alone are a great resource for better educating our volunteers on the characteristics of the bed which they monitor, enhancing the potential for future ecological pattern recognition.

The Quickdraw Contour file type (.qdc) produced by the Striker is not compatible with any ecosystem outside the Quickdraw Community, eliminating our ability to conduct analysis with these maps. Additionally, the Striker Cast requires the paddler be traveling less than 2kt to collect data hampering efforts at bigger beds and places of high current. Solutions are currently being discussed, including the use of a pattern of stationary data points that would allow for below 2kt data collection and the creation of an analog Bathymetric Contour Map for use in analysis. Further investigation will be made next season.

Overall, the pilot program was an illuminating success laying the foundation for future development and integration of these devices into our toolbox. Challenges remain and lessons have yet to be learned, however, the potential for deeper exploration of the beds has received excitement from volunteers and leads alike.

7. Lessons Learned

Overall, the Island County Floating Kelp Monitoring Project:

- Excels at determining sea surface expression of beds in August of the accepted growing season (June-September).
- Is improving its ability to survey each of the 5 historically monitored sites once a month during the growing season (June-September).
- Learned that mild weathered seasons are key to consistent monitoring across all 5 sites.
- Learned, further metrics are necessary to characterize the changes in the health of any given bed within Whidbey Basin.

During its 2024 Pilot Programs, the Island County Floating Kelp Monitoring Project:

- Learned that EcoSense 300a CTD Monitor is effective at creating profiles of salinity and temperature within the water column with relative ease of deployment.
- Learned that the Garmin Striker Cast GPS is effective at creating Contour Maps of the Bathymetric profile within kelp beds. However, the use of the maps is limited to the Garmin Quickdraw Contours Community and thus cannot be used in quantitative analysis.

8. Next Steps

- Increase Volunteer Participation
  - Increase volunteer numbers at all sites.
  - Create replicate perimeters using multiple volunteers/GPS devices to hone volunteer recognition of survey distance standards.
- Continue to improve on survey consistency and precision.
  - Develop plans to mitigate weather related cancellations.
    - Explore the use of tidal indexing through monitoring at slack tides other than around 0-tide
  - Consider monthly or bi-monthly surveys for all 5 sites.
- Re-asses currently held assumptions.
  - Is June-September a characteristic survey window to assess Island County Kelp Health?
  - Have we formally evaluated the accuracy of the August max expression assumption using data we have already collected?
- Make progress to monitor sites in a more holistic and comprehensive way.
  - Formulate long term plans to measure density.
  - Refer to DNR and NWS literature as a framework to evolve data collection protocols.
    - Kelp forest monitoring with volunteer kayak surveys: Data synthesis and recommendations for the MRC Volunteer Kelp Monitoring Program (NWS)
    - For example, those recommendations found in 4.3.
    - Long-term kayak monitoring of floating kelp in Puget Sound: Results through field year 2023 (DNR)
    - For example, assess the efficacy of transect creation in select IC beds.
    - Puget Sound Kelp Conservation and Recovery Plan (DNR)
    - For example, address questions posed in 1.3 (Environmental Stressors) and 1.9 (Biological Stressors - Invasive Algae Competition).
  - Further the use of newly piloted equipment.
    - Protocol Development and Integration
    - Training
    - Quantify Deviation Compared to Historically Used Equipment
- Expand to unmonitored sites where volunteer numbers allow.

Images

Image 1. Shows Carter Webb During a June Survey at Hoypus Point Courtesy Steve Boskovich

Image 2. Shows Bull Kelp During a June Survey at Hoypus Point Courtesy Kathryn Tooker

Image 3. Shows Bull Kelp During a June Survey at Hoypus Point Courtesy Kathryn Tooker

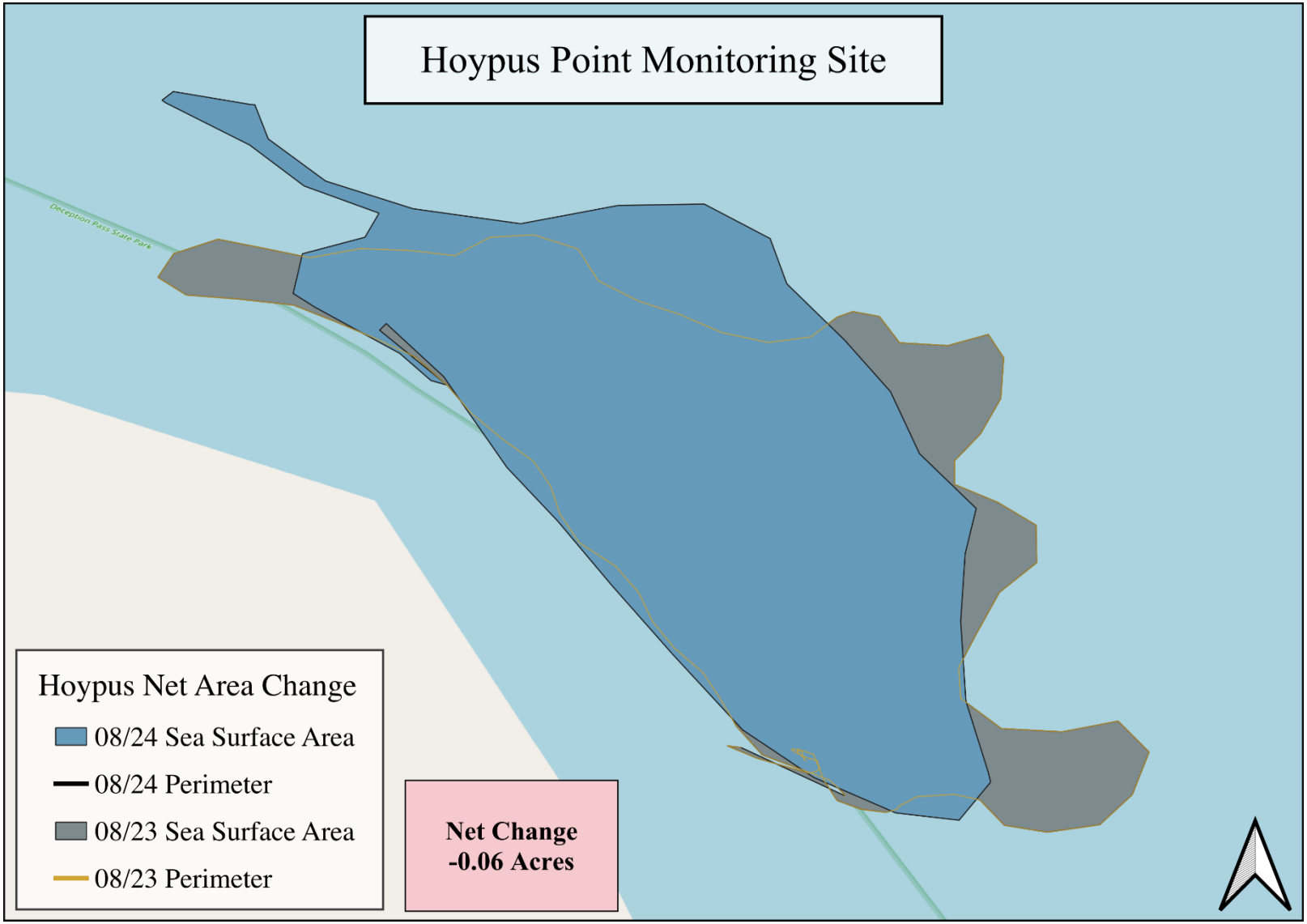
Appendices and Links

Useful Links

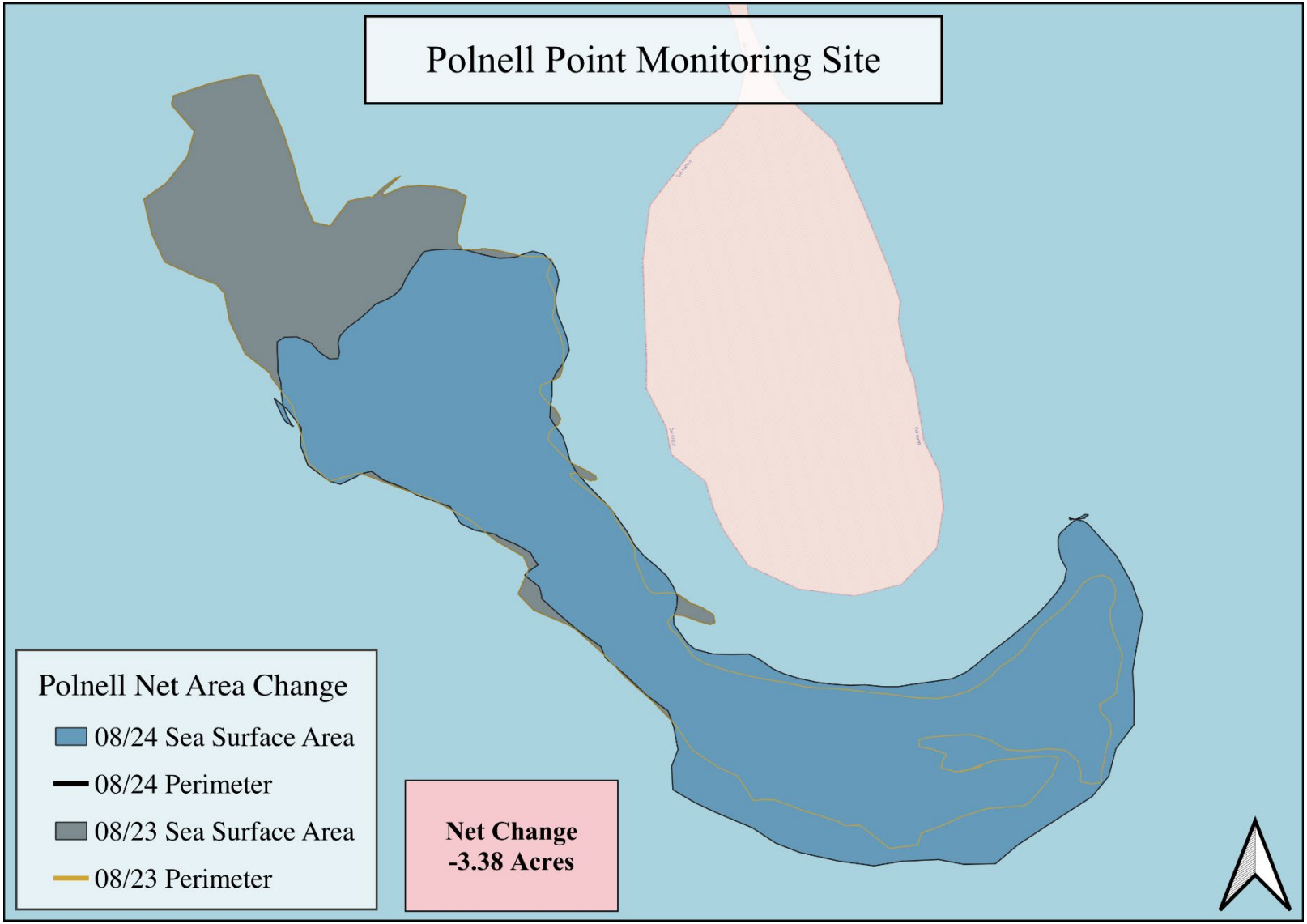
- YSI EcoSense 300a: Specs and Manual
- Garmin Striker Cast GPS: Manual
- NWS Floating Kelp Monitoring Protocol
- Kelp forest monitoring with volunteer kayak surveys: Data synthesis and recommendations for the MRC Volunteer Kelp Monitoring Program (NWS)
- Long-term kayak monitoring of floating kelp in Puget Sound: Results through field year 2023 (DNR)
- Puget Sound Kelp Conservation and Recovery Plan (DNR)

Where Does Our Data Go?

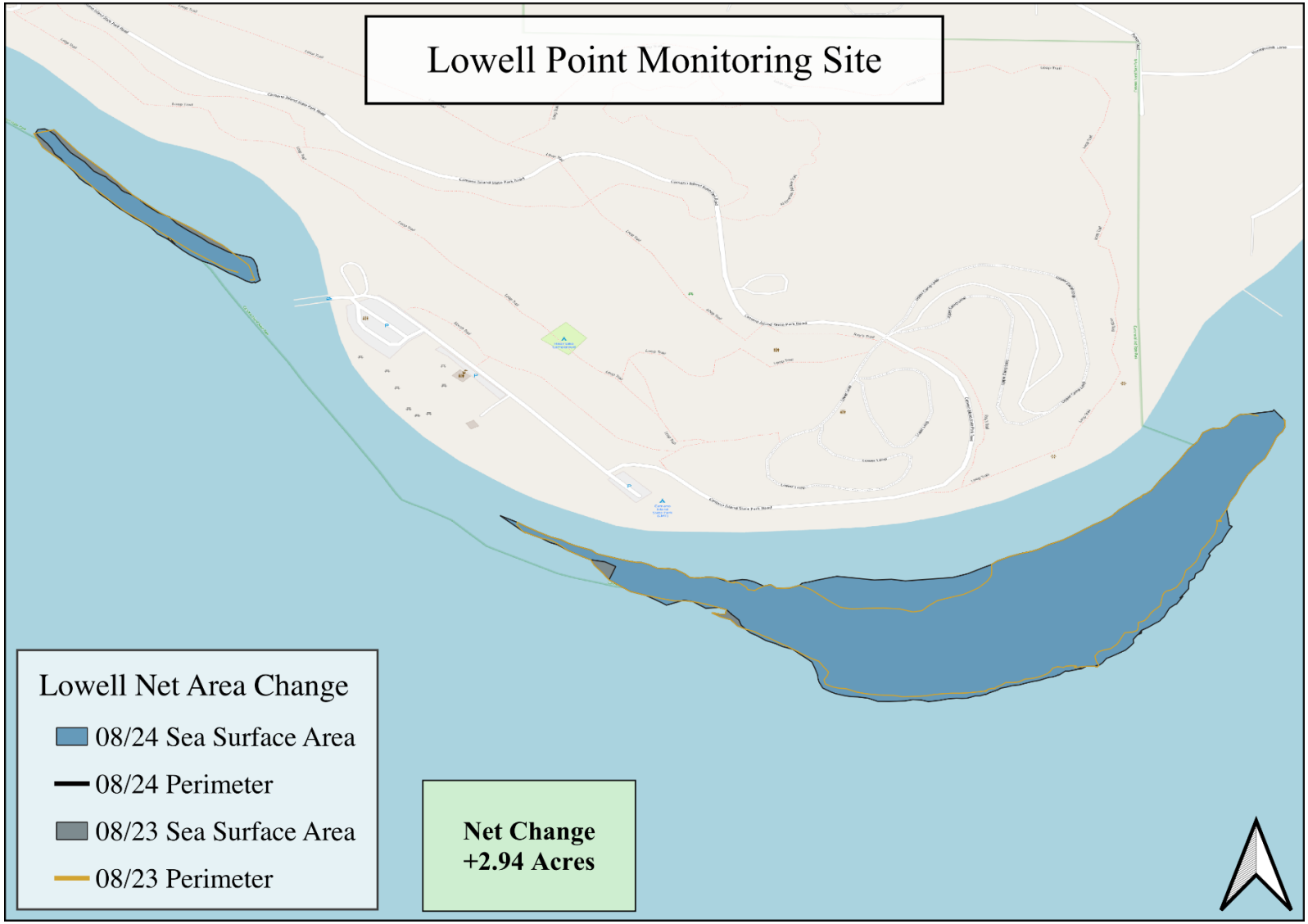
- Northwest Straits Initiative Story Map
- SoundIQ
- WA State Floating Kelp Indicator



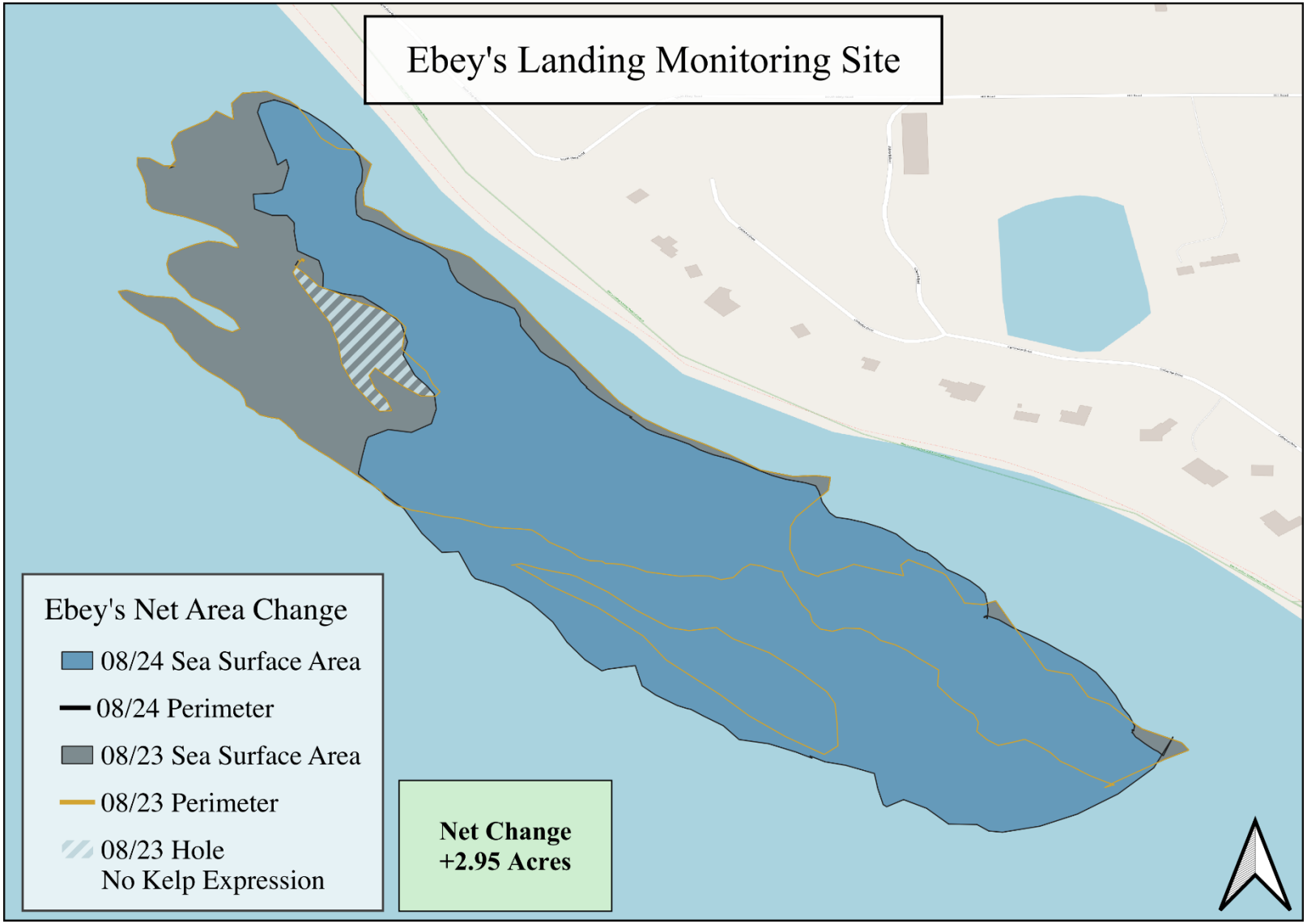
Appendix 1. compares the Maximum Sea Surface Expression in August 2023 (gray) with that of August 2024 (blue) at the Hoypus Point Monitoring Site. Their respective perimeters are outlined in gold and black.



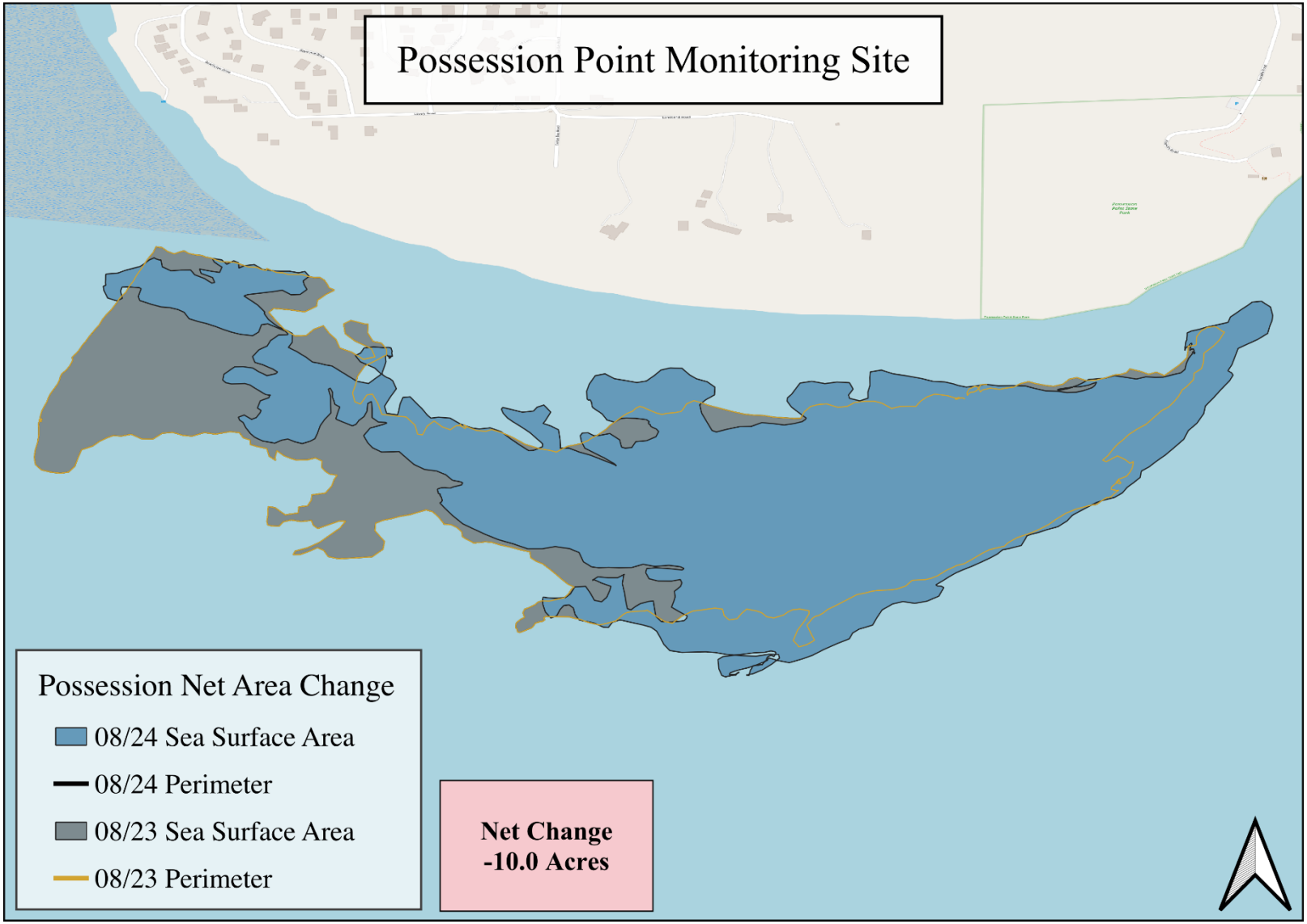
Appendix 2. compares the Maximum Sea Surface Expression in August 2023 (gray) with that of August 2024 (blue) at the Polnell Point Monitoring Site. Their respective perimeters are outlined in gold and black.



Appendix 3. compares the Maximum Sea Surface Expression in August 2023 (gray) with that of August 2024 (blue) at the Lowell Point Monitoring Site. Their respective perimeters are outlined in gold and black. The Northwest Bed in the above appendix was monitored in 23 & 24, however, was not included in any bed area calculations as it is outside the survey area.



Appendix 4. compares the Maximum Sea Surface Expression in August 2023 (gray) with that of August 2024 (blue) at the Ebey's Landing Monitoring Site. Their respective perimeters are outlined in gold and black.



Appendix 5. compares the Maximum Sea Surface Expression in August 2023 (gray) with that of August 2024 (blue) at the Possession Point Monitoring Site. Their respective perimeters are outlined in gold and black.