Bull Kelp Monitoring

Figure 1. The southeasternmost portion of the Freshwater Bay 2 bed, seen with Amelia Kalagher in the background tracing the shallow edge with the GPS unit. 9/1/24, Freshwater Bay 2, photo credit Joanne LaBaw.

Project Reporting Period 10/01/23-9/30/24 Task 2.8

Grant number SEANWS-2023-ClCoCD-00005

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1. Abstract

In 2024, Clallam MRC continued the collaboration with the Northwest Straits Commission on the kelp monitoring project. The goal was to monitor the size and density of kelp canopies at four kelp beds during low-tide events between July and September 2024. The expected outcomes were 1) to use established methods to produce georeferenced density data to be incorporated into SoundIQ, and potentially the Department of Natural Resources database; 2) to contribute georeferenced density data which can be used to evaluate longer-term trends, and support environmental decision-making. Due to constraints of schedules, volunteers and weather this year, only the three beds at Freshwater Bay could be monitored with one survey each, while the Clallam Bay bed could not be monitored. The large bed at Freshwater Bay was found to be dense and slightly larger than very recent years. Freshwater Bay 2, the bed around Observatory Point, has a similar extent to previous years. The bed west of this, Freshwater Bay 3, was surveyed farther west than before and noted to fringe the rocky shoreline far to the west. In conclusion, the three beds at Freshwater Bay appeared to be in good health in 2024, and the MRC will prioritize surveys of Clallam Bay in addition to these beds in 2025.

Figure 2. MRC project lead Alan Clark (right) and volunteer Joanne LaBaw (left) scouting kelp density to determine the most accurate path for the GPS unit along the bed edge. 8/22/24, Freshwater Bay 1 bed, photo credit Amelia Kalagher.

2. Project Goals

This project is part of the wider regional effort by the Northwest Straits Commission and many Marine Resources Committees to monitor the extent, density and health of kelp beds in the Northwest Straits region. As described in the grant forming the basis for the project, Clallam MRC aims "to monitor changes in local kelp populations and promote community science contributions to regional research."

- Goal 1: To monitor changes in local kelp populations.
- Goal 2: To promote community science contributions to regional research.

3. Project Engagement

In 2024, Clallam MRC partnered with members of the local kayakers' club: Olympic Peninsula Paddlers. Three highly motivated volunteers from that club engaged in a virtual training session and an on-land mockup survey, and became fully trained as kelp surveyors. The match with this club was a great fit because members already have excellent kayaking and rescue skills, and were excited to learn new skills as citizen scientists. Due to schedule and weather constraints, only one volunteer was able to join for surveys on the water, but the MRC is optimistic that several volunteers from this club will be engaged as kelp survey volunteers in 2025.

3.1. Participants

Surveys were conducted by Alan Clark (MRC project lead), Joanne LaBaw (community volunteer) and Amelia Kalagher (MRC staff, functioned as survey lead). Two additional volunteers trained to complete surveys, but were unable to participate this year due to weather conditions.

4. Project Methods/Actions

Clallam MRC followed the shared protocol developed by Emily Bishop for the Northwest Straits Commission: "A kayak-based survey protocol for Bull Kelp in Puget Sound". A Garmin78sc GPS unit and digital thermometer were used. The MRC did not identify any points for kelp clusters outside main beds, nor carried out the optional zooplankton sampling methods described in the protocol.

Figure 3. Volunteer Joanne LaBaw taking in the lead line to sample depth alone the edge of the Freshwater Bay 2 bed during the 9/1/24 survey. Photo credit Amelia Kalagher.

Due to volunteer and schedule constraints, Clallam MRC was only able to begin this project in late August 2024. Tide windows below 0 feet were identified, and surveys were performed whenever availability and weather allowed. The following surveys were performed in 2024:

Kelp Bed(s)	**Date**	**Team**
Freshwater Bay 1 (large bed)	8/22/24	Alan Clark, Joanne LaBaw, Amelia Kalagher
Freshwater Bay 2 (Observatory Point)	9/1/24	Joanne LaBaw, Amelia Kalagher
Freshwater Bay 3 (west of Observatory Point)	9/1/24	Joanne LaBaw, Amelia Kalagher
Clallam Bay	None (unsafe conditions during tide windows)	--

The draft maps of bed extent below were prepared using ArcGIS Pro.

5. Results

5.1. Data Summary

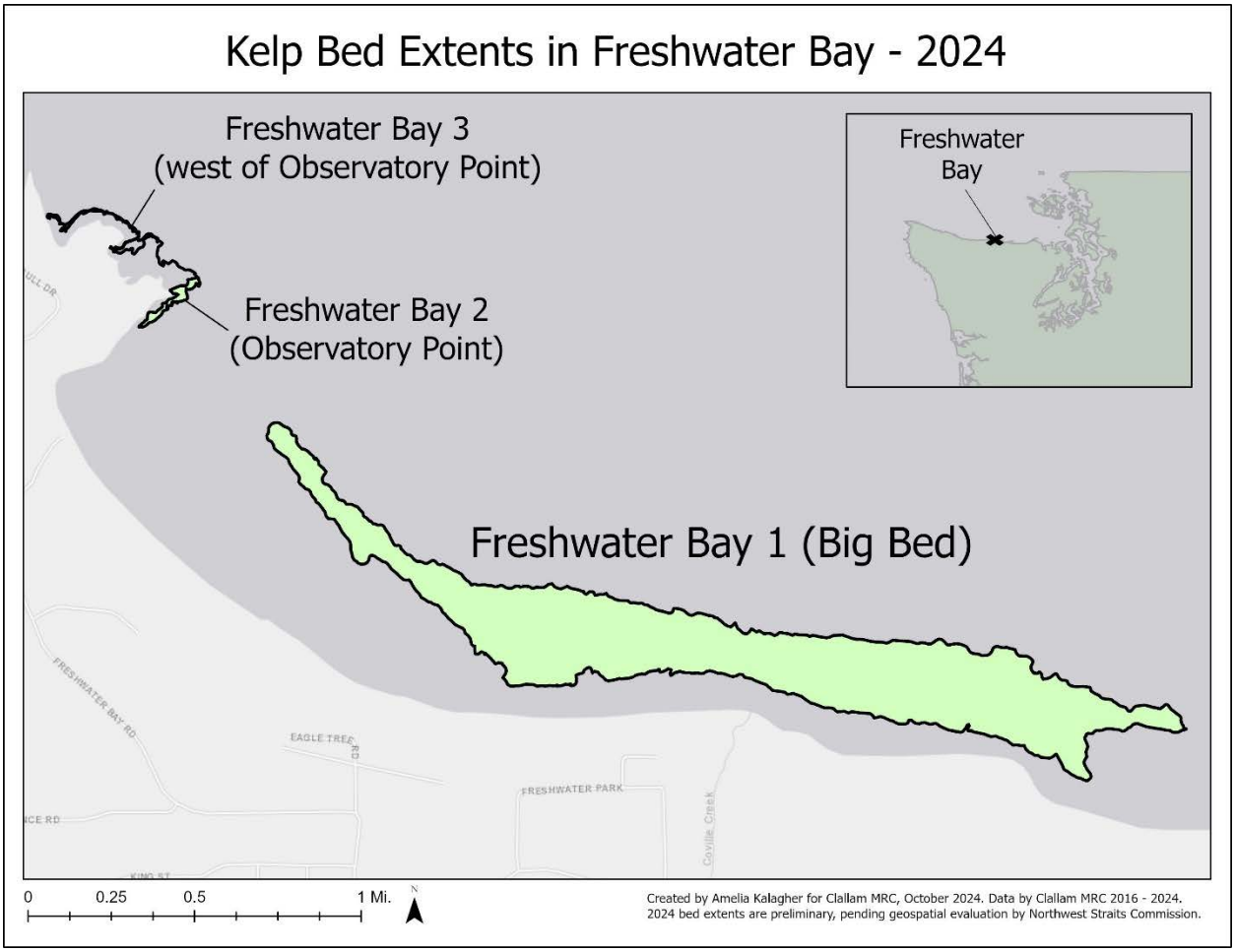


Figure 4. A map depicting the extents of the three Freshwater Bay kelp beds, as measured by 2024 surveys. For bed 3 (farthest west), only the deep edge of the bed is depicted as a line – this bed was directly touching the rocky shoreline. Note that this data is preliminary, and is pending geospatial evaluation by Northwest Straits Commission staff before it is finalized.

Freshwater Bay 1 (Large Bed)

The Freshwater Bay 1 (large bed) survey conducted on August 22nd revealed a bed that appeared healthy overall, and denser than in 2022 and 2023. The kelp was very clean for late August, with comparatively little encrusting growth such as bryozoan. *Nereocystis* again constituted the majority of the kelp present, while *Macrocystis* was noted in some areas, with other understory kelps also seen along the shallow edge of the kelp bed. Three "holes" were noted in the kelp bed near the shallow edge, ranging from approximately 50 to

90 feet on a side. These were sandy bottom areas, one with some cobble, that seemingly did not support kelp growth.

Figure 5. The formal "to beach" photo taken during the August 22 survey of the Freshwater Bay 1 bed, taken approximately in the middle of the bed. 8/22/24, photo credit Joanne LaBaw.

Figure 6. A dense, tangled cluster of Nereocystis at the deep edge of the Freshwater Bay 1 bed, as seen from Joanne LaBaw's kayak. August 22, photo credit Joanne LaBaw.

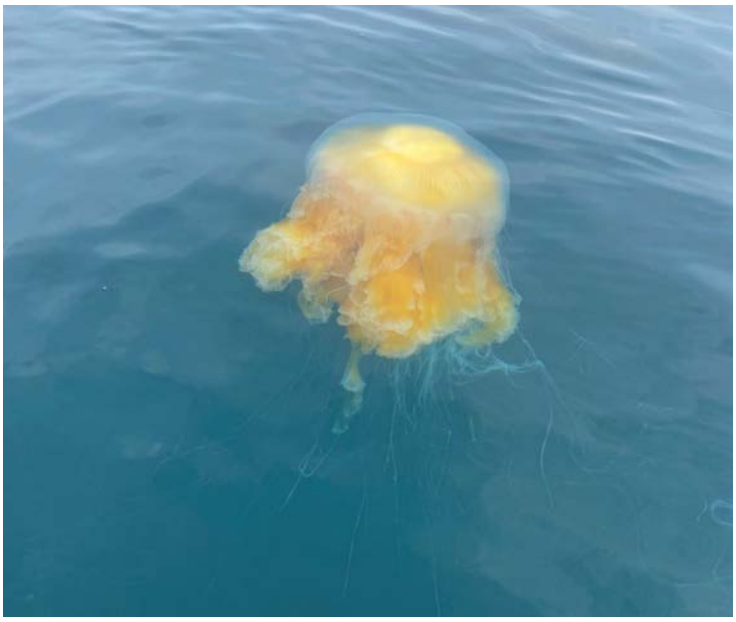


Figure 7. A jelly seen along the edge of the kelp bed - one of many during the 8/22/24 survey of the Freshwater Bay 1 bed. Photo credit Amelia Kalagher.

Freshwater Bay 2 (Observatory Point)

The Freshwater Bay 2 (Observatory Point) survey conducted on September 1st found a bed that was against the rocky shoreline for much of its length, including against Bachelor Rock and just to the west of it. The only portion of the bed that was not directly against the shoreline was the narrow portion just southeast of Bachelor Rock. The bed was only barely divided by a narrow "alley" from the Freshwater Bay 3 kelp bed. The kelp was very sparse directly near the pocket beaches west of Bachelor Rock. A large white buoy was located in this area with a hole in the kelp around it, possibly relating to the low density of kelp. This bed consisted of *Nereocystis*, with no *Macrocystis* noted during this survey. Large amounts of encrusting bryozoan were observed on kelp blades.

Figure 8. The southeasternmost portion of the Freshwater Bay 2 bed, seen with Amelia Kalagher in the background tracing the shallow edge with the GPS unit. 9/1/24, Freshwater Bay 2, photo credit Joanne LaBaw.

Figure 9. The Freshwater Bay 2 kelp bed, as seen from directly seaward of Bachelor Rock. Although the density was low in this immediate area, the bed was continuous around Observatory Point and Bachelor Rock. 9/1/24, Freshwater Bay 2, photo credit Amelia Kalagher.

Figure 10. A large buoy seen close to shore on the west end of the Freshwater Bay 2 bed. Much lower kelp density was observed in a wide swath around this buoy. 9/1/24, Freshwater Bay 2, photo credit Joanne LaBaw.

Freshwater Bay 3 (west of Observatory Point)

The Freshwater Bay 3 survey conducted on September 1st found a bed that was directly touching the rocky shoreline, and extending as a fringe bed quite far to the west. It is unknown how far west this "line" of kelp may have extended, as time and tide limitations forced the team to end the survey before an end to the kelp bed was found. This bed varied in thickness, and consisted in some areas of "clumps" of kelp. This was likely due to the bed being surveyed late in the season, as some kelp had detached and signs of tangling and decay were seen. Small amounts of *Macrocystis* were seen, as well as moderate amounts of detached, floating *Fucus* mixed in with the *Nereocystis* bed. Large amounts of encrusting bryozoan were seen on kelp blades in this bed. Young herring in large shoals were observed moving throughout the bed, very close to the surface.

Figure 11. "Fringing" style kelp, directly against the rocky shore, seen extending far to the west as part of the Freshwater Bay 3 bed during the 9/1/24 survey. Photo credit Amelia Kalagher.

Figure 12. A particularly thick area of bull kelp seen at the west end of the Freshwater Bay 3 bed during the 9/1/24 survey, with staff member Amelia Kalagher paddling the perimeter with the GPS unit in hand. Photo credit Joanne LaBaw.

Raw datasheets for these three surveys are available as an appendix to this report. Finalized polygons representing kelp bed extent will be available in the coming months on the SoundIQ platform.

5.2. Outcomes

Goal 1, "to monitor changes in local kelp populations", was partially achieved. For the three kelp beds monitored at Freshwater Bay, comparative maps can be produced this year from the monitoring efforts that were completed. However, additional surveys during the height of summer would have strengthened the data produced this year on the changes in these beds. This goal was not achieved for the Clallam Bay kelp bed, however, due to swells and weather conditions during the limited survey dates that could be planned. This was a consequence of the project's late start this year, and planning the schedule during the normal spring timeframe in 2025 will ensure Clallam Bay is surveyed next year by providing many more backup survey dates.

Goal 2, "to promote community science contributions to regional research", was achieved very well this year. Three avid kayakers from the community trained or re-trained with the kelp survey protocol, and all three were very actively engaged and enthusiastic about the process throughout the season. Despite some volunteers being new to things like the GPS unit or following a detailed survey protocol, these volunteers showed tremendous enthusiasm and constitute an engaged group that the MRC expects to work with again in 2025.

5.3. Outputs

- 3 kelp beds surveyed on one occasion each
- 3 surveyors on the water (1 MRC member, 1 community volunteer, 1 staff)
- 4 kelp surveyors newly trained or training refreshed (3 community volunteers, 1 staff)

5.4. Results in context

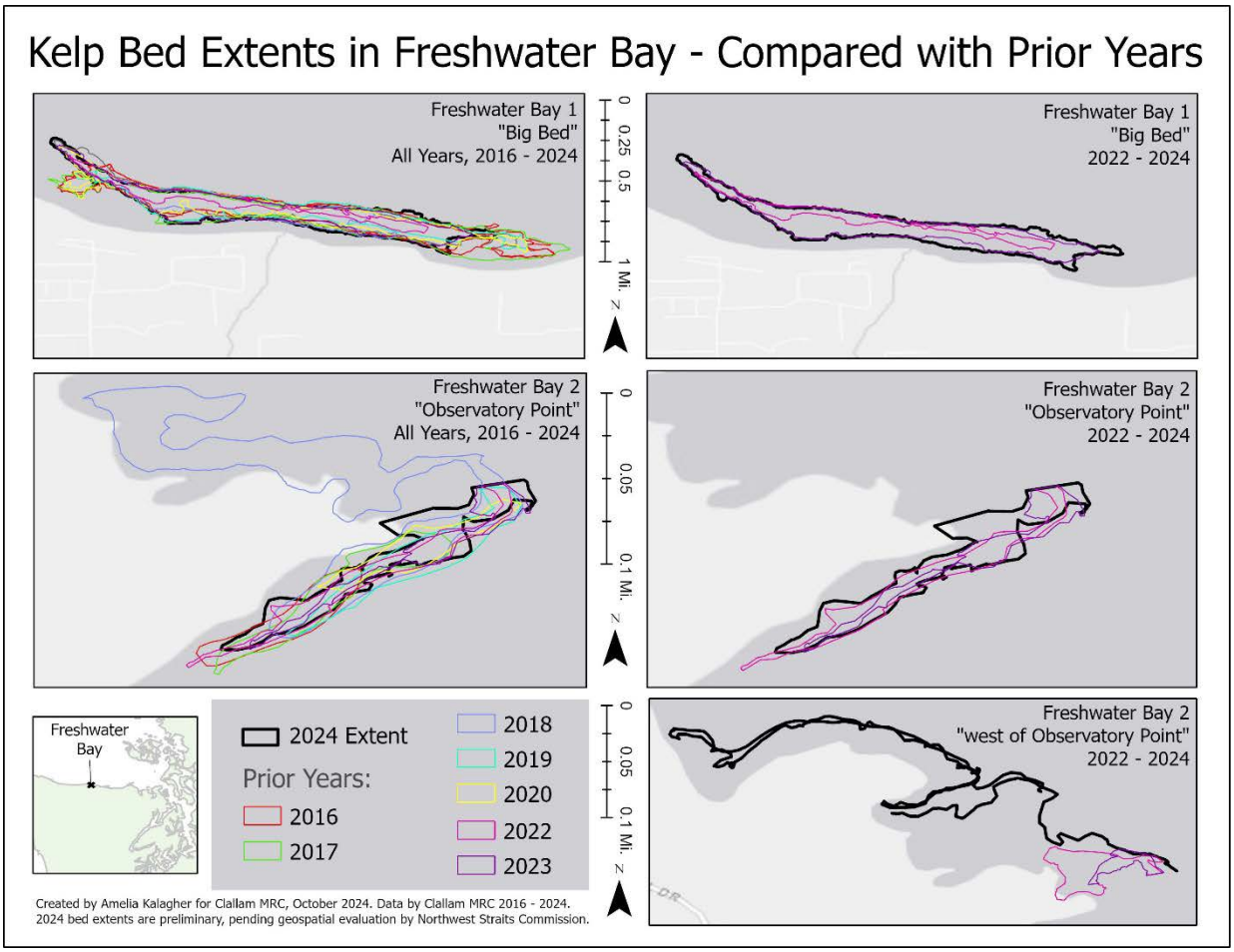


Figure 13. Maps depicting the extent of each bed in 2024, as compared with prior years 206-2023 (left) and the most recent two years (right). Note that this data is preliminary, and is pending geospatial evaluation by Northwest Straits Commission staff before it is finalized.

Freshwater Bay 1 (Large Bed)

The large bed, Freshwater Bay 1, was found to be slightly larger and more dense than in the previous two years. This bed shows signs of recovery in size since its smallest extent in 2022. Most of the additional extent seen this year was along the east and south sides of the bed, with a narrow additional “strip” of kelp also found on the northwest corner.

Table 1. Freshwater Bay 1 (large bed) size between 2016 and 2024. 2024 results are preliminary, pending geospatial evaluation by Northwest Straits Commission staff.

Date	Area (acres)
August 2024	145.61
August 2023	121.98
July 2022	41.85
July 2021	128.52
August 2020	112.67
July 2019	117.86
July 2018	78.0
August 2017	174.7
July 2016	141.1

Freshwater Bay 2 (Observatory Point)

The extent of this bed was roughly similar to years past. Additional acreage was noted this year due to the kelp extending through the full area between Bachelor Rock and the remainder of Observatory Point.

Table 2. Freshwater Bay 2 (Observatory Point) bed size between 2016 and 2024. 2024 results are preliminary, pending geospatial evaluation by Northwest Straits Commission staff – especially so with this smaller bed, due to its somewhat contiguous nature with the neighboring small bed.

Date	Area (acres)
August 2024	1.34
August 2023	0.55
July 2022	0.78
September 2021	0.93
August 2020	0.64
July 2019	0.97
August 2018	1.06
September 2017	0.92
July 2016	0.71

Freshwater Bay 3 (west of Observatory Point)

The survey of the Freshwater Bay 3 bed revealed the most interesting results in 2024, varied from previous years. The team was able to survey the bed well to the west of its previously measured extent, and found the kelp bed continued as a fringe farther than time allowed for a survey. This represents an opportunity to continue surveying this area in future years, to indicate whether this is a continuously present narrow bed.

6. Project Highlights, Innovations & Stories

This year in the Clallam MRC's kelp monitoring project was a testament to the excitement of great volunteers. The MRC members that traditionally lead this project had personal constraints that prevented the project's normal kickoff schedule, so the project planning began in August with staff support. Three volunteers from the local kayakers' club stood out as highly motivated, engaged supporters of the project; there likely would be no survey data this year without these volunteers. Joanne LaBaw, in particular, participated in both surveys this year after participating in 2023 as well. She was persistent throughout 2024 by inquiring about the project, attending MRC meetings, recruiting her fellow kayak club members, and following up with lots of photos after the surveys.

Figure 14. The September 1st sunrise at Freshwater Bay, with volunteer Joanne's kayak being prepped at left. The dedication and flexibility of volunteers to get out on the water during early mornings was the highlight of the project this year. Photo credit Amelia Kalagher.

In the time spent on the water, the greatest highlights were found on our final survey day, investigating the fringing kelp bed known as Freshwater Bay 3 (west of Observatory Point). This kelp was right against the rocky shoreline, and extended so far west on this survey day that the survey team turned around due to time constraints rather than reaching the end of the kelp itself. We also observed wildlife on this survey: a cormorant nesting site with about 50 birds, plenty of ochre stars, and young herring moving in and out of the kelp. Volunteer Joanne ended the expedition by experimenting with some underwater photography, shown below.

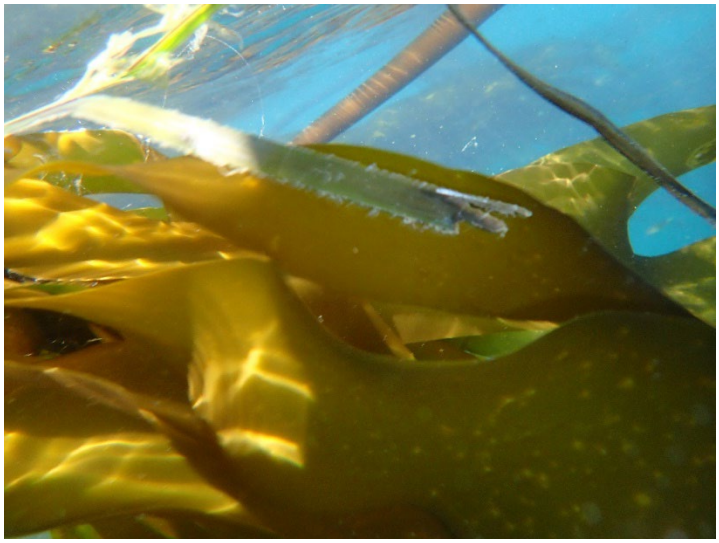


Figure 15. An "experimental" underwater photo of bull kelp blades. Freshwater Bay bed 2 (Observatory Point), 9/1/24, photo credit Joanne LaBaw.

Figure 16. An "experimental" underwater photo of juvenile herring. Freshwater Bay bed 2 (Observatory Point), 9/1/24, photo credit Joanne LaBaw.

As the season concluded with our last low tide window in mid-September, we were disappointed to discover that moderate swells combined with some rain were just enough to make a Clallam Bay survey impossible. Once again, two community volunteers were rockstars; they spent the days leading up to the potential survey in consistent communication with the survey lead, offered to change their schedule if it meant the survey could happen, and finally mentioned that they are excited to participate next year despite not making it out for their planned surveys this year. This motivation to participate in citizen science by a pair of non-scientists was a highlight of the season, and certainly the silver lining to the disappointment that the Clallam Bay bed could not be surveyed. The MRC looks forward to working with these volunteers and others in 2025.

7. Lessons Learned

The major lesson learned this year was the importance of early-season planning. Of course that is always the intention, but the constraints of the usual project leads in 2024 emphasized the impact of not initiating survey planning for this project in the spring. Administrative requirements within Clallam County government also presented a challenge this year with volunteer recruitment and availability. In 2025, the MRC will begin in early spring by recruiting community volunteers and starting their onboarding process as County volunteers. This will allow for survey planning to start in late spring, so many survey dates and backup dates are available.

One success the MRC will repeat was training volunteers with an on-land mockup survey. Using the data sheets, protocol and GPS unit while volunteers were on land with opportunity for discussion and review was key for our successful surveys. In future years, we will continue to either have volunteers attend the regional training, or hold a mockup on-land survey ourselves once again.

Finally, the team added some minor quality-of-life tips to our arsenal this year. These included choosing fewer people to learn the GPS to avoid unnecessary confusion, checking GPS status on all cameras before surveys to avoid battery issues, and loading shoreline segment data to our GPS ahead of time for reference while on the water.

8. Next Steps

The results of these surveys will add to the regional database continually cultivated within SoundIQ by the Northwest Straits Commission, and may inform regional strategy by entities such as the Department of Natural Resources. The MRC will continue prioritizing citizen science by engaging with community volunteers, including the local kayakers' club. Next year, early planning will be emphasized, with a focus on multiple, high-quality surveys of Clallam Bay's kelp bed.

Appendix

The raw data sheets for each of the three surveys are attached as an appendix.

Northwest Straits INITIATIVE

Bull Kelp Survey Data Sheet (on shore)

Pre-Survey Section (on the beach)

Trip Leader: Amelia Kalagher Date: 8/22/24

Name of surveyors: Amelia Kalagher, Joanne LaBau, Alan Clark

Location (Shoreline Segment): Freshwater Bay

Name of GPS unit or phone app Garmin 78sc Accuracy of GPS: +/- 9 ft

Weather conditions (circle one)

Clear Haze Clouds (Fog/mist) Light rain Heavy rain

Tide station Port Angeles - NOAA Tide height (ft): 0.28 ft

Current station/source: Alan Clark, observation Current (knots): 0-2 kt

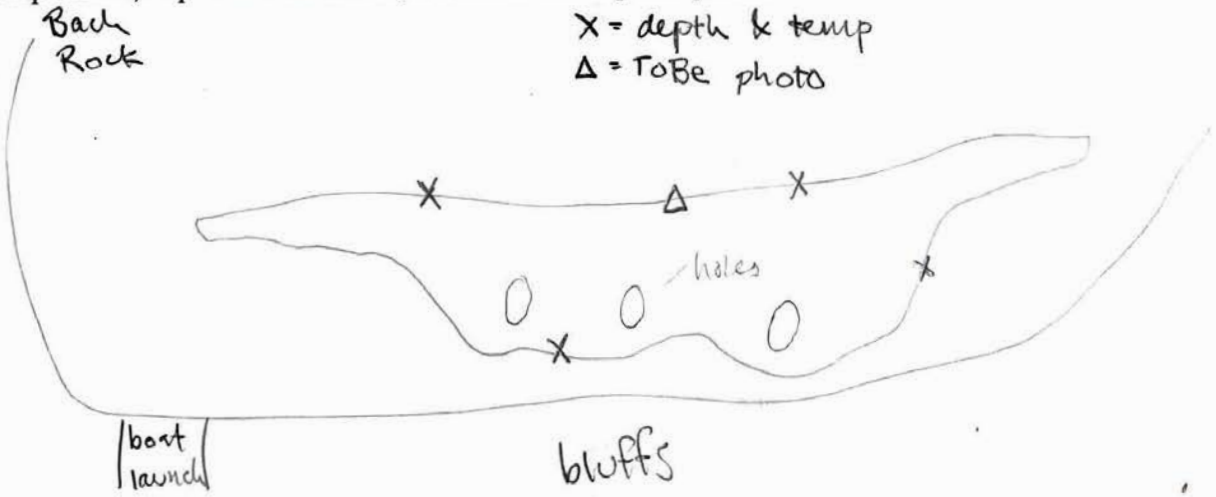
Survey condition notes (wind/wave condition, current behavior, sparse kelp outside of perimeter?):

Start: Calm, overcast, intermittent fog. Glassy, good vis to kelp below.
Light rain by end, intermittent

Proceed to page 2 to conduct survey. Following your survey, fill out Post-Survey section below.

Post-Survey Section (back on the beach after the survey)

Provide a sketch of the area surveyed, including approximate location of kelp bed boundary line, temperature, depth measurements, and locations of photo points.



Post-survey checklist:

- ☑ Kelp bed perimeter track is saved in one or more GPS units
- ☑ GPS units are collected for storage until next survey
- ☑ Data sheets are completely filled out and legible.
- ☑ Photo point has been taken (and is later uploaded with properly labeled names)

Northwest Straits INITIATIVE

Bull Kelp Survey Data Sheet (on the water)

Kelp Bed name Freshwater Bay **Survey start time:** 1110 hours

Survey Endpoints (1 = first recorded survey endpoint, 2 = second recorded survey endpoint)

Survey Endpoint 1 (GPS point name): 031 Survey Endpoint 2 (GPS point name): 035

Perimeter Start 2024-08-22-13:58

GPS perimeter (track name): 031 GPS-Track

Start of perimeter (GPS point name): 030 End of perimeter (GPS point name): ~~035~~ 040

Points (If there is no bed, take a waypoint for each kelp cluster with ≤10 bulbs within shoreline segment):

Deep edge → GPS Point name: 032 Depth: 36 ft, Temp: 10.0 C Observations: Outside, W end 1120

→ GPS Point name: 034 Depth: 36.5 ft, Temp: 9.6 C Observations: Outside, E end 1210

depth x temp GPS Point name: _____ Depth: _____ ft, Temp: _____ Observations: _____

GPS Point name: _____ Depth: _____ ft, Temp: _____ Observations: _____

GPS Point name: _____ Depth: _____ ft, Temp: _____ Observations: _____

Kelp Bed Water Temperature and Depth (ft):

Edge closest to shore 1 (GPS Point name): 037 Depth: 10 ft, Temp: 10.0 C Time: 1303

Edge closest to shore 2 (GPS Point name): 039 Depth: 8 ft, Temp: 9.8 C Time: 1341

Edge farthest to shore 1 (GPS Point name): _____ Depth: _____ ft, Temp: _____ Time: _____

Edge farthest to shore 2 (GPS Point name): _____ Depth: _____ ft, Temp: _____ Time: _____

Photo points: (take first photo, then take a photo of this data sheet with the corresponding box checked)

033 ☑ **ToBe** ☑ **Interesting kelp bed photos** ☑ **Photos of Volunteers** – Joanne

Observations (consider density, animals present, overall health of blades, presence of understory kelp, human impacts, fishing activity, etc.): Kelp very clean for late August

Appears denser than 2022, 2023

Macrocystis noted @ GPS point 037

Hole 50'x80' North GPS point 037 – sandy bottom

Hole 60'x90' North of 038 – no kelp sandy bottom w cobble

End time (time of last measurement or observation before returning to shore): 1433

Northwest Straits INITIATIVE

Bull Kelp Survey Data Sheet (on shore)

Pre-Survey Section (on the beach)

Trip Leader: Amelia K Date: 9/1/24

Name of surveyors: Joanne LaBaw

Location (Shoreline Segment): Freshwater Bay 2

Name of GPS unit or phone app Garmin 78sc Accuracy of GPS: +/- 9 ft

Weather conditions (circle one)

Clear Haze (Clouds) Fog/mist Light rain Heavy rain

Tide station Port Angeles Tide height (ft): -0.5ft

Current station/source: Amelia K -observation Current (knots): 2kt

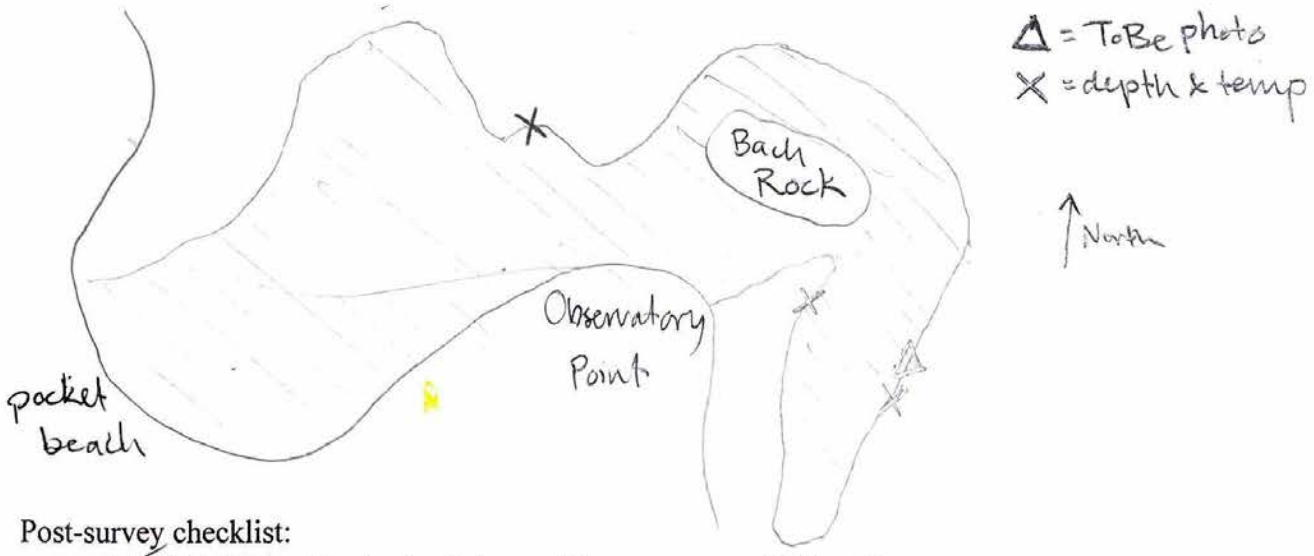
Survey condition notes (wind/wave condition, current behavior, sparse kelp outside of perimeter?):

flat calm

Proceed to page 2 to conduct survey. Following your survey, fill out Post-Survey section below.

Post-Survey Section (back on the beach after the survey)

Provide a sketch of the area surveyed, including approximate location of kelp bed boundary line, temperature, depth measurements, and locations of photo points.



Post-survey checklist:

- ☑ Kelp bed perimeter track is saved in one or more GPS units
- ☑ GPS units are collected for storage until next survey
- ☑ Data sheets are completely filled out and legible.
- ☑ Photo point has been taken (and is later uploaded with properly labeled names)

Northwest Straits INITIATIVE

Bull Kelp Survey Data Sheet (on the water)

Kelp Bed name east / Bach Rock - Freshwater Bay 2 **Survey start time:** 8:54

Survey Endpoints (1 = first recorded survey endpoint, 2 = second recorded survey endpoint)

Survey Endpoint 1 (GPS point name): 051 Survey Endpoint 2 (GPS point name): 057

Perimeter

GPS perimeter (track name): 2024-09-01 09:29:40

Start of perimeter (GPS point name): 052 End of perimeter (GPS point name): 056

Points (If there is no bed, take a waypoint for each kelp cluster with ≤10 bulbs within shoreline segment)**:**

GPS Point name: _____ Depth: _____ ft, Temp: _____ Observations: _____

GPS Point name: _____ Depth: _____ ft, Temp: _____ Observations: _____

GPS Point name: _____ Depth: _____ ft, Temp: _____ Observations: _____

GPS Point name: _____ Depth: _____ ft, Temp: _____ Observations: _____

GPS Point name: _____ Depth: _____ ft, Temp: _____ Observations: _____

Kelp Bed Water Temperature and Depth (ft):

Edge closest to shore 1 (GPS Point name): unsafe Depth: _____ ft, Temp: _____ Time: _____

Edge closest to shore 2 (GPS Point name): 055 Depth: 14 ft, Temp: 9.8 Time: 9:31

Edge farthest to shore 1 (GPS Point name): 053 Depth: 29 ft, Temp: 10.0 Time: 9:01

Edge farthest to shore 2 (GPS Point name): 054 Depth: 21 ft, Temp: 10.5 Time: 9:20

Photo points: (take first photo, then take a photo of this data sheet with the corresponding box checked)

1054 AK phone ☑ **ToBe** forgot pt 2 off right of back rock ☐ **Interesting kelp bed photos** ☐ **Photos of Volunteers**

Observations (consider density, animals present, overall health of blades, presence of understory kelp, human impacts, fishing activity, etc.): Bed very sparse near pocket beaches. Lots of bryozoan. Large white buoy with hole in kelp around it- no pics.

End time (time of last measurement or observation before returning to shore): 9:36

Northwest Straits INITIATIVE

Bull Kelp Survey Data Sheet (on shore)

Pre-Survey Section (on the beach)

Trip Leader: Amelia Kalagher Date: 9/1/24

Name of surveyors: Joanne LaBaw

Location (Shoreline Segment): Freshwater Bay beds 2 & 3 (Bach Rock)

Name of GPS unit or phone app Garmin 78SC Accuracy of GPS: +/- 9 ft

Weather conditions (circle one)

Clear Haze (Clouds) Fog/mist Light rain Heavy rain

Tide station Port Angeles Tide height (ft): -0.5 ft

Current station/source: Amelia K - observation Current (knots): 2kt

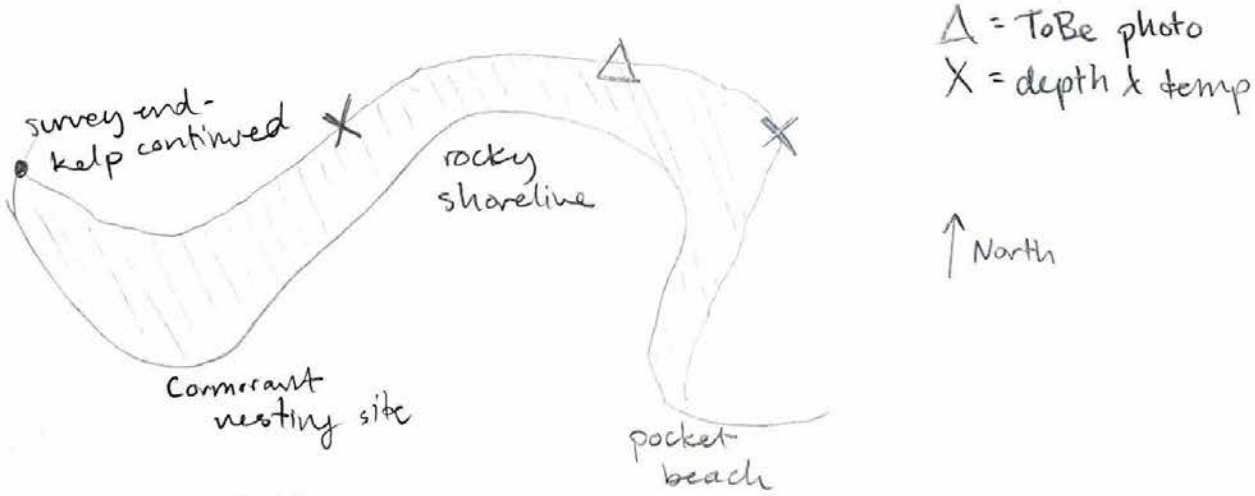
Survey condition notes (wind/wave condition, current behavior, sparse kelp outside of perimeter?):

Flat calm.

Proceed to page 2 to conduct survey. Following your survey, fill out Post-Survey section below.

Post-Survey Section (back on the beach after the survey)

Provide a sketch of the area surveyed, including approximate location of kelp bed boundary line, temperature, depth measurements, and locations of photo points.



Post-survey checklist:

- ☑ Kelp bed perimeter track is saved in one or more GPS units
- ☑ GPS units are collected for storage until next survey
- ☑ Data sheets are completely filled out and legible.
- ☑ Photo point has been taken (and is later uploaded with properly labeled names)

Northwest Straits INITIATIVE

Bull Kelp Survey Data Sheet (on the water)

Kelp Bed name Farther west - Freshwater Bay 3 **Survey start time:** 9:09

Survey Endpoints (1 = first recorded survey endpoint, 2 = second recorded survey endpoint)

Survey Endpoint 1 (GPS point name): 041 Survey Endpoint 2 (GPS point name): 047

Perimeter

GPS perimeter (track name): 2024-09-0108:51:13

Start of perimeter (GPS point name): 042 End of perimeter (GPS point name): 049

Points (If there is no bed, take a waypoint for each kelp cluster with ≤10 bulbs within shoreline segment)**:**

GPS Point name: _____ Depth: _____ ft, Temp: _____ Observations: _____

GPS Point name: _____ Depth: _____ ft, Temp: _____ Observations: _____

GPS Point name: _____ Depth: _____ ft, Temp: _____ Observations: _____

GPS Point name: _____ Depth: _____ ft, Temp: _____ Observations: _____

GPS Point name: _____ Depth: _____ ft, Temp: _____ Observations: _____

Kelp Bed Water Temperature and Depth (ft):

Edge closest to shore 1 (GPS Point name): [illegible] Depth: _____ ft, Temp: _____ Time: _____

Edge closest to shore 2 (GPS Point name): unsafe Depth: _____ ft, Temp: _____ Time: _____

Edge farthest to shore 1 (GPS Point name): 043 Depth: 27 ft, Temp: 15.5 Time: 8:15

Edge farthest to shore 2 (GPS Point name): 045 Depth: 24 ft, Temp: 12.3 Time: 8:30

046 corner cuts

Photo points: (take first photo, then take a photo of this data sheet with the corresponding box checked)

☑ **ToBe** 044 ☐ **Interesting kelp bed photos** ☑ **Photos of Volunteers**

Observations (consider density, animals present, overall health of blades, presence of understory kelp, human impacts, fishing activity, etc.): Lots of detached kelp, some rotting. Bed in lower dumps. Macrocystis & rockweed floating mixed in. Lots of bryozoan. Young herring.

Had to stop because kelp fringe was constant. Unsafe to record shallow edge

End time (time of last measurement or observation before returning to shore): 8:49 for this bed