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PROJECT TITLE: Bull Kelp Monitoring Report

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2018 Kelp Monitoring

Introduction

In 2018 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 three locations during low-tide events between July and September, 2018.

The expected outcomes were 1) to use of 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 support environmental decision-making.

Kelp Survey in Clallam Bay July 16, 2018

Two surveyors, Griffin Hoins and Helle Andersen, conducted a survey of the kelp bed identified in Clallam Bay during the 2016 land based reconnaissance survey. The survey was initiated at 12:40 with a tidal elevation of 0.0 ft. and completed at 14:40. The perimeter of the kelp bed was approximately 1.1 miles and the total kelp bed area was approximately 18.8 acres. Most of the area was dominated by giant kelp with the perimeter a mix of giant and bull kelp, but approximately 5.5 acres was dominated by bull kelp (Figure 1). Figure 2 presents photos from the survey. The survey datasheets are provided in Appendix A.

Figure 1. The map of the kelp bed in Clallam Bay based on the field recorded GPS readings taken July 16, 2018. The purple/blue line depicts the extent of the kelp bed in 2018 and the red line in 2017. The light blue section of the 2018 kelp bed was dominated by bull kelp. The red number boxes indicate where depth and temperature measurements were taken.

The kelp bed measurements taken during surveys in 2017 and 2018 are summarized in Table 1.

Table 1. Kelp bed size and composition in 2017 and 2018.

Date	Diameter (miles)	Area (acres)	Area Dominated by Bull Kelp (acres)
July 2018	1.1	18.8	5.5
July 2017	1.14	23	14.7

The water temperature and depth around the perimeter of the kelp bed were measured and recorded (Table 2). The red boxes on Figure 1 show the locations of the measurements.

Table 2. Temperature and depth measurements taken during the kelp survey in Clallam Bay.

Location	Temperature (°C)	Depth (ft.)	Time
Inside #24	13	9	12:43
Inside #28	14	7	13:23
Inside #29	14	8	13:33
Outside #25	13	15	12:55
Outside #26	12	18	13:00
Outside #27	13	16	13:12


Figure 2. Pictures of the kelp bed in Clallam Bay taken during the 2018 survey.

Plankton sampling was attempted using the NW Straits protocol to document zooplankton-kelp associations. The protocol advises for 500ml of surface water to be collected and filtered from inside and 15 meters outside the bed. We also collected 2L of surface water using the same method because we thought 500ml was an insignificant volume for sampling. We filtered the water through the cod end of a 180 micron plankton net. Either the 500 ml or 2 L samples provided any significant counts of zooplankton.

Kelp Surveys in Freshwater Bay

Two monitoring surveys were conducted in Freshwater Bay July 26 and August 10, 2018. The following sections provide a brief summary of the two surveys.

<u>Survey July 26, 2018</u>

Three surveyors, Griffin Hoins, Jeff Ward and Alan Clark, conducted a monitoring survey in Freshwater Bay on July 26, 2018. The survey, which focused on a large kelp bed east of the boat ramp, was initiated at 10:07 with a tidal elevation of 0.3 ft. and completed at 12:40. The perimeter of the kelp bed was approximately 2.9 miles and the total kelp bed area was approximately 78 acres (Figure 3). Most of the area was dominated by bull kelp. Figure 4 presents photos from the survey. The survey datasheets are provided in Appendix A.

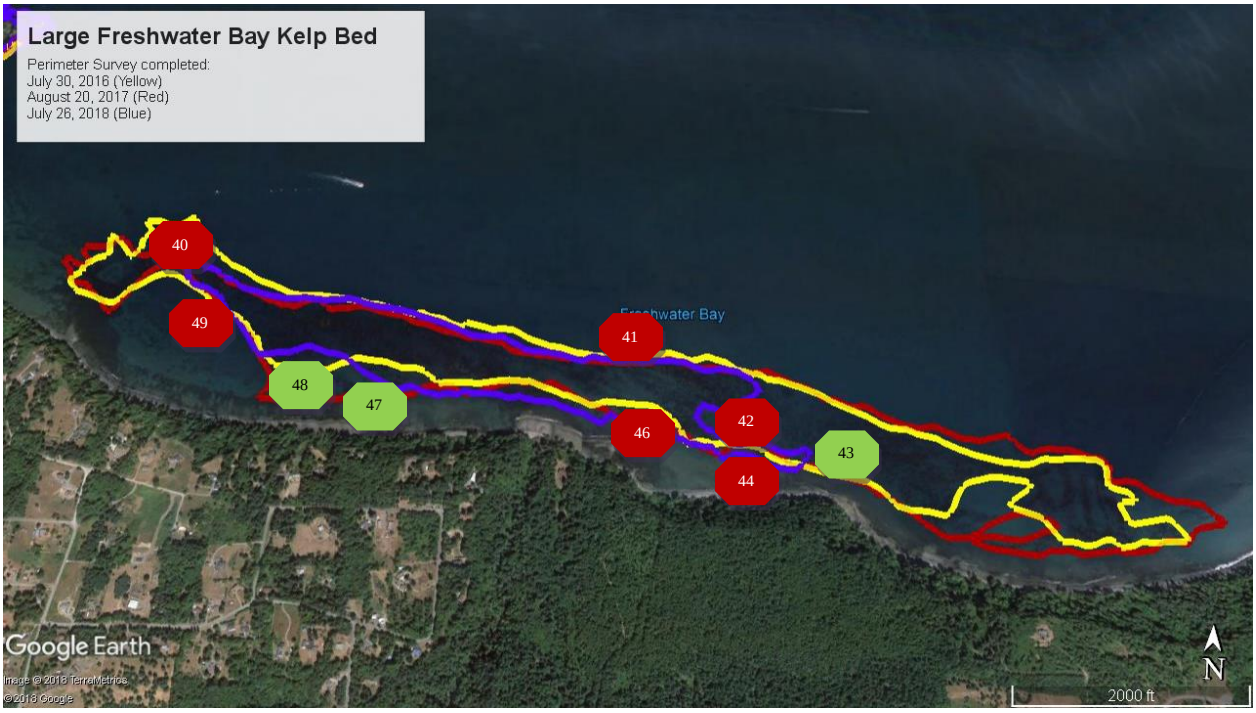


Figure 3. The map of the large kelp bed at Freshwater Bay based on the field recorded GPS readings taken July 26, 2018. The purple/blue line depicts the extent of the kelp bed in 2018, the red line in 2017 and the yellow line in 2016. The red number boxes - waypoints - indicate where depth and temperature measurements were taken.

At waypoint #43 (green box Figure 3) the kelp continued east but spacing between individuals was wide enough that we chose to consider it not part of the large bed. It was the same case for #47 and #48 where the bed was sparse south of the perimeter and not considered part of the large bed. The kelp bed measurements taken during surveys in 2016, 2017 and 2018 are summarized in Table 3.

Table 3. Size and composition of large kelp bed in Freshwater Bay in 2016, 2017 and 2018.

Date	Diameter (miles)	Area (acres)	Kelp Composition
July 2018	2.9	78.0	Mostly bull kelp
August 2017	4.98	174.7	Mostly bull kelp with two areas of giant kelp
July 2016	5.08	141.1	Not recorded

The water temperature and depth around the perimeter of the kelp bed were measured and recorded (Table 4). The red boxes on Figure 3 show the locations of the measurements.

Table 4. Temperature and depth measurements taken during the survey of the large bed in Freshwater Bay.

Location	Temperature (°C)	Depth (ft.)	Time
Inside #42	13	15	11:15
Inside #44	14	4	11:35
Inside #46	15	5	11:52
Inside #49	12	25	12:15
Outside #40	12	22	10:34
Outside #41	12	33	10:59

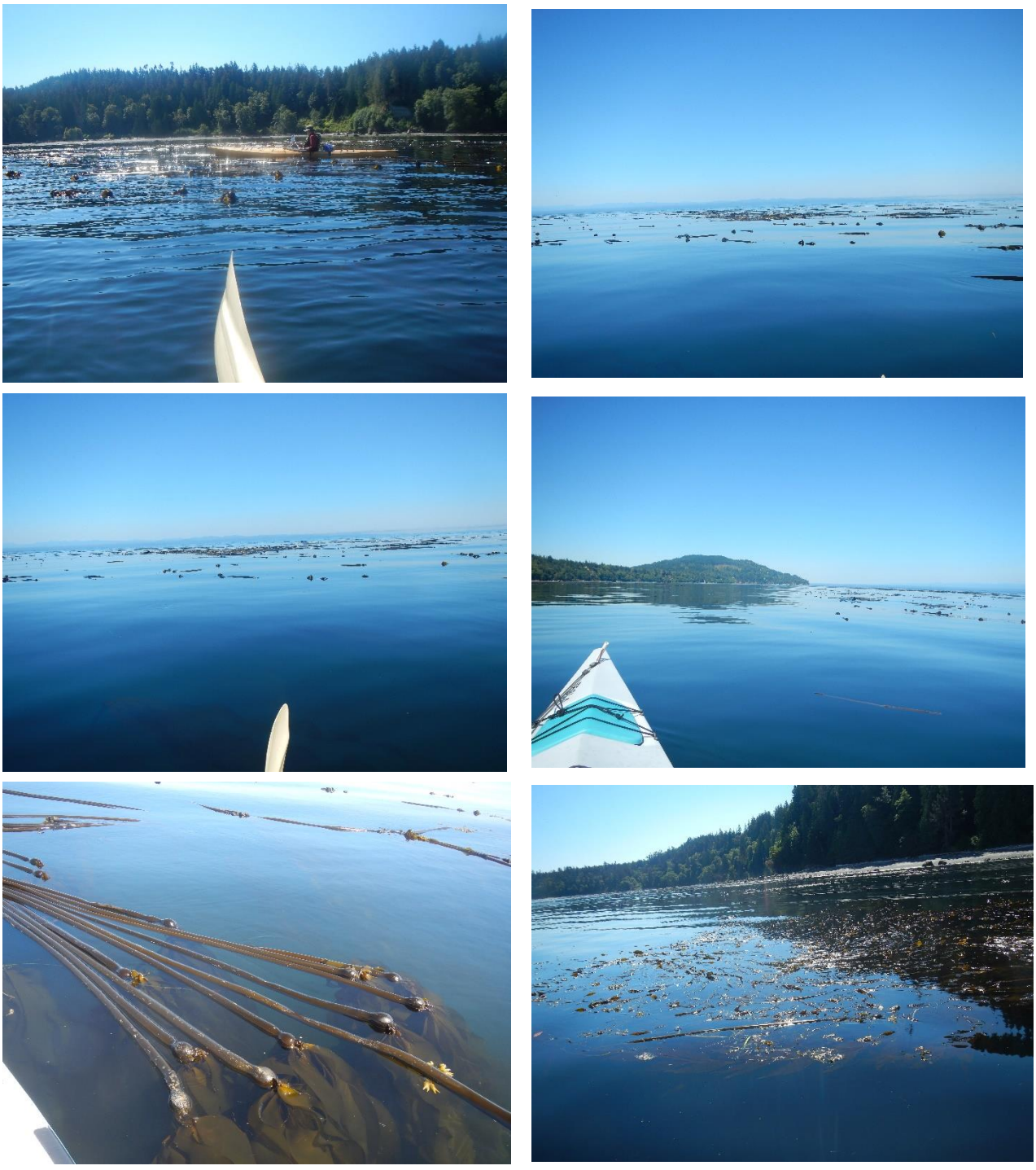


Figure 4. Pictures of the large kelp bed in Freshwater Bay taken during the 2018 survey.

Similar to the survey in Clallam Bay plankton sampling was attempted again, this time using a 180 micron plankton net and taking a vertical 15-foot water column sample. The samples were much more concentrated, but unfortunately dropping the plankton net into the middle of a kelp bed led to difficulties retrieving it, thus making the actual volume of water sampled between inside and outside of

the bed different. Counts and general zooplankton observed were recorded from 5 ml of 180 micron filtered sample (Table 5). However, counts cannot be accurately compared between sites.

Table 5. Zooplankton counts from samples collected during the survey July 26, 2018.

Zooplankton Group	Inside	Outside
Nauplii	113	273
Larvacean	6	9
Copepod	29	59
Polychaete	0	1
Cladoceran	1	0
Cyprid	0	1
Fish Larvae	0	1

Survey August 10, 2018

Three surveyors, Griffin Hoins, Jeff Ward and Alan Clark, conducted a survey in Freshwater Bay on August 10, 2018. The survey, which focused on the small kelp bed west of the boat ramp, was initiated at 09:47 with a tidal elevation of -0.7 ft. and completed at 11:00. The perimeter of the kelp bed was approximately 0.9 miles and the total kelp bed area was approximately 4.3 acres (Figure 5). All of the area was dominated by bull kelp. Figure 7 presents photos from the survey. The survey datasheets are provided in Appendix A.

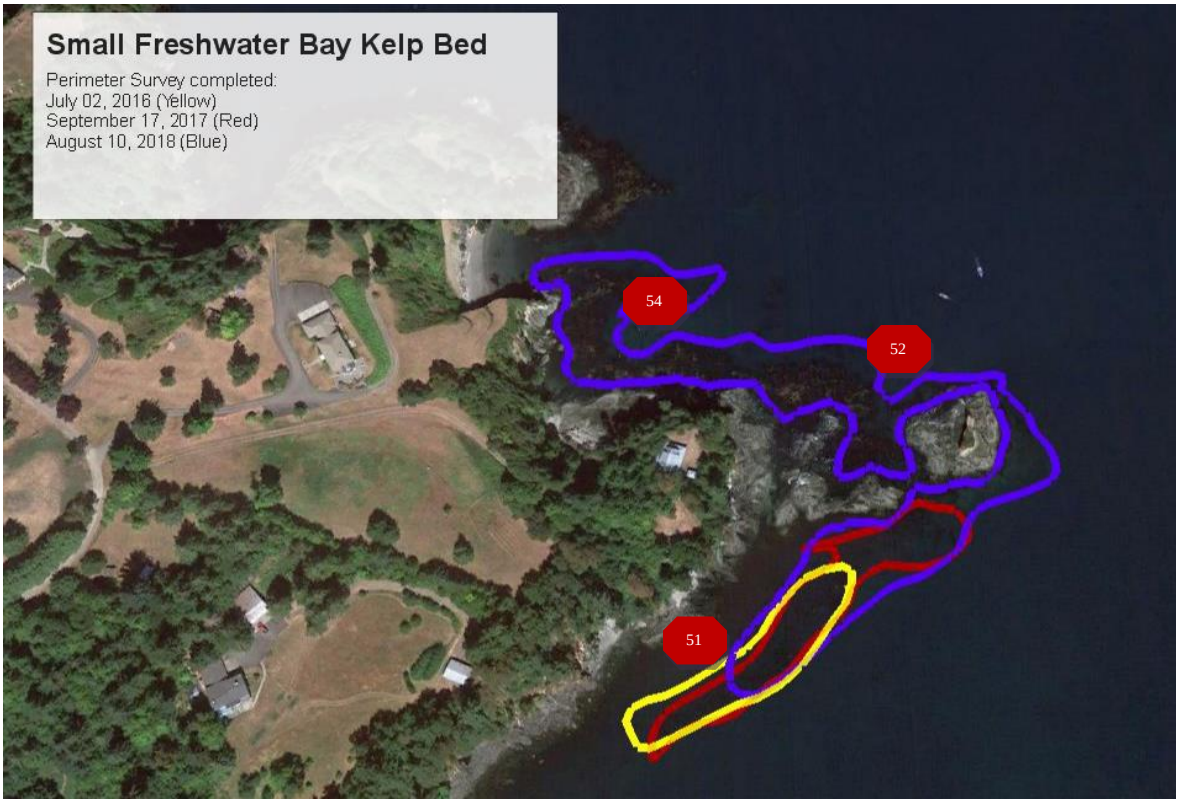


Figure 5. The map of the small kelp bed at Freshwater Bay based on the field recorded GPS readings taken August 10, 2018 (Google Earth map). The purple/blue line depicts the extent of the kelp bed in 2018, the red line in 2017 and the yellow line in 2016. The red number boxes - waypoints - indicate where depth and temperature measurements were taken.

The kelp bed measurements taken during surveys in 2016, 2017 and 2018 are summarized in Table 6. Because the survey in 2018 went outside Bachelor Rock and included the kelp on the north side of the shore, the kelp bed area south of Bachelor Rock was estimated to enable a comparison with the kelp bed in 2016 and 2017 (Figure 6).

Table 6. Size and composition of small kelp bed in Freshwater Bay in 2016, 2017 and 2018

Date	Diameter (miles)	Area (acres)	Kelp Composition
August 2018	0.9	1.06 (total area 4.3)	Only bull kelp
September 2017	0.25	0.92	Only bull kelp
July 2016	0.2	0.71	Not recorded

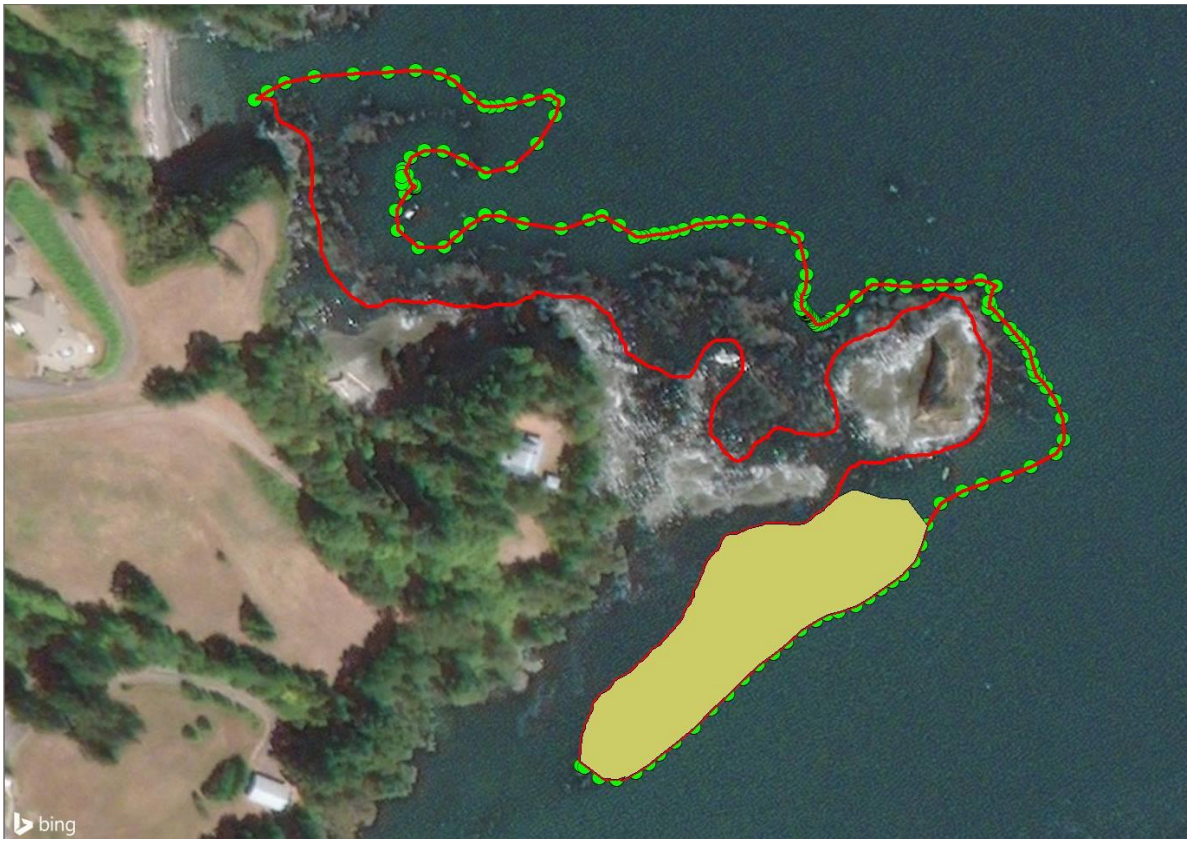


Figure 6. The map of the small kelp bed at Freshwater Bay based on the field recorded GPS readings taken August 10, 2018. The green dots are the track line, the red line the estimated extent of the kelp bed and the green highlighted area the estimated area of the kelp bed south of Bachelor Rock.

The water temperature and depth around the perimeter of the kelp bed were measured and recorded (Table 7). The red boxes on Figure 5 show the locations of the measurements.

Table 7. Temperature and depth measurements taken during the survey of the small bed in Freshwater Bay

Location	Temperature (°C)	Depth (ft.)	Time
Inside #51	15	8	9:50
Outside #52	11	23	10:02
Outside #54	12	14	10:11

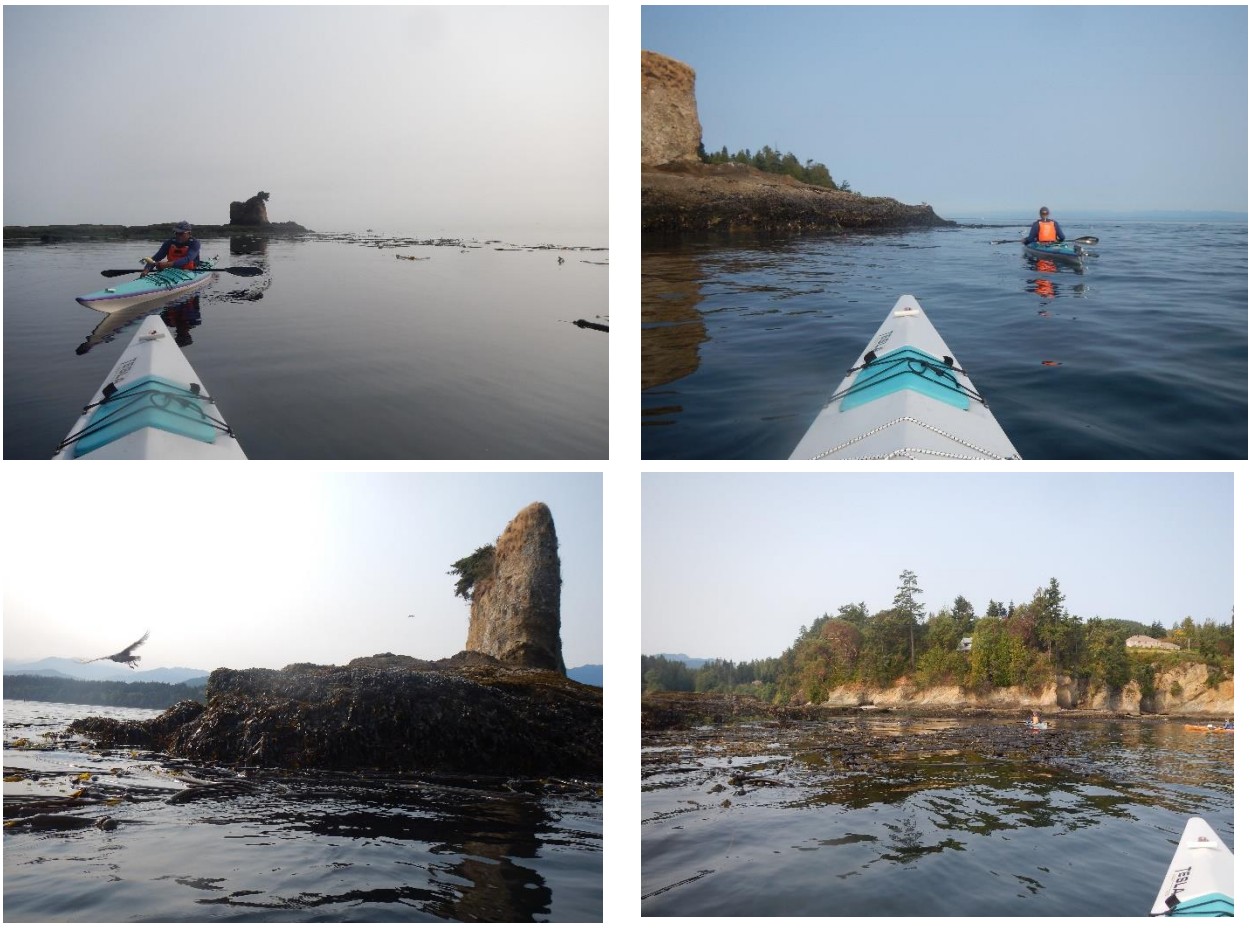


Figure 7. Pictures of the small kelp bed in Freshwater Bay taken during the 2018 survey.

Plankton sampling was attempted again within kelp bed using a device created by Jeff Ward that pumped water to avoid the difficulties of dropping a net into a thick kelp bed. It was found that 8 pumps were approximately 8 gallons of water, which was then filtered through the 180 micron plankton net. Plankton samples have yet to be processed.

2018 Intern Project

The kelp monitoring project was used as one of the 2018 intern projects. Griffin Hoins participated in the three kelp bed surveys. He gave a PowerPoint presentation at the Intern Celebration, August 20, 2018.

Appendix A – Field Data Sheets

Bull Kelp Survey Data Sheet (on shore)

Pre-Survey Section (on the beach)

Names of surveyors: Griffin Hoins, Helle Andersen

Location: Clallam Bay West County Park

Date: 07/16 Weather conditions (circle one)

(Clear) 12:40 Clouds Heavy rain Light rain Fog/mist

Tide height (ft): Start 0.0ft Tide station: 9443361, Sekiu, Clallam Bay, WA

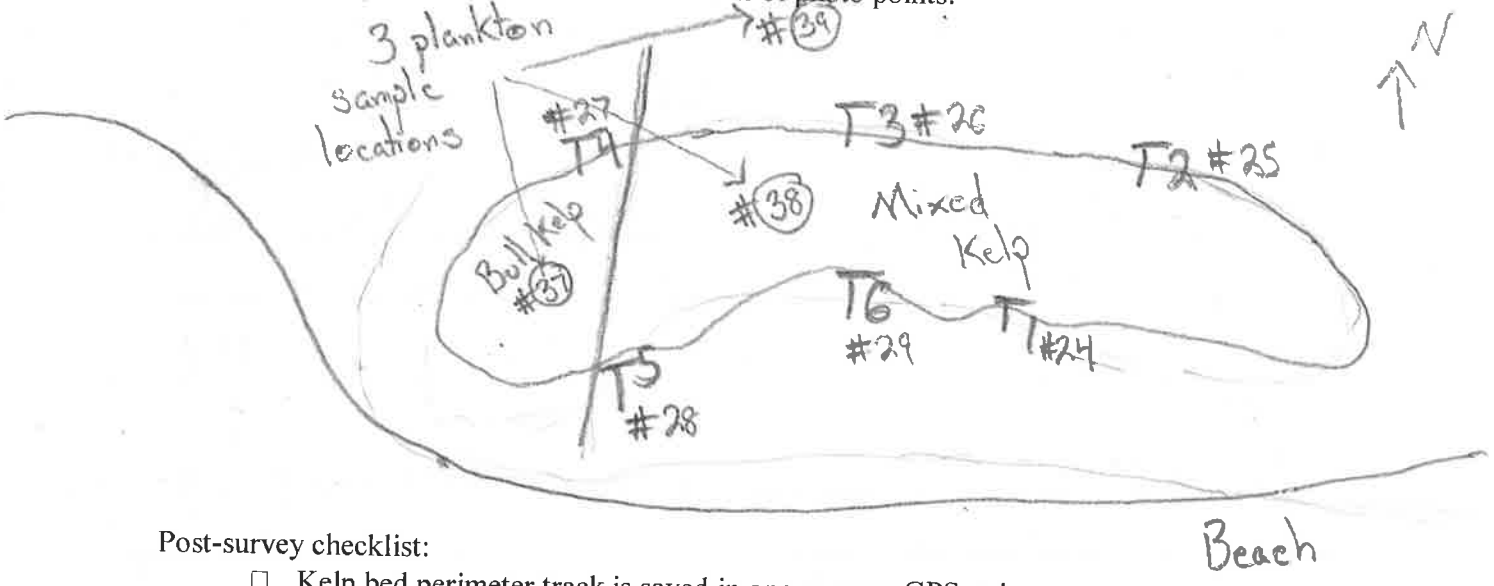
Current (knots): -0.75 Station/source: Pillar Point/NOAA

Name of GPS unit or phone app GPS map 60CSx Accuracy of GPS: +/- 10 ft

☐ 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 approx. 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 points have been taken (and are later uploaded with properly labeled names)

Plankton

37
Bull 1 500
2 2000

38
Macro 1 500
2 2000

Bull Kelp Survey Data Sheet (on the water)

Data point in GPS

Kelp Bed number or Name Clallam Bay

Start time (time of ~~temperature~~ measurement): 12:40 Time

In #24 **Water Temp. (°C):** 14° 9ft 12:43 Temp. Depth

Out #25 **Depth (ft):** 13° 15 ft 12:55

#26 Edge closest to shore: 12° 18 ft, GPS Point name: 1:00 Time:

#27 Edge farthest to shore: 13° 16 ft, GPS Point name: 1:12 Time:

In #28 **Perimeter:**

GPS point name at beginning of paddle around bed: 14° 7ft 1:23 #24 beginning of track

#29 GPS perimeter track name: 14° 8ft 1:33

GPS point name at end of paddle around bed: 16 Jul Clal

39 Out 1
2

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

☐ **ToBe** ☐ **ToWa** ☐ **BeL** ☐ **BeR** ☐ **Volunteer photos**

Observations (consider density, animals present, overall health of blades, presence of understory kelp, human impacts, etc.): High visibility & water clarity. Macro majority composition of be
Nereo majority western corner & outer perimeters Phyllospora
& Egregia along shore side make up understory. Eel grass
also present in shallow depths. Seals, marine birds
observed.

Other notes:
Attempted plankton sampling using NW Straits protocol
inside & outside of beel

End time (time of last measurement or observation before returning to shore): 14:40

10:07

Bull Kelp Survey Data Sheet (on shore)

Pre-Survey Section (on the beach)

Names of surveyors: Griffin, Alan, Jeff

Location: Freshwater Bay

Date: 7/26/18 Weather conditions (circle one)

(Clear) Clouds Heavy rain Light rain Fog/mist

Tide height (ft): Start 0.3 Tide station: Will, Weather / NOAA

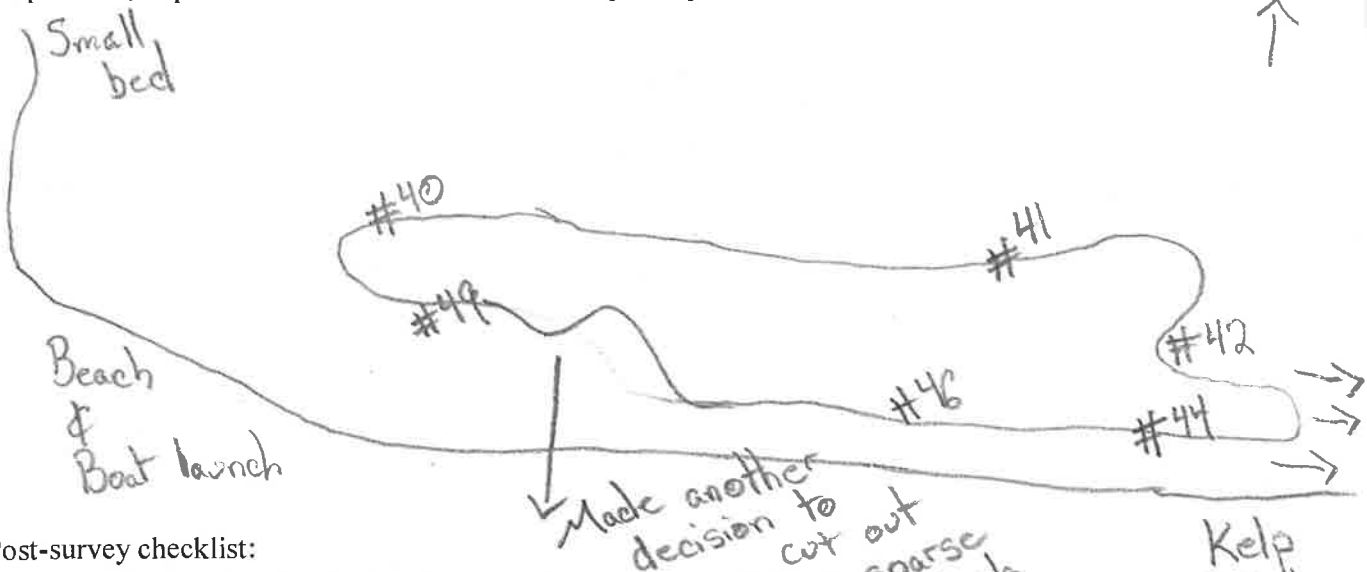
Current (knots): -2.5 Station/source: Angeles Pt / NOAA

Name of GPS unit or phone app: GPS map 60CSx Accuracy of GPS: +/- 10 ft

☐ 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 approx. 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 <u>completely</u> filled out and legible.
- ☐ Photo points have been taken (and are later uploaded with properly labeled names)

Bull Kelp Survey Data Sheet (on the water)

Kelp Bed number or Name Freshwater Bay

Start time (time of temperature measurement): _____

Out 1 **Water Temp. (°C):**	12°	22ft	#40	10:34
Out 2 **Depth (ft):**	12°	33ft	#41	10:59
In 1 Edge closest to shore:	13° ft, GPS Point name:	15ft	#42	Time: 11:15
In 2 Edge farthest to shore:	14° ft, GPS Point name:	4ft	#44	Time: 11:35
In 3 **Perimeter:**	15°	5ft	#46	11:52
In 4 GPS point name at beginning of paddle around bed:	12°	25ft	#49	12:15 #43

Calling it sparse but Kelp continues Dense close to shore

GPS perimeter track name: 26JulFWB

GPS point name at end of paddle around bed: _____

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

☐ **ToBe** ☐ **ToWa** ☐ **BeL** ☐ **BeR** ☐ **Volunteer photos**

Observations (consider density, animals present, overall health of blades, presence of understory kelp, human impacts, etc.): Lot of surf smelt seals gulls, cormorants jumping salmon, feather boa (Egregia), Nereo Macro, Pterygophora loon, Nereo vast majority of bed composition. Bed massive but some areas sparse and based on protocol decided to not record in perimeter of actual bed

Other notes:

#45 Sparse in middle of bd. denser around perimeter

#47-48 To the left, shoreline bed connected by narrow band but not recorded

More plankton sampling, this time with net to collect larger volume of water.

End time (time of last measurement or observation before returning to shore): 12:40

Bull Kelp Survey Data Sheet (on shore)

Pre-Survey Section (on the beach)

Names of surveyors: Griffin, Alan Clark Jeff Ward

Location: Freshwater Bay, Small bed

Date: 8/10/18 Weather conditions (circle one)

Clear Clouds Heavy rain Light rain Fog/mist Haze

Wildfires

Tide height (ft): Start -0.7 Tide station: Willy Weather / NOAA

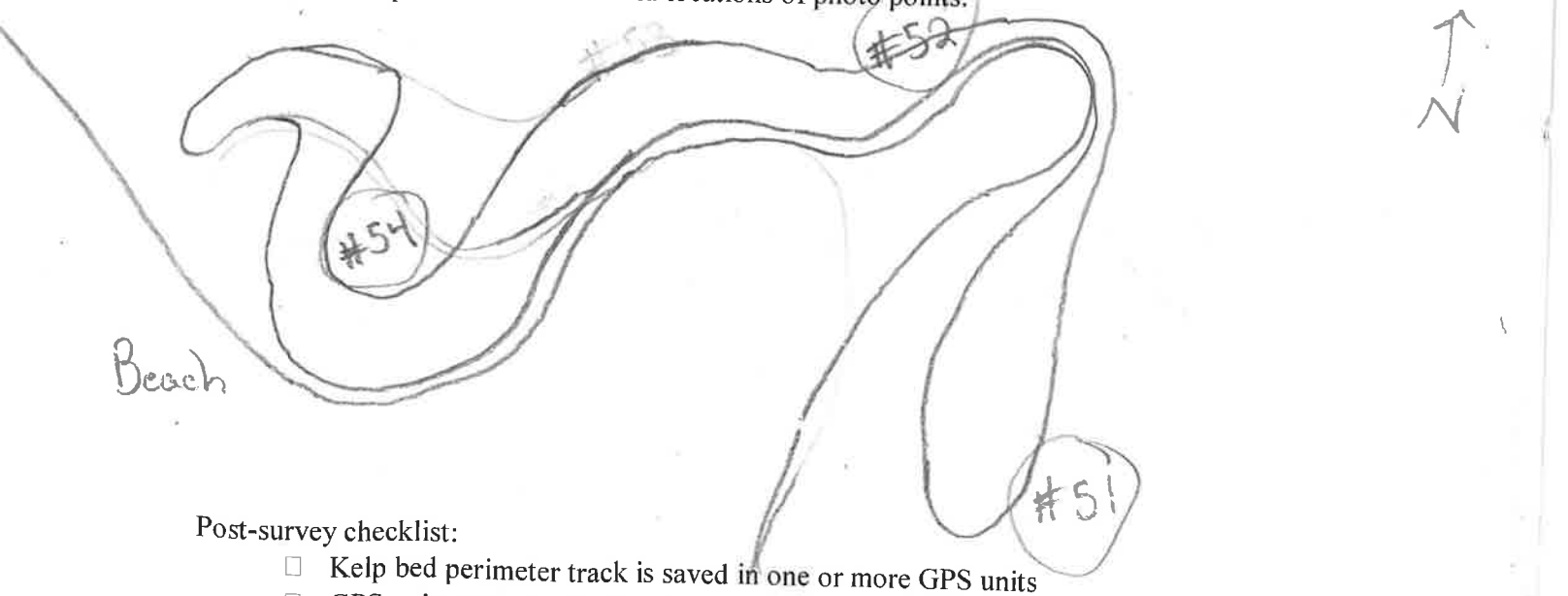
Current (knots): -2.5 Station/source: Angeles Pt / NOAA

Name of GPS unit or phone app GPS map 60CSx Accuracy of GPS: +/- 10 ft

☐ 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 approx. location of kelp bed boundary line, temperature, depth measurements and locations of photo points.



Post-survey checklist:

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- ☐ GPS units are collected for storage until next survey
- ☐ Data sheets are completely filled out and legible.
- ☐ Photo points have been taken (and are later uploaded with properly labeled names)

Bull Kelp Survey Data Sheet (on the water)

S3 Patch to right

Kelp Bed number or Name FWB Small bed

Start time (time of temperature measurement): 09:47

Water Temp. (°C): _____ In #51 8ft 15°C 9:50

Depth (ft): Out #52 23ft 11°C 10:02

Out #54 14ft 12°C 10:11

Edge closest to shore: _____ ft, GPS Point name: _____ Time: _____

Edge farthest to shore: _____ ft, GPS Point name: _____ Time: _____

Perimeter:

GPS point name at beginning of paddle around bed: #51

GPS perimeter track name: 10 Aug FWSm

GPS point name at end of paddle around bed: _____

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

☐ **ToBe** ☐ **ToWa** ☐ **BeL** ☐ **BeR** ☐ **Volunteer photos**

Observations (consider density, animals present, overall health of blades, presence of understory kelp, human impacts, etc.): Lots of bait fish, otter mom & pups, salmon jumping, Kingfisher, all Nereo, some clean kelp, other lots of epiphytes, made call to continue with bed around headland unlike in other years People fishing around area.

Other notes:

3rd attempt at sampling plankton, this time with pump/bilge device created by Jeff.

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