

**Fisheries Report
For the Streams in the
Proposed
Port Clements Shoreline Park Area**

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1.0. Introduction

The Village of Port Clements has plans to develop a strip of oceanfront property that extends for approximately two km in front of 24 rural residential lots. Several small streams drain the surrounding landscape and flow through proposed park property into Masset Inlet adjacent to the Yakoun River estuary. Eight species of salmonids, two species of sculpins and sticklebacks use the nearby Yakoun River and concerns were raised regarding the fish use of the streams in the proposed park area. The purpose of this project was to sample the streams for fish presence and assess the fish habitat in the streams in the area.

1.1. The Study Area

The property in question is approximately 2km long and ranges from approximately 35 to approximately 140m wide. Average width is approximately 60m. The foreshore of the property meets the intertidal zone of Masset Inlet, adjacent to the Yakoun River estuary.

The estuary of the Yakoun River is a very important area, with abundant forage and cover and is heavily used by a wide variety of fish and wildlife species throughout the year. The Yakoun estuary received the only maximum rating for coastal wetlands on the islands for its waterfowl, wildlife and fisheries productivity (Hunter et.al., 1985). Large tidal flats with communities of eelgrass (*Zostera marina*), rockweed (*Fucus sp.*) and sedges (*Carex sp.*) are found in the estuary and provide important rearing and feeding areas for numerous fish and wildlife species (Nijman, 1993; Stockner and Levings, 1982). The Yakoun River estuary was among the highest ranked estuaries in the "Coastal Wetland Habitat Classification for Northwestern BC" (Remington, 1993). The upper intertidal portion of the beach is lined with driftwood and logs of varying size as well as other marine life and detritus washed in with the tide.

The property the streams flow through has been logged in various locations at various times creating a unique and diverse ecosystem in several stages of seral development in a thin strip of uneven aged forest types adjacent to the estuary. The forest of the proposed park is rich in biodiversity with abundant plant species and wildlife, in particular songbirds. Almost all of the creeks drain the landscape across Bayview Drive and flow in a more or less westerly direction toward the ocean. Several of the creeks flow across an existing trail that winds through the forest and runs more or less parallel to the beach. The trail passes through many of the diverse habitat types in the forest and was created in about 1999 using a small "Bobcat" – type excavator.

The inland boundary of the proposed park area is a two lane paved road known as Bayview Drive and all fish sampling effort was concentrated in the area between

Bayview Drive and the foreshore of Masset Inlet (Figures 1a, 1b). The GPS reference points refer to the streams as outlined in Table 1.

Preliminary reconnaissance and georeferencing took place on June 10, 2001. Fish sampling took place on June 12 and 13, 2001.



Figure 1. Aerial photo of northern half of study area including stream GPS points logged.

100 0 100 200 300 400 500 600 Meters



Figure 1b. South half of study area including GPS points logged.

Table 1. Georeferencing table showing points logged at points on streams in the study area. Point numbers refer to points shown on air photos in Figures 1a and 1b.

Creek Number	GPS point where stream meets beach	GPS point at trail crossing	GPS point at road crossing
1	278	N/A	277
2	297	279	280
3	283	N/A	281
4	N/A	285	N/A
5	299	286	296
6	289	288	287
7	290	291	292
8	294	293	N/A
9	302	301	300
10	306	N/A	305
11	309	N/A	303

2.0. Methods

2.1. Georeferencing

Each stream encountered was surveyed from the high tide line at the beach to its road crossing on Bayview Drive. A Garmin 12XL GPS unit was used to log location points at the beach, trail crossing and culvert or nearest point on Bayview Drive. Orange ribbons mark the location and “Creek #” of each stream at their culverts along Bayview Drive. The creeks were numbered sequentially as “Creek 1” through “Creek 11” starting at the north end of the study area.

2.2. Habitat Parameters

Stream channel parameters were measured with a meter tape or meter stick as appropriate. Measurements taken for each stream surveyed were: channel width (average of 6 measurements), wetted width (average of 6 measurements), width at the trail crossing, channel depth (average of 3 measurements). Substrate D90 was measured using a pocket ruler or recorded as <1cm if the substrate was nearly 100 percent fines.

Gradient was measured using a Suunto clinometer and recorded as percent slope.

Water temperature was measured to the nearest half degree Celsius at each site using a handheld, alcohol-filled pocket thermometer. Turbidity was estimated visually as either clear, lightly turbid, moderately turbid or turbid.

Habitat parameters observed or estimated include dominant and sub-dominant substrate materials, dominant and sub-dominant fish cover types, crown closure, flood signs, in-stream vegetation and riparian vegetation stage. Significant fish habitat features were recorded as encountered.

2.3. Fish Sampling

Each wetted stream was sampled for fish presence. Some of the streams in the study area are ephemeral and dry up or nearly dry up in the summer months. Fry traps were placed in each stream that was deep enough, and streams too shallow for traps were electrofished. Creeks that were dry at the time of the study were not sampled for fish presence.

The electrofisher used was a Smith-Root Model XIIB unit with a 10 - inch diameter anode ring and a "rat-tail" cathode. Voltage settings were typically 300-400 volts with a frequency of 80 hertz and pulse width of 6 milliseconds. Electrofishing sessions began prior to taking physical measurements and started at the downstream end of the sample site and progressed upstream. All available habitat types were sampled. Fish captured were identified to species, measured to the nearest mm fork-length, and released. Electrofishing ceased after one fish was captured, confirming fish presence in the stream.

3.0. Results and Discussion

3.1. Habitat Parameters and Fish Sampling

The streams in the study area flow through the proposed park area and into Masset Inlet amongst the logs along the high tide line. At low tide, most of the streams dissipate into the intertidal beach substrate before entering the ocean, making the streams only accessible to marine species on high tides. Although most of the streams had minimal flow at the time of the survey (e.g on average, wetted widths were usually less than half of channel widths), it is evident that after periods of heavy rainfall, the streams likely become more significant potential fish habitat.

Fish habitat parameters recorded for each stream are included in Table 2. Fish sampling results are shown in Table 3.

Table 2. Summary of habitat parameters from creeks in the Port Clements proposed shoreline part study area June 12 - 13, 2001. All width are in meters, gradient in %, D90 in cm; IV= instream vegetation, OV= Overstream veg., LWD= large woody debris, SWD= small woody debris.

Stream #	Channel Parameters				Substrate			Cover				Temp. C	
	Avg Channel Width	Avg Width at Fall Line	Avg Channel Depth	Gradient	D90	Dominant Substr.	D90	total	Dominant	Support	Instream vegetation		Dominant Riparian Type
1	0.8	N/A	0.13	8	6	gravel	6	low	OV	IV	A	shrub	1-20%
2	3.8	3m	0.22	2	1	gravel	1	high	OV	LWD	V,M,A	polesapling	40-70%
3	1.8	N/A	0.12	6	4	gravel	4	moderate	SWD	LWD	M	polesapling	70-90%
4	not sampled	no definite channel			2	gravel	2	high	OV	LWD	V,M,A	polesapling	70-90%
5	1.8	4m	0.13	8	1	gravel	1	moderate	IV	SWD	V,M,A	grasses	0
6	1.4	3m	0.34	9	3	gravel	3	moderate	LWD	OV	M	mature forest	40-70%
7	1	N/A	0.12	18	1	gravel	1	low	OV	SWD	M	mature forest	20-40%
8	2.8	N/A	0.32	9	4	gravel	4	moderate	OV	LWD	V,M,A	mature forest	40-70%
9	1.6	N/A	0.32	4	2	gravel	2	moderate	IV	OV	V,M,A	polesapling	20-40%
10	1.9	N/A	0.08	2	2	gravel	2	moderate	IV	LWD	V,M,A	polesapling	20-40%
11	1.6	N/A	0.18	2	2	gravel	2	moderate	IV	LWD	V,M,A	polesapling	20-40%

Table 3. Summary of fish sampling effort and catch from creeks in the Port Clements proposed shoreline part study area June 12 - 13, 2001. RMA class with a (*) are defaulted to fish-bearing status.

Stream #	Fish Sampling Method	Fly Traps		Electrofishing			Fish Species Captured (total #, sizes)	RMA Class
		Time in June 12, 2001	Time out June 13, 2001	Time (Seconds)	Voltage	Frequency		
1	Electrofishing			118	300	80	NFC	S4*
2	3 Traps	12:55	7:55				NFC	S3*
3	3 Traps	13:50	8:15				NFC	S3*
4	none (nvc)							
5	3 Traps	14:15	8:35	107	300 - 400	80	COHO (19) 45-60mm	S3
6	Electrofishing						NFC	S4*
7	none (dry)						NFC	S4*
8	Electrofishing			14	400	80		S3*
9	Electrofishing			97	400	80	DV (*) 125mm	S3
10	Electrofishing			250	400	80	NFC	S3*
11	Electrofishing			93	400	80	NFC	S3*

A brief description of each creek follows.

3.1.1. Creek 1

Located at the north end of the study area, this narrow creek passes through a culvert near the northeast corner of the proposed park and flows more or less straight down one track of an old beach access road. The substrate is mostly gravel and rust colored, possibly indicating mineral deposits and algal growth is significant, particularly near the road. The stream was very shallow and provides little potential cover for fish except in one pool immediately downstream of the culvert. This pool was heavily choked with algal growth that may be a result of septic runoff from nearby properties.

No fish were captured in 118 seconds of electrofishing in this stream. Gradient of the stream is 8%. Although it is possible that fish could access this stream at high flows and at high tide, overall fish use potential is considered to be low.

3.1.2. Creek 2

This is one of the largest streams in the study area, spreading out significantly with multiple channels downstream of the trail crossing.

The stream is confined to a single channel upstream of the trail crossing and a 0.5m high LWD controlled step is located approximately 5m upstream of the trail crossing. This step is erodable, however, and although it may presently be a barrier to upstream fry migration, this will likely change over time. If present in the stream, Dolly Varden over about 10cm in length may now be able to pass the obstruction if flow conditions are suitable.

Although no fish were captured in the 3 fry traps set overnight, the stream is considered good potential fish habitat, particularly downstream of the trail crossing. Cover is abundant and the gradient is under 3%. At high flows, this stream may spill over its low banks in the lower section, flooding the area between the presently wetted channels.

The mouth of this stream is presently heavily jammed with logs and debris that have washed up on the beach, probably preventing most fish access at this time. As the tides and storms regularly shift the distribution of this shoreline debris in this area, it is likely this stream may become more accessible and used by fish as overwintering or rearing habitat when conditions are favorable.

The trail crossing on this stream has several large logs laying in the channel, probably placed there during trail construction. These logs are presently forming a "corduroy

bridge” across the creek but are likely affecting stream flows and fish migrations in the stream. It is recommended that these logs be removed and replaced by a more appropriate trail crossing.

3.1.3. Creek 3

This stream flows in a channel with high banks on either side, becoming higher approaching the ocean. These banks may have been created by an excavator when the area was logged. Approximately 10m upstream from the ocean the channel drops down slightly and veers to the north as the high banks end near the beach. The stream was de-watered for approximately 10m before the beach at the time of the survey. The channel then enters a pool, located just at the high tide mark. This pool was approximately 0.6m deep and approximately 7mx3m in size. This pool is filled with logs for cover and may be good potential fish habitat. Gradient in the lower portion is 8-10% and 2-4% in the upper section. The de-watered section likely prevents fish from accessing the upper stream in low flows, but at higher flows fish may be able to access the stream.

Although no fish were caught overnight in the fry traps, this stream has fair to good potential fish habitat in the lower 20m and fair habitat upstream to the road, if flow conditions provided fish passage upstream. The portion of this stream upstream of the road is also potential fish habitat.

The existing trail does not cross this creek. The end of the channel nearest the road would require a shorter spanning bridge than would one placed further downstream.

3.1.4. Creek 4

This low wet area was initially thought to be a stream due to the corduroy logs placed across the trail, but upon further investigation, no channel was found. It appears to be a seepage area and was omitted from this survey.

3.1.5. Creek 5

Nineteen coho salmon (*Oncorhynchus kisutch*) fry were captured in 3 fry traps set overnight in Creek 5, the most fish captured in any stream during this survey. The forest surrounding Creek 5 has a very thick shrub layer, consisting mostly of salmonberry, thimbleberry and elderberry. These shrubs provide excellent overstream vegetation cover for the fish using the stream.

The main channel splits into several other channels and floods a Fisheries Sensitive Zone (FSZ) just upstream of the beach. In addition to multiple channels winding through the forested area, this FSZ has some grassy portions that flood at higher water forming pools of standing water with a mucky substrate.

Substrate in the stream is fines near the beach with more gravel and cobble further upstream. It is unknown if the fry present in this stream are progeny of fish that spawned in this creek, or if they are progeny of fish that spawned in a nearby stream (e.g. Yakoun River, Cohoe Creek) and have entered this stream as part of their rearing strategy.

The existing trail crosses this stream with two narrow logs that span the channel. Tracks of dirt bikes that have been using the trail can be seen where riders have driven their motorcycles through a pool where several fish were trapped. The creek is approximately 3m wide at the trail crossing and a proper structure would be required to facilitate crossing the stream.

3.1.6. Creek 6

This narrow ditch was likely dug during logging operations when the forest surrounding this stream was logged in the mid 1990's. The riparian zone is mowed grass in the upper half and the lower portion is surrounded by longer grasses and recently cut alder sapling which cover much of the lower channel. The channel is straight on the upstream end and starts to become sinuous closer to the beach, where the ditching ends.

Due to a meter high bank at the beach, fish access to the stream from the ocean would be possible only at very high tides and major runoff times. The channel drains the ditchlines of adjacent houses and a strong septic smell was obvious. The channel is filled with algae and vascular plants and this stream is considered to be marginal fish habitat at best. No fish were captured in 107 seconds of electrofishing in this stream.

There is presently a wooden plank foot-bridge spanning the channel at the trail crossing.

3.1.7. Creek 7

This stream channel flows through a mature forest section of the proposed park, but it was dry at the time of the study. The lower 2m of this stream above the beach has been routed along the existing trail, causing water (when present) to flood along the trail and soak into the ground without entering the ocean in a definite channel. A small wooden foot-bridge has been placed over this wet area to allow hikers to cross the stream. A few meters upstream of the trail crossing the terrain gets quickly steeper and then flattens out again on top of the ridge. On top of the ridge, water holds in two isolated pools that eventually dry up in dry weather.

The steep section is 27% gradient and it is unlikely that fish can ascend it due to a lack of deep pools to facilitate jumping. That, combined with the present lack of direct access to the ocean, indicates that fish use in this stream is presently unlikely. However, if conditions change and the channel is re-established into the ocean and erosion smoothes access to the upper section, fish may be able to use the stream when water levels are favorable.

3.1.8. Creek 8

This wide channel also flows through mature forest. The stream was very nearly dry at the time of the study, with only a few shallow pools of water, less than 2cm deep. When following this stream from the foot-bridge on the trail up toward the road, it was difficult to ascertain the origin of the stream. No culvert was found at the road and the lack of water made it difficult to determine flow patterns.

Although no fish were caught in 14 seconds of electrofishing, this sample cannot be considered conclusive because the stream may be used by fish as overwintering habitat when water levels are higher.

3.1.9. Creek 9

A 125mm long Dolly Varden char (*Salvelinus malma*) was captured in this stream after 97 seconds of electrofishing.

The lower portion of this creek flows northward, parallel to the beach, for approximately 25m before entering the ocean. The lower section has several channels, mucky substrate, and abundant overstream vegetation cover and floods over its banks into the surrounding grassy areas. For these reasons it must be considered a Fisheries Sensitive Zone. Closer to the road this stream narrows and has a nice gravel substrate. Gradient averages less than 1% near the ocean and 4% closer to the road.

The culvert on Creek 9, crossing Bayview Drive, is perched approximately 1m at the outlet and is likely a barrier to upstream migration of smaller fishes, especially at low flows. A strong septic smell was noticed near this stream.

The existing trail meets up with the road before crossing this creek. The stream banks are higher and more stable nearer to the road (and away from the FSZ) and this should be considered if the trail is to eventually cross this road.

3.1.10. Creek 10

Creek 10 is a low gradient stream that spreads out into several channels nearer to the ocean. The stream also flows sub-surface in places. The channels disperse thorough the forest and mostly veer to the north and run parallel to the beach for approximately 30m before entering the ocean.

Although no fish were captured in 250 seconds of electrofishing in this stream, we cannot rule out fish use. The stream has access to the ocean and could be used by fish whenever flows are adequate. The stream may be particularly useful as overwintering habitat.

The low gradient, low banks and fine soil texture combined with frequent flooding combine to make this area a Fisheries Sensitive Zone. The extent of this FSZ has not been delineated and should be mapped properly by qualified personnel before any development in the area is considered.

3.1.11. Creek 11

Creek 11 has channel characteristics and flow patterns much the same as Creek 10, except on a larger scale. The channels have low banks and numerous muddy overflow channels are visible throughout the forest in the area. At the time of this survey, many of these channels had little or no water in them, but most were quite wet it was obvious that most have had water in them until very recently.

No fish were caught in 93 seconds of electrofishing, but the water in the creek was very low at the time of the study with little available water to sample. At higher water levels, fish could use this stream and its associated flood channels and pools. It may be used as overwintering habitat when conditions are favorable.

Access to the ocean, low gradient, low banks and fine soil texture combined with frequent flooding combine to make this area an extensive Fisheries Sensitive Zone. The extent of this FSZ is substantial and it should be mapped properly by qualified personnel before any development in the area is considered.

3.2. Georeferencing

The GPS points logged during this survey using the Garmin 12XL do not appear to be as accurate as we had hoped. This may be due to poor satellite geometry at the time of the survey or limitations of the equipment. The attached maps (Figures 1a, 1b) show the locations of the points logged. Because some of these points show up quite far from where we know they should land on the photo, it is strongly suggested that these points be confirmed with a more sensitive GPS unit or another mapping method.

Note that for clarity all streams have been labeled with orange ribbon indicating their "Creek # " at their respective road crossings.

4.0. Conclusions and Recommendations

- 1) Although only two of the 10 streams sampled had fish present at the time of this survey, it must be emphasized that one brief sampling session is not considered sufficient proof to confirm fish absence in a stream. The proximity to the ocean and the estuary of the Yakoun River make it very likely that certain fish species use many if not all of the of the other streams in this area at one time or another. No obstacles over 1m high were found and the smaller obstacles cannot be considered barriers to all fish passage. Dolly Varden, in particular, are capable of negotiating the types of obstacles observed in the study area.
- 2) In general, the most sensitive areas in each stream seem to be located immediately upstream of the beach. Near the beach, the terrain is generally flat, the soil texture and banks are quite unstable and comprised mostly of fines. The streams generally tend to spread out into multiple cannels near the ocean and all streams except streams #1 and #6 show signs of flooding over their banks on a regular basis. These floodable areas must be treated as Fisheries Sensitive Zones and managed accordingly.
- 3) Water quality is critical to fish habitat. Most of the water flowing into most of the streams in the proposed park area is runoff from the ditches and residential acreages on the east side of Bayview Drive. The smell of sewage was strong in several places in the study area. It is unknown what effect, if any, the runoff from residential sewage is having on the fish and fish habitat in the creeks in the study area. It is recommended that proper water quality testing is conducted by qualified personnel on water samples taken at regular intervals (approximately every 100-200m) along the ditches on the east side of Bayview Drive at various flow conditions to monitor levels of substances that may be harmful to fish inhabiting the streams in the area.
- 4) The Riparian Management Area (RMA) classifications assigned to each stream are based on average channel widths and fish presence/absence. Streams where fish were not caught, but with access to fish-bearing waters have been defaulted to fish presence. Streams defaulted to fish-bearing status have and asterisk (*) after their RMA listed in Table 1. Follow up fish sampling should take place during periods of high flows when fish will have access to more areas in each stream.
- 5) It is recommended that the mapping of the Fisheries Sensitive Zones is conducted in the winter months at maximum flows when the areas of concern can be accurately delineated.

- 6) The GPS points logged during this survey using the Garmin 12XL do not appear to be as accurate as we had hoped. This may be due to poor satellite geometry at the time of the survey or limitations of the equipment. The attached maps (Figures 1a, 1b) show the locations of the points logged. Because some of these points show up quite far from where we know they should land on the photo, it is strongly suggested that these points be confirmed with a more sensitive GPS unit or another mapping method.
- 7) The width of the channel at the trail crossings shown in Table 1 is not intended to serve as a guideline to the size of the structure required to cross the stream. A qualified stream-crossing engineer is recommended to determine the type and size of the structure needed at each stream crossing, and to supervise the removal of any debris that has already been placed in the creeks, particularly in Creek 2.
- 8) Garbage was observed in some of the streams and in the ditches that feed the streams, particularly those near the north end of the study area. A garbage cleanup of the area is recommended.

5.0. References

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