Stream Classification and Mapping of Streams in Greensea Bay, Sonora Island.

Prepared For:

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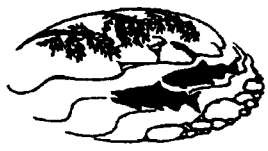

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Introduction

North Island Biological Consultants Ltd., under contract with the Campbell River Forest District, Small Business Forest Enterprise Program, performed stream classifications and fish surveys on Greensea Bay, Sonora Island (Figure 1). Sonora Island can be found northeast of Quadra Island and is located on the Cordero Channel. A total of three streams were surveyed along with their tributaries. The survey was completed according to Fish Stream Identification, and Riparian Management Area guidelines as outlined in the Forest Practices Code of BC. In addition, recommendations are provided based on the findings of this survey.

Survey Methodology

Danita Propp examined the area on September 15, 1998. Physical parameters such as stream gradient, reach length, water temperature, and channel widths were quantified utilizing a Suunto PM-5/360 clinometer, hip chain, alcohol thermometer, and metric surveyor's tape respectively. Fish were sampled using a Smith-Root model 12-A backpack electrofisher as well as by visual sightings. Representative sites were photographed with a Canon model 90 water-resistant camera. Any fish captured during sampling were identified to species, photographed and released. All distances stated in this report are slope distances.

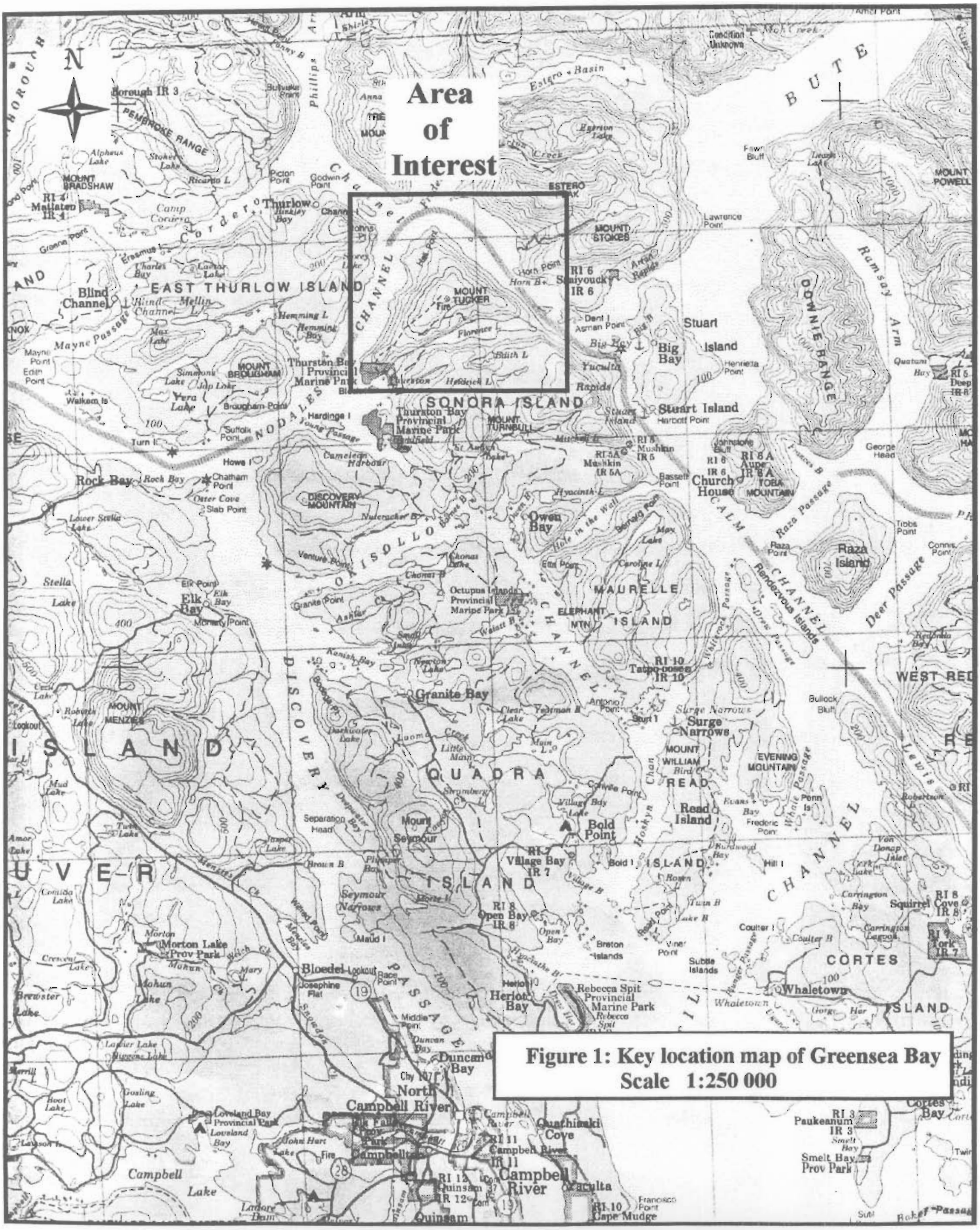

Figure 1: Key location map of Greensea Bay
Scale 1:250 000

Physical Description

Stream 1

The survey of Stream 1 began at its confluence with Greensea Bay, more specifically, at the high water mark (Figure 2). Stream 1 has three reaches and one tributary in the portion of the stream surveyed. Substrate composition of Reach 1 is dominated by boulders, cobble and gravel. Average channel width is 1.4 m and the stream gradient is 3% for the first 66 m. This stream flows through an area dominated by second growth timber with the understory containing salmonberry (*Rubus spectabilis*) and sword fern (*Polystichum munitum*).

Reach 2 begins at 66 m where the average channel width increases to 1.7 m and the channel gradient increases slightly to 6%. The substrate of the stream remains the same. Surrounding vegetation now includes salal (*Gaultheria shallon*), hemlock (*Tsuga heterophylla*), cedar (*Thuja plicata*), and red huckleberry (*Vaccinium parvifolium*). There is a lot of large organic debris (LOD) in the stream channel at this point. At 146 m upstream, the channel braids for a short distance, bedrock starts to appear and the stream gradient increases slightly to 13%. At 236 m, Tributary 1 enters Stream 1 from the south.

Upstream at 251 m, the gradient increases again to 35% and bedrock becomes the dominant substrate. This marks the beginning of the third reach and the completion of the survey of Stream 1.

Tributary 1 - Stream 1

Tributary 1 enters Stream 1 from the south. Average stream gradient is 30% and the average channel width is 1.4 m. The substrate of the stream is composed mainly of boulders, cobble and gravel.. There is a large amount of LOD within the stream itself (Figure 3).

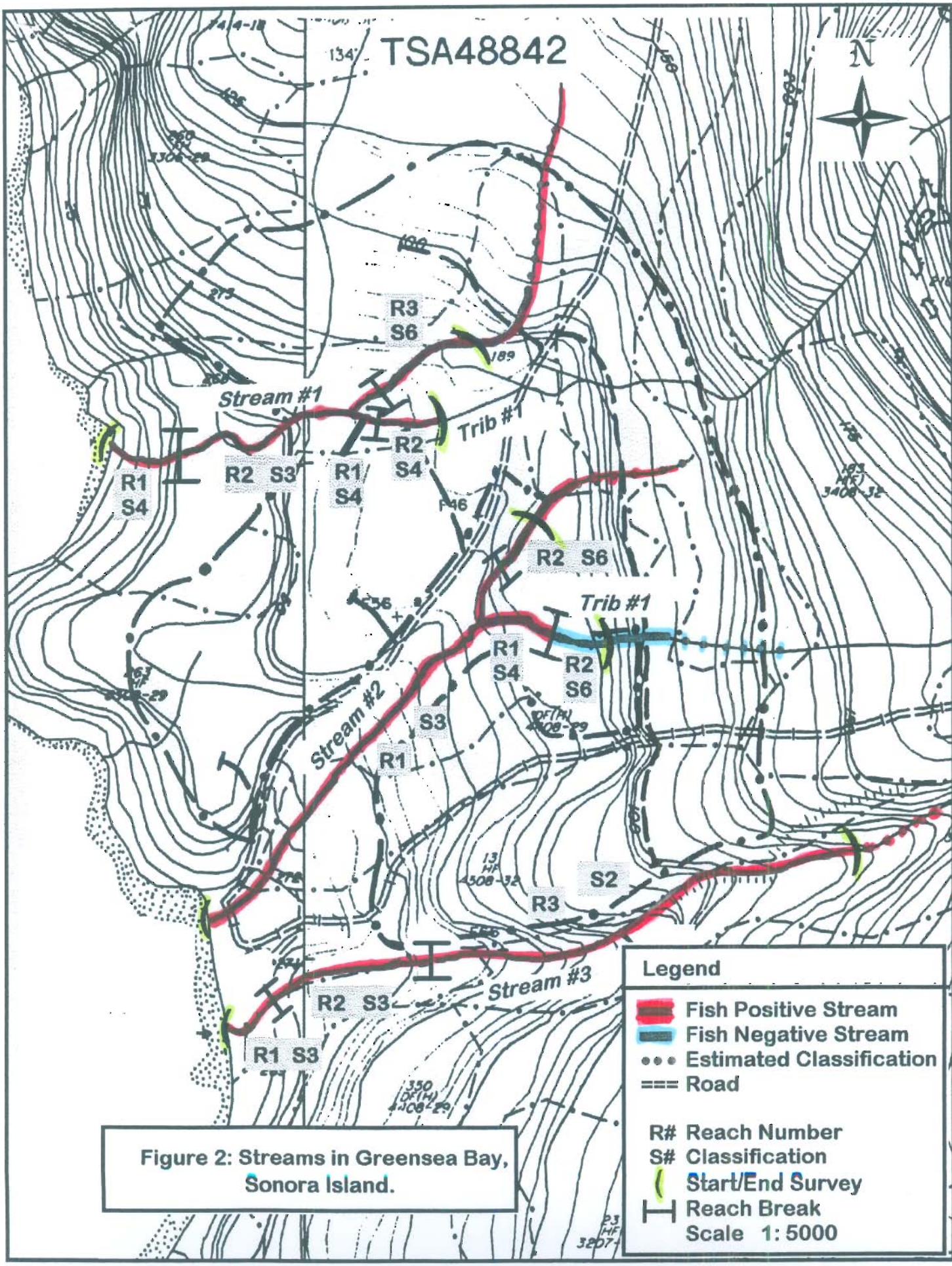

Figure 2: Streams in Greensea Bay, Sonora Island.

At 26 m upstream, the substrate changes to exclusively gravel and sand. This is the beginning of Reach 2 of Tributary 1. After 61 m, bedrock appears and the stream gradient decreases to 7% as the tributary enters a flat area. After 30 m, the stream disappears underground and was not detected again.

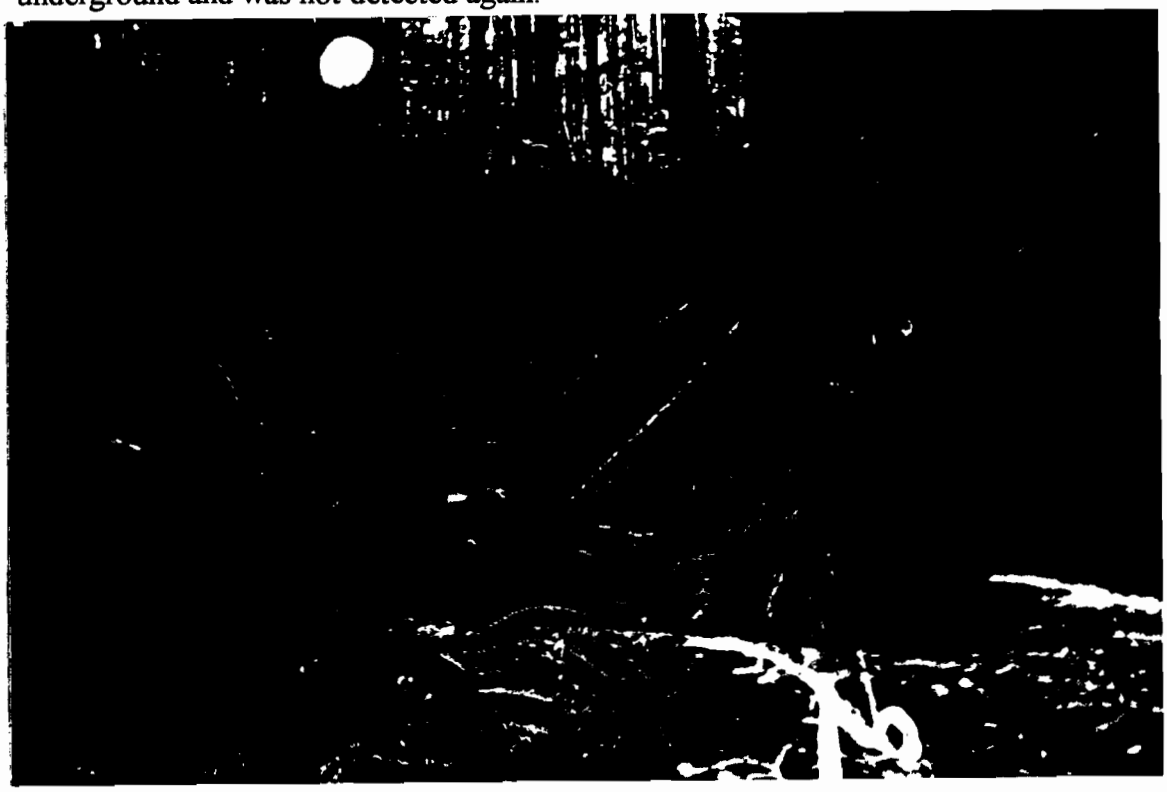

Figure 3: Tributary 1 - Stream 1. Large amount of LOD found in the stream.

Stream 2

At the beginning of Stream 2, there is a long metal culvert, approximately 40 m long, which joins Greensea Bay to Stream 2 (Figure 2 and 4). Stream 2 has two reaches and one tributary. Reach 1 consists of cobble, gravel and some boulders throughout (Figure 5). Average stream gradient is 7% and the channel width is 2.6 m. Water was intermittent in the channel and found predominantly in pools. Upstream at 445 m, a tributary enters from the east. Channel characteristics remain consistent for the next 30 m where a large logjam is situated. This logjam is positioned such that it may prevent fish movement above. This marks the beginning of Reach 2 (475 m). Gradient after the logjam increases significantly to 40%+. The survey continued for 100 m at which point it was terminated.

Figure 4: Culvert found at the beginning of Stream 2.

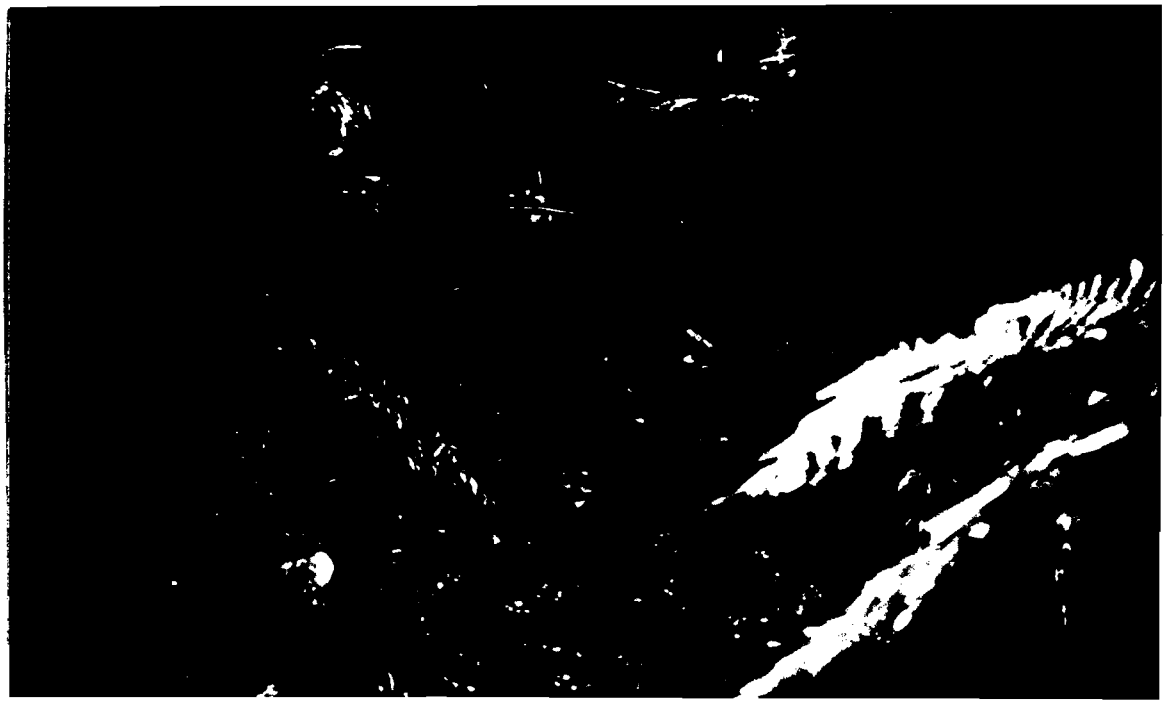

Figure 5: Reach 1 of Stream 2.

Tributary 1 - Stream 2

Tributary 1 enters Stream 2 from the east. Substrate composition consists of gravel, cobble and boulders. At the junction with Stream 2, the channel gradient is 15%. The average channel width is 1.2 m throughout its length. There is a large amount of LOD in Tributary 1, which congests the water and creates many steps. At 50 m, gradient increases significantly to 50%+ making fish passage impossible beyond this point.

Stream 3

The survey of Stream 3 began at the confluence with Greensea Bay (Figure 2). Stream 3 travels through an old box culvert, which was constructed during previous logging of this area (Figure 6). The culvert as exists, is 30 m long. Substrate composition of the stream is mainly boulders and cobble. Average channel width is 4.2 m and the stream gradient is very low, approximately 1%. At 24 m the channel splits and rejoins 30m later. The diversion, in this case, is due to LOD and a live tree present in the stream channel.

Figure 6: Box Culvert found at the beginning of Stream 3.

Reach 2 begins at 54 m where the substrate changes to gravel and cobble. Stream gradient increases slightly to 5 % and the average channel width is 3.8 m. The surrounding vegetation is consistent with that found along Stream 1. At 219 m, a tributary enters from the south of Stream 3.

Further upstream at 224 m, the channel width increases to an average of 5.4 m and the substrate changes to include large boulders, signaling the start of Reach 3. Bedrock starts to appear in the stream at 340 m and persists for approximately 90 m. The average gradient in this reach is 17%. The survey is completed at 716 m where the stream crosses the block boundary.

Results and Discussion

Results obtained from this survey can be found in tabular format at the end of this section (Table 1).

Stream 1

Cutthroat trout (*Oncorhynchus clarkii*) were detected in the first two reaches of Stream 1 (Figure 7). Based on fish prescence and channel width, Reach 1 and 2 are classified as S4 and S3 respectively. At the beginning of Reach 3, gradient is high (35%+) and may prevent fish passage. No fish were found above this section. Therefore, Reach 3 is classified as S6. No fish were found in Tributary 1, although it does contain suitable fish habitat and connects to Stream 1 in a fish bearing reach. While the gradient is steep, the structure of the stream is such that it is possible that fish may be able to reach the flat area in reach 2. Based on this, both reaches of Tributary 1 are classified as S4.

Stream 2

Cutthroat trout were found in the first reach of Stream 2 and is therefore assigned a classification of S3. While no fish were found past the logjam at the beginning of reach 2, the logjam itself cannot be considered a barrier due to its non-permanent nature. At higher flows, it may be possible for fish to be able to get past this and reach the upper portion of

Figure 7: Cutthroat trout found in Stream 1.

the stream. However, stream gradient increases significantly beyond the logjam preventing fish from moving further upstream. For this reason, reach 2 of Stream 2 is given a classification of S6.

While no fish were encountered in Tributary 1 of Stream 2, habitat exists and is accessible from Stream 2. This reach (Reach 1) is given a classification of S4. Reach 2 is classified as an S6 due to the high gradient (30% +) which would prevent fish passage.

Stream 3

No water was present in Stream 3 at the time of the survey. However, Stream 3 has suitable fish spawning and rearing habitat. Therefore, Stream 3 is classified as fish positive with the following classifications assigned to the reaches: Reach 1 (S3), Reach 2 (S3) Reach 3 (S2).

Although only cutthroat trout were encountered during the survey, other salmonids such as coho (*Oncorhynchus kisutch*) may use these creeks. Around the time of the survey of the three streams, new guidelines on Fish-Stream Identification were put out by the Forest Practices Board requiring all streams to be surveyed for a minimum of 100 m after a possible barrier is encountered. While sampling did occur above any barrier encountered, further sampling should occur to reflect the changes in the code as well as to cover the range of behavioral patterns exhibited by different species of fish. As well, higher water surveys should be conducted to confirm the fish positive designation of Stream 3 which was dry at the time of survey.

Table 1: Survey results of the three streams surveyed in Greensea Bay.

Stream Number	Reach Number	Length (m)	Gradient (%)	Channel Width (m)	Riparian Classification
Stream 1	1	66	3	1.4	S4
	2	185	10	1.7	S3
	3	-	35+	1.9	S6
Stream 1 Tributary 1	1	26	30	1.4	S4
	2	65	7	1.4	S4
Stream 2	1	475	7	2.4	S3
	2	-	40+	1.8	S6
Stream 2 Tributary 1	1	50	15	0.7	S4
	2	-	50+	0.7	S6
Stream 3	1	54	1	4.2	S3
	2	170	5	3.8	S3
	3	492	17	5.4	S2