Viner River

Inventory and Restoration Plan

June 2001

Report Prepared For: **Combined North Island Fisheries Centre**

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EXECUTIVE SUMMARY

The Viner River is on Gilford Island (DFO planning unit 12-38), the largest island in the Broughton Archipelago at the top of Johnstone Strait. Echo Bay is the local community center with post office and school on Gilford Island which is in the Kwiksutaineuk Band traditional territory. The largest regional community is Port McNeil on the north east coast of Vancouver Island. It can be accessed by boat out of Port McNeil. The Viner River Watershed has an area of approximately $22km^2$.

The river has 4.5 kilometers of mainstem anadromous habitat. It is a third order stream with several tributaries; the two largest enter the mainstem near Wahkana Main crossing. The anadromous habitat supports Coho, Chum, Sockeye, Pink Salmon, Steelhead, and Cutthroat and Rainbow Trout (FISS, 2000). There are headwater populations of Cutthroat Trout in most low gradient drainages in the watershed.

Concerns over declining salmon stocks in Viner River, in particular Chum salmon, observed by the local organizations. The area has a legacy of historic logging and fishing practices that have contributed to the decline.

On October 26th and 27th 2000, the authors (with the aid of Eric Nelson, Dean Coon, Edna Coon, and Graham Scow) were able to undertake a survey of the lower reaches of Viner Creek. An upstream traverse of stream location and elevation were done including cross sections of the channel and floodplain; channel and riparian areas were assessed for restoration opportunities.

The mainstem of Viner River is exhibiting signs of habitat degradation resulting from upstream slides and LWD removal. The sediment load from these sources has deposited a pulse of sediment throughout the lower gradient reaches of Viner River. While a sediment source survey has not been done, the upstream impacts appear to have reduced over time.

The riparian zone was found to consist of two distinct vegetation types. One is characterized by a dominant deciduous forest over a poorly stocked conifer understory. The deciduous component along lower Viner River consists primarily of Alder, with a minor (or non-existent) understory of spruce. The other type is characterized by first growth conifer or functional old second growth conifer.

In-stream restoration objectives of this report is to develop a naturally sustaining thalweg in this channel. The objective of this reports riparian treatment is to speed up the natural recovery process by re-establishing a more natural frequency of conifer species and promoting the conifer species growth.

ACKNOWLEDGEMENTS

The authors would like to thank Shelly Jepps of DFO, Jim Dunkley of MOF, and Dave MacKay of Interfor for arranging the original reconnaissance field trip of lower Viner River on October 6, 2000. Without concerns voiced by Bill Proctor of the Mainland Enhancement of Salmon Species Society, and Eric Nelson of the Broughton Island Streamkeepers this crucial step in the restoration process of Viner River would not have started.

The authors would also like to thank Mike Berry for arranging the field crew (Dean Coon, Edna Coon, and Graham Scow) from the Kwiksutaineuk Watershed Project and Eric Nelson for their participation in the two day field assessment phase on October 26th and 27th, 2000. Their work ethic and interest made the work very enjoyable.

Finally the authors would like to thank the following groups for their financial contribution for this joint effort::

- Department of Fisheries and Oceans (DFO)
- D.R. Clough Consulting
- Fisheries Renewal BC (FishRBC)
- Forest Renewal BC (FRBC)
- Ministry of Forests (MOF)
- Interfor, Scott Cove
- Interfor, Kingcome Enhanced Forestry Division (KEFD)

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1.0 INTRODUCTION

This inventory and restoration plan of Viner River was completed after interest by many organizations; Broughton Archipelago Stewardship Alliance, Kwicksutaineuk Watershed Project, International Forest Products, D.R. Clough Consulting, Department of Fisheries and Oceans, Fisheries Renewal and Mainland Enhancement of Salmonid Species Society.

The interest formed from the concern over declining salmon stocks, in particular Chum salmon, observed by the local organizations. The area has a legacy of historic logging and fishing practices that have contributed to the decline. Due to this concern, a field trip was organized for October 6th, 2000 by Jim Dunkley (MOF, Port McNeill), Shelley Jepps (DFO), and Dave MacKay (Interfor). The purpose of the trip was to determine if effective restoration plans could be developed for Viner River and included Warren Warttig, RPBio and Dave MacKay RPF (both of Interfor), Shelley Jepps, Jim Dunkley, Bill Proctor (Mainland Enhancement of Salmon Species Society) and Eric Nelson (Broughton Archipelago Stewardship Alliance).

The objective of this report is to outline the limiting habitat features of the instream and riparian zones for the lower Viner River. It then identifies the restoration opportunities available for the channel and riparian zones in these reaches.

On October 26th and 27th 2000, the authors were able to undertake a survey of the lower reaches of Viner Creek. We worked with Eric Nelson and the Kwiksutaineuk Watershed Project (Dean Coon, Edna Coon, Graham Scow). Interfor provided the authors with a float plane trip to the site and accommodation at Scott Cove Camp. The Kwiksutaineuk members were arranged through Mike Berry. They arrived by boat from the Gilford Reserve, as did Eric Nelson from Echo Bay. We took a camp truck approximately 20 kilometers to the bridge site on the Wahkana Main.

We walked downstream approximately 2.4 km to the estuary to begin our survey. An upstream traverse of stream location and elevation were done including cross sections of the channel and floodplain; channel and riparian areas were assessed for restoration opportunities.

FishRBC provided funding of the field component for the Kwiksutaineuk Band members. Eric Nelson generously donated his time. DFO Port Hardy sponsored the field component for Dave Clough. Warren Warttig was funded through Interfor, KEFD under Campbell River Operations. The authors donated the report data processing and write up for presentation in January.

1.1 Definitions and Concepts

Bedloading is an accumulation of sediment that can include silt, sand, clay, gravel and cobble. Excessive bedloading can affect both spawning and rearing habitat. The term *aggrading* is also used to define the channel buildup processes.

Compaction is often the result of bedloading, where the spaces between spawning gravels are filled with sediments making them impermeable and hard.

Glide is a stream habitat with little residual depth and usually uniform water velocity across the surface. In larger rivers they are called *flats* and *runs*. These habitat units are usually not associated with LWD and Boulders.

LWD is Large Woody Debris. Flood stable wood found in the stream channel, such as logs and roots. Also called *LOD* - Large Organic Debris.

Pool is a section of stream with residual depth and reduced velocity.

Reaches are segments of stream that have similar characteristics such as channel gradient and riparian type.

Riffle is a section of stream with little residual depth, higher gradient with substrates penetrating the surface at normal flow regimes.

Riparian is a term used to describe the bank vegetative zone adjacent each side of the stream. The riparian zone for a given fish-bearing stream can range from five to fifty metres.

Scour is the process where water is forced to a higher velocity on the bottom of the streambed to the extent that the water cleans all or most of the fine soil and organic matter, leaving large rock or gravel.

Side Channels are natural or constructed channels that provide a flood protected environment for spawning and rearing fish. The channels are usually located in floodplains of systems severely impacted by floods and bedloading. Side channels recruit water from mainstem, ground or tributary sources.

Watershed is the rainfall catchment or drainage basin of a given stream, bounded peripherally by a topographic height of land.

1.2 Field Methodology

A preliminary reconnaissance in September of survey areas was previously completed which allowed a concentrated effort in the lower 2.5 km of Viner River. Assistance and advice from the local partners were used (see acknowledgements).

On October 25 & 26 th we conducted our field measurements. An elevation and traverse survey was the chosen method of survey utilizing DFO SHIM mapping standards (B. Mason et al 1998). Traverse stations were permanently established. Effort was made the establish stations along the river thalweg, and at each major reach break. Traverse instruments included compass, hipchain, and Suunto clinometer. We used standard forestry engineering data collection methods bearing, slope and distance. Floodplain elevation information was collected perpendicular to the river flow direction at each traverse station. All traverse and elevation data was processed with engineering software (Softree RoadEng).

Other information gathered included photographs and diagrams, and Eric Nelson also counted Chum spawners for an escapement report. There had been a recent flood overtopping the banks but flow had dropped considerably to 20 % of the bank full discharge during the survey.

Riparian Vegetation Types (RVT's) were classified and mapped during the stream survey. Species, age, height, and density information was collected to fulfill Stand Management Prescriptions requirements.

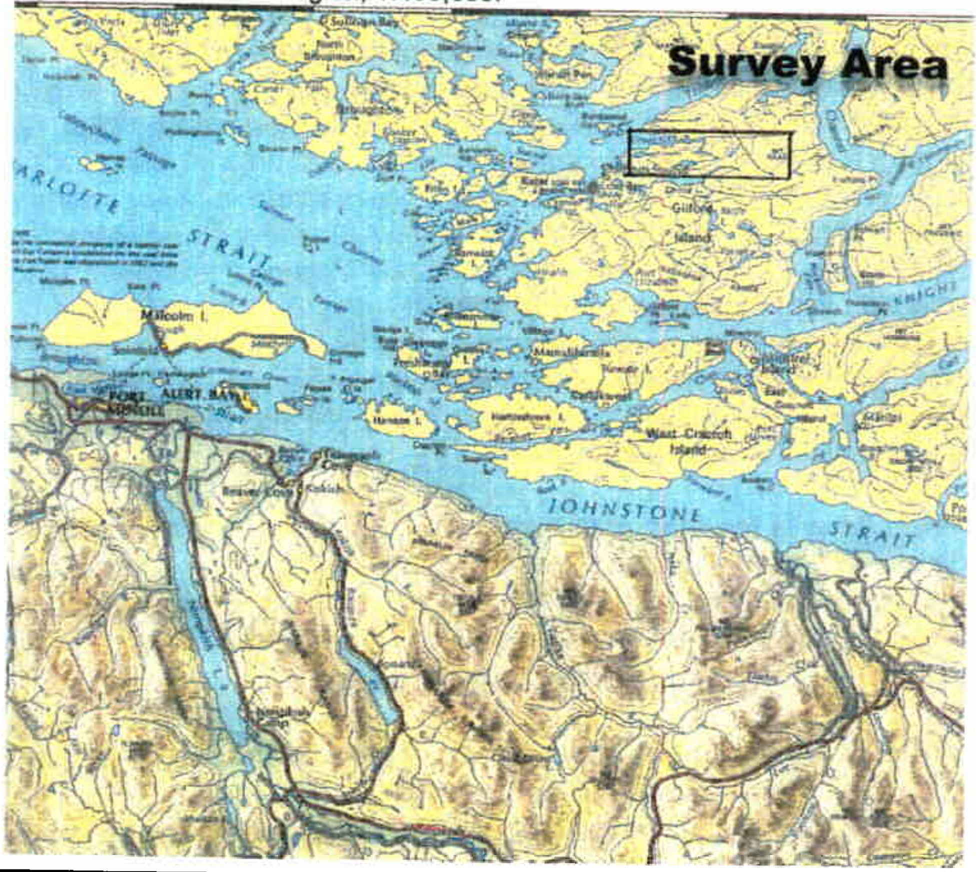
Qualifications of Dave Clough and Warren Warttig are registration with the Association of professional Biologists of BC.

2.0 DESCRIPTION OF WATERSHED

The Viner River is on Gilford Island (DFO planning unit 12-38), the largest island in the Broughton Archipelago at the top of Johnstone Strait. Echo Bay is the local community center with post office and school on Gilford Island which is in the Kwiksutaineuk Band traditional territory. The largest regional community is Port McNeil on the north east coast of Vancouver Island. The Viner River Watershed has an area of approximately 22km^2.

The river has 4.5 kilometers of mainstem anadromous habitat. It is a third order stream with several tributaries; the two largest enter the mainstem near Wahkana Main crossing. The anadromous habitat supports Coho, Chum, Sockeye, Pink Salmon, Steelhead, and Cutthroat and Rainbow Trout (FISS, 2000). There are headwater populations of Cutthroat Trout in most low gradient drainage's in the watershed.

Figure 1.) Gilford Island and Region, 1:400,000.



The Mainland Enhancement of Salmonid Species Society has enhanced the area Chum and Coho stocks since 1983. In the past they have planted Coho and Chum fry or eggs into Viner Creek (DFO FISS/pers comm. E. Nelson).

3.0 LIMITING FISH HABITAT: LOWER VINER RIVER

The mainstem of Viner River is exhibiting signs of habitat degradation resulting from upstream slides and LWD removal. The headwaters of Viner Creek at the base of Mt. Read are 1400 meters in elevation. The valley is steep and there are several historic slides, some clearcut and road related, and some natural. There was also likely historic road sediment from the construction and operation of the Wahkana Main and spurs. The sediment load from these sources has deposited a pulse of sediment throughout the lower gradient reaches of Viner River. While a sediment source survey has not been done, the upstream impacts appear to have reduced over time. Air photos indicate the majority of the slides are relatively old (1961+) and are no longer contributing any significant sediment. Most of the historic slide areas have regenerated significantly with shrubs and alder.

Sediment has caused many problems in the lower reaches, problems exacerbated by the lack of LWD. The loss of LWD left the channel with no ability to create complexity and confinement. The result has been long glides, braiding and little pool formation. Habitat complexity was found only around the few remaining LWD sites. The infilled channels have resulted in many braids where the floodplain is low. These braids flow over new sediment sources and create stranding of adults, redd's, and fry. The mainstem channels are often "W" shaped in cross section with moderate and low flows divided to either side of an aggraded bar. Many areas go dry at extreme low flow. The stream substrate appeared to be only moderately embedded and compacted. Some areas of reaches had very loose substrates due to the lack of LWD to stabilize the material and amount of sediment moving in the channel.

The Riparian Zone is the area of forest that borders the edges of streams (Appendix 1). Based on a Forest Practices Code (FPC) stream classification the lower Viner River was designated as S2, requiring a 30m Riparian Reserve (Appendix 2). Riparian Vegetation Types (RVT's) are broken into 5 basic classifications (Poulin, Harris, Simmons, 2000) where:

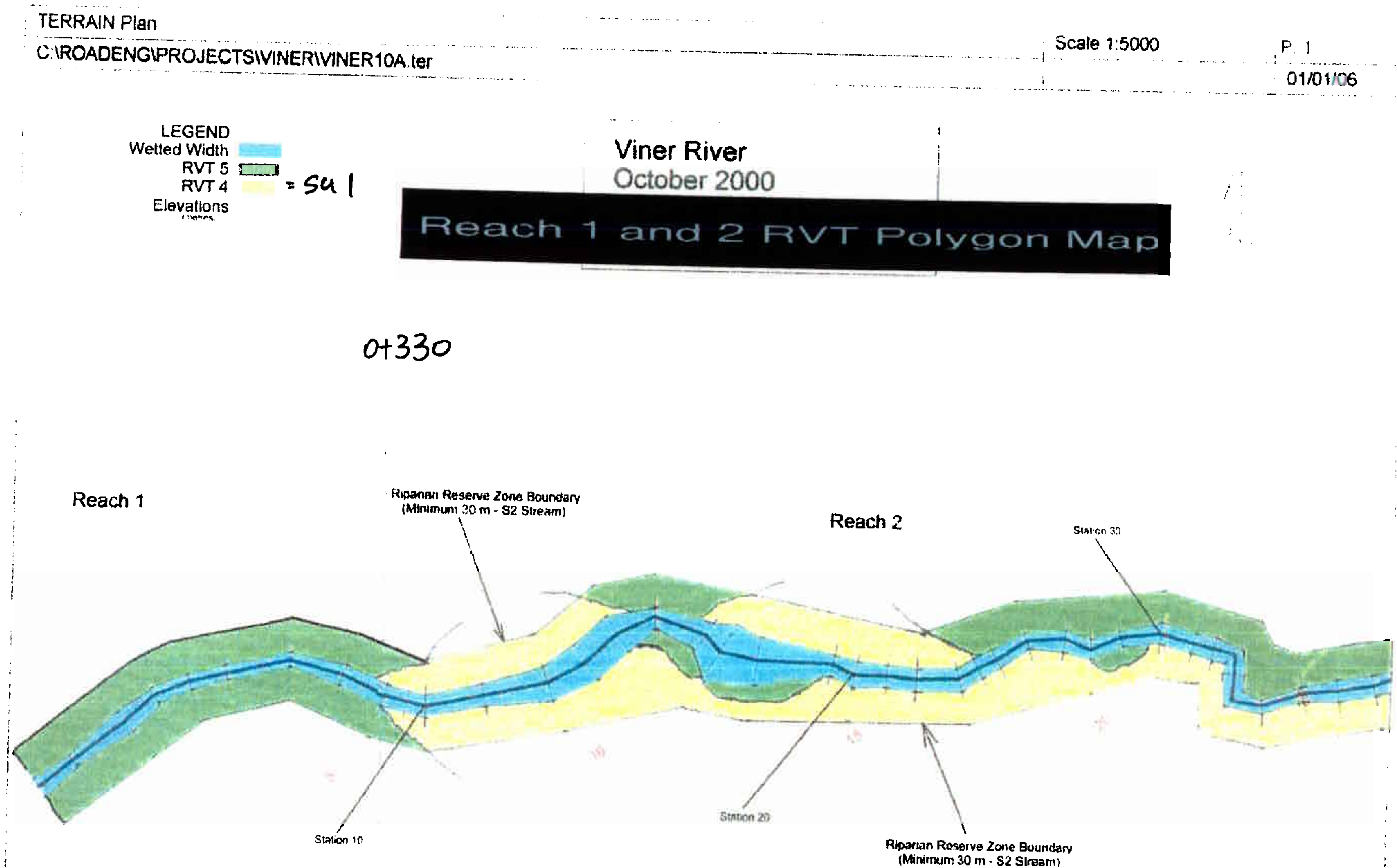
- RVT 1: Brush dominated, with poorly stocked conifer component
- RVT 2: Over stocked conifer
- RVT 3: Deciduous forest over top of a good conifer understory
- RVT 4: Deciduous forest with a poor conifer understory
- RVT 5: Old growth or old second growth forest

RVT classification of lower Viner River resulted in 4.7ha of RVT 4 and 8.5ha of RVT 5. The results were determined by areas measured from the Contour and Station Maps (Figure 2 & 3) RVT of the RVT assessment on the Lower Viner river were:

Table 1. Lower Viner River Reach Characteristics.

Reach	Length (m)	Channel Width	Gradient (%)	FPC Classification	Riparian Reserve
1	360	17	<2	S2	30m
2	1074	24	<2	S2	30m
3	753	17	5	S2	30m
4	266	22	2	S2	30m

Figure 2: Contour and Station, Reach 1 & 2 RVT Polygon Map 1:5000



Map Sheet 092L079

Port McNeill Forest District

Tenure: **FL A19238**	Block: **SU 1, RVT 4**	Location: **Viner River RRZ, 0+330m to 2+600m**
Licensee: **Interfor**	Region: **Pacific**	TSA: **Kingcome**
Map Sheet: **92L079**	Polygon: **077**	Lat/Long @ 2+470 on Viner R: **N50°47'385",W126°19'620"**
Date: **June 2001**		

TERRAIN Plan
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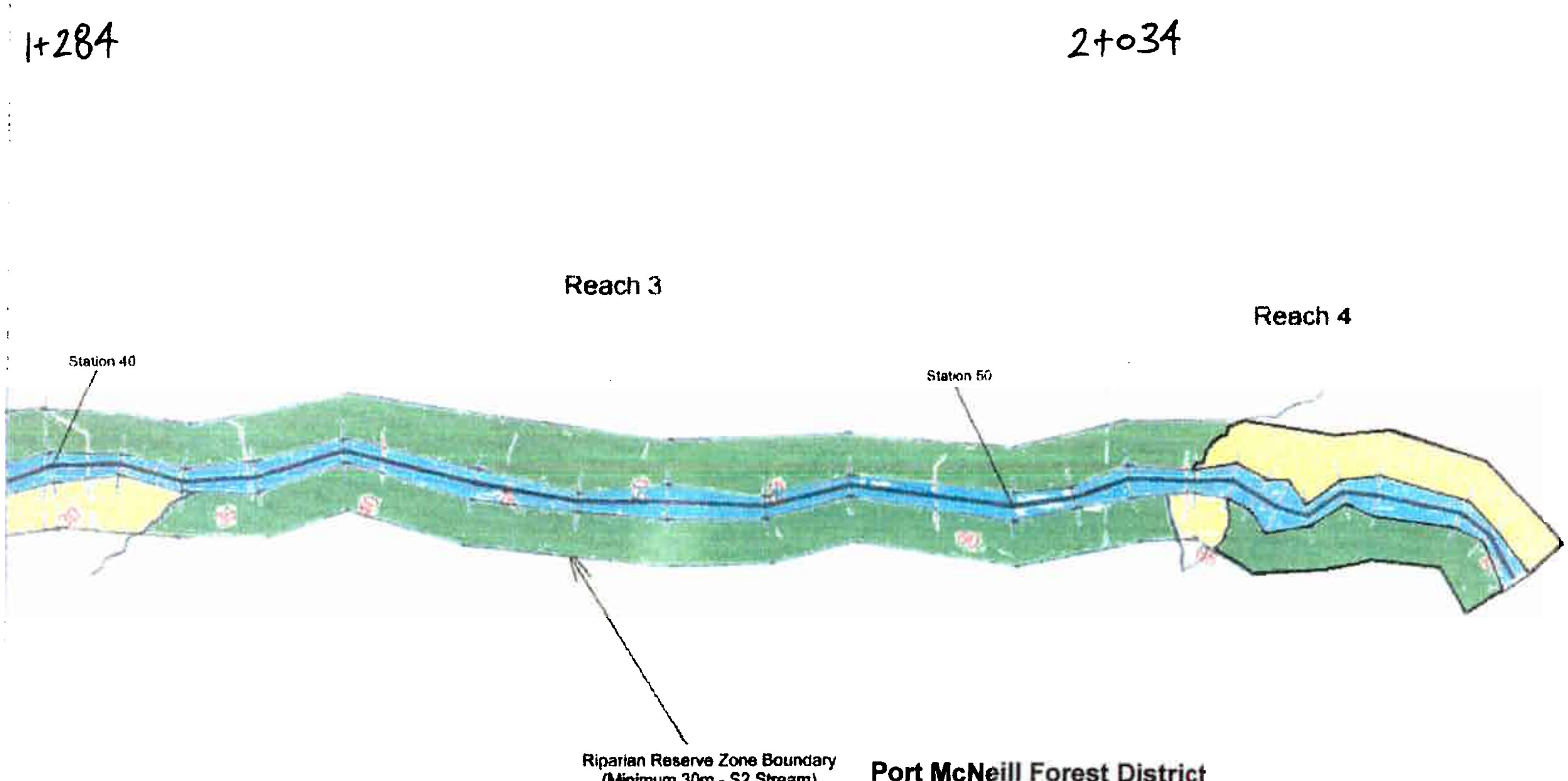
Scale 1:5000 P. 2
01/01/06

LEGEND
Wetted Width
RVT 5
RVT 4 = su 1
Elevations

Viner River
October 2000

Reach 3 and 4 RVT Polygon Map



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Date: **June 2001**		

Map Sheet 092L079

Table 2. Lower Viner River Riparian Characteristics.

	Area (ha)				
Reach	**RVT 1**	**RVT 2**	**RVT 3**	**RVT 4**	**RVT 5**
1	0.0	0.0	0.0	0.0	1.8
2	0.0	0.0	0.0	3.4	1.9
3	0.0	0.0	0.0	0.2	3.8
4	0.0	0.0	0.0	1.1	1.0
TOTAL	**0.0**	**0.0**	**0.0**	**4.7**	**8.5**

3.1 Reach 1 Instream Limiting Habitat Features.

The lowest reach is 360 meters long and is typified by a relatively stable channel, as there is an adjacent large, mature spruce and hemlock riparian zone alongside the channel (Fig.4). The channel is 17.0 m wide over a gradient of less than two percent (Table 1). This reach is LWD deficient, there were only 4 or 5 functional sites creating pools and cover. The channel is aggraded from sediment sources, which filled in many of the pools, however the mature riparian condition has maintained good bank stability. The substrates are good for spawning but only a few pools were deep enough to offer cover for fry. There is poor cover for adult spawners as well. This was evident by the pre-spawner Chum mortality observed during the survey. There is a side-channel on the river-right bank created by overflows upstream at several sites to 200 meters. This channel is moderately stable offering some spawning and rearing habitat but with poor water flow and fish cover characteristics.

Figure 4 Reach 1.

3.2 Reach 2 Instream Limiting Habitat Features.

This is the most impacted reach on the lower river from 330 to 1284 m. It lacks a pool/riffle habitat complex along its historically logged banks. The channel is braided and wide (Fig. 5) . Average channel width was 24 m, 7 m wider than reach 1 yet the channel has the same gradient (<2%) as Reach 1. The entire channel is LWD deficient, with singular pieces strewn along the channel at a frequency of 1 per channel width. The are no stable multiple LWD complexes. The riparian zone is mostly RVT 4/second growth alder and minimal conifer understory. A historic logging road runs along the left bank. The sediment buildup has forced water to overflow into the floodplain at discharges above 50 % stage height. The weak riparian zone offered little resistance to flood waters. There are many areas of eroding banks where the tree roots have given away. There were areas with as many as four degraded channels. A historic slide on the river-left bank at 950 to 1064m may have been a significant historic sediment source. There are few stable spawning gravels or deep cover rearing areas, egg and fry survival must suffer.


Figure 5: Reach 2.

3.3 Reach 3 Instream Limiting Habitat Features.

This reach is confined with relatively high banks on either side. The channel is 17.0 m wide with a gradient averaging 5 percent. There is almost no LWD in this reach as well. Most historic LWD appears to have been logged, or swept away. This reach is almost continuous boulder/gravel riffle habitat. It would offer trout fry and parr excellent habitat if there were refuge areas from winter floods and predators. This reach is deficient in cover habitat due to lack of LWD.

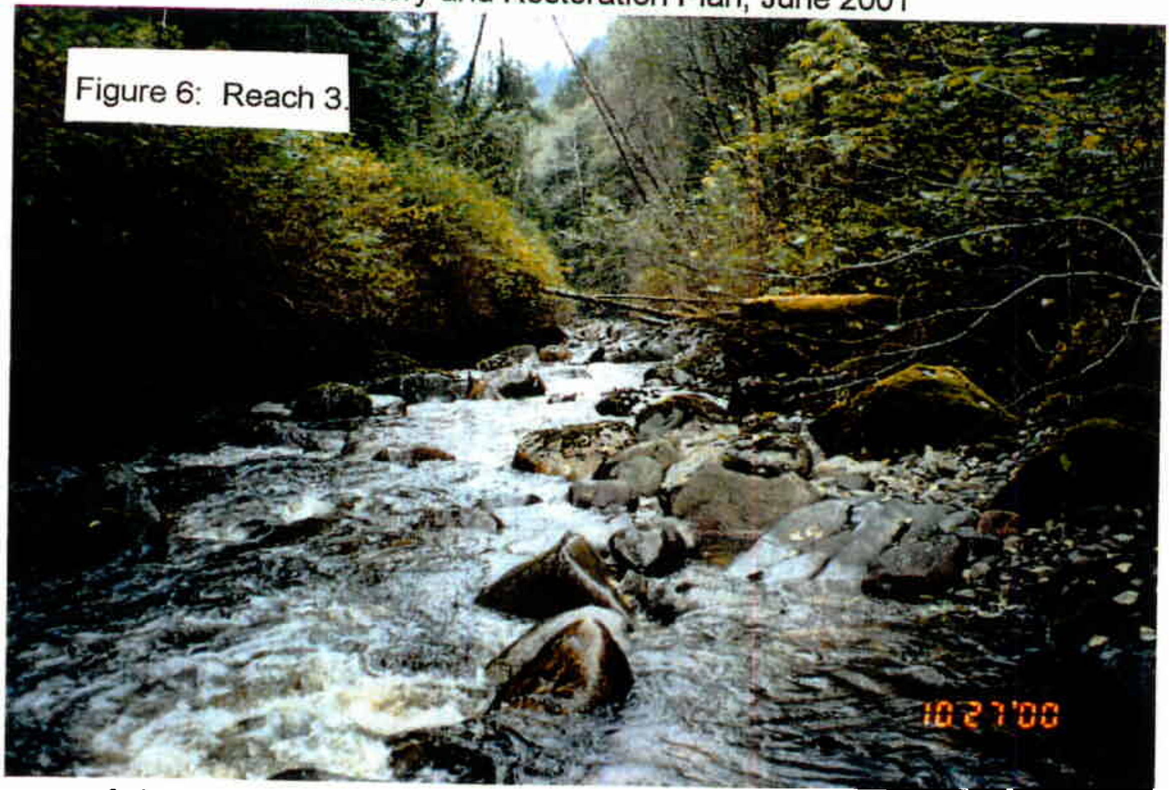

Figure 6: Reach 3.

3.4 Reach 4 Instream Limiting Habitat Features.

Reach 4 is very similar to Reach 2, the reach has many braids and overflowing banks. The channel is loaded with sediment and lacks LWD. There is a "hot spot" that requires urgent attention, where a channel breakout occurs at 2+326 m. Figure 5 shows the typical condition of bedload material filling and dividing low flow in this reach. Note the lack of anchored LWD in this picture. This reach lacks the historic LWD dominated pool/riffle habitat complex.

Figure 7: Reach 4.

3.5 RVT 4 Limiting Habitat Features.

A dominant deciduous forest characterizes RVT 4 over a poorly stocked conifer understory. The deciduous component along lower Viner River consists primarily of Red Alder, with a minor (or non-existent) understory of spruce.

While Alder may be a good nitrogen fixer, and provide reasonable overhead cover, it lacks adequate root strength. Alder is a shade intolerant colonizing species of disturbed sites. It is an extremely fast growing tree that puts most of its' energy into canopy and stem growth in an effort to maximize its' exposure to the sun. As an Alder approaches the end of its' life span, the supporting root structure becomes insufficient to bear the weight of the tree, and if it doesn't blow over, it will soon fall over.

Alder growing close to a river bank will often grow towards the center of the river to capitalize on the sun, as the trees grow older and fall over into the river, the upturned root ball creates a divot along the river bank resulting in an erosion "nick point".

Once Alder has fallen into a stream system, it will degrade quickly. While it is beneficial for invertebrate populations (and hence food sources for rearing fry and smolts), its rapid degradation makes it a poor species for in-stream LWD structures. It is these characteristics of Alder that make it a poor dominant riparian species.

Conifers are generally more shade tolerant than deciduous species. Conifers are slower growing but longer lived, so will eventually out compete a deciduous forest. They have a more developed rooting system, and therefore far more likely to provide stream bank stability. They are also far slower to degrade once in the water, therefore are superior for LWD structures. As a result of these differing characteristics RVT 4 represents the highest opportunity and priority for recommended treatment (Poulin, Simmons 1998).

3.6 RVT 5 Limiting Habitat Features

RVT 5 is characterized by older conifer forests (first growth or older second growth). This RVT is functioning well, and contains all of the attributes required for riparian areas including large woody debris, coarse woody debris, shade, streambank floodplain stability, and structural diversity. The first growth component found along Reach 1 will serve to act as an ecological template for riparian restoration.

4.0 RESTORATION OBJECTIVES

In-Stream: Our restoration objective is to develop a naturally sustaining thalweg in this channel. Our methodology will be to introduce a natural frequency of habitat components to this reach. This will be done through introduction of LWD which can safely be described as deficient, where a FHAP minimum of 2 LWD per channel width is desired (Johnson, N.T. and P.A. Slaney, 1996).

The current habitat condition of the reaches is wide channels from 17 to 24 m (Table 1), which lack scour velocities. All the reaches show some signs of aggraded sediments, bank erosion and lack of LWD. The historic channel condition likely ranged from 15 to 17 meters with greater bank full depth. Our LWD prescriptions are targeted towards confining the channel, reducing aggrading sediments and creating stable fish habitat.

LWD placement is intended to improve channel condition, fish habitat and accelerate the natural recovery process. Our past experience has shown that recovery time is based on seasonal flow regimes, stream gradient, functional objectives, number of structures, sediment sources and redd scour contributed primarily by Chum salmon. Indications of performance will be monitored after the first winter. The assessment component of our report identifies the method of evaluating each site's performance.

Riparian: Riparian areas are an essential component of a healthy forest and stream ecosystems. Functioning riparian ecosystems provide many of the essential attributes required by fish and other aquatic organisms including shade, bank stability, protection from flood events, and a recruitment source of large woody debris and course woody debris.

Non-functioning (or impaired) riparian ecosystems as seen in RVT4 will supply poor bank protection and be a poor recruitment supply of large woody debris. This impaired ecosystem will eventually recover, over an extended period of time, to a RVT5 type classification (D. Prichard, 1993). The objective of a riparian treatment is to speed up the natural recovery process by re-establishing a more natural frequency of conifer species and promoting the conifer species growth.

4.1 Reach 1 Restoration Objectives.

This reach needs a LWD prescription to provide cover for fish, primarily a Chum Salmon reach. Bank stability is better than other reaches but it lacks cover for spawners and emergent fry. The LWD structures would also constrict the channel and create some scour for pool creation. In 2001 we are not planning any major LWD structures due to our priorities with other reaches.

4.2 Reach 2 Restoration Objectives.

The priority restoration area, this reach has the most habitat impacts but offers the highest use for fish if restored. Its' continued degradation affects reach 1 sediment loads as well. Our objective is to begin to restore a channel thalweg and prevent braiding. Breakout channels are to be addressed with LWD prescriptions for corner jams and deflector logs. We have identified 2 structures side by side at 515 m and at 704 m (Appendix 8). Tree and shrub cuttings in the gravel bars will help stabilize the channel material. LWD sources in the adjacent riparian zone will be identified for use in the stream.

4.3 Reach 3 Restoration Objectives.

This high gradient, bouldery riffle is in need of cover for salmon adults during migration to rest under as well as juvenile habitat. The steep banks of this confined channel conspire against good LWD anchor points. This reach is not being addressed with major LWD structure prescriptions in 2001 due to its lower priority with respect to funding limitations. A prescription of opportunistically available riparian LWD anchored along the edges using existing trees is suggested. Boulder clusters may be prescribed as well in the future depending on transport.

4.4 Reach 4 Restoration Objectives.

The channel breakout points at 2+300 m are scheduled to be addressed in 2001. A LWD complex structure will be placed at this site to prevent the overflow and provide instream habitat. There is need for LWD prescriptions confining and complexing the channel along the entire of the reach. Cover and scour log structures will be created as time and budget permit using the "free" LWD found in the floodplain in 2001.

4.5 Riparian RVT 4 Restoration Objectives.

To re-establish conifers along river banks to stabilize channel and reduce erosion of banks, and provide a long term recruitment source of LWD

4.6 Riparian RVT 5 Restoration Objectives.

No treatment required.

5.0 DISCUSSION AND CONCLUSIONS

5.1 Detailed Prescriptions - Instream

The inventory results indicate lack of LWD as the primary missing ingredient in the stream environment. LWD provides the structural stability to the stream spawning gravel as well as the more obvious pool scour and fish cover functions. The LWD is also important substrate for algae and invertebrate production, wildlife perches, crossings and dens. The LWD also directs water to flush fine sediments out of spawning gravels adjacent to their structures, an important feature in this system. The LWD can also protect banks from erosion.

LWD placement cannot in itself heal all the problems of a river channel condition. Upslope slides and increased runoff from manmade and natural events are the usual causes for these downstream conditions. The upslope condition assessment underway will compliment the instream work. The LWD prescriptions have to take into consideration the fact that this system is high energy with sediment and flow regimes outside a normal pattern. A LWD prescription for a stable, low energy system is not the desired in this river. The current channel condition dictates, from the authors' experience, that LWD prescriptions be biased towards structural stability. They must be well anchored while functional towards protecting banks from erosion and/ mitigate for lack of fish habitat. There may also be benefit towards channel scour by concentrating the flow along a thalweg.

The LWD design will be structures that extend no more than 1/3 of the channel width given the movement of debris and water through this system. Site selection will depend on anchoring opportunities such as large roots, trees, logs or compacted substrates that hold ground anchors. The LWD material size will vary depending on site and application. The size may vary from 3 meter stumps to whole conifers depending on the site access and helicopter and crew capabilities. The LWD prescriptions being suggested are meant to mitigate and help adjust the river condition towards a positive habitat condition. A further application of LWD after monitoring of their performance and making any necessary adjustments is recommended.

The LWD prescriptions are based on the FHAP standards of 2 LWD per Channel Width in Table 3. Each reach should receive that approximate amount of LWD. This may take several years depending on budget and performance.

Table 3. LWD prescriptions for Lower Viner River.

Reach	Channel Width	LWD per reach
1	17	44
2	24	90
3	17	88
4	22	24

LWD Structures will be designed with standard methods as described in numerous publications (Slaney & Zaldokas 1997,Adams and White 1990, R.L. Hunt 1993). Examples of structures are shown in Appendix 8 . Our primary LWD structure design is shown in Appendix 9. Dimensions of structures are primarily a function of reach gradient and channel width. Their functions may be scour, cover and/or bank protection. Reach conditions and LWD prescriptions are described below.

Reach 1: Adult spawner cover structures should be selected in this reach. This reach is the prime Chum spawning area. It has a healthy riparian zone that is holding the banks together, bank protection LWD is not needed. Instream cover for the Chum spawners is needed. LWD cover structures should be designed to hide adult Chum salmon along the banks. A scour function may be incorporated into the structure if it is sited in a site where sedimentation is expected. The Chum may help keep these sites open in the fall. LWD can be placed as bundled logs parallel to flow along either bank. The structures should not extend out to disturb the spawning area.

Reach 2: This reach has considerable opportunity. It has high fish values being easily accessible for Chum spawners. The problems of braided channels and eroding banks should be addressed with LWD prescriptions. LWD can be placed at the blowout areas along the bank to reduce the braiding and sedimentation. The LWD may also be placed along the outer edges of the multiple channels to help constrict the water flow. This LWD can be placed on bank areas where erosion is just beginning such as blowdown alders, to help protect the bank. The structures in this area are primarily for channel stability, there will be some benefits to fish cover but these are secondary. As the channel is braided there will be less success with LWD cover structures in this area as the channel may abandon or fill in the site with sediment. Scour structures along the bank edges may be employed to help promote a single thalweg.

Reach 3: This reach is a higher energy area than the lower reaches with over twice the channel gradient (5%). Instream structures other than parallel LWD cover structures or large boulders may get blown out. There are already considerable boulders in the run. LWD structures should be placed in sites where existing boulder scour has created pools along the edges. Erosion sites along the bank will also be addressed. Secure anchoring in this area is necessary as well.

Reach 4: This reach is similar to reach 2 in condition. It has several large braids that dry in summer. The overflow channels should be LWD sites as well as several areas of erosion and extra width. These LWD prescriptions will help channel characteristics.

5.2 Detailed Prescriptions – Riparian (Appendix 10)

RVT 4 Treatments Prescribed,overstory treatment (OT) ,individual conifer release (IC), conifer release (CR), fill plant (FP), sanitation space conifer (SPC), river structures (RS). **Target Stand Condition:***Treatment is aimed toward achieving the following target stand condition:*

1. alder overstory thinned to allow maximum growth potential
2. canopy gaps where conifer regeneration is promoted
3. up to 40% full sunlight penetration to planted conifer
4. release or sanitation space of natural conifer regeneration
5. fill planting in conifer deficient areas in canopy gaps promoting conifer regeneration
6. largest most vigorous deciduous trees retained

Treatment Description: *Girdling/Felling/Sanitation Spacing:*

7. Fell, girdle, or distress overstory alder (OT). Method of treatment will be at the discretion of the project supervisor and may include a combination of methods. Felling reduces the uncertainty of mortality to understory conifers caused when girdled trees ultimately die and fall. It is acceptable to employ the most effective and efficient method provided post-treatment mortality is considered and trees selected for girdling will not result in unacceptable amounts of small woody debris entering the stream.

8. Retain all large diameter alder and alder used by wildlife for feeding and or nesting. When selecting alder for overstory retention or as individual trees retain those with good branching, largest live crowns and best diameter.

9. Fill plant and spot fertilize conifer in natural and created openings in higher density clumps (FP) . Plant approximately 800 to 1200 sph within 5m along the main river. One slow release fertilizer packet /seedling should be buried near and outside the seedlings drip line. Preferred species CW, Ba, secondary Hw, Ss. Inter-tree spacing should average 2 to 3 m, to a minimum of 1.5 m. Remove all above ground vegetation, and manually screef away all brush, duff, and root mat down to mineral soil within a 0.5 m radius of each potential planting site. Remove all above ground vegetation within a 1.5m radius of any existing conifers. If possible annual brushing should occur in spring or late summer until the seedlings have out competed the brush.

10. Sanitation space conifer understory (SPC) as directed by the project supervisor. Sanitation spacing will be undertaken where the primary objective is to reduce physical damage to target conifers while retaining alder. Where sanitation spacing may result in loss of an alder described in 2 above, do not girdle, fell or distress the alder unless authorized by a project supervisor.

11. Spot fertilize remaining existing conifers to promote release (CR and ICR). Two slow release fertilizer packets/tree (greater than 3m) , and one packet/tree less than 3m, should be buried near and outside the trees drip line.

12. Girdle/fell trees within 3 m of the stream edge only if a lower live limb is present to allow coppicing and retention of live roots.

13. Dress girdle where possible with a chain saw to mimic natural wounds. Hand tools are acceptable on small trees. Allow a range of decay rates by girdling 25% to 100% of the stem while ensuring for target overstory densities.

14. When felling is employed, thin overstocked patches of conifer understory if present, to 800 sph unless the patch is to be retained untreated for wildlife or biodiversity reasons. Do not thin overstocked conifer patches where overstory is girdled. Girdling can cause upwards to 40% mortality to understory seedlings.

15. Fell trees away from understory conifer and buck and remove any tree or branches causing conifer press. Upright any tree disturbed by felling.

16. To the extent possible, fell trees at right angle to the floodplain to maximize sediment storage capability of downed slash and debris. Minimize bucking where possible to keep trees intact. Longer boles will resist movement in high flow. This is especially important on low and medium benches. On high benches, reduce slash build-up by bucking initial trees felled and limbing such that the stems come in close contact with the ground. Leave the last layer of trees to felled intact. High stumps are acceptable sources of coarse woody debris and may be left high to lock debris on floodplain. Cut alder within 3 m of the stream edge above the lower live limbs to allow the tree to coppice and retain a live root system unless in competition with a target conifer.

17. Where thinnings can safely augment or create river structures (RS) suitable for use by fish, felling toward or across the channel or on to existing debris is acceptable. All trees felled into the channel are to be individually selected by the project supervisor and felled in his presence. Only trees that can be wedged or otherwise stabilized should be felled for purpose of fish habitat augmentation. Allow trees to overhang banks where this material provides useful cover and source of nutrients for fish. Densities and placements of debris should mimic natural accumulations and spaced at similar natural intervals. Cabling should be considered where trees are at risk of movement by floodwater. This treatment will only be implemented under Section 9 approval.

As the Riparian Zone is an important area for other species, efforts should be made to leave or cut access trails. Alder should also be limbed and bucked so that the main stem of the tree is in contact with the ground, this will promote quicker degradation of the tree as well as improving access.

Average density should be approximately 600 stems per hectare, this will help ensure a long term desired stocking level of approximately 400 stems per hectare. Try to utilize the felled Alder as obstacles for deer.

- **Other:** This area affords excellent opportunity for the establishment of bird and bat houses. Often these structures can be constructed at minimal cost through school programs. Plans and specifications for various bird and bat houses that cater to specific species are available through Ministry of Environment, Lands & Parks.

RVT 5:
- No action required.
- **Other:** Some conifers along Reach 3 may be utilized for in-stream complexing. This area also affords excellent opportunity for the establishment of bird and bat houses. Often these structures can be constructed at minimal cost through school programs. Plans and specifications for various bird and bat houses that cater to specific species are available through Ministry of Environment, Lands & Parks.

5.3 Effectiveness Evaluation Plan

1.) A completion report will be written on the project. It will list all activities in a brief format with a list of structures built and units of area restored. Before and after photographs of all instream structures and representative riparian treatments should be done.

2.) The instream restoration can be evaluated using the WRP Gant Charts which allow an efficient checklist style of monitoring. The structural and biological performance are evaluated on a rating system. It requires a immediate post work listing of intended performance followed by at least one evaluation after a winter season. Structures should be marked with a recoverable tag to ensure proper location for follow up.

3.) Spawner enunmeration, core samples, sediment samples, fry density and smolt traps are all other additional ways to determine biological effectiveness. Most of these methods will first have to be vetted by the partnerships to determine their necessity as they may cost as much as the restoration budget.

4.) Riparian Performance can be economically monitored by routine silviculture methods such as the FS704 planting quality check card can be used. Health and vigor of planted trees by mortality and annual growth can also be done.

5.4 Implementation Plan

The timing of activities will evolve according to specific timing windows as well as some opportunities.

- Funding applications generally take place in winter. This is also the time to establish partnerships and determine responsibilities (5 days).
- After funding is determined, permits can be applied for; MoELP Work in Stream Approval, Crown Land permit and referral with local authorities in DFO, MoELP and MOF (3 days).
- The management team and crew will arrange training in the spring before work. Streamkeeper Habitat Restoration course, First Aid, Riparian Restoration and possibly other skill courses should be taken (1 week).
- A pre-work inspection and layout by the management team along with inspection by authorities can be expected in late spring (2-3 days).
- Instream work will commence when permits are approved and after the beginning of the work in stream window (July 1 - Sep 30).
- Work areas to be prioritized are “hot spots” previously mentioned in text and reach 2.
- Assessment may be both pre and post work for before and after conditions. Depending on budget the assessment can be for both winter and spring conditions.
- Completion reports for field activities and assessment should be scheduled before the next funding window and as per agency deadlines.

Table 4.) Annual Project Activity Schedule.

Activity	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Planning	X	X										X
Funding	X	X	X									
Permits			X	X	X	X						
Training					X	X	X					
Layout						X	X					
Instream Restoration							X	X	X			
Riparian Restoration		X	X	X	X	X				X	X	
Reporting & Assessment	X	X					X	X	X	X	X	X

5.5 Budget

Funding sources will generally dictate the scope of activities in each year. Appendix 11 shows the 2001 FsRBC budget application for instream work on the Viner River. We hope to receive additional funding from outside sources such as Pacific Salmon, HRSEP and others. The applications will be submitted as the available. The funding would allow us to ramp up our project scope and excavate additional area, complete further reconnaissance and inventory/assessment.

Crew time includes construction labour and riparian restoration. Professional time includes the permits, construction monitoring, as built inventory and completion reports. This chart should be completed when funding sources are confirmed.

1.0 REFERENCES

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Poulin Simmons, 1998. "Riparian Assessment: Malksope River". Report prepared for Kingcome Enhanced Forestry, Campbell River.

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Adams, M.A. and I.L. Whyte. 1990. Fish Habitat Enhancement; a manual for fresh water, estuarine and marine habitats. Dept. Fisheries and Oceans Canada. DFO 4474 330p

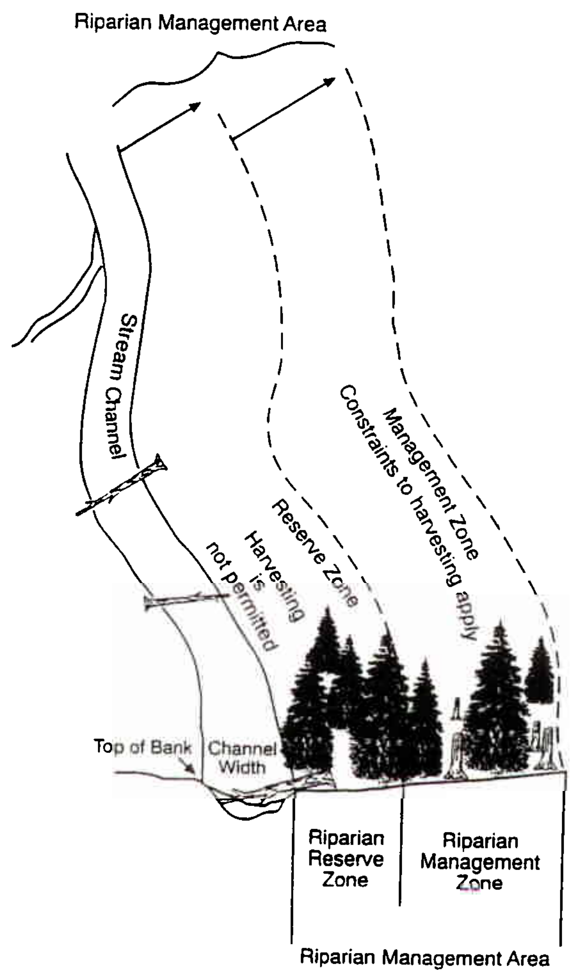
Slaney, P.A. and D.O. Zaldokas. 1997. Fish Habitat Restoration Procedures. Watershed Restoration Technical Circular No. 9. WRP MoELP 2204 Main Mall UBC Vancouver BC

Appendix 1 & 2 – Riparian Classes and RMA's

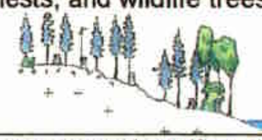
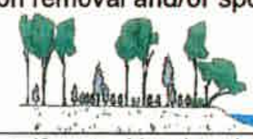
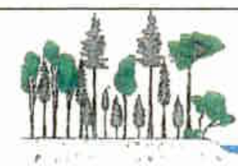
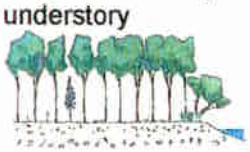
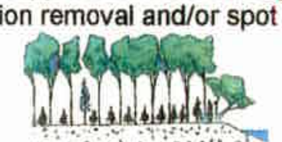
Riparian class	Average channel width (m)	Reserve zone width (m)	Management zone width (m)	Total RMA width (m)
S1 large rivers	≥100	0	100	100
S1 (except large rivers)	>20	50	20	70
S2	>5≤20	30	20	50
S3	1.5≤5	20	20	40
S4	<1.5	0	30	30
S5	>3	0	30	30
S6	≤3	0	20	20

Fish stream or community watershed

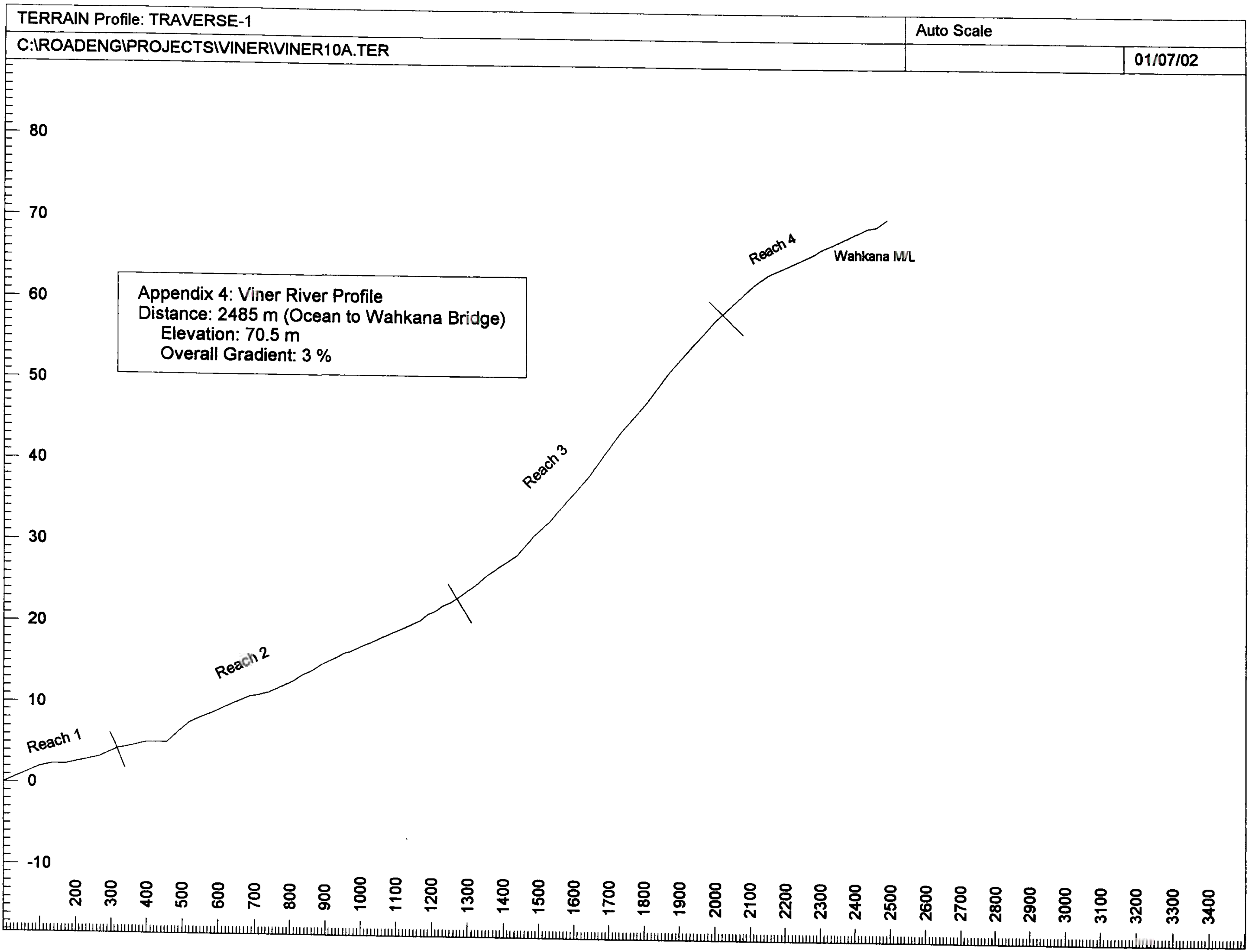
Not fish stream and not in community watershed



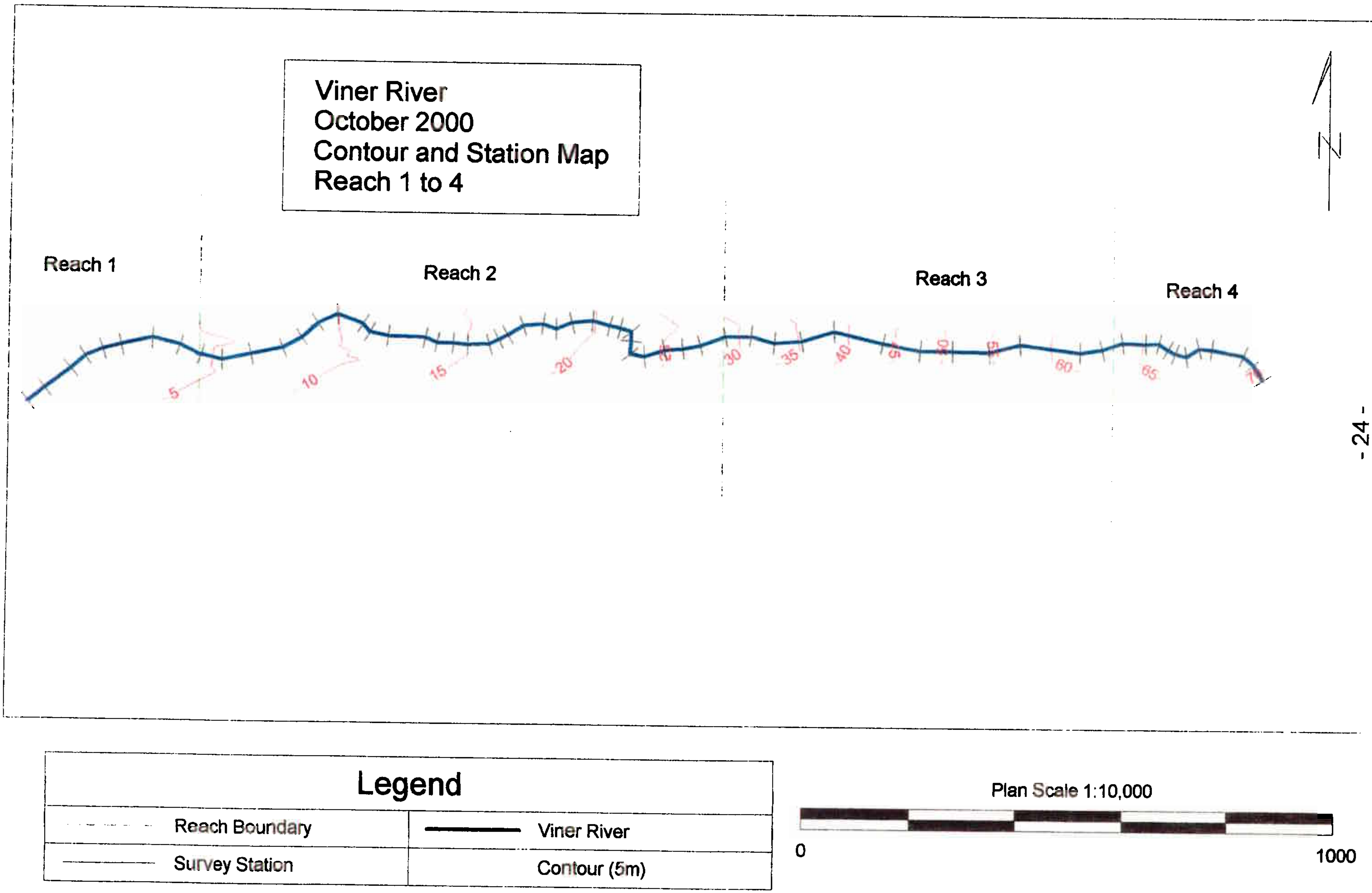
Appendix 3 – RVT Identifier

RVT	Stand Condition	Function Impaired	Area (ha)	Recommended Treatment	Desired Future Condition
1	Brush dominated, poorly stocked conifer component 	Large wood, shade, bank and floodplain stability	N/A	Improve conifer stocking by planting. Release suppressed trees through competition removal and/or spot fertilizing 	
2	Over stocked conifer, >800 stems per ha 	Large wood, forage for wildlife, structural diversity	N/A	Thin to 400-600 sph, favouring largest diameter trees; vary densities creating gaps and clusters. Opportunities for bird and bat nests, and wildlife trees. 	
3	Deciduous forest over top a good conifer understory 	Large wood, bank and flood plain stability	N/A	Release over topped conifers through competition removal and/or spot fertilizing 	
4	Deciduous forest over top a poor conifer understory 	Large wood, structural diversity, bank and flood plain stability	4.7 ha	Improve conifer stocking by planting. Release suppressed trees through competition removal and/or spot fertilizing 	
5	Old growth, or old second growth (>70 years)		N/A	No treatment required	N/A

Viner River Riparian Vegetation Types, and Their Recommended Restoration Treatments


TERRAIN Profile: TRAVERSE-1
C:\ROADENG\PROJECTS\VINER\VINER10A.TER
Auto Scale
01/07/02
Appendix 4: Viner River Profile
Distance: 2485 m (Ocean to Wahkana Bridge)
Elevation: 70.5 m
Overall Gradient: 3 %
Reach 1
Reach 2
Reach 3
Reach 4
Wahkana M/L
80
70
60
50
40
30
20
10
0
-10
200
300
400
500
600
700
800
900
1000
1100
1200
1300
1400
1500
1600
1700
1800
1900
2000
2100
2200
2300
2400
2500
2600
2700
2800
2900
3000
3100
3200
3300
3400

Appendix 5 – Viner River Contour and Station Map 1:10,000



Appendix 6 – Viner River Contour and Station Map 1:5,000

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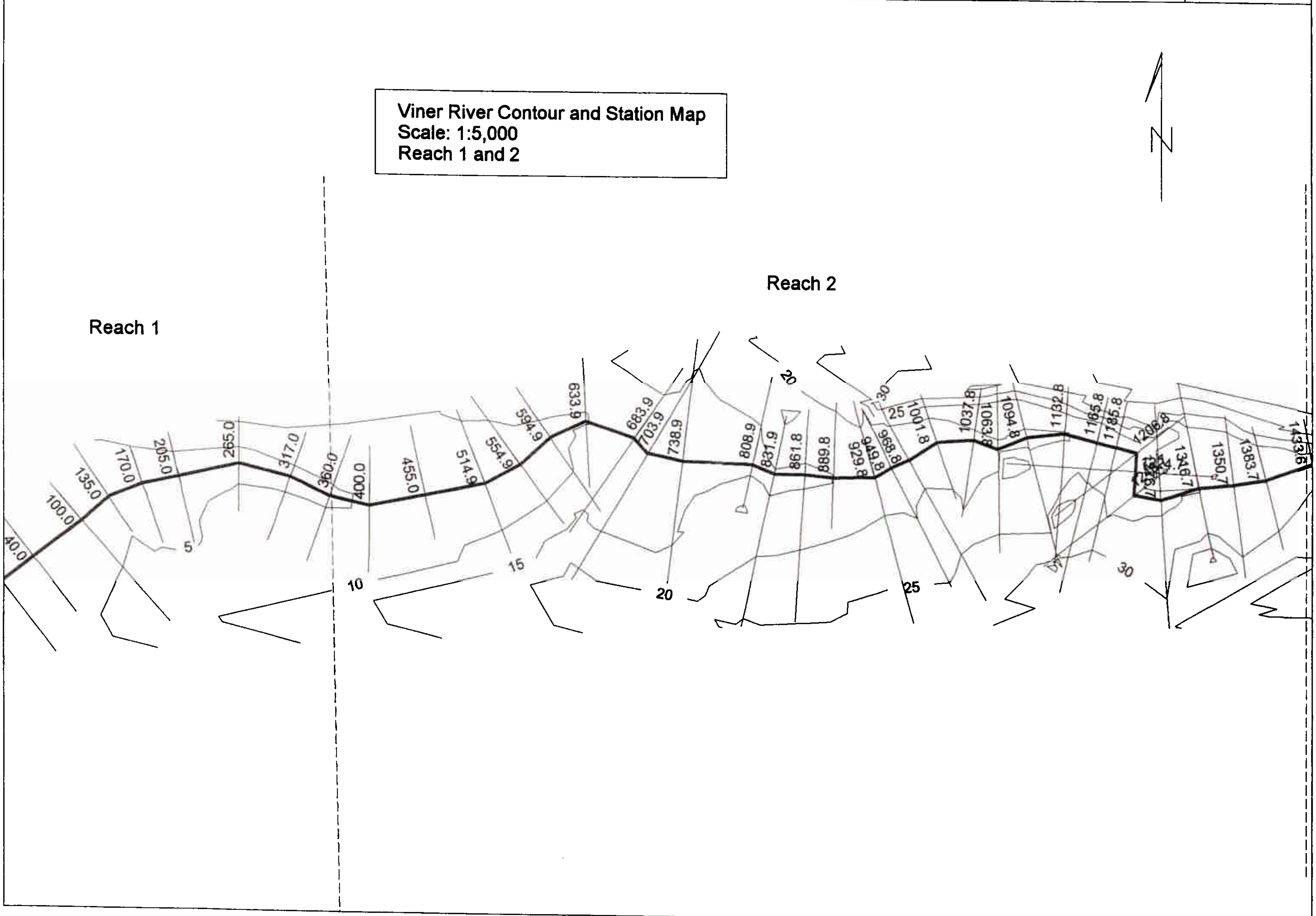
		01/07/02



Appendix 7 – Viner River Contour and Station Map 1:5,000

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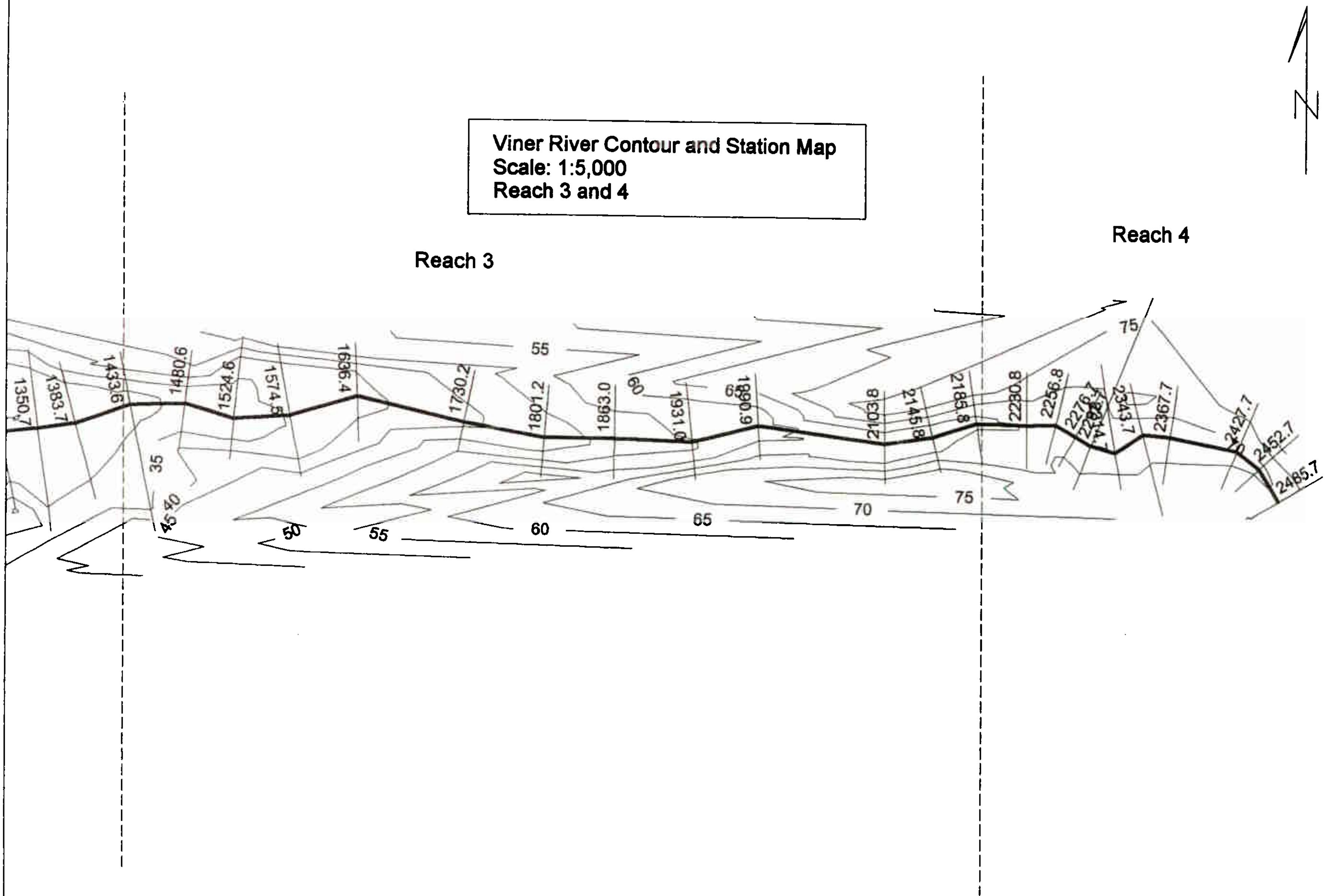
		01/07/02



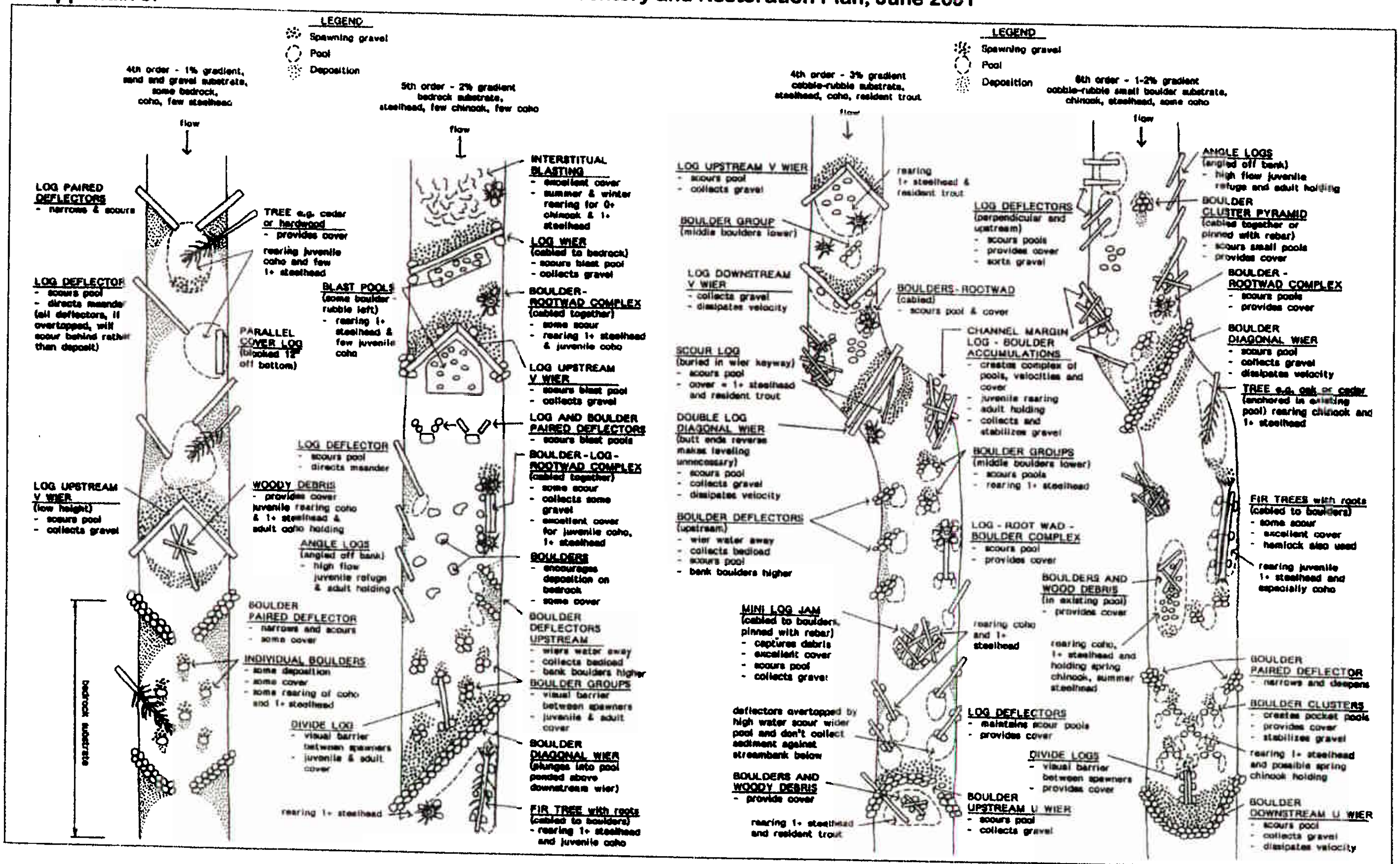
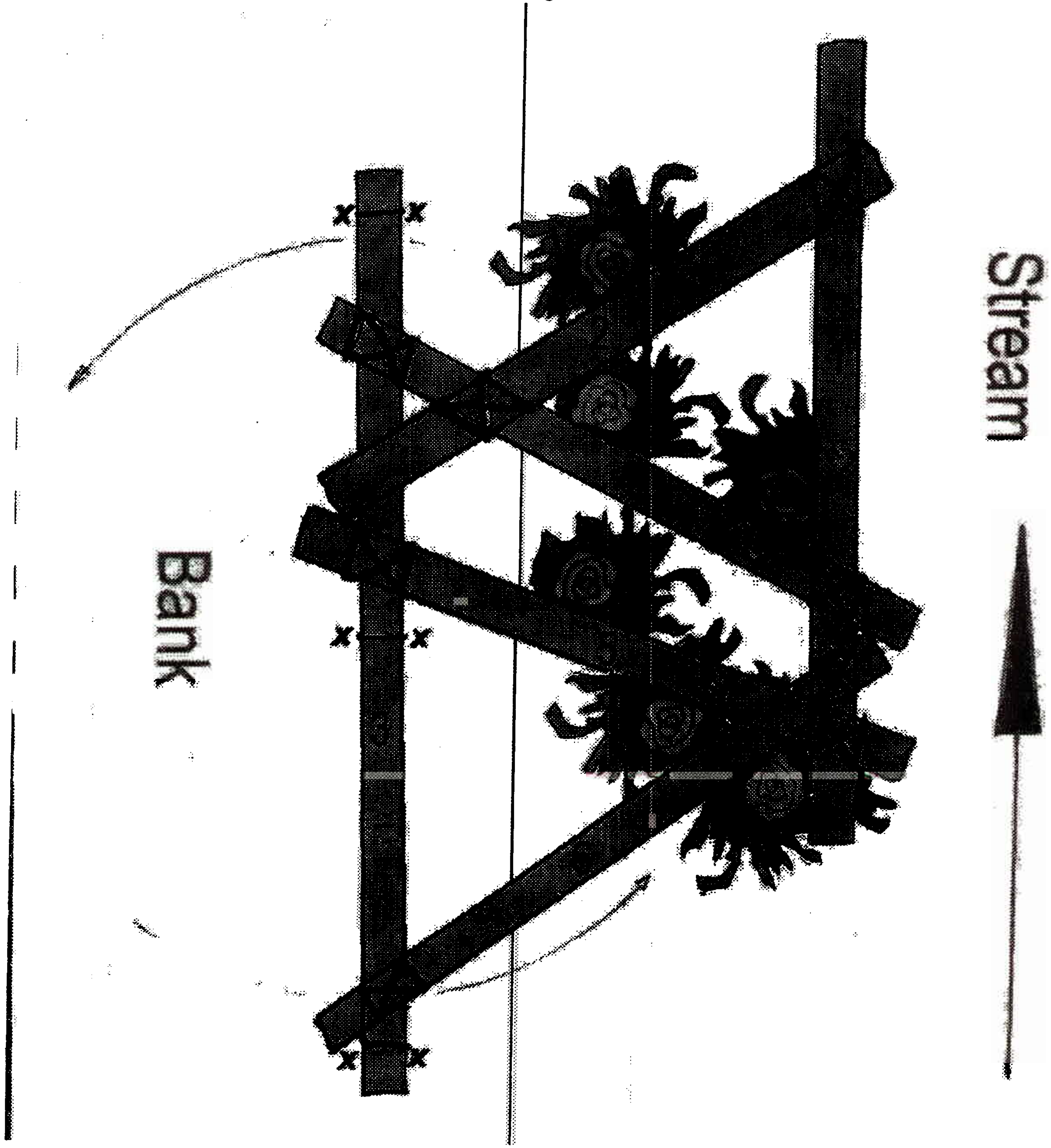


Figure 8-3A. Typical structures used in representative small- and medium-sized (4th and 6th order) streams, low gradient/sediment laden streams, and in bedrock streams (Crispin 1988).

Appendix 9 – Viner River LWD Structure Design



Appendix 10. STAND MANAGEMENT PRESCRIPTION

FOREST DISTRICT Port McNeill

SINGLE 4 MULTI-AREA

MANAGEMENT OBJECTIVES	(X) ORIGINAL ( ) AMENDMENT	DATE Y/M/D 01/05/29

A. LOCATION

A-1. GENERAL DESCRIPTION OF AREA

SU	AREA IDENTIFIER (OPENING NO.; CUTBLOCK; TIMBER MARK; OTHER) TA= RTV polygons, Supporting information is attached	TA	TREATMENT AREA (ha)
1	**92L079-077** **SU 1** areas are alder dominated sites where poor conifer densities are being over-topped and suppressed (RVT 4). This is impeding the development of riparian characteristics needed for restoration of fish and wildlife habitat, water quality and channel stability.	1	4.7
FIELD WORK BY: W. Warttig, RPBio & D. Clough, RPBio	DATE COMPLETED October 28, 2000		TOTAL TREATMENT AREA 4.7 (ha)

B. MANAGEMENT OBJECTIVES

B-1. HIGHER-LEVEL PLANS

ARE THESE TREATMENT AREAS WITHIN LOCAL RESOURCE USE, TOTAL RESOURCE, INTEGRATED WATERSHED MANAGEMENT, OR OTHER SPECIFIC PLANNING AREAS? ( ) YES (X) NO

ARE ANY OF THESE TREATMENT AREAS WITHIN A COMMUNITY WATERSHED ? ( ) YES (X) NO

	PLAN NAME	Date Y	M	D
IF YES:				

IF NO: CONSULT WITH OTHER RESOURCE AGENCIES TO ASSIST IN DEVELOPING MANAGEMENT OBJECTIVES FOR THE PRESCRIPTION.

SUMMARY OF HIGHER-LEVEL OBJECTIVES FOR THESE TREATMENT AREAS (Please rank specific objectives *[1 = highest priority, 10 = lowest]*):
( ) Timber ( ) Range ( ) Recreation ( ) VQO ( ) Wildlife Habitat ( ) Biodiversity ( ) Wildlife Trees ( ) Fisheries ( ) Water Quality ( ) Other:

UTILIZE SECTION B2. STAND-LEVEL OBJECTIVES TO CLARIFY, CONFIRM AND SPECIFY MANAGEMENT OBJECTIVES FROM HIGHER-LEVEL PLANS.

B-2. STAND-LEVEL OBJECTIVES

ANY SPECIAL AREA(S) WITHIN ANY TREATMENT AREAS? (x) Yes () No
IF 'YES,' PLEASE CLEARLY DELINEATE ALL SPECIAL AREAS WITHIN EACH TREATMENT AREA ON THE APPROPRIATE STANDARDS UNIT MAP:
All treatment areas are within the riparian reserve zone (S2)

ARE CURRENT STAND-LEVEL OBJECTIVES AVAILABLE FROM SILVICULTURE PRESCRIPTIONS? ( ) Yes (X) No IF 'YES,' SEE FS 711A.

ARE CURRENT STAND-LEVEL OBJECTIVES STILL APPROPRIATE FOR THESE STANDS? ( ) Yes ( ) No (X) NA

USE THIS SECTION TO SUMMARIZE OBJECTIVES FROM HIGHER-LEVEL PLANS OR FOR DEVELOPING OR CLARIFYING STAND-LEVEL OBJECTIVES.

TIMBER OBJECTIVES

THESE OBJECTIVES DO NOT APPLY TO THIS SMP; All Planned treatments are located in the RRZ.

WILDLIFE – HABITAT / BIODIVERSITY / WILDLIFE TREES	STAND-LEVEL ATTRIBUTES/ MANAGEMENT OBJECTIVES: To speed the recovery of riparian attributes needed by wildlife dependent on old forest characteristics.

THESE OBJECTIVES APPLY TO: SU 1

FS68 HFP 98/6

Grey shaded boxes are non-Code required information, therefore not mandatory.

Appendix 10 cont'd

WATERSHED	MANAGEMENT OBJECTIVES To improve water quality and watershed stability by enhancing the growth of streamside trees
THESE OBJECTIVES APPLY TO: SU 1	
FISHERIES/Streams - wetlands	MANAGEMENT OBJECTIVES To speed the recovery of riparian attributes needed for maintaining and creating fish habitat.
THESE OBJECTIVES APPLY TO: SU 1	

RANGE	CATTLE USE? ( ) Yes (X) No	IF 'YES,' RANGE UNIT PASTURE
CATTLE PRIMARY ACCESS TRAILS? ( ) Yes ( ) No	IF 'YES,' LOCATE ON ATTACHED MAP	SEEDED? ( ) Yes (Year) ( ) No
THESE OBJECTIVES APPLY TO: SU________		

VISUAL LANDSCAPE (VQO)	LANDSCAPE SENSITIVITY NA	VISUAL QUALITY OBJECTIVE
THESE OBJECTIVES APPLY TO: SU 1		

Viner River drains into a fjord on the Northwest coast of Gilford Island. All treatments proposed in this SMP will not result in any visible openings larger than natural gaps in late serial forests.

RECREATION	FEATURE SIGNIFICANCE Low
KEY FEATURE	MANAGEMENT CLASS
THESE OBJECTIVES APPLY TO: SU 1	

Recreational opportunities in the treatment watersheds are low.

OTHER RESOURCE VALUES/INTERESTS	MANAGEMENT OBJECTIVES To retain all resources of value and interest.
THESE OBJECTIVES APPLY TO: SU 1	

The objectives of this SMP are to enhance riparian attributes for the benefit of fish and wildlife, water quality and watershed stability. The treatments are not to be undertaken at the expense of any other valued resource or interest. All wildlife trees will be retained, any nesting or den sites will be left undisturbed, game trails are not to be blocked, plants of special interest are to be retained including poorly represented understory shrubs or trees of significance.

B-3. PRESCRIPTION APPROVAL

PREPARATION		PRESCRIPTION APPROVAL
PREPARED BY *(SIGNATURE)*		PRESCRIBING FORESTER *(SIGNATURE/SEAL-RPF)*
PRINTED NAME : Warren Warttig, RPBio	DATE SUBMITTED Y / M / D 01/06/13	DATE Y / M / D
MINISTRY OF ENVIRONMENT , DESIGNATED ENVIRONMENT OFFICIAL		FINAL APPROVAL
SIGNATURE		DISTRICT MANAGER *(SIGNATURE)*
PRINTED NAME	DATE SIGNED Y / M / D	DATE APPROVED Y / M / D

FS 668 HFP 98/6

TREATMENT AREA (TA) DESCRIPTION

SU 1 | **Area Identifier(s) 92L079 - 077** | **TA 1**

C-1. AREA DESCRIPTION

ZONE, SUBZONE, VARIANT	SITE SERIES (RANGE)	MOIST/NUTR. GRID
CWHvm1	08 09 10	5-6 / C-D

ELEVATION	ASPECT	SLOPE DATA	SLOPE POSITION	SLOPE LENGTH	SLOPE UNIFORMITY
Min: 3 m Max: 70 m Avg.:20m	N/A	Min. %: 2 Max. %: 40 Avg. %: 5	Level	50 m	Uniform

HUMUS FORM	ROOTING DEPTH	SOIL DEPTH TO RESTRICTING LAYER	SOIL TEXTURE	SOIL COARSE FRAGMENT	DRAINAGE
Mull	> 50	>100	LS	5 %	Moderate - good

WATER COURSES	* MECHANIZED STAND TENDING	SOIL DISTURBANCE?	HIGHEST HAZARD RATING (LSD)	MAX. SOIL DISTURB. ALLOWANCE
few Gullies none	( ) Yes (X) No	( ) Yes ( ) No (X) n/a %	NA	NA

C-2. CURRENT STAND DESCRIPTION

TA	Strata	Layer	Rank	Spp	%	Spp	%	Spp	%	Spp	%	Spp	%	Age (yrs)	Height (0.1) m	Ref. year	Site index	Density (stems/ha)	Well-spaced (stems/ha)
1		1		Dr	100									37	23	2000	30	1300	N/A
		2		Hw	70	Ss	30							31	18	2000		40	N/A
		3		Ss	90	Hw	10								3.8	2000		200	N/A

C-3. SILVICULTURAL SYSTEM (WRITTEN DESCRIPTION)

No commercial harvest, TA is within the Riparian Reserve Zones

C-4. FOREST HEALTH AND PROTECTION

FOREST HEALTH — AGENT OCCURRENCE

TA	AGENT CODE	AGENT NAME	% INCID.	TA	AGENT CODE	AGENT NAME	% INCID.
		No agents observed					

THE FOLLOWING FOREST HEALTH STRATEGIES WILL BE APPLIED:
No action will be taken with respect to forest health issues. Trees with deformities are considered acceptable elements in riparian ecosystems. Spruce is a valued riparian tree species. If weeviled spruce are found, they will be retained where required to meet riparian objectives.

PROTECTION

THE FOLLOWING FIRE HAZARD ASSESSMENT & PROTECTION STRATEGIES WILL BE APPLIED:
No special actions required. Implementation to be conducted outside fire season.

FS68 HFP 98/6
Aggregate Treatment Areas onto this page as appropriate. This page can also be duplicated to accommodate separate Treatment Areas; one page per Treatment Area if appropriate.
* only required if mechanized stand tending proposed.

TARGET STAND CONDITIONS AND STRATEGY

STAND TREATMENT REGIME — The Stand Treatment Objectives for all Treatment Areas in this standards unit must be the same. Clearly describe the average target stand condition for all Treatment Areas under this standards unit. Clearly identify how you propose to achieve the forest management objectives in Part B of this prescription. Clearly explain how the proposed treatments will achieve the stated objectives and/or mitigate impacts on non-timber forest resources listed in Part B. Where quantification is *NOT* possible, use qualitative descriptions.

Treatments Prescribed:

- overstory treatment (OT)
- individual conifer release (IC)
- conifer release (CR)
- fill plant (FP)
- sanitation space conifer (SPC)
- river structures (RS)

Target Stand Condition:

Treatment is aimed toward achieving the following target stand condition:

1. alder overstory thinned to allow maximum growth potential
2. canopy gaps where conifer regeneration is promoted
3. up to 40% full sunlight penetration to planted conifer
4. *release or sanitation space of natural conifer regeneration*
5. fill planting in conifer deficient areas in canopy gaps promoting conifer regeneration
6. largest most vigorous deciduous trees retained

Treatment Description:

Girdling/Felling/Sanitation Spacing:

1. Fell, girdle, or distress overstory alder (OT). Method of treatment will be at the discretion of the project supervisor and may include a combination of methods. Felling reduces the uncertainty of mortality to understory conifers caused when girdled trees ultimately die and fall. It is acceptable to employ the most effective and efficient method provided post-treatment mortality is considered and trees selected for girdling will not result in unacceptable amounts of small woody debris entering the stream.
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4. Sanitation space conifer understory (SPC) as directed by the project supervisor. Sanitation spacing will be undertaken where the primary objective is to reduce physical damage to target conifers while retaining alder. Where sanitation spacing may result in loss of an alder described in 2 above, do not girdle, fell or distress the alder unless authorized by a project supervisor.
5. Spot fertilize remaining existing conifers to promote release (CR and ICR). Two slow release fertilizer packets/tree (greater than 3m), and one packet/tree less than 3m, should be buried near and outside the trees drip line.
6. Girdle/fell trees within 3 m of the stream edge only if a lower live limb is present to allow coppicing and retention of live roots.
7. Dress girdle where possible with a chain saw to mimic natural wounds. Hand tools are acceptable on small trees. Allow a range of decay rates by girdling 25% to 100% of the stem while ensuring for target overstory densities.
8. When felling is employed, thin overstocked patches of conifer understory if present, to 800 sph unless the patch is to be retained untreated for wildlife or biodiversity reasons. Do not thin overstocked conifer patches where overstory is girdled. Girdling can cause upwards to 40% mortality to understory seedlings.
9. Fell trees away from understory conifer and buck and remove any tree or branches causing conifer press. Upright any tree disturbed by felling.
10. To the extent possible, fell trees at right angle to the floodplain to maximize sediment storage capability of downed slash and debris. Minimize bucking where possible to keep trees intact. Longer boles will resist movement in high flow. This is especially important on low and medium benches. On high benches, reduce slash build-up by bucking initial trees felled and limbing such that the stems come in close contact with the ground. Leave the last layer of trees to felled intact. High stumps are acceptable sources of coarse woody debris and may be left high to lock debris on floodplain. Cut alder within 3 m of the stream edge above the lower live limbs to allow the tree to coppice and retain a live root system unless in competition with a target conifer.
11. Where thinnings can safely augment or create river structures (RS) suitable for use by fish, felling toward or across the channel or on to existing debris is acceptable. All trees felled into the channel are to be individually selected by the project supervisor and felled in his presence. Only trees that can be wedged or otherwise stabilized should be felled for purpose of fish habitat augmentation. Allow trees to overhang banks where this material provides useful cover and source of nutrients for fish. Densities and placements of debris should mimic natural accumulations and spaced at similar natural intervals. Cabling should be considered where trees are at risk of movement by floodwater. This treatment will only be implemented under Section 9 approval.

Selection Criteria for trees to be retained (species preference, height, age, dbh, health, vigour, stem form, crown form, crown class, other): All conifers are priority tree species for retention. See 4 above for additional criteria.

D-1. POST-TREATMENT STANDARDS

Use the table below to enter the schedule of stand-level treatments and appropriate standards. Complete only the relevant columns.

TARGET				SCHEDULE		STAND STRUCTURAL ATTRIBUTES								
Year	Age/ Height	DBH	Layer	Treatment	Area (ha)	Species: Preferred	Species: Acceptable	Target No. Well-spaced /ha	Min. Pref. Well-spaced SPH	Min. Inter-tree Dist	Min. Total Well-spaced SPH	Max. Total Well-spaced SPH	Min. BA or Vol	Prune Min. Lift Height
01/02	37Y 15-26m	16+	1	Variable: Overstory retention to 100-400 sph/understory treatment may or may not be required depending on conifer density, if present includes brushing and release; 30-40% full sunlight to understory conifer when released using openings	4.7	Dr, all conifers		100-400	200	0.5	*see below	*see below	*see below	*see below

OTHER POST-TREATMENT STANDARDS: Describe any other post-treatment standards (type and rate of fertilizer, minimum live crown percent after pruning, maximum stump height after spacing, or other appropriate standards that apply to Forest Health, IRM, wildlife trees, etc.) *STAND STRUCTURAL ATTRIBUTES: The riparian prescriptions are aimed at managing Dr while providing conifer release when present, and openings for conifer planting. To promote release, all retained conifers greater than 3m will be fertilized with two 30 gm packets/tree of slow release fertilizer buried near, and outside of the drip line. Existing retained trees less than 3m will be fertilized with one 30 gm slow release fertilizer packet/tree. Spacing of understory conifers depends on density and choice of overstory treatment. Overstory retention will be highly variable ranging from 100-sph to 400-sph. Trees may be present singly or in clusters. Units may be treated wholly or partially including uniform or variable density spacing of overstory. Spatial variability will be further promoted by retaining patches or clusters of trees where these trees achieve a biodiversity objective. Provisions are provided to allow for creation or retention of gaps in the forest canopy; where insufficient conifers exist, these areas will be fill planted in higher density clusters (i.e 900 to 1200 sph). Each seedling will be fertilized with one 30 gm slow release fertilizer packet buried near and outside of the seedlings drip line. Planting within the 5m strip along Viner River will be uniform target spacing of 900 sph, any Alder thinning in this zone will occur only if there can be a cut above a live branch, however pruning of overhead obastcles is prefered. Where possible, a mixture of Cw and an alternate species will be planted.

D-2. SPECIAL AREAS

SPECIAL AREAS WITHIN STANDARDS UNIT? (X) Yes ( ) No	TYPE OF SPECIAL AREA (e.g., Riparian Reserve Zone, Riparian Mgmt Zone, Lakeshore Mgmt Zone, FENs, research installations, other)	
AREA NO. SU 1	SIZE 4.7 ha	Description of special area and significant features

SU1 is contained within the riparian reserve zone (RRZ) of Viner River. Treatment area is situated from 0+330 m to 2+600 m upstream. All treatments will be undertaken within the riparian reserve zone. Sites include floodplain areas adjacent to the mainstem of the river.

DESCRIBE HOW MANAGEMENT ACTIVITIES DIFFER FROM THE REST OF THE STANDARDS UNIT

AREA NO.	SIZE ha	Description of special area and significant features

DESCRIBE HOW MANAGEMENT ACTIVITIES DIFFER FROM THE REST OF THE STANDARDS UNIT

COMMENTS June 28, 2001	INITIALS			
	PREPARED BY Warren Warttig, RPBio	LICENSEE	DESIGNATED ENVIRONMENT OFFICIAL	DISTRICT MANAGER

FS68 HFP 98/6

Fisheries Renewal BC
Project Budget

Appendix 11

AMENDED MAY 24, 2001

Partner Group Name: Combined North Island Fisheries Centre

Name and Number of Project: *Viner River In Stream Restoration Project S-029-Y02-07*

note: please verify calculations within this spreadsheet; formulas may not be accurate

Time frame: 07/01/01 (mm / dd / yy) to 10/31/01 (mm / dd / yy)

Labour

Wages & Salaries

Position	# of crew	# of work days including stats	hrs per day	rate per hour	Total (FsRBC + in-kind + cash)	In-Kind + Cash	FsRBC Amount
Restoration Tech	5	10	8	17	6,800		6,800
					-		-
					-		-
					-		-
					-		-
					-		-
					-		-
Person Days (# of crew x work days)		50		sub total	6,800	-	6,800

Labour - Employer Costs (percent of wages subtotal amount)

					Total	In-Kind + Cash	FsRBC Amount
(CPP, EI, WCB, Vacation Pay)	rate	20%		sub total	1,360	-	1,360

Subcontractors & Consultants

Subcontractors & Consultants	# of crew	# of work days	hrs per day	rate per hour	Total	In-Kind + Cash	FsRBC Amount
Supervisor	1	15	8	35	4,200		4,200
					-		-
					-		-
					-		-
WCB if applicable (not covered by own policy)	rate	0%			-	-	-
				sub total	4,200	-	4,200

Volunteer Labour

Volunteer Labour	# of crew	# of work days	hrs per day	rate per hour	Total	In-Kind + Cash	FsRBC Amount
Skilled	2	4	8	25	1,600	1,600	
Un-skilled				10	-	1,600	
WCB if applicable (not covered by own policy)	rate	0%			-	-	-
				sub total	1,600	3,200	-

	Total	In-Kind + Cash	FsRBC Amount
Total labour costs	13,960	3,200	12,360

Site / Project costs

Site / Project costs	Detail (use additional page for details if needed)	Total	In-Kind + Cash	FsRBC Amount
Travel (do not include to & from work)	Vehicle mileage and boat transportation for volunteer labour	600		600
Small Tools & Equipment	power saw winch, turfer jacks, radios	2,000		2,000
Site Supplies & Materials	cable, clamps, anchors, fuel oil, film, misc.	4,860		4,860
Equipment Rental	Pick up, misc.	2,400	2,400	-
Work & Safety Gear		200		200
Safety Training & Supplies				-
Repairs & Maintenace		450		450
Permits	Section 9	130		130
Technical Monitoring		800	800	-
Other site costs	Helicopter	6,000	1,700	4,300
	Total Site / Project Costs	17,440	4,900	12,540

Fisheries Renewal BC
Project Budget

Appendix 11

AMENDED MAY 24, 2001

Partner Group Name: Combined North Island Fisheries Centre
Name of Project: Viner River Instream Restoration Project

Training	Detail (use additional page for details if needed)	Total (FsRBC + in-kind + cash)	In-Kind + Cash	FsRBC Amount
Safety / 1st Aid		500	500	-
				-
				-
				-
				-
	Total Training	500	500	-

Overhead	Detail (use additional page for details if needed)	Total (FsRBC + in-kind + cash)	In-Kind + Cash	FsRBC Amount
Office space; including utilities, etc.		100	100	-
Insurance				-
Office supplies		200	200	-
Telephone & long Distance		200	200	-
Photocopies & printing		300		300
Other overhead costs		800		800
				-
				-
				-
	Total Overhead	1,600	500	1,100

Capital Costs / Assets (*subject to FsRBC policy*)		Total (FsRBC + in-kind + cash)	In-Kind + Cash	FsRBC Amount
				-
				-
				-
				-
				-
	Total Capital Costs	-	-	
	Project Total	33,500	9,100	26,000

Budget Summary
(FsRBC + In-kind + cash)

Labour	13,960
Project / Site Costs	17,440
Training Costs	500
Overhead Costs	1,600
Capital Costs	-
Total	33,500