LANG CREEK RIPARIAN RESTORATION MONITORING SURVEYS

Prepared for:

Renewal Investment Corp.
Suite 3 – 730 – 13th Avenue
Campbell River, BC
V9W 4H1

January 2004

Picture courtesy of Lunn and Younie (2002)

FIA# 6223004

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1. Introduction

This report is a summary of observations made to assess the survival of conifer seedlings planted in 2002, the level of brush competition, and the incidence of elk damage. The report also includes an overview summary of the project since its inception, including information collected and summarized by Lunn and Younie (2002). Much of the report is based on information collected by Christina Wilson as part of a paper prepared for a course in ecological restoration at the University of Victoria. The walkthrough reconnaissance surveys and monitoring are required to ensure the successful establishment of these seedlings and assess the need for any followup treatments. Monitoring restoration treatments is an essential phase in the adaptive management process, particularly since riparian restoration is relatively new and untested in British Columbia (Lunn and Younie 2002).

Lang Creek, located south of Powell River, is one of the most significant fish bearing streams on the Sunshine Coast (Lunn & Younie 2002). This creek is part of the Haslam/Lang Creek watershed and supplies the community of Lang Creek with drinking water. Past logging practices allowed the removal of trees up to the stream banks and in some cases directly across the creek. When forest practices changed, timber harvesting was discontinued along the stream bank and the forest was left to regenerate naturally. Earlier studies by Carson (2000) and GFC Forest Management Ltd. (2001) have shown that the resulting riparian area for Lang creek is a mix of coniferous and deciduous forest, which is dominated by red alder (\textit{Alnus rubra}) (Figure 1 – 3). Several concerns were raised by these earlier studies, including forest age class, debris dams, turbidity, and elevated stream temperatures. The age class of the trees is relatively uniform and many of the conifers are being suppressed, especially western red cedars (\textit{Thuja plicata}). Debris dams were observed in the stream (Figure 4) and were determined by Carson (2000) to be caused by the red alder (\textit{Alnus rubra}) which is reaching senescence and falling into the creek. Erosion and turbidity have increased and water is being diverted to towards the stream banks. The turbidity levels at the headwaters, Haslam Lake, have been recorded as negligible, yet the levels at the mouth of Lang Creek exceed the drinking water guidelines (Carson 2001).

Lang Creek has been designated temperature sensitive due to concerns raised by both fisheries and drinking water managers regarding elevated in-stream temperatures (Haslam Lake and Lang Creek Integrated Watershed Management Planning Team 1999). Stream temperature is therefore being monitored at locations adjacent to the treatment areas.

In 2000, funding from Forest Renewal BC was allocated to Weyerhaeuser to complete surveys to assess the potential for restoration treatments in the Riparian Reserve Zone (RRZ) adjacent to Lang Creek. GFC Forest Management Ltd. completed level I and II assessments and treatments were implemented in 2002. The report by Lunn and Younie (2002) represents an ongoing study to monitor the effectiveness of restoration treatments adjacent to Lang Creek.
2. Methods
GFC Forest Management Ltd. began the restoration project with a riparian overview and Level I assessment. The following project goals and objectives, which were developed from this process, were to (Weyerhaeuser 2003):

- Accelerate succession towards old growth forest function;
- Improve long-term shading and temperature moderation of creek;
- Reduce large alder (*Alnus rubra*) debris jams in the creek;
- Promote variable age class stands along Lang Creek by establishing younger stands of conifers where existing conifer densities are low;
- Stabilize bank and reduce surface run-off;
- Release suppressed conifers and increase conifer component.

The Level I assessment resulted in the RRZ adjacent to the creek being divided into polygons with distinct riparian vegetation types, such as conifer dominated, alder dominated or mixed. The polygons were ranked based on the level of functioning and
treatment potential. The level of functioning of the riparian zone was determined by data collected in the field and based on the following criteria (Weyerhaeuser 2003):

- Large woody debris;
- Shade;
- Small organic debris;
- Surface sediment filtering;
- Channel stability;
- Bank stability.

Areas within the polygons were identified where it would be possible to reduce the negative effects of the decaying alder (*Alnus rubra*). Gaps were created within the stands and conifer seedlings were planted to increase the conifer content. Existing conifers were released by removing red alder (*Alnus rubra*) that was directly competing for light, nutrients and moisture. It was decided that an adaptive management approach was to be taken and the total area to be treated was reduced from 15.7 ha to 6.9 ha. The area was further reduced to 4.0 ha when Northwest Hardwoods recognized the potential for a future restoration project in conjunction with normal timber harvesting operations in one part of the treatment area (Lunn and Younie 2002).

Initial treatments began in January 2002 and continued up to February 2002 (see Appendix 1 for Stand Management Prescription [SMP]). Control plots were established for the purposes of long-term monitoring and operational research as outlined by Lunn and Younie (2002). The SMP outlines the specific management objectives as applicable to wildlife management, watershed management, fisheries and wetlands and stand level objectives.

Two field inspections were conducted and attended by government personnel and various stakeholder groups. One was pre-treatment and one was post treatment. In general treatments were implemented as per the SMP. Subsequent field inspections were conducted in 2002 and twice in 2003 to assess and monitor the growth of competing brush species and planted conifer seedlings. An inspection was completed early in the summer of 2003 to confirm the requirements for manual brushing and cage maintenance. A second inspection was completed in October 2003 to assess the survival and growth of the planted seedlings.

2.1 Stream Temperature (February 2002)

Three thermostats were installed to measure the impact of removing streamside vegetation (Figures 5-6). Temperatures were measured on an hourly basis commencing June 2001 at a site 50 m upstream from the treatment areas, a site at the downstream end of the treatment areas and a site 100 m downstream from the treatment areas (Lunn and Younie 2002). Effects of canopy removal were calculated using pre-treatment and post-treatment data as well as long-term stream temperature data from the entire watershed. The report by Lunn and Younie (2002), entitled *Lang Creek Riparian Treatment Effectiveness Monitoring*, may be referred to for further details.
2.2 Planting, Browse Protection, and Manual Brushing

Three canopy gaps approximately 0.2 hectares in size were created in areas where the conifer understory was low by falling the alder and bucking the logs such that wildlife traffic would not be impeded. The size of the gaps was considered sufficient to allow enough light for conifer growth. Within each gap, 1 or 2 alder trees were retained for habitat and to promote stand structure diversity. Between 5 and 7 planting clusters approximately 9.0 m in diameter and at an inter-cluster distance of 14.0 m were created within each gap by manually brushing all competing brush species within the clusters. Each cluster was then planted with approximately 14 western red cedar and 2 grand fir (Abies grandis) large stocktype (2+0 615) seedlings at an inter-tree distance of between 1.5 to 3.0 m. All seedlings were also protected from potential vegetation press and animal browse using 1.3 m tall sinocast cones. Western red cedar seedlings were also planted at an inter-tree distance of 3.0 m in a single row within 5.0 m of Lang Creek for the length of the treatment area, and protected using sinocast cones. The sinocast cones were replaced with wire cages early in 2003 due to significant elk browse. All seedlings were manually brushed in a 1.5 m radius around each tree in 2002 and 2003.

Five monitoring plots were established at the time of planting in 2002 as outlined below and in Lunn and Younie (2002):

- protective cones/cages with no brushing (Figure 7)
- protective cones/cages with brushing (Figure 8)
- no protective cones/cages with brushing (Figure 9)
- no protective cones/cages with no brushing
- no canopy gap with no cones and no brushing (Figure 10)

Using a standard construction measuring tape, each seedling was measured from the leader tip to ground level at the trunk base. This allows for future evaluation of seedling growth and the effect of gap opening, brushing and cones (Lunn and Younie 2002).
2.3 Conifer Release (February 2002)
In the remaining treatment area outside of the canopy gaps, alder trees were felled or girdled using chainsaws to create a girdle between 10 and 30 cm wide at a height of approximately 1.3 m. Scattered alder trees were retained to provide wildlife habitat and structural diversity. The released conifers were measured and ten target trees were tagged for control purposes. Any red alder (*Alnus rubra*) that was considered to be competing were either felled or girdled around the control conifers. For further details on the methods used in this portion of the project, refer to *Lang Creek Riparian Treatment Effectiveness Monitoring* (Lunn and Younie 2002).

2.4 Effectiveness Monitoring (October 2003)
The three established canopy gaps and the control gap were surveyed on October 12, 2003 using a plot radius of 3.99 m. A tree species stem tally was taken of the overstory and the height of the dominant species was recorded. Understory species were recorded and a plot summary calculated. Each site was observed for disturbance indicators and the level of functioning of the riparian zone was assessed. A soil pit with dimensions of
approximately 50 cm by 50 cm was dug and soil horizons classified. Overview photos of each site were taken and are included in this report.

3. Results
3.1 Stream Temperature (February 2002)
Stream temperature data collected was recorded and analyzed. As of February 2002, Lunn and Younie (2002) state that there is no significant difference in stream temperature between the sites located above and below the treatment areas.

3.2 Planting (February 2002)
Table 1 lists seedling heights at the time of planting. The conifer seedlings were rated as healthy and in good condition (Lunn and Younie 2002).

Table 1: Seedling Heights at Time of Planting (Lunn and Younie 2002)

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Range</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cones &amp; No Brushing</td>
<td>41.5 – 62.0</td>
<td>51.8</td>
</tr>
<tr>
<td>Cones &amp; Brushing</td>
<td>37.0 – 60.0</td>
<td>48.2</td>
</tr>
<tr>
<td>No Cones &amp; Brushing</td>
<td>35.0 – 54.0</td>
<td>47.1</td>
</tr>
<tr>
<td>No Cones &amp; No Brushing</td>
<td>40.0 – 60.0</td>
<td>52.4</td>
</tr>
<tr>
<td>Control Gap Plot</td>
<td>46.0 – 57.0</td>
<td>51.0</td>
</tr>
</tbody>
</table>

3.3 Conifer Release (February 2002)
Lunn and Younie (2002) observed that height:dbh ratios were almost identical for both the control as well as the released trees, but expect that this ratio for the released trees will decrease due to crown expansion and the resulting girth increase.

3.4 Effectiveness Monitoring (October 2003)
Table 2 lists seedling heights at the time of this survey (Oct. 2003). Most of the seedlings were growing well and were in good health. Overall seedling survival is estimated at approximately 90%. Some cages did not have any seedlings indicating that these particular trees had died. A combination of elk browse damage and leaf blight are primarily responsible for the observed mortality, with microsite selection (too wet) at the time of planting accounting for some minor mortality. There was some evidence of cedar leaf blight on the western red cedar (*Thuja plicata*) seedlings at all the plots.

Table 2: Seedling Heights at Time of Survey (October 2003)

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Range</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cones &amp; No Brushing</td>
<td>70.0 – 90.0</td>
<td>80.0</td>
</tr>
<tr>
<td>Cones &amp; Brushing</td>
<td>65.0 – 85.0</td>
<td>75.0</td>
</tr>
<tr>
<td>No Cones &amp; Brushing</td>
<td>60.5 – 70.5</td>
<td>65.0</td>
</tr>
<tr>
<td>Control Gap Plot</td>
<td>55.0 – 65.0</td>
<td>60.0</td>
</tr>
</tbody>
</table>
3.4.1 Plot 1 - Control Gap Plot:

Plot 1 is located in the CWHxm1 zone and is classified as site series 07. The structural stage is mature (6) outside the plot and for the red alder (*Alnus rubra*) in the plot and tall shrub (3b) for the seedlings. This plot is located in a level meso slope position. The moderately well drained mineral soils are moist (SMR 5) and rich (SNR D), have a loamy texture and are greater than 40 cm deep.

Brushing is evident at this plot, despite it being within the control gap (Figure 11 – 12). Both red alder (*Alnus rubra*) and western red cedar (*Thuja plicata*) are found in the plot. The red alder (*Alnus rubra*) are mature trees with an average height of 22.0 m. The western red cedar (*Thuja plicata*) observed are seedlings and have an average height of 0.60 m. Seedlings which were alive are healthy and growing well. Two stakes had no trees next to them, thus indicating dead trees. The likely cause is due to animal grazing.

The understory species varied in size, with some salmonberry (*Rubus spectabilis*) having an average height of 2.5 m. This was primarily surrounding the plot, however, some was within the plot boundaries. In addition to this tall shrub, there were smaller shrubs that had been brushed within the plot boundaries. The brushed species included salmonberry (*Rubus spectabilis*), red elderberry (*Sambucus racemosa*), spiny wood fern (*Dryopteris expansa*), sword fern (*Polystichum munitum*), electrified cat’s tail moss (*Rhytidiadelphus triquetrus*), and Oregon beaked moss (*Kindbergia oregana*). The understory was an average height of 40 cm and consisted of 8% of the total canopy cover. There were signs of disease (cedar leaf blight), flooding and fire. Despite these disturbance indicators, the overall state of the seedlings remains good.

The level of functioning is as follows:

- Large woody debris (LWD) – high due to fallen trees and snags outside plot
- Shade – low due to brushing of plot and a low canopy cover
- Small organic debris (SOD) – moderate due to salmonberry (*Rubus spectabilis*) outside plot
- Surface sediment filter (SSF) – high due to woody debris on ground

Channel stability and bank stability were recorded as functioning moderately.
3.4.2 Plot 2 - Cones/no brushing:
Plot 2 is located in the CWHxm1 zone and is classified as site series 12. The structural stage is mature (6) outside the plot and tall shrub (3b) for the western red cedar (*Thuja plicata*) seedlings. This plot is located in a level meso slope position. The soils are imperfectly to poorly drained mineral soils and are wet (SMR 7) and rich to very rich (SNR D – E), have a loamy texture and are greater than 30 cm deep.

Brushing is evident at this plot (Figure 13 – 14). Western red cedar (*Thuja plicata*) seedlings are the only tree species found in the plot and have an average height of 0.80 m. The seedlings are healthy and doing well.

![Figure 13: Plot 2 – October 2003 Brushing evident](image1)

![Figure 14: Plot 2 – October 2003 Brushing evident](image2)

The understory showed evidence of prior treatment (brushing) and therefore were not overtaking the seedlings. The species observed included salmonberry (*Rubus spectabilis*), red elderberry (*Sambucus racemosa*), spiny wood fern (*Dryopteris expansa*), sword fern (*Polystichum munitum*), common horse tail (*Equisetum arvense*), electrified cat’s tail moss (*Rhytidiadelphus triquetrus*), and slender beaked moss (*Kindbergia praelonga*). The understory is an average height of 30 cm and consisted of 20% of the total canopy cover. Signs of disease (cedar leaf blight), animal damage (elk), blow down, and flooding were observed. Despite these disturbance indicators, the overall state of the seedlings is good.

The level of functioning is as follows:
- Large woody debris (LWD) – low due to small amounts of fallen trees
- Shade – low due to brushing of plot and a low canopy cover
- Small organic debris (SOD) – low due to brushing of understory.
- Surface sediment filter (SSF) – moderate due to some woody debris on ground

Channel stability and bank stability were recorded as functioning moderately.
3.4.3 Plot 3 - Cones/brushing:
Plot 3 is located in the CWHxm1 zone and is classified as site series 07. The structural stage is mature (6) outside the plot and tall shrub (3b) for the seedlings. This plot is located in a level meso slope position with well drained mineral soils that are moist (SMR 5) and rich (SNR D), have a sandy to loamy texture and are greater than 30 cm deep.

Both grand fir (Abies grandis) and western red cedar (Thuja plicata) seedlings are found in the plot (Figure 15 – 16). The grand fir (Abies grandis) seedlings have an average height of 0.70 m and the western red cedar (Thuja plicata) seedlings have an average height of 0.75 m. The grand fir (Abies grandis) seedlings are not doing as well as the western red cedar (Thuja plicata) and show evidence of animal damage.

Salmonberry (Rubus spectabilis) surrounds the plot and is an average height of 1.7 m tall. The understory is an average height of 40 cm and makes up 30% of the total canopy cover. These species include salmonberry (Rubus spectabilis), spiny wood fern (Dryopteris expansa), sword fern (Polystichum munitum), and electrified cat’s tail moss (Rhytidiadelphus triquetrus). There were signs of disease (cedar leaf blight), animal damage (elk), and fire present in the plot. Despite these disturbance indicators, the overall state of the seedlings remains good.

The level of functioning is as follows:
- Large woody debris (LWD) – moderate due to snags outside plot
- Shade – low to moderate due to brushing of plot and surrounding brush species
- Small organic debris (SOD) – moderate due to salmonberry (Rubus spectabilis) outside plot
- Surface sediment filter (SSF) – moderate due to woody debris on ground

Channel stability and bank stability were recorded as functioning moderately.
3.4.4 Plot 4 - No cones/brushing:
Plot 4 is located in the CWHxm1 zone and is classified as site series 07. The structural stage is mature (6) outside the plot and tall shrub (3b) for the seedlings. This plot is located in a level meso slope position with moderately well drained mineral soils that are moist (SMR 5) and rich (SNR D), have a sandy to loamy texture and are deeper than 30 cm.

Western red cedar (*Thuja plicata*) seedlings are found in the plot and have an average height of 0.65 m (Figure 17 – 18). The seedlings are doing well, despite some evidence of cedar leaf blight. There is some grand fir (*Abies grandis*) seedlings located outside of the plot, which are very healthy and reach an average height of 1.3 m.

![Figure 17: Plot 4 – October 2003](image)

![Figure 18: Plot 3 – October 2003](image)

The understory is an average height of 20 cm and makes up 20% of the total canopy cover. These species include salmonberry (*Rubus spectabilis*), spiny wood fern (*Dryopteris expansa*), sword fern (*Polystichum munitum*), and electrified cat’s tail moss (*Rhytidiadelphus triquetrus*). There were signs of disease (cedar leaf blight), animal damage (elk), and flooding observed in the plot. Despite these disturbance indicators, the overall state of the seedlings remains good.

The level of functioning is as follows:
- Large woody debris (LWD) – low due to a low level of snags and woody debris on the ground
- Shade –moderate due to brushing of plot
- Small organic debris (SOD) – moderate due to salmonberry (*Rubus spectabilis*) outside plot
- Surface sediment filter (SSF) – moderate due to woody debris on ground

Channel stability and bank stability were recorded as functioning moderately.
4 Discussion and Recommendations

Table three contains the change in mean height of the seedlings since the time of planting.

Table 3: Change in mean height of seedlings since planting

<table>
<thead>
<tr>
<th>Treatment/Plot #</th>
<th>Time of Planting</th>
<th>Present</th>
<th>Increase in Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control Gap (Plot 1)</td>
<td>52.4</td>
<td>60.0</td>
<td>7.6</td>
</tr>
<tr>
<td>Cones/No Brushing (Plot 2)</td>
<td>51.8</td>
<td>80.0</td>
<td>28.2</td>
</tr>
<tr>
<td>Cones/Brushing (Plot 3)</td>
<td>48.2</td>
<td>75.0</td>
<td>26.8</td>
</tr>
<tr>
<td>No Cones/Brushing (Plot 4)</td>
<td>47.1</td>
<td>65.0</td>
<td>17.9</td>
</tr>
</tbody>
</table>

It is apparent that seedlings in plots 2 and 3 have experienced the most amount of growth. This is likely due to the protection from animal damage by the wire cages and the brushing treatments. Plot 4 seedlings have experienced moderate growth and would do better if caged. The lower growth in plot 4 is likely due to increased browse by elk as the seedlings are not protected and were also brushed. It is speculated that the elk in this area recognize wire cages and cones as having seedlings growing in them. They may be more likely to approach these areas for grazing.

The treatment areas have very favourable conditions for western red cedar (*Thuja plicata*) and if the seedlings can continue to grow without competition from the surrounding brush or elk, they stand a good chance of developing into mature trees. Salmonberry (*Rubus spectabilis*) and the other brush species are aggressive competitors and must continue to be controlled. It is important that these planted areas become established as they have the potential to provide a younger age class of conifers. This will help to establish a variable age stand that is currently lacking in the RRZ.

Temperature is still currently being monitored upstream and downstream of the treatment areas. This is important as bank stability may decrease in the future years as the remaining large woody debris decays. There is also the risk of increased soil erosion and sedimentation related to the decaying and falling red alder (*Alnus rubra*) stems. At the time of this survey, bank and channel stability is functioning moderately and the aforementioned risk is low. However, the level of functioning must be constantly evaluated by future surveys.
5 Conclusion

The restoration project being undertaken adjacent to Lang Creek is progressing well. The prescribed treatment of planting conifer seedlings appears to be working well in most plots. Those seedlings in plots with protection from animal damage and competing brush species have experienced the most amount of growth. The restoration of the riparian zone adjacent to Lang Creek can be successful with future monitoring and treatment of the planted areas. The conifer seedlings can become established and contribute to the functioning of the stand if they are able to reach a height above that of the surrounding brush.

Future monitoring and brushing will be necessary to ensure that these seedlings develop into young trees, particularly in those plots where there is no brushing or cones. Once established, the trees will be essential in contributing to a riparian reserve zone that is functioning properly. Lang Creek is important as a source of local drinking water as well as to fisheries. The riparian zone impacts the health of the creek and therefore it is important to ensure that it is functioning well. Through the adaptive management process, the restoration of the riparian zone adjacent to Lang Creek can prove to be a success.
References


GFC Forest Management Ltd. 2001. Lang Creek Riparian Assessment Overview and Level I. Prepared for Renewal Investment Corp.


Weyerhaeuser. 2003. FRBC Riparian Silviculture Treatments on Lang Creek. Report to Annual Works Meeting Haslam/Lang Creek IWMP Planning Team. Prepared by GFC Forest Management Ltd.
APPENDIX 1

Stand Management Prescription
### SMP – RIPARIAN FORMAT

#### A. LOCATION AND GENERAL DESCRIPTION OF AREA

<table>
<thead>
<tr>
<th>SU</th>
<th>TREATMENT AREA (TA) IDENTIFIER (General Location, Licensee, Stream Reaches, Other – e.g., GPS coordinates, photo number)</th>
<th>TA #</th>
<th>TREATMENT AREA (to nearest 1 or 0.1 ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>SU1 is located within the Riparian Reserve Zone (RRZ) along the southwest bank of Lang Creek near Powell River. The area is located within FLA19228 in the Sunshine Coast TSA. Weyerhaeuser will implement the prescribed treatments with funding from Forest Renewal B.C. The two reaches of Lang Creek for which treatments are prescribed are class S1 and S2. The photo reference number is MB95004-221. Treatment area A is the western portion of the treatment area under this prescription. Lang Creek is a class S1 watercourse for those stream reaches adjacent to treatment area A.</td>
<td>A</td>
<td>4.2</td>
</tr>
<tr>
<td>1</td>
<td>Treatment area B is the eastern portion of the treatment area under this prescription. Lang Creek is a class S2 watercourse for those stream reaches adjacent to treatment area B.</td>
<td>B</td>
<td>3.3</td>
</tr>
<tr>
<td>2</td>
<td>SU2 comprises the first 5 m of the Riparian Reserve Zone immediately adjacent to Lang Creek in the same areas described above.</td>
<td>C</td>
<td>0.5</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td></td>
<td>8.0</td>
</tr>
</tbody>
</table>

#### B. MANAGEMENT OBJECTIVES

##### B-1. HIGHER LEVEL PLANS

- ARE ANY OF THE TREATMENT AREAS SUBJECT TO A HIGHER LEVEL PLAN? (X) YES ( ) NO

<table>
<thead>
<tr>
<th>PLAN NAME</th>
<th>Year</th>
<th>Month</th>
<th>Day</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1999</td>
<td>Oct.</td>
<td></td>
</tr>
</tbody>
</table>

The area is located within FLA19228 for which a 5 year Forest Development Plan is prepared.

##### B-2. STAND-LEVEL OBJECTIVES

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

- ARE CURRENT STAND-LEVEL OBJECTIVES STILL APPROPRIATE FOR THESE SUs? ( ) Yes ( ) No N/A

- Accelerate the succession towards old growth stand structure attributes and ecological processes.
- Improve the long-term shading and temperature moderation of Lang Creek.
- Reduce the occurrence of large alder debris jams in the creek and reduce the total organic carbon flush.
- Promote the development of variable age class stands along Lang Creek by establishing younger stands of conifers where existing conifer densities are low.
- Stabilize the bank and reduce surface run-off.

#### TIMBER MANAGEMENT OBJECTIVES

These objectives apply to all SU(s)

No timber harvesting is prescribed under this prescription. No trees will be removed from the Riparian Reserve Zone. Timber production is not an objective of this prescription.

#### WILDLIFE MANAGEMENT OBJECTIVES – HABITAT/BIODIVERSITY/WILDLIFE TREES

These objectives apply to all SU(s)

- To accelerate the development of old growth stand structure attributes and associated ecological processes.
- To promote the development of stands with variable ages and species composition.
- To retain a proportion of existing red alder (Dr – Alnus rubra) and bigleaf maple (Mb – Acer macrophyllum), while increasing the ratio of conifer to deciduous trees. Hardwoods will occupy approximately 10 to 15% of the final stand density on a per hectare basis.
- To increase species diversity with the establishment of western red cedar (Cw – Thuja plicata), Sitka spruce (Ss – Picea sitchensis), Douglas-fir (Fd – Pseudotsuga menziesii), and grand fir (Bg – Abies grandis) in areas where it is absent.
- To extend the availability of standing decaying trees as habitat for insects, birds and bats.
- To promote the long-term retention of moderate to high value wildlife trees.
- To support the health, diversity and long-term retention of shrub species within openings in the stand to provide shelter and forage for passerine birds, ungulates and bears.
WATERSHED MANAGEMENT OBJECTIVES

THESE OBJECTIVES APPLY TO ALL SU(s)
- To improve bank stability and reduce surface runoff in the long term.

Maintenance of water quality and quantity is a high priority in managing the area around Lang Creek. Lang Creek is a source of domestic water for the Brew Bay Water Improvement District and several private homes. The Powell River Regional District has identified it as a potential future water supply source.

Bank stability is expected to be at increased risk over the next two decades due to the decay of the remaining large woody coniferous debris, and the increased soil surface erosion and sedimentation associated with decaying and falling alder stems.

Treatments immediately adjacent to Lang Creek and wetter areas will be restricted to periods of dry conditions to reduce the potential short-term negative impacts on water quality from sedimentation and surface erosion.

The following report was referred to for the preparation of this prescription: Watershed Assessment of Lang Creek Community Watershed, Powell River, BC, Brian Carson. July 2000

FISHERIES/STREAMS – WETLAND MANAGEMENT OBJECTIVES

THESE OBJECTIVES APPLY TO ALL SU(s)
- To maintain or enhance current fish populations.
- To moderate water temperature in the long term.
- To provide year-round litter fall.
- To improve long term bank stability.
- To increase the available coniferous coarse woody debris in the long term. At present there is likely a low quantity of larger coarse woody debris within portions of the treatment area immediately adjacent to Lang Creek relative to what may have been historic levels.

Lang Creek is a class S1 watercourse for those reaches adjacent to treatment area A and a class S2 watercourse for those reaches adjacent to treatment area B. Class S1 watercourses require a 70 m Riparian Management Area (50 m Riparian Reserve Zone and 20 m Riparian Management Zone). Class S2 watercourses require a 50 m Riparian Management Area (30 m Riparian Reserve Zone and 20 m Riparian Management Zone).

Coarse woody debris will not be removed from the prescribed treatment areas.

No refuelling is permitted within 20 m of Lang Creek.

RANGE MANAGEMENT OBJECTIVES

CATTLE USE? ( ) Yes ( X ) No

VISUAL LANDSCAPE MANAGEMENT OBJECTIVES (VQO)

LANDSCAPE SENSITIVITY N/A

VISUAL QUALITY OBJECTIVE

THESE OBJECTIVES APPLY TO: SU (s)
No concerns.

RECREATION MANAGEMENT OBJECTIVES

FEATURE SIGNIFICANCE "C" moderate recreation resource value

KEY
FEATURE Feature related activities include:
f01 sport fishing

MANAGEMENT CLASS CLASS 2 – "Normal" - Normal forest management practices are adequate to maintain recreational values. Consultation with recreation staff is desirable but not essential

OTHER RESOURCE VALUES/INTERESTS - MANAGEMENT OBJECTIVES

Lang Creek is prone to bank erosion and portions have been classified as terrain stability class III and V, with Moderate and High surface soil erosion potential\(^1\). No treatments will be implemented on steep slopes adjacent to Lang Creek where there is evidence of surface erosion. Lang Creek and bank are part of the Sliammon Band’s traditional territory. The prescribed treatments are not anticipated to adversely affect any traditional uses that may occur in/adjacent to the site.

Mineral resources (kaolin/alumina-silicates-silicates/germanium) are known to be in the area.

TREATMENT AREA (TA) DESCRIPTION For SU 1
Within any standards unit there can be multiple geographically distinct treatment areas (TA).

TA: A and B 7.5 ha

This SU has an overstory dominated by 70-year-old red alder with some scattered conifers in the dominant and codominant layers. There is also an emerging understory of intermediate and suppressed western red cedar and western hemlock (Hw – Tsuga heterophylla) trees in the pole, sapling, and regen layers. The shrub layer is dominated primarily by salmonberry (Rubus spectabilis) with some red elderberry (Sambucus racemosa). Soils are sandy loam and silt loams.

The primary prescribed treatment for this SU is to release the emerging conifers through girdling some of the dominant red alder. Larger coarse woody debris is currently lacking within portions of the RRZ. Girdling of alder will provide some standing snags and downed wood in the short term.

Some areas within this SU have little or no conifer understory and would benefit from stocking with Cw, Ss, Fd, and Bg. Small openings or gaps in the alder canopy will be created by cutting alder to provide light for the establishment of younger conifers within the RRZ. Within these gaps, small clusters (9 m diameter) will be planted and brushed. Salmonberry and other brush species within the planting clusters are going to be aggressive competitors to the planted stock and must be controlled if the prescribed treatment is to succeed. Regeneration surveys and manual brushing treatments will be required to ensure the seedlings are established. The inter-cluster areas will not be planted or brushed and will continue to support a healthy understory of brush and browse species. The planted clusters will provide a younger age class of conifers that are currently lacking within the RRZ. These will be the future habitat trees and large organic debris in the RRZ.

Larger alder or alder with high structural diversity (i.e. broken tops, multiple stems, deformities) will be left within the gaps and throughout the treatment area. These trees and the surrounding Dr and conifers will limit the amount of light reaching the forest floor and will be a limiting factor in the successful establishment of planted conifer stock.

C-1. AREA DESCRIPTION

ZONE, SUBZONE, VARIANT
CWHxm1

SITE SERIES (RANGE) 07 (12)

MOIST/NUTR. GRID - range 5-7/D-E

ELEVATION
Min:100  Max:130  Avg:105

ASPECT
SE and Flat

SLOPE
Min. 0%:  Max. 45%:  Avg. 5%:

HUMUS FORM
Mull

ROOTING DEPTH
75+

SOIL DEPTH TO RESTRICTING LAYER
75+

SOIL TEXTURE
Sil. - Silt

SLOPE
D, F

POSITION

LENGTH

UNIFORMITY

WATER COURSES
Water S1, S2 Gullies

MECHANIZED STAND TENDING
( ) Yes  ( X ) No

IF YES, SEE OPERATIONAL PLANNING REGULATION FOR FURTHER CONTENT REQUIREMENTS

C-2. CURRENT STAND DESCRIPTION

TA Layer Spp % Spp % Spp % Spp % Spp % Age (yrs) Height (m) Ref yr Density sph Well spaced BA m²/ha

A & B 1 Dr 69 Cw 21 Fd 8 Hw 2 70 (Dr) 27.8 2001 535

2+3 Cw 93 Hw 7

4 Cw 100

Site Index for Cw = 28

C-3. FOREST HEALTH AND PROTECTION

FOREST HEALTH

AGENT OCCURRENCE

SU AGENT CODE AGENT NAME HOST SPECIES TOTAL TREES AFFECTED (%) TOTAL CONIFERS AFFECTED (%) HOST TREES AFFECTED (%) AREA (ha)

1 DMH Hemlock Dwarf Mistletoe (Arceuthobium tsugense) Hw <1 <2 <3 7.5

FOREST HEALTH STRATEGIES:
The presence of mistletoe within the treatment area is not a concern for the health of the Hw over the long-term. Mistletoe will provide some structural diversity on individual stems and contribute to the overall structural stand diversity.

PROTECTION

FIRE HAZARD ASSESSMENT & PROTECTION STRATEGIES:
No concerns. The fire hazard from people is low for the area under prescription.
**D. TREATMENTS TO ACHIEVE TARGET STAND CONDITIONS AND OBJECTIVES**

### STAND TREATMENT REGIME —

Areas identified for alder girdling will be treated as follows:

- Alder will be girdled to a final leave density of approximately 150 mature live stems per hectare (varying from 25 to 250).
- The final target density of all trees, including coniferous and hardwood species, is expected to be between 300 to 400 stems per hectare of mixed species, age and dbh.
- The largest diameter alder and other alder trees with deformities such as multiple tops, broken tops, forks, crooks, and poor form should be selected for retention first.
- Small higher density patches of alder trees should also be targeted for retention (e.g. a large alder with several deformed alder in close proximity would ideally be selected for retention).
- Do not girdle trees within one tree length of the canopy gap openings identified for cluster planting described below. Alder trees within one tree length of these openings will be felled to ensure the safety of future brushing crews.
- Slash will be cut and lopped to a depth of less than 40 cm to facilitate wildlife movement. Any obvious wildlife trails should be cleared of slash.
- Fallers must avoid damaging existing understory cedar, hemlock, Douglas-fir, and spruce when falling alder trees. All coniferous trees and advanced regen of any form, including crooks, forks and dead tops will be retained.
- Any moderate to high value wildlife trees will be retained by incorporating no work zones where required.

Areas identified for the creation of canopy gaps and planting will be treated as follows:

- Canopy gaps will be cut in the alder overstory and cluster planting sites will be manually site prepared using chainsaws and/or brush saws. Canopy gaps and cluster centers will be marked in the field prior to implementing the treatments. Canopy gap openings will be established approximately every 90 metres in TA A (estimate 4 openings) and every 120 metres in TA B (estimate 6 openings). All alder stems within the canopy gap openings will be felled with the exception of stems retained as described below. Alder branches and stems will be piled to facilitate cluster planting and slash will be cut and lopped to a depth of less than 40 cm to facilitate wildlife movement.
- Between 1 to 3 alder stems will be retained within each canopy gap opening. The largest diameter alder and other alder trees with deformities such as multiple tops, broken tops, forks, crooks, and poor form should be selected for retention first.
- Within Treatment Area A where the RRZ is 50 m wide, the canopy gap openings will be approximately 50 x 45 metres (0.23ha) and contain eight (8) planting clusters.
- Within Treatment Area B where the RRZ is 30 m wide, the canopy gap openings will be approximately 30 x 60 metres (0.18 ha) and contain six (6) clusters.
- Planting clusters will be created within the canopy gap openings by removing alder slash and cutting all brush within the clusters to a height of 10 cm. The clusters created will have a target diameter of 8.0 m and the target inter-cluster distance will be 14.0 m.
- Up to 16 trees/cluster (approximately 550 sph within canopy gap) will be planted within the clusters in the spring of 2002 at a variable target inter-tree distance of between 1.5 m to 3.0 m and mixed species composition. The prescribed species composition for planting is approximately Cw75Ss15Fd5Bg5. Douglas-fir will be restricted to raised sites or sites where it will get exposure to maximum direct sunlight (north edge of openings). Weevil resistant Sitka spruce will be planted to increase species diversity.
- A large stock type, preferably a 1+1 or 2+0 PSB 615 or 1015, is recommended for these high vegetation competition sites. The installation of protective cones at the time of planting is also prescribed. An estimated 1000 seedlings will be required (750 Cw, 150 Ss, 50 Fd, and 50 Bg).
- Manual brushing of the clusters is prescribed for the fall of 2002 and in subsequent years as required until an average minimum of 8 trees/cluster within each canopy gap has achieved 150% the height of the competing brush. This will ensure that a minimum of approximately 250 sph within each canopy gap are established. A survival and regeneration survey will be required in the fall of 2002 and in subsequent years as required to assess the survival, performance, and requirement for brushing treatments.

**CONTROL PLOTS**

A number of control plots will be established as described below and as directed by the recipient representative for the purposes of long-term monitoring and operational research. The plots will be marked in the field to permit easy identification in subsequent years following the prescribed treatments. Stand data and other information at established plots throughout the prescribed area within both the treatment areas and in the control plots will be collected prior to the implementation of the prescribed treatments and in subsequent years. The exact methodology of the research will be determined and directed by a representative of the Ministry of Water, Land & Air Protection.

- Within both Treatment Area A and B, a control plot approximately 0.25 ha in size will be established for which no further treatments are prescribed.

Within every second canopy gap opening several different types of control plots for clusters will also be established as outlined below:

- One cluster will be planted in an area that is not manually site prepared to remove brush prior to planting and for which no further brushing treatments will be implemented.
- One cluster will be planted in an area that is manually site prepared but for which no further brushing treatments will be implemented.
- One cluster that is manually site prepared and brushed will not have protective cones established.
# D-1. POST-TREATMENT STANDARDS

Use the table below to enter the schedule of stand-level treatments and appropriate standards - add rows if needed

<table>
<thead>
<tr>
<th>Treatment and timing</th>
<th>Attributes of what is to be treated (spp, ht, age)</th>
<th>Area (est) ha</th>
<th>Standards – Stand Structural Attributes – use columns and space below.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pref Spp</td>
<td>Acc Spp</td>
<td>Target</td>
</tr>
<tr>
<td>Cutting and girdling of Dr is prescribed to occur from later summer through to early spring.</td>
<td>Dr, 15-25m, 70-80 years.</td>
<td>7.5</td>
<td>Cw, Ss, Dr, Mb</td>
</tr>
<tr>
<td>Manual site preparation of the planting clusters is prescribed for the early spring in March.</td>
<td>Primarily Rubus spectabilis and Sambucus racemosa but also other brush species within clusters.</td>
<td>1.5</td>
<td>Cw, Ss</td>
</tr>
<tr>
<td>Planting is prescribed for immediately following the manual site preparation. 16 trees/cluster at an inter-tree spacing of 1.5 m – 3.0 m is prescribed. A large stock type, 1+1 or 2+0 PSB 615 or 1015, is recommended. 1000 trees required at a mixed species composition of Cw7Ss15Fd5Bg5.</td>
<td>Protective cones will be installed at the time of planting. Fd will be planted at the north edge of openings and on higher microsites.</td>
<td>1.5</td>
<td>Cw, Ss</td>
</tr>
</tbody>
</table>

TREATMENT STANDARDS – Additional Detail:
Refer to stand treatment regime outlined above.

# D-2. SPECIAL AREAS - (TREATMENT PROPOSED)

<table>
<thead>
<tr>
<th>TREATMENT AREA</th>
<th>TYPE OF SPECIAL AREA</th>
</tr>
</thead>
<tbody>
<tr>
<td>AREA NO.</td>
<td>SIZE ha</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TREATMENT AREA #A and B</th>
<th>TYPE OF RESERVE AREA</th>
</tr>
</thead>
<tbody>
<tr>
<td>AREA NO.</td>
<td>SIZE</td>
</tr>
</tbody>
</table>

Within both Treatment Area A and B, a control plot approximately 0.25 ha in size will be established for which no further treatments are prescribed.
TREATMENT AREA (TA) DESCRIPTION For SU 2

Within any standards unit there can be multiple geographically distinct treatment areas (TA).

TA: C 0.5 ha

C-1. AREA DESCRIPTION

<table>
<thead>
<tr>
<th>ZONE, SUBZONE, VARIANT</th>
<th>SITE SERIES (RANGE)</th>
<th>MOIST/NUTR. GRID - range</th>
</tr>
</thead>
<tbody>
<tr>
<td>CWHxm1</td>
<td>07 (12)</td>
<td>5-7/D-E</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ELEVATION</th>
<th>ASPECT</th>
<th>SLOPE DATA</th>
<th>SLOPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min:100</td>
<td>Max:130</td>
<td>SE and Flat</td>
<td>D</td>
</tr>
<tr>
<td>Avg:105</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>HUMUS FORM</th>
<th>ROOTING DEPTH</th>
<th>SOIL DEPTH TO RESTRICTING LAYER</th>
<th>SOIL TEXTURE</th>
<th>SOIL COARSE FRAGMENT</th>
<th>DRAINAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mor-moder</td>
<td>75+</td>
<td></td>
<td>Sil. - SL.</td>
<td>&lt;25%</td>
<td>Fair -moderate</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>WATER COURSES</th>
<th>MECHANIZED STAND TENDING</th>
<th>IF YES, SEE OPERATIONAL PLANNING REGULATION FOR FURTHER CONTENT REQUIREMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water 1 Gullies</td>
<td>( ) Yes (X) No</td>
<td></td>
</tr>
</tbody>
</table>

C-2. CURRENT STAND DESCRIPTION – use table and/or describe in words

<table>
<thead>
<tr>
<th>TA</th>
<th>Layer</th>
<th>Spp</th>
<th>%</th>
<th>Spp</th>
<th>%</th>
<th>Spp</th>
<th>%</th>
<th>Age (yrs)</th>
<th>Height (m)</th>
<th>Ref yr</th>
<th>Density sph</th>
<th>Well spaced</th>
<th>BA m²/ha</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>1</td>
<td>Dr</td>
<td>69</td>
<td>Cw</td>
<td>21</td>
<td>Fd</td>
<td>8</td>
<td>Hw</td>
<td>2</td>
<td>70 (Dr)</td>
<td>27.8</td>
<td>2001</td>
<td>535</td>
</tr>
<tr>
<td></td>
<td>2+3</td>
<td>Cw</td>
<td>93</td>
<td>Hw</td>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>Cw</td>
<td>100</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Site Index for Cw = 28

SU2 – Treatment Area C is the first 5 m of the Riparian Reserve Zone immediately adjacent to Lang Creek. This narrow area is contiguous with SU1 and is similar in stand structure and species composition.

C-3. FOREST HEALTH AND PROTECTION

FOREST HEALTH

AGENT OCCURRENCE

<table>
<thead>
<tr>
<th>SU</th>
<th>AGENT CODE</th>
<th>AGENT NAME</th>
<th>HOST SPECIES</th>
<th>TOTAL TREES AFFECTED (%)</th>
<th>TOTAL CONIFERS AFFECTED (%)</th>
<th>HOST TREES AFFECTED (%)</th>
<th>AREA (ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>DMH</td>
<td>Hemlock Dwarf Mistletoe (Arceuthobium tsugense)</td>
<td>Hw</td>
<td>&lt;1</td>
<td>&lt;2</td>
<td>&lt;5</td>
<td>0.5</td>
</tr>
</tbody>
</table>

FOREST HEALTH STRATEGIES:
The presence of mistletoe within the treatment area is not a concern for the health of the Hw over the long-term. Mistletoe will provide some structural diversity on individual stems and contribute to the overall structural stand diversity.

PROTECTION

FIRE HAZARD ASSESSMENT & PROTECTION STRATEGIES:
No concerns. The fire hazard from people is low for the area under prescription.
D. TREATMENTS TO ACHIEVE TARGET STAND CONDITIONS AND OBJECTIVES

Bank stability is expected to be at increased risk over the next two decades due to the decay of the remaining large woody coniferous debris, and the increased soil surface erosion and sedimentation associated with decaying and falling alder stems.

An assessment will be completed to identify and mark individual alder stems located within the first 5.0 m adjacent to Lang Creek that are deemed to be threatening the bank stability and have potential to cause significant erosion due to failure of the entire stem including the root wad into Lang Creek. These trees will be those with one or more of the following characteristics: a significant lean, lifting of the root wad, significant defects including cracks and/or broken tops, and location at the end of a bend in the creek. This assessment will be completed in consultation with representatives from local fisheries agencies. Trees that are deemed to be susceptible to failure will be felled where safe to do so and taking into consideration the water velocity and levels of Lang Creek (i.e. trees will be felled during low water flow to minimize loss of debris from felled trees downstream). Trees that fall into Lang Creek will be removed using a combination of portable winches and/or pulleys and manual cutting as required provided no scouring of the streambank occurs. Falling and removing alder trees from the water in Lang Creek can only be implemented in February and March of 2002 or within the August fisheries window of 2002 and subsequent years. The alternative to felling the trees is a manual girdling treatment. If the process of falling and removing the trees from Lang Creek is deemed to be causing too much scouring then the alternative treatment of girdling alder stems will be implemented. This review and decision will also be completed in consultation with representatives from local fisheries agencies. Alder stems will be girdled to promote slower decay from the top and reduce the risk of the entire stem and root wad failing into Lang Creek. Only Dr trees that have been marked/painted with an orange “X” at 1.3 m height will be felled or girdled.

Western red cedar seedlings will be planted immediately adjacent to Lang Creek for the entire length of SU2 at 3.0 m inter-tree spacing. The installation protective cones at the time of planting is also prescribed. Manual brushing of the seedlings in a 2.0 m radius is prescribed for the fall of 2002 and in subsequent years as required until 50% of the seedlings have achieved 150% the height of the competing understory brush.
## D-1. POST-TREATMENT STANDARDS

Use the table below to enter the schedule of stand-level treatments and appropriate standards - add rows if needed

<table>
<thead>
<tr>
<th>Treatment and timing</th>
<th>Attributes of what is to be treated (spp, ht, age)</th>
<th>Area (est) ha</th>
<th>Standards – Stand Structural Attributes – use columns and space below.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Falling and/or girdling of Dr trees that have been marked/painted with an orange ‘X’ at 1.3 m height. Falling and removal of debris from Lang Creek is restricted to between February and March of 2002 or the August fisheries window of 2002 and subsequent years. Girdling can be implemented at any time.</td>
<td>Dr, 15-25m, 70-80 years.</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>Cedar will be planted at a 3.0m inter-tree spacing for the entire length of SU2. A large stock type, 1+1 or 2+0 PSB 615 or 1015, is recommended. Approximately 400 trees will be required.</td>
<td>Protective cones will be installed at the time of planting.</td>
<td>0.5</td>
<td></td>
</tr>
</tbody>
</table>

TREATMENT STANDARDS – Additional Detail:

### D-2. SPECIAL AREAS - (TREATMENT PROPOSED)

<table>
<thead>
<tr>
<th>TREATMENT AREA #</th>
<th>TYPE OF SPECIAL AREA</th>
</tr>
</thead>
<tbody>
<tr>
<td>AREA NO.</td>
<td>SIZE ha</td>
</tr>
</tbody>
</table>

### D-3. RESERVE AREAS – (NO TREATMENT PROPOSED)

<table>
<thead>
<tr>
<th>TREATMENT AREA #</th>
<th>TYPE OF RESERVE AREA</th>
</tr>
</thead>
<tbody>
<tr>
<td>AREA NO.</td>
<td>SIZE ha</td>
</tr>
<tr>
<td>E-3. ADMINISTRATION</td>
<td></td>
</tr>
<tr>
<td>---------------------</td>
<td></td>
</tr>
<tr>
<td>PRESCRIPTION PREPARED BY</td>
<td></td>
</tr>
<tr>
<td>(RPF SIGNATURE AND SEAL):</td>
<td></td>
</tr>
<tr>
<td>NAME (Printed)</td>
<td></td>
</tr>
<tr>
<td>Date of field work:</td>
<td></td>
</tr>
<tr>
<td>RUSSELL G W BREWER</td>
<td></td>
</tr>
<tr>
<td>NAME (Printed)</td>
<td></td>
</tr>
<tr>
<td>RPF SIGNATURE</td>
<td></td>
</tr>
<tr>
<td>DATE: ____________________________</td>
<td></td>
</tr>
<tr>
<td>RPF NO.: __________</td>
<td></td>
</tr>
<tr>
<td>PRESCRIPTION ATTACHMENTS:</td>
<td></td>
</tr>
<tr>
<td>☐ ADDITIONAL SMP COMMENTS</td>
<td></td>
</tr>
<tr>
<td>☑ SMP MAP(S)</td>
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<tr>
<td>☐ FIELD DATA CARDS</td>
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<tr>
<td>☐ TERRAIN STABILITY FIELD ASSESSMENT</td>
<td></td>
</tr>
<tr>
<td>☐ FOREST HEALTH/PEST INCIDENCE ASSESSMENT</td>
<td></td>
</tr>
<tr>
<td>☐ ECONOMIC ANALYSIS</td>
<td></td>
</tr>
<tr>
<td>☐ RIPARIAN ASSESSMENT</td>
<td></td>
</tr>
<tr>
<td>☐ OTHER: SPECIFY: ___________________________</td>
<td></td>
</tr>
<tr>
<td>Licence Holder Signing Authority Signature (delete if not applicable)</td>
<td></td>
</tr>
<tr>
<td>Licence Holder Signing Authority Name (Printed) (delete if not applicable)</td>
<td></td>
</tr>
<tr>
<td>Date</td>
<td></td>
</tr>
<tr>
<td>AGREEMENT IN WRITING (required for felling or modification of trees in a Riparian Reserve Zone Silviculture Practices Regulation section 4 )</td>
<td></td>
</tr>
<tr>
<td>PRESSCRIPTION APPROVED BY:</td>
<td></td>
</tr>
<tr>
<td>Designated Environment Official Signature</td>
<td></td>
</tr>
<tr>
<td>Designated Environment Official Name (Printed)</td>
<td></td>
</tr>
<tr>
<td>Date :</td>
<td></td>
</tr>
<tr>
<td>Original approval date (if amended): ____________________________</td>
<td></td>
</tr>
<tr>
<td>District Manager’s Signature</td>
<td></td>
</tr>
<tr>
<td>District Manager’s Name (Printed)</td>
<td></td>
</tr>
<tr>
<td>Date :</td>
<td></td>
</tr>
<tr>
<td>Original approval date (if amended): ____________________________</td>
<td></td>
</tr>
</tbody>
</table>
## Stand Management Prescription - Riparian Lang Creek

<table>
<thead>
<tr>
<th>SU AND TREATMENT AREA</th>
<th>AREA</th>
<th>BGC ZONE</th>
<th>DATE</th>
<th>SCALE</th>
<th>DRAWN BY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Area Under Prescription</td>
<td>8.0 ha</td>
<td>CW(12)</td>
<td>October 18, 2001</td>
<td>1:5,000</td>
<td>R.B. / GFC Forest Management Ltd</td>
</tr>
<tr>
<td>SU1 - Treatment Area A</td>
<td>4.2 ha</td>
<td>CW(12)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SU1 – Treatment Area B</td>
<td>3.3 ha</td>
<td>CW(12)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SU2 – Treatment Area C</td>
<td>0.5 ha</td>
<td>CW(12)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### SU1 – Treatment Areas A and B

- Girdle Alder to a final leave density of approximately 150 stems per hectare (varying from 25 to 250).
- The final target density of all trees, including coniferous and hardwood species, is expected to be between 300 to 400 stems per hectare of mixed species, age and size.
- The largest diameter alder and other alder trees with deformities such as multiple tops, broken tops, forks, crooks, and poor form should be selected for retention first.
- Smaller higher density patches of alder trees should also be targeted for retention (e.g., a large alder with several deformed alders in close proximity would ideally be selected for retention).
- Do not girdle trees within one tree length of the canopy gap openings identified for cluster planting described below. Alder trees within one tree length of these openings will be tagged to ensure the safety of future brushing crews.
- Slash will be cut and topped to a depth of less than 40 cm to facilitate wildlife movement. Any obvious wildlife trails should be cleared of slash.
- Fellers must avoid damaging existing understory oeder, hemlock, Douglas-fir, and spruce when felling older alders. All coniferous trees and advanced regen of any form, including crooks, forks and dead tops will be retained.
- Any moderate to high value wildlife trees will be retained by incorporating no work zones where required.

### Areas Identified for the Creation of Canopy Gaps and Planting

- Canopy gaps will be cut in the alder overstory and cluster planting sites will be manually site prepared using chainsaws and/or brush saws.

- Canopy gaps and cluster centers will be marked in the field prior to implementing the treatments. Canopy gap openings will be established approximately every 90 meters in TA A (estimate 4 openings) and every 120 meters in TA B (estimate 6 openings). All alder stems within the canopy gap openings will be felled with the exception of stems retained as described below. Alder branches and stems will be piled to facilitate cluster planting and slash will be cut and topped to a depth of less than 40 cm to facilitate wildlife movement.

- Between 1 to 3 alder stumps will be retained within each canopy gap opening. The largest diameter alder and other alder trees with deformities such as multiple tops, broken tops, forks, crooks, and poor form should be selected for retention first.

- Within Treatment Area A where the RRZ is 30 m wide, the canopy gap openings will be approximately 50 x 45 meters (0.23ha) and contain eight (8) planting clusters. Within Treatment Area B where the RRZ is 30 m wide, the canopy gap openings will be approximately 50 x 50 meters (0.25 ha) and contain six (6) clusters.

- Planting clusters will be created within the canopy gap openings by removing alder slash and cutting all brush within the clusters to a height of 10 cm. The clusters created will have a target diameter of 9.0 m and the target inter-cluster distance will be 14.0 m.

- Up to 16 stems/clusters (approximately 550 spf within canopy gap) will be planted within the clusters in the spring of 2002 at a variable target inter-tree distance of between 1.5 to 3.0 m and mixed species composition. The prescribed species composition for planting is approximately 30% Sitka spruce, 30% cottonwood and 40% alder. Each planting site will be marked with a stake and a flagged marker. The prescribed species composition for planting is approximately CW64% Sitka spruce, 15% Cottonwood, 5% alder. Douglas-fir will be restricted to raised sites or sites where it will get exposure to maximum direct sunlight (north edge of openings). Weevil resistant Sitka spruce will be planted to increase species diversity.

- The installation of protective cones at the time of planting is also prescribed.

- Manual brushing of the clusters is prescribed for the fall of 2002 and in subsequent years as required until an average minimum of 8 trees/cluster within each canopy gap has been achieved 150% the height of the competing brush. This will ensure that a minimum of approximately 250 spf within each canopy gap is established. A survival and regeneration survey will be required in the fall of 2002 and in subsequent years as required to assess the survival, performance, and requirement for brushing treatments.

### Control Plots

A number of control plots will be established as described below and as directed by the recipient representative for the purposes of monitoring and operational research. The plots will be marked in the field to permit easy identification in subsequent years following the prescribed treatments.

- Within both Treatment Area A and B, a control plot approximately 0.25 ha in size will be established for which no further treatments are prescribed.

- Within every second canopy gap opening several different types of control plots for clusters will also be established as outlined below:

  - One cluster will be planted in an area that is not manually site prepared to remove brush prior to planting and for which no further brushing treatments will be implemented.
  - One cluster will be planted in an area that is manually site prepared but for which no further brushing treatments will be implemented.

### SU2 – Treatment Area C

Girdle only those Dr trees that have been marked/planted with an orange "X" at 1.3 m height.

Cedar will be planted at a 3.0 m inter-tree spacing for the entire length of SU2.

### Treatment Areas:

<table>
<thead>
<tr>
<th>SU1 – TA A</th>
<th>SU1 – TA B</th>
<th>SU2 – TA C</th>
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</thead>
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### Existing Road and Landing:

### Proposed Road: