Fertilization Planning Update For The Fraser TSA

B.A. Blackwell & Associates Ltd.
March, 2007

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FRASER TSA CO-OP

FERTILIZATION PLANNING UPDATE

For the Fraser TSA

Submitted by:

Jeff McWilliams, RPF
B.A. Blackwell and Associates Ltd.
3087 Hoskins Road
North Vancouver, B.C.
V7J 3B5

Submitted to

Fred Lowenberger, RPF
FIA Coordinator, Madrone Environmental Services Ltd.
202-2602 Mt. Lehman Rd.
Abbotsford, BC
V4X 2N3

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& Associates Ltd.

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1.0 Introduction

There is a long history of fertilization of Douglas-fir on the coast and in the Fraser TSA. A potential financially viable method of improving timber supply in the Fraser TSA is to enhance the growth of Douglas-fir leading forest stands through fertilization (*Type 2 Silviculture Investment Strategy for the Fraser TSA,* Cortex Consultants Ltd., 2002).

The objectives of fertilization in the Fraser TSA are:

- To mitigate short and mid term timber supply impacts through strategically focused fertilization activities.
- To add merchantable volume to existing age class 1-4 stands to ensure that they can become operable sooner or contain more volume when harvested.
- To carry out viable investments in crown land to support both short and mid term employment.

Good fertilization planning is necessary to direct investments to stands that will have the greatest treatment response and will maximize the financial return to the Crown.

In 1999 B. A. Blackwell and Associates Ltd. completed a GIS review of fertilization opportunities in the Fraser TSA. As a result, several fertilization projects (planning and application) were completed for portions of the Fraser TSA between 1999 and 2001. The areas targeted were the Chilliwack River Valley, the east and west sides of Harrison Lake and the north side of the Fraser River Valley, between the Chehalis River Valley and Stave Lake. These projects resulted in 3000 to 5000 hectares of fertilization prescriptions or reports recommending treatment of specific polygons. As a result, 2000 to 3000 hectares of Douglas-fir leading second growth stands were fertilized between 1999 and 2001.

In 2005, B. A. Blackwell and Associates Ltd. completed an update to the fertilization planning process for the west side of Harrison Lake. This project involved reviewing areas previously fertilized (as of 2000) and un-treated polygons previously recommended for treatment with respect to updated information on:

- areas recently logged or planned for logging,
- non-timber resource values and,
- First Nation's values and interests

This project resulted in about 300 hectares of fertilization in the spring of 2006.

1.1 Objectives

The overall objective for this project is to update forest-level fertilization plans for the remaining priority areas within the Fraser TSA.

The process will be consistent with the framework and results of the previous planning projects in the Fraser TSA and the current Stand Selection Guidelines (Appendix I). This project will provide recommendations for future actions necessary to implement fertilization treatments in the TSA over the next 10 years.

1.2 Scope and Limitations

This project was focused at the forest level and utilized current GIS data available from government and the major licensees.

Based on the results of the 1999 GIS review of fertilization opportunities and the subsequent planning updates, the project scope includes the following general areas[1]:

1. East side of Harrison Lake,
2. Chilliwack River Valley,
3. North side of the Fraser River, between Harrison Lake and Stave Lake,
4. Fraser Canyon north of Hope[2],
5. South side of the Fraser River, between Chilliwack and the Skagit River[2]
6. East of Hope[2]

These areas makeup the majority of the accessible portions of the TSA which contain significant areas of Douglas-fir dominated stands.

[1] Con-currently, as a separate project, B. A. Blackwell and Associates Ltd., is completing a review of fertilization opportunities within Teal Cedar Ltd's Pitt Lake operating area.

[2] Areas where no previous fertilization planning work has been completed.

2.0 Methodology

For areas where recent fertilization planning has occurred (the east side of Harrison Lake, the Chilliwack River Valley and the north side of the Fraser River, between Harrison Lake and Stave Lake), the initial task was to produce a GIS theme showing the areas previously identified for treatment (and potentially suitable for re-treatment) from Stand Management Prescriptions (SMP) and Assessment Reports. As most of the SMP and Assessment Report maps only exist on paper the majority of the potential treatment areas were digitized.

Next, for all areas, a GIS theme was produced showing ranked fertilization opportunities based on analysis of forest cover (VRI), BEC or TEM (where it is was available), significant non-timber resource values, recent deletions (since the last updates to VRI) and planned logging.

The algorithms for the GIS ranking theme were developed using the 2005 MoFR Stand Selection Guidelines (see Appendix I) and the following criteria:

- Age; 15 to 80 years old,
- Fd %; 50 to 100% with >50% being preferred,
- BEC Subzone/ Variant; dm, ds1, vm1, vm2 with dm, ds1 and vm1 preferred,
- For areas covered by TEM data, Site series and modifiers; ss01 with slopes <60% (modifier not ss or ss).

The algorithms for the areas not covered by TEM data and the areas covered by TEM data are shown in Tables 1 and 2 respectively.

Table 1: Algorithm for determining fertilization rankings for areas not covered by TEM data

Fertilization Rank	Age	%Fd	BEC Subzone/Variant
High Mature Forest (HMF)	51 to 80	>=80	CWH dm, ds1, vm1
Moderate Mature Forest (MMF)	51 to 80	>= 50% <= 79	CWH dm, ds1, vm1
Low Mature Forest (LMF)	51 to 80	>= 50	CWH ms1, vm2
High Young Forest (HYF)	15 to 50	>=80	CWH dm, ds1, vm1
Medium Young Forest (MYF)	15 to 50	>= 50% <= 79	CWH dm, ds1, vm1
Low Young Forest (LYF)	15 to 50	>= 50	CWH ms1, vm2

Table 2: Algorithm for determining fertilization rankings for areas covered by TEM data

Fertilization Rank	Age	%Fd	BEC Variant, Site Series
High Mature Forest (HMF)	51 to 80	>=80	CWH dm, ds1, vm1 and Eco1_SS = 01 and Eco1_SM1 or Eco1_SM2 or Eco1_SM3 not equal to ss, or hs
Moderate Mature Forest (MMF)	51 to 80	>= 50% <= 79	CWH dm, ds1, vm1 and Eco1_SS = 01 and Eco1_SM1 or Eco1_SM2 or Eco1_SM3 not equal to ss, or hs
Low Mature Forest (LMF)	51 to 80	>= 50	CWH ms1, vm2 and Eco1_SS = 01 and Eco1_SM1 or Eco1_SM2 or Eco1_SM3 not equal to ss, or hs
High Young Forest (HYF)	15 to 50	>=80	CWH dm, ds1, vm1 and Eco1_SS = 01 and Eco1_SM1 or Eco1_SM2 or Eco1_SM3 not equal to ss, or hs
Medium Young Forest (MYF)	15 to 50	>= 50% <= 79	CWH dm, ds1, vm1 and Eco1_SS = 01 and Eco1_SM1 or Eco1_SM2 or Eco1_SM3 not equal to ss, or hs
Low Young Forest (LYF)	15 to 50	>= 50	CWH ms1, vm2 and Eco1_SS = 01 and Eco1_SM1 or Eco1_SM2 or Eco1_SM3 not equal to ss, or hs

The analysis was conducted in ESRI ArcMap 9.2 and the resulting polygon layer was cleaned to remove any isolated polygons less than 3 hectares. These polygons were then cut down to obtain a gross area by excluding the following features:

- Alienated land (Tree Farm Licences, Woodlot Licences, private land, municipalities, Indian Reserves, Parks and Protected Areas and Wildlife Habitat Areas and,
- Recently logged areas.

The gross area was then further reduced to obtain the net area by excluding the following features:

- Planned logging (from the most recent Chilliwack Forest District Consolidated FDP maps),
- Old Growth Management Areas (legal and draft),
- Ungulate Winter Ranges,
- Visual Quality Objective - Retention polygons,
- Community Watersheds and,
- Long term Owl Habitat Areas within SRMZs,

Finally, the netted down resultants of the GIS algorithms, together with the constraints listed above, were displayed by mapsheet (1:50,000 scale) for the analysis area. Area summaries for the various rankings were also produced.

The preliminary results of the GIS analysis were sent to the Chilliwack Forest District and the major licensees in the Fraser TSA in November, 2006. The purpose of this consultation was to identify significant errors in the data and to identify potential conflicts with planned logging.

As was made clear to the licensees, the benefits of fertilization are reduced or lost if treated stands are harvested within 3 to 5 years after fertilization. Therefore, it is important to identify potential conflicts prior to treatment.

In late 2006, using the results of this project, B. A. Blackwell and Associates Ltd. was commissioned to complete office (including reviews of opening files and air photos) and field reviews of the candidate polygons on the east side of Harrison Lake, the Chilliwack River Valley and the north side of the Fraser River, between Harrison Lake and Stave Lake areas. This separate project includes prescriptions (for areas recommended for treatment in next 5 years) and assessment reports (for areas not recommended for treatment in next 5 years) and financial analysis of some of the prescribed units. As it is more appropriate to complete financial analysis using the data collected from field assessments, financial analysis was not included as part of this overview project.

The only standards applicable to this project are the 2005 MoFR Stand Selection Guidelines (see Appendix I).

3.0 Results and Discussion

The fertilization opportunity areas, together with the constraints, are displayed by mapsheet in Appendix II.

Table 3 summarizes the gross and net area of fertilization opportunity areas by rank resulting from the GIS analysis. Table 4 shows the areas of previously treated or recommended polygons potentially suitable for treatment in, or after, 2007. Table 5 shows the total gross and net areas of fertilization opportunities in the project area.

Table 3: Gross and net[3] area of fertilization opportunities by ranking as identified by GIS analysis.

GIS Fertilization Rank		Gross Area			Net Area		
		TEM based	BEC based	Subtotal	TEM based	BEC based	Subtotal
High Mature Forest		513	3877	4390	338	2530	2868
Moderate Mature Forest		209	8832	9041	152	6169	6321
Low Mature Forest		2389	9561	11950	1735	6595	8330
High Young Forest		75	4177	4252	41	3511	3552
Moderate Young Forest		73	6672	6745	29	5594	5623
Low Young Forest		1966	11583	13549	1835	9477	11312
SUBTOTALS		5225	44702	49927	4130	33876	38006

[3] Net area is gross area less conflicts with UWRs, OGMAs, VQO=Ret, LTOHAs, and blocks planned for logging.

Table 4: Gross and net area of previously treated or recommended polygons eligible for treatment in, or later than, 2007.

Previously Treated or Recommended		Gross Area		Net Area
North Fraser (Stave L to Chehalis R)	Young Forest			1155
	Mature Forest			121
	Total	1448		1276
Chilliwack R Valley	Young Forest			167
	Mature Forest			765
	Total	1033		932
East Harrison	Young Forest			1144
	Mature Forest			229
	Total	1410		1373
SUBTOTALS		3891		3581

Table 5: Gross and net area summary for fertilization opportunities

NET SUBTOTAL FOR YOUNG FOREST			22,953
NET SUBTOTAL FOR MATURE FOREST			18,634
GROSS AND NET TOTALS	**53,818**		**41,587**

Based on this analysis about 41,600 hectares of area is currently available for fertilization in the project area. However, this should be considered the maximum opportunity area. About 45% of the total area is considered mature forest (40 to 80 years old) and is potentially merchantable. Given the limited timber supply and the shortage of operable second growth Fd-leading stands in the Fraser TSA, there is expected to be significant short term harvesting pressure on the mature fertilization opportunity areas.

By the end of 2006, responses to consultation were received from Lakeside Pacific Ltd, Teal Cedar Ltd and Tamihi Logging Ltd. No significant errors in the data were identified. Lakeside Pacific Ltd. identified 3 previously fertilized polygons in the Bear Creek area on the east side of Harrison Lake, as being interest areas for planned logging in the near future. These areas, making up about 313 hectares, were deferred from stand level fertilization planning until the harvesting layout is completed.

4.0 Conclusions

The results from this project were used as the basis for a stand-level project to office and field review opportunity areas on the east side of Harrison Lake, the Chilliwack River Valley and the north side of the Fraser River, between Harrison Lake and Stave Lake areas. As a result, treatment prescriptions were developed, or updated, for about 2,000 hectares. These areas were fertilized in March, 2007.

It is hoped that subsequent stand level planning projects will use the results of this overview planning process and lead to significant future fertilization in the Fraser TSA.

APPENDIX I: Stand Selection Guide for Forest Fertilization – 2005

Consider a stand's site conditions, health, biodiversity and potential for integrated resource management in the selection process. Stand level activities should be consistent with forest level objectives. Evaluate candidate stands according to biological factors. Those stands that are biologically acceptable should then be checked for operational feasibility to ensure they can indeed be treated and are suitable for treatment.

Species preference: Douglas-fir.

Age preference:

Age	Priority
40 - 79	1
15 - 39	2

Site index:
Douglas-fir responds on nutrient medium to deficient sites with no significant water deficit or excessive moisture.

The live crown of the crop trees is greater than 30%, to utilize the added nutrients. This may be dominant and co-dominant trees or a spaced or thinned stand.

There should be room for crowns to expand, and the stand should be fully stocked.

The height/diameter breast height (dbh) ratio for Douglas-fir should be less than 85. Avoid fertilizing conifer stands with a height/dbh ratio greater than 100.

The following four operational factors should be considered during the evaluation of candidate stands.

Location: Choose sites closest to communities as distance to haul the fertilizer affects transportation costs. Also, costs of future harvests are partly determined by hauling distances to manufacturing plants and markets.

Access: Conditions of access also affect costs of transporting material and personnel in fertilizer operations, in addition to later expenses of hauling timber to manufacturing plants. Avoid areas which require ferry flights longer than 2km.

Slope: Costs of future management and harvesting usually increase as terrain becomes steeper. Furthermore, flying over steep or irregular, contoured land may not be conducive to efficient and uniform aerial distribution of fertilizer.

Project and Block Size: Project and block sizes affect efficiency and cost of operation. Large-scale programs (e.g., >300 ha) are generally more cost effective than small-scale.

Source: Ministry of Forests Guidelines (From S. Quinn, Price Waterhouse Coopers, 08/30/05).

APPENDIX II: 1:50,000 Fraser TSA Fertilization Planning 2006 Maps