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Using FPInterface to Estimate Available Forest-Origin Biomass in British Columbia: Fraser TSA

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Abstract

Based on inventory information and a 20-year harvest queue, estimates of the amount of biomass available from forest harvest residues were estimated in $10 increments of delivered cost. For the Fraser Timber Supply Area, a total of 75 000 ODT/year was projected to be available, while only 11 000 ODT/year were expected to be available at the economic price of $60/ODT.

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1 Executive summary

FPInnovations estimated the amount of forest-origin harvest residue biomass available from the Fraser Timber Supply Area (TSA), largely following the process previously established for several British Columbia TSAs using FPInterface between 2010 and 2017. The biomass inventory was based on 20-year harvest data and road network plans for Crown land that were provided by the B.C. Ministry of Forests, Lands and Natural Resource Operations, and excluded Woodlot Licences, Tree Farm Licences, Community Forest Agreements, and First Nations tenures.

The biomass yield predicted from harvest residues for the Fraser TSA was 39.9 oven-dried tonnes per hectare (ODT/ha). The biomass ratio (the ratio of recovered biomass to recovered merchantable roundwood) was estimated at 14.8%. Over the next 20 years, a total of 1.52 million ODT of available biomass was predicted to be generated by harvest in the Fraser TSA, or approximately 75 000 ODT/year. Of this, approximately 221 500 ODT in total, or 11 000 ODT/year, were expected to be available at the economic price of $60/ODT. Approximately 80% of the total predicted volume was expected to be available at $90/ODT: a total of 1.18 million ODT, or 59 000 ODT/year.

A low-cost scenario was attempted with the grinding cost reduced by $5.05/ODT. At the economic rate of $60/ODT, biomass availability increases by approximately 200 000 ODT over 20 years, or about 10 000 ODT/year. If increases in efficiency or decreases in cost can be realized, there could be an increase in available biomass by this amount.

Most of the biomass that is considered economically available (≤ $60/ODT) is closer to the TSA's delivery points (Chilliwack and Richmond). The amount of economically available biomass decreased consistently through time from approximately 19 000 ODT/year in years 1 to 5 to 5 700 ODT/year in years 15 to 20. This decrease may be due to increased distances between planned harvest areas and the delivery locations in later periods.

2 Introduction

FPInnovations estimated the amount of forest-origin harvest residue biomass from the Fraser Timber Supply Area (TSA), largely following the process previously established for several British Columbia TSAs using FPInterface between 2010 and 2017. The biomass inventory was based on 20-year harvest data and road network plans for Crown land that were provided by the B.C. Ministry of Forests, Lands and Natural Resource Operations (FLNRO), and excluded Woodlot Licences, Tree Farm Licences (TFLs), Community Forest Agreements (CFAs), and First Nations tenures. Detailed introductory statements that apply to this project and the greater project as a whole are provided in Friesen & Goodison (2018).

3 Objective

The objective of the project was to calculate the cost of forest-origin biomass as a feedstock in the Fraser TSA.

Specific deliverables were:

a. An analysis showing the delivered cost of biomass from point of origin; and
b. An analysis showing the amount of biomass delivered at different prices. A value of $60 for one oven-dried tonne (ODT) is regarded as the market value for biomass, in accordance with the analyses that were previously conducted.

4 Methods

Overall process

The basic methodology for determining biomass supply in western Canada was established during analysis of the Quesnel (Friesen & Goodison, 2018) and Williams Lake TSAs.

This analysis focused on the Fraser TSA and was based on polygon data (tree characteristics) and a road data set that were supplied by FLNRO. It did not include any nearby Woodlot Licences, TFLs, CFAs, or First Nations tenures. Including some of these areas could alter the available supply of biomass.

Additionally, small piece size stands that are not considered merchantable were not included in the analysis. The analysis focused on recovering harvest residues from merchantable stands. Purpose-harvesting unmerchantable stands for biomass could add to the biomass supply, and further analysis could be undertaken to determine its profitability. Recent analysis has shown that harvesting these stands is not yet profitable.

Figure 1 shows the steps taken to build the final inventory of economically available biomass for the Quesnel TSA. A similar process was used for the Fraser TSA.

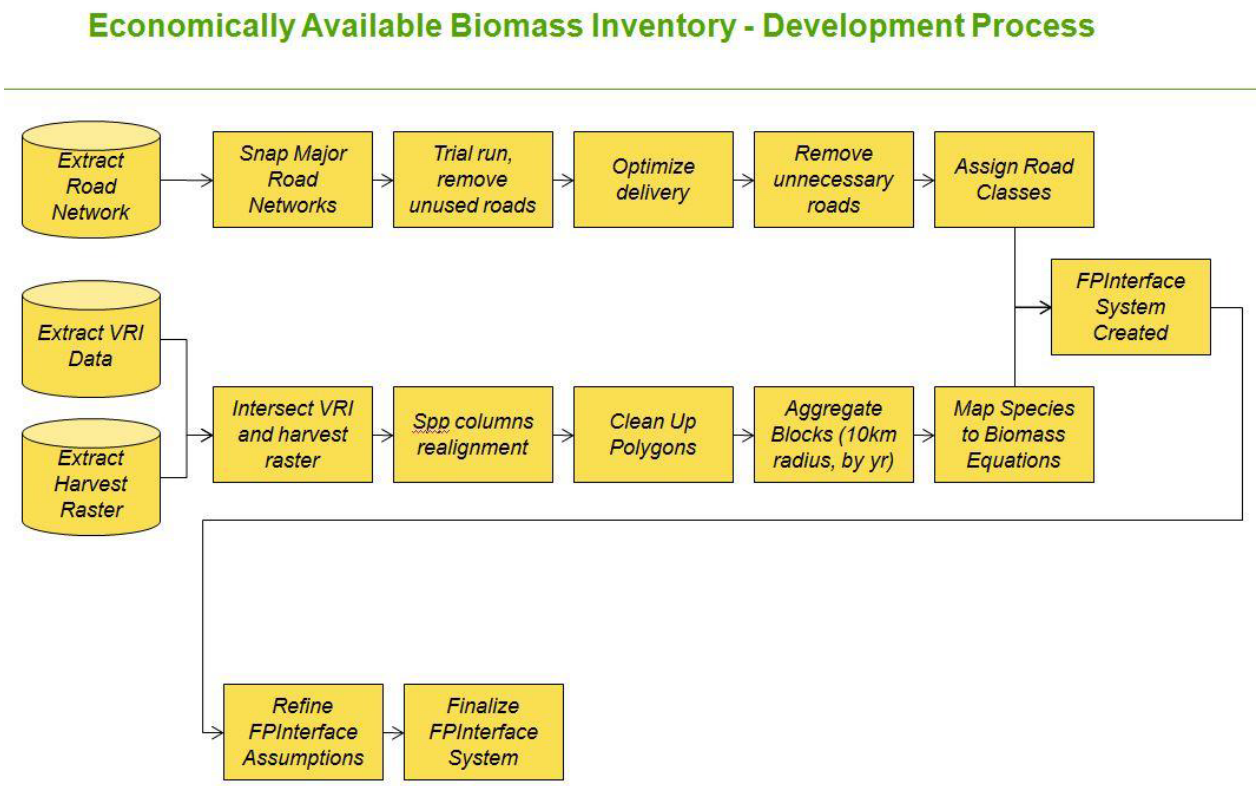


Figure 1. The steps taken to build the final inventory of economically available biomass.

Data acquisition

Data layers for the Fraser TSA were acquired from FLNRO (excluding woodlots, TFLs, CFAs, and any First Nations tenures), and included Vegetation Resource Inventory (VRI) polygons with attributes, and road linework with attributes. The polygon data was for 20 years of harvest over four consecutive 5-year periods.

The total 20-year harvest queue is a point-in-time snapshot. It indicates which polygons are expected to be harvested in the next 20 years. No attempt was made to model possible growth or mortality during the 20-year period. Any projections of growth or mortality are already accounted for in the harvestable proportion contained in the harvest raster data.

Data transformation

FPInterface requires two major inputs: a polygon layer of harvestable blocks with attributes, and a road layer. The polygon layer must also have a harvest raster built into it, indicating which polygons are to be cut in which time period. To calculate biomass amounts, FPInterface requires tree size data (height, and diameter at breast height) and either stand density (stems per hectare) or volume per hectare by species in each polygon. When the polygon layer is uploaded, it is necessary to tie species in the resultant to FPInterface species.

In order to speed calculation, polygons with little or no merchantable volume were targeted for elimination. Polygons with no volume were removed from the resultant. Some of these polygons

resulted from the process of intersecting the VRI and the harvest raster layers. Aggregation rules dictated that blocks were grouped if they had an identical harvest year and were within a 10-km radius.

FPInterface calculates cost in part by finding a transportation route from product origin in a polygon (block) to the mill or delivery site. The program relies on a continuous path along the road network. If digital road segments are not joined together (snapped), the program is not able to find a path between block and mill, or may find a suboptimal circuitous path.

Examination of the received data set showed that road snapping was required. A program was used to identify gaps in the road network and close them.

Biomass equations

To perform the analysis, tree species in the VRI were tied to single-tree biomass equations in FPInterface. For the Quesnel TSA analysis in 2010–11, these equations were based on "Canadian national tree above ground biomass equations" by Lambert et al. (2005). Although this equation set includes trees from all across Canada, including western and northern Canada, there were very few samples from B.C. More recently, Ung et al. (2008) have released tree equations for B.C. (accepted by FLNRO); these were incorporated into FPInterface for the Williams Lake TSA analysis and subsequent analyses, including this one.

FPInterface parameters

Tree species associations

Tree species associations were made as shown in Table 1.

Table 1. Species associations

FPInterface species	System label	Named	Original data set
Spruce, white	S	white spruce	S, SS, SE
Aspen, trembling	AT	trembling aspen	AC, AT, ACT
Cedar, western red	CW	western redcedar	CW
Alder, red	DR	red alder	DR, D, RA
Birch, white	EP	white birch	E, EP, EW
Douglas-fir	FD	Douglas-fir	FD, FDC
Hemlock, western	HW	western hemlock	H, HW, HM
Maple, silver	MB	bigleaf maple	MB, MV, M
Pine, lodgepole	PL	lodgepole pine	PL, PLC, PA
Pine, western white	PW	western white pine	PW
Cherry, black	VB	choke cherry	VB, VP
Cedar, western red	TW	western yew	TW
Cedar, yellow	YC	yellow cedar	YC
Fir, Pacific silver	BA	amabilis fir	B, BG, BA, BL

Road classes

Unlike the Quesnel TSA data set, the Fraser road data set contained no road classes. However, FPInterface has the ability to assign road classes based on the amount of volume hauled over each section of the road. The volume hauled is for merchantable volume as calculated by FPInterface. The volume and speeds associated with each road class were assigned as outlined in Table 2.

Table 2. Road class associations

FPInterface road class	Volume (m^3)		Road speed (km/h)		
	Minimum	Maximum	Posted speed	Empty haul[a]	Loaded haul[b]
Paved	10 000 001	50 000 000	90	86	77
Class 1 (off highway)	0	0	70	67	60
Class 1	2 000 001	10 000 000	70	67	60
Class 2	1 000 001	2 000 000	50	48	43
Class 3	500 001	1 000 000	40	38	34
Class 4	5 001	500 000	20	19	17
Class 4 (operational)	0	0	20	19	17
Class 5 (winter)	0	5 000	20	19	17

[a] 95% of posted speed
[b] 85% of posted speed

General parameters

The price of fuel can have significant impacts on model results. Some equipment in the model can use diesel, and some can use marked fuel. A price of $1.25/L was assigned, which is slightly higher than current rates for diesel but approximates a medium-term average.

FPInterface's default values for productivities and costs of forestry equipment rely on FPInnovations studies and information. If a user has specific values or costs they wish to apply to any phase or machine, these can be used instead of the defaults. For this project, only the default values were used.

Based on a terrain classification system developed by the Canadian Pulp and Paper Association (CPPA) (Mellgren, 1980), average slope the Fraser TSA was assigned CPPA Class 3 (20–32%). Ground strength was rated CPPA Class 3 (moderate), and ground roughness was rated CPPA Class 3 (uneven).

Comminution cost

The working time for B.C. conditions was based on previous base case studies and consists of one 12-hour shift per day, 200 days/year. Grinder utilization was set at 60%, and fuel used per productive machine hour (PMH) for the grinder was the standard 135 L/PMH. These are the standard base case parameters used in past FPInnovations studies, which enabled comparisons to those studies. In this study, these parameters produced a grinding cost of $27.55/ODT.

However, developments in the industry have lowered grinding costs, so these parameters were changed in a low-cost scenario to 75% efficiency and fuel use of 100 L/PMH in order to represent the

new conditions. This produced a grinding cost of $22.50/ODT. This is thought to be achievable for an experienced operator in the conditions of the Fraser TSA.

Topping diameter

Although B.C. regulations require a topping diameter of 10 cm for most merchantable species, this analysis used 12.5 cm to reflect more common industrial practise. Topping diameter can have a significant effect on the volume of a tree that is available for biomass use.

Parameters as entered into FPInterface

Table 3 shows some of the parameters that were entered into FPInterface for the base case, which produced a grinding cost of $27.55/ODT. The low-cost scenario (Fraser – LowCostAll) was also modelled, and produced a grinding cost of $22.50/ODT. For this scenario, the grinder efficiency and grinder fuel use parameters were adjusted to 75% and 100 L/PMH.

Table 1. FPInterface parameters: base case

Run descriptor	Value
run name	Fraser Feb7th
output name	Biomass - Fraser Feb7th
block system	biomass_blocks_FRA.shp
road system	roads_v3.shp
transfer yard(s)	Chilliwack, Richmond
cost per transfer yard, respectively	0
year(s) analyzed	all
species attribute linking	BC
automatic assignment of road class by volume	yes
road maintenance	yes
haul speeds	graduated
haul speeds at 95%/85% of posted	yes
transport shifts/day	1
transport hours/shift	12
transport days/year	200
transport fuel price/litre	$1.25
ground strength	3 - moderate
ground roughness	3 - uneven
average slope %	20–32
slash used for biomass	yes
full stem used for biomass	no
chip destination	Chilliwack, Richmond
topping diameter	12.5 cm

truck used for logs	3-axle
truck used for chips	Tridem B-train
harvesting fuel price/litre (x3)	$1.25
harvesting shifts/day (x3)	1
harvesting hours/shift (x3)	12
harvesting days/year (x3)	200
harvesting system	full tree with roadside processing
felling & processing	mechanized and bunched
skid type	skidder with grapple
type of roadside processing	cut-to-length
on site biomass treatment (roadside)	comminution
recovery season	winter
slash freshness	>3 months
slash pre-piled at roadside	yes
grinder size type	horizontal 600 kW
biomass fuel price/litre (x2)	$1.25
biomass hours/shift (x2)	12
biomass shifts/day (x2)	1
biomass days/year (x2)	200
grinder efficiency	60%[a]
grinder fuel use (L/PMH)	135[b]
indirect costs - biomass ($ value)	$0.00
indirect costs - harvesting ($ value)	$0.00

[a] Parameter was adjusted to 75% in the low-cost scenario.
[b] Parameter was adjusted to 100 L/PMH in the low-cost scenario.

Delivery locations

All harvest residues from in-woods operations (not from mills) were directed to large industrial areas in the Fraser TSA. In this model, Richmond and Chilliwack were used as delivery locations. Initial comminution was set to take place at roadside, and costs are calculated for biomass delivered to the delivery locations.

Biomass calculations

The biomass calculations in FPInterface produce a volume of total available biomass once merchantable roundwood has been removed. For this project, only biomass transported to roadside was considered recoverable; biomass that was likely to remain at the stump or that was dispersed on the cutblock was not. Once it is transported to roadside, some biomass becomes unavailable due to handling and technical losses. The remainder is considered recovered biomass. Figure 2 shows this

breakdown based on the numbers from the 20-year harvest of the base case with normal grinder utilization of 60% and fuel usage of 135 L/PMH.

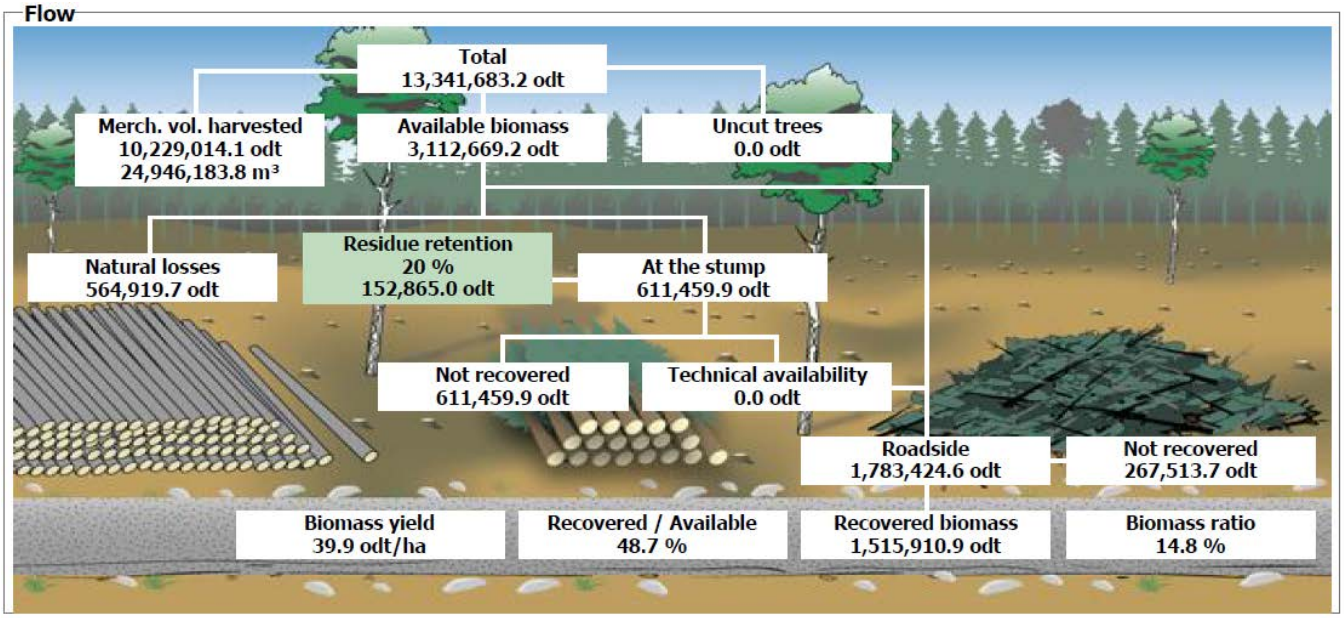


Figure 2. Recoverable biomass in the Fraser TSA, delivered to Richmond and Chilliwack.

5 Results and discussion

Summary of key results

All results from the different runs performed in FPInterface are summarized in Appendix 1. The FPInterface analysis of biomass supply in the Fraser TSA, based on inventory information and the road network supplied by FLNRO, indicated an average biomass yield of 39.9 ODT/ha for the base case. This was in the form of comminuted hog fuel and was from harvest residues only—tops, branches, and other roadside logging waste. Mill residues were not predicted by the model.

Biomass amounts

In total, for the base case, it was predicted that 1 515 911 ODT could be recovered from roadside and delivered to the delivery locations over the course of 20 years. The amount of available biomass was relatively consistent throughout all four periods. The first 5-year period (years 1–5) had the lowest amount of available biomass, possibly due to a smaller planned harvest area and/or a lower biomass ratio of 12.4%. The amount of biomass available each year in the study area was approximately 75 000 ODT/year, at any price. However, the amount of biomass available in each 5-year period varied from as much as 80 000 ODT/year in period 2 (years 5–10) to as low as 70 000 ODT/year in period 1 (years 1–5). The economically available volume was estimated at 11 000 ODT/year (Table 4).

Table 4. Key amounts of biomass availability in the Fraser TSA

	Volume at $60/ODT (ODT)[a]	Volume at $90/ODT (ODT)	Total volume ($190/ODT) (ODT)
Over 20-year period	221 571	1 184 631	1 515 911
Per year	11 079	59 232	75 796

[a] ODT: oven-dried tonne

Additionally, the model indicated that about 1 329 244 ODT of biomass would be left on the cutblock and would not make it to roadside. This includes material that falls off trees naturally and material that breaks off logs and is left on the ground during normal harvesting operations. This large amount of material retained in the forest was equal to 88% of the amount removed for biomass and is much higher than that deemed necessary to replenish the forest floor and prevent nutrient degradation in the soil. Additionally, 268 000 ODT of biomass material that makes it to roadside was not recovered due to technical handling efficiencies; that is, the material is too small or large for machine handling or is incorrectly positioned for economic accessibility.

Biomass ratio

The biomass ratio is the ratio of recovered biomass to recovered merchantable roundwood). The ratio for the base case scenario was 14.8% (Table 5).

Table 5. Calculation of the biomass ratio: base case

Biomass ratio (ODT)[a]	
Recovered biomass	1 515 911
Recovered roundwood	10 229 014
Biomass ratio (%)	14.8

[a] ODT: oven-dried tonne

Knowing the biomass ratio for an area can be useful for roughly predicting the amount of available harvest residue if the amount of merchantable timber harvest is known.

Cost availability

FPInterface breaks down the available supply into delivered cost in $10 increments. At the presumed market rate of $60/ODT, the amount available over 20 years is predicted to be 221 571 ODT or about 11 000 ODT/year. The complete results in $10 increments for the entire 20-year period are presented in Table 6 and Figure 3.

Table 6. Cost availability of biomass in the Fraser TSA: base case

Base case	Normal grinder utilization at $60/ODT[ab]	
Cost ($/ODT)	Total (ODT)	Annual (ODT)
10	–	–
20	–	–
30	–	–
40	–	–
50	9 500.0	475.0
60	221 571.2	11 078.6
70	627 337.9	31 366.9
80	948 044.1	47 402.2
90	1 184 630.6	59 231.5
100	1 302 999.8	65 150.0
110	1 372 071.8	68 603.6
120	1 427 134.6	71 356.7
130	1 457 866.0	72 893.3
140	1 479 653.3	73 982.7
150	1 497 579.2	74 879.0
160	1 505 749.7	75 287.5
170	1 509 994.3	75 499.7
180	1 512 618.4	75 630.9
190	1 513 017.0	75 650.9
200	1 514 689.3	75 734.5
210	1 515 910.9	75 795.5

[a] Presumed market rate.
[b] ODT: oven-dried tonne

The amounts are cumulative, so the amount available at $60/ODT, for example, includes all the biomass at $50/ODT and the additional biomass available between $50 and $60/ODT.

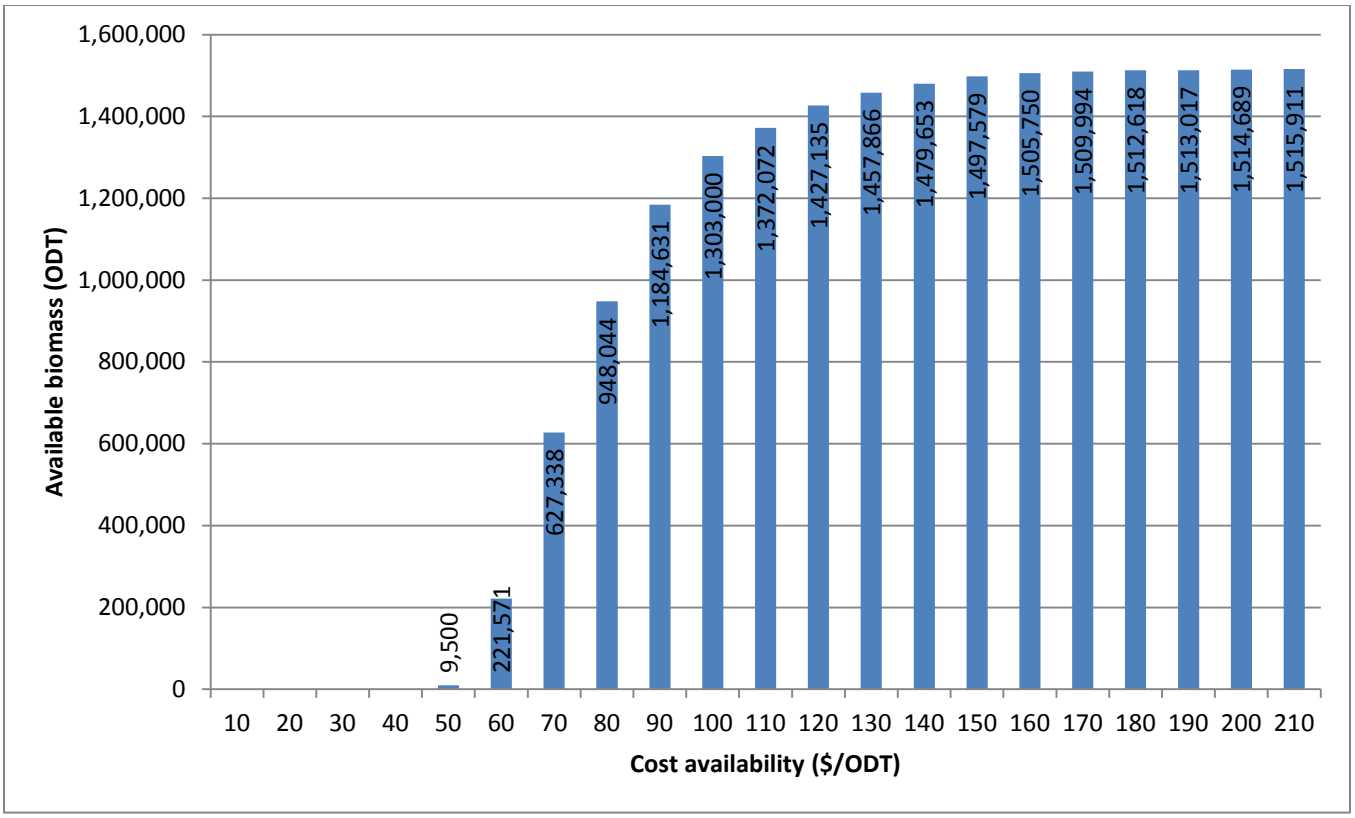


Figure 3. Cost availability of biomass in the Fraser TSA, over 20 years: base case (ODT: oven-dried tonne)

Low-cost scenario

In addition to the base case scenario with a grinding cost of $27.55/ODT, a low-cost scenario with a grinding cost of $22.50/ODT was examined ($5.05 below the base case). Although this cost was achieved by manipulating the grinder utilization and fuel consumption values, differences in delivered cost can also be created by changes to equipment or practices that raise or lower operating costs or a lower fuel price, for example. Thus, if greater efficiency in grinding technology is realized, the amount of biomass that is economically available can be increased dramatically, especially at the lower price points (Table 7 and Figure 4).

Table 7. Cost availability of biomass in the Fraser TSA: comparison of the base case and low-cost grinding scenarios

	Base case – grinding cost of $27.55/ODT[a]		Low-cost scenario – grinding cost of $22.50/ODT	
	Biomass available		Biomass available	
Cost ($/ODT)	Total (ODT)	Annual (ODT)	Total (ODT)	Annual (ODT)
10	–	–	–	–
20	–	–	–	–
30	–	–	–	–
40	–	–	–	–
50	9 500	475	59 984	2 999
60[b]	221 571	11 079	429 413	21 471
70	627 338	31 367	800 151	40 008
80	948 044	47 402	1 072 616	53 631
90	1 184 631	59 232	1 258 845	62 942
100	1 303 000	65 150	1 338 074	66 904
110	1 372 072	68 604	1 404 780	70 239
120	1 427 135	71 357	1 439 286	71 964
130	1 457 866	72 893	1 473 631	73 682
140	1 479 653	73 983	1 490 101	74 505
150	1 497 579	74 879	1 501 221	75 061
160	1 505 750	75 287	1 507 699	75 385
170	1 509 994	75 500	1 512 460	75 623
180	1 512 618	75 631	1 512 878	75 644
190	1 513 017	75 651	1 513 858	75 693
200	1 514 689	75 734	1 515 911	75 796
210	1 515 911	75 796	–	–

[a] ODT: oven-dried tonne

[b] Presumed market rate.

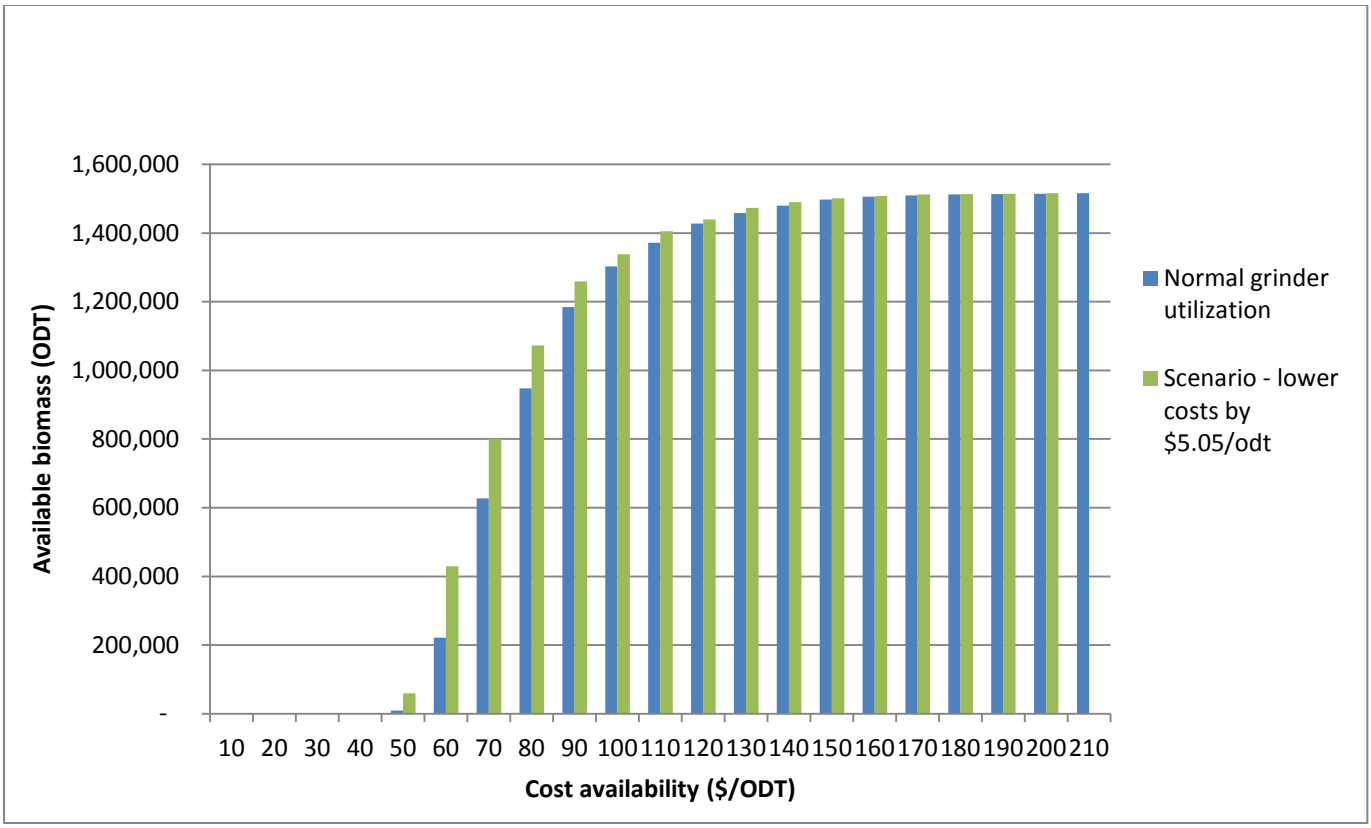


Figure 4. Cost availability of biomass in the Fraser TSA, over 20-year period; comparison of the base case and low-cost scenarios (ODT: oven-dried tonne).

The lowering of costs by $5.05/ODT produced some startling differences in biomass availability. At $60/ODT, more than 200 000 ODT additional biomass were available over 20 years with the lowered grinding costs, almost double the base case amount. This equates to more than 10 000 additional ODT/year. This difference at $60/ODT, the presumed market rate for biomass, is highlighted in Figure 5.

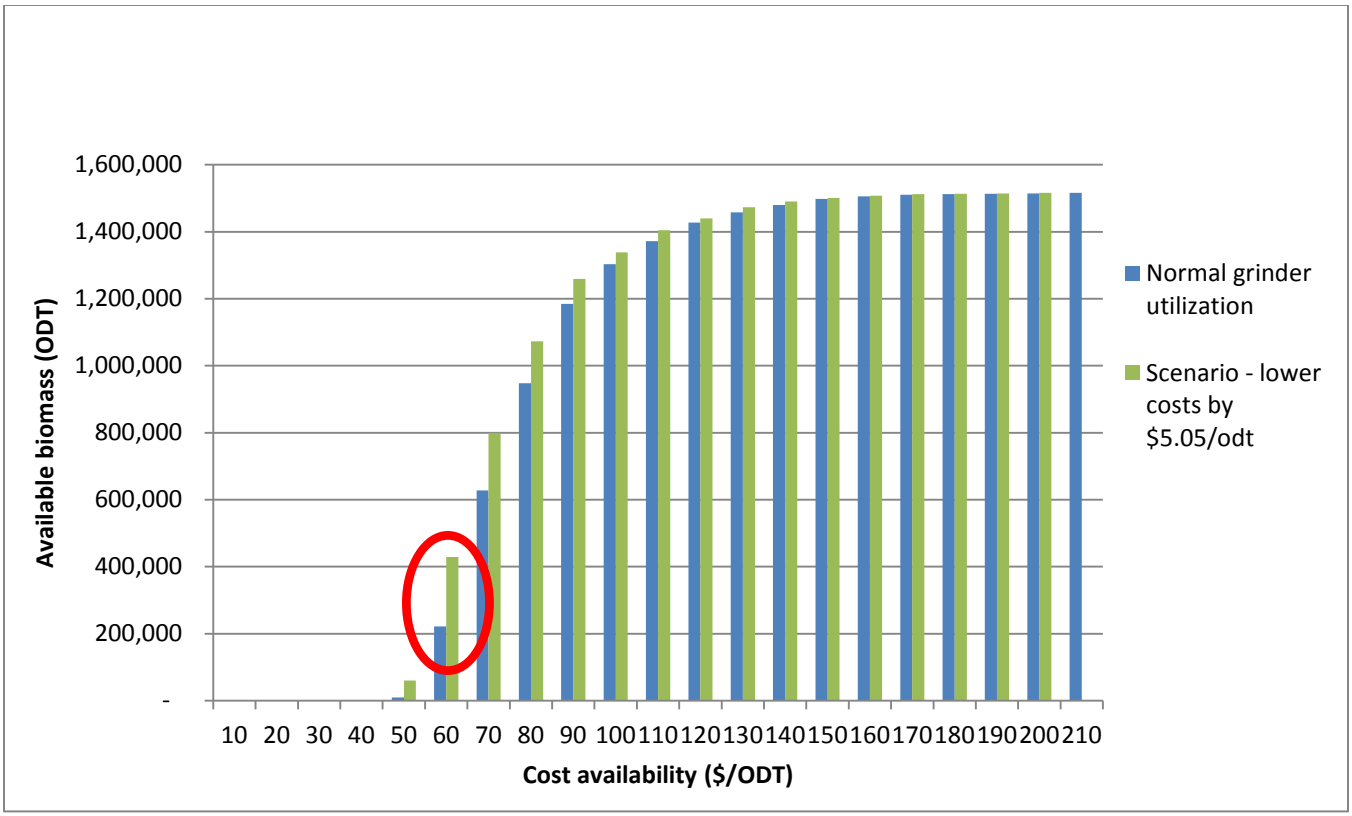


Figure 5. Cost availability of biomass in the Fraser TSA: comparison of the base case and low-cost grinding scenarios, over 20-year period, with the difference at $60/oven-dried tonne (ODT) highlighted.

This means that much more biomass is available when fuel costs are lower. The actual difference in cost per delivered tonne of biomass is only $5.05, but the effect this has on availability is much greater because of the spatial distribution of biomass. The average price for delivered biomass across the Fraser TSA is shown in Table 8.

Table 8. Average cost of delivered biomass across the entire Fraser TSA

Fuel price	Average cost of delivered biomass ($/ODT)[a]
Base case – grinding at $27.55/ODT	79.11
Low-cost scenario – grinding at $22.50/ODT	74.06

[a] ODT: oven-dried tonne

Mapping

FPInterface shows the distribution of costs by cutblock, using a colour scale that ranges from lime green (blocks with the lowest delivered biomass costs) to pink (blocks with the most expensive costs); grey shows the transition between the two (Figure 6). The delivery points (Chilliwack and Richmond) are represented by blue triangles. All biomass from the study area was scheduled for delivery to these points. The costs ranged up to $202/ODT for the blocks farthest from the delivery point.

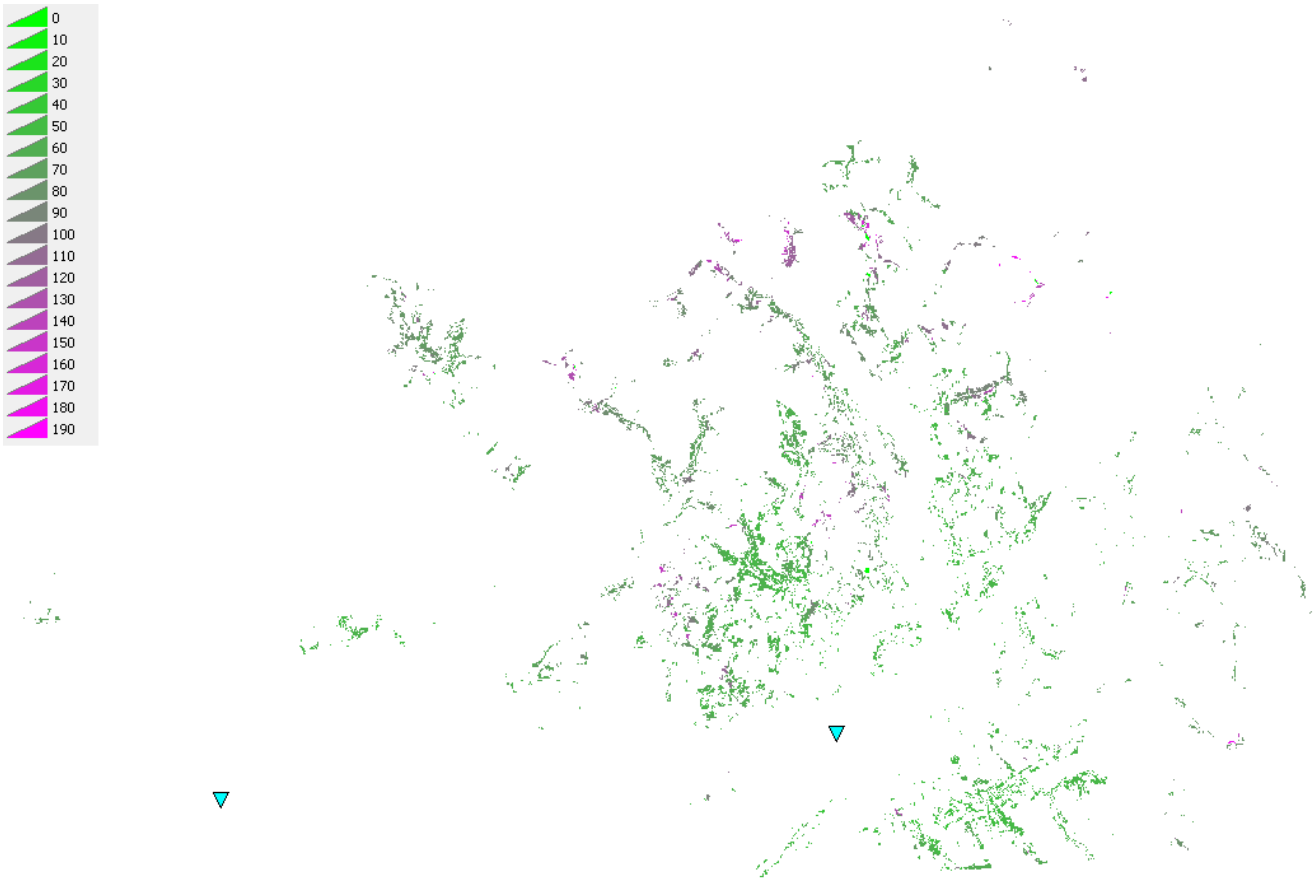


Figure 6. Cost of delivered biomass from point of origin to the delivery points, in increments of $10/oven-dried tonne.

Figure 7 shows the road network to the cutblocks and delivery points. Different classes of roads are shown in different colours. Road class is determined by the amount of harvest that passes over the road. Each road class has a unique set of speed associations for loaded and empty trucks; these are used to determine the cycle times needed to calculate the delivery cost for biomass (Table 2). Most of the roads with the slowest speeds are shown in blue; red and black show roads with the fastest speeds.

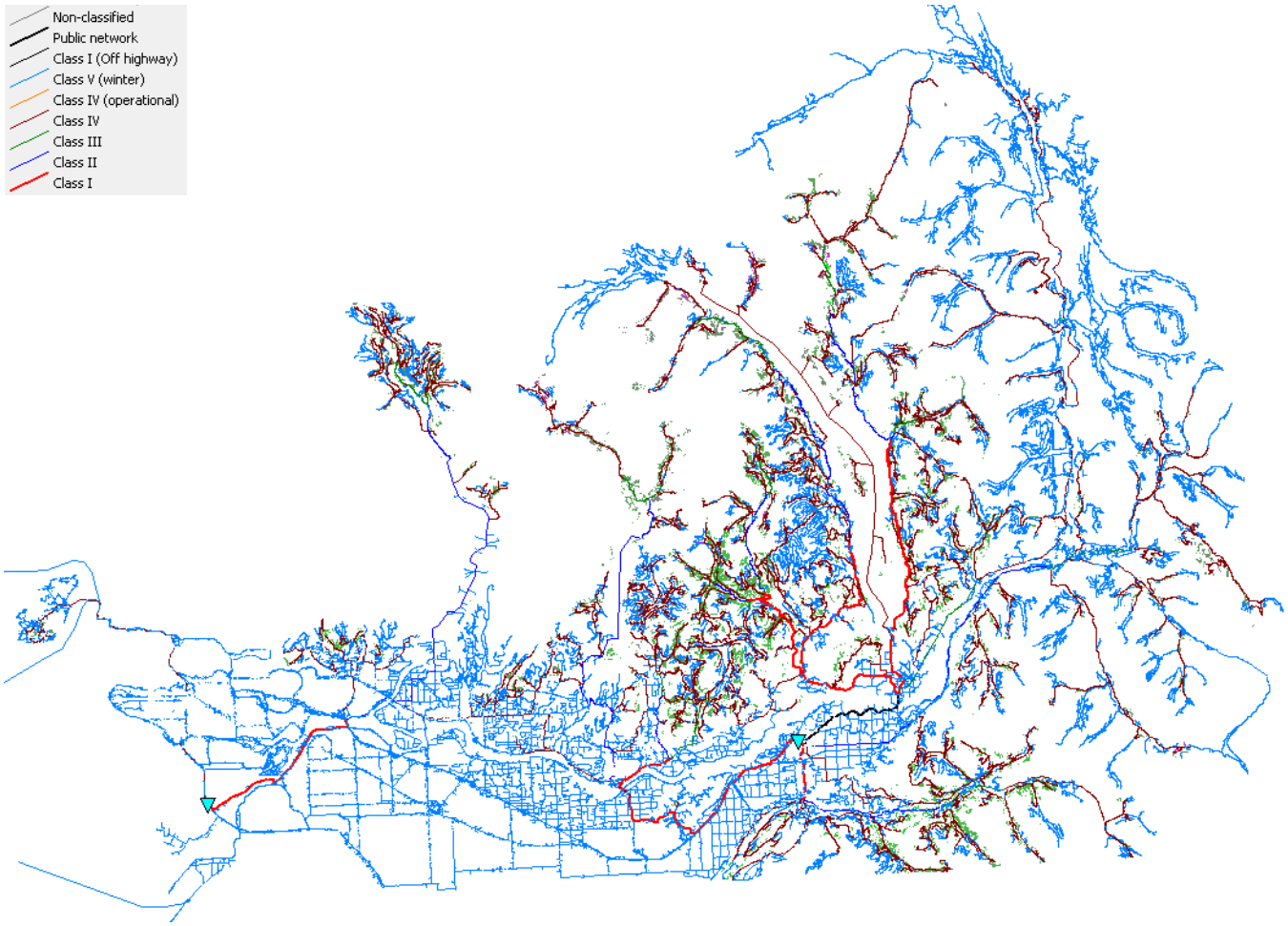


Figure 7. Blocks with road access in the Fraser TSA, as shown in FPInterface.

Temporal distribution of harvest

The harvest data included a time period assigned to each cutblock. There are four periods, each of which represents a 5-year period. The harvest projection showed a relatively steady supply of available biomass between each harvest period (Figure 8).

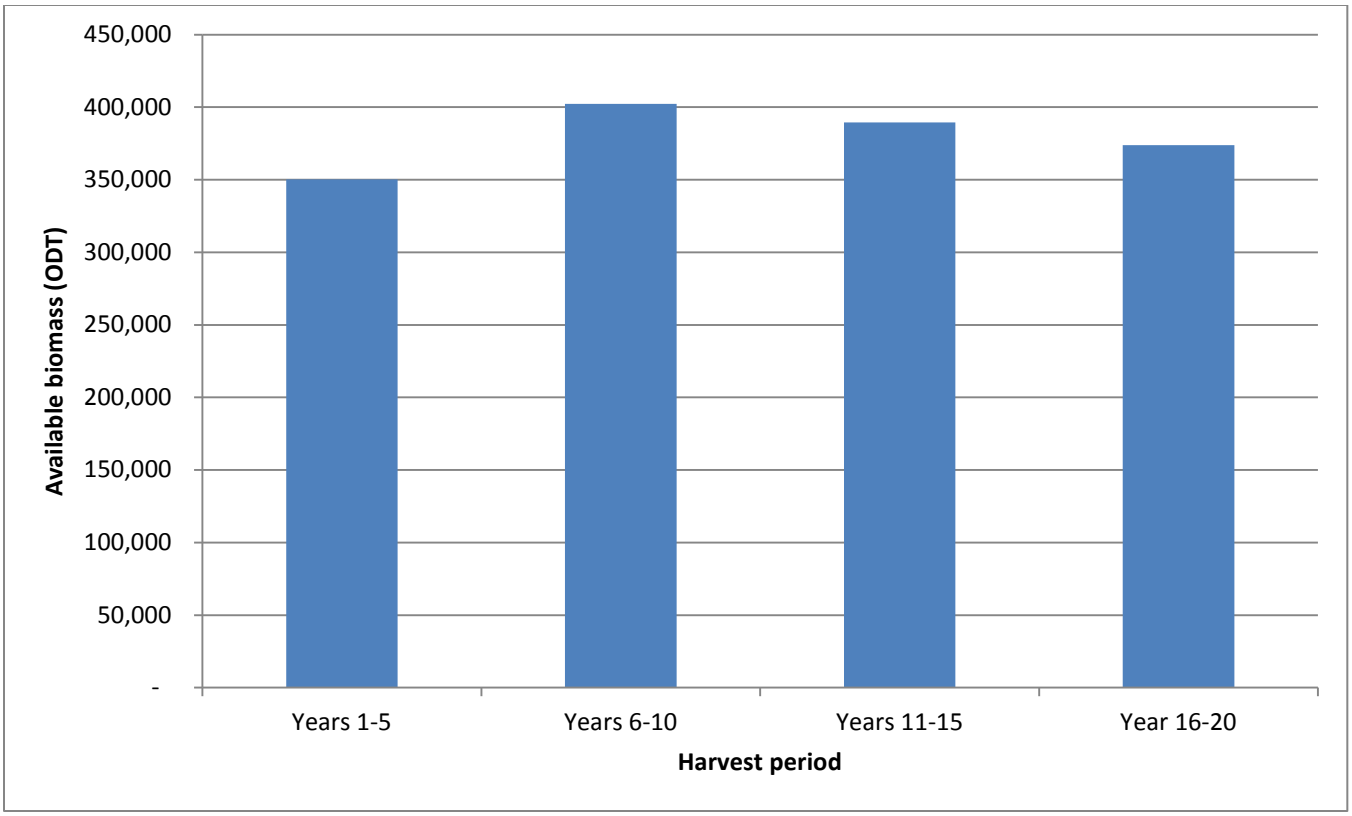


Figure 8. Availability of biomass in the Fraser TSA, by 5-year harvest period at $60/oven dried tonne.

The economic harvest available (amount of biomass at $60/ODT) in each 5-year period (Figure 9) showed a disproportionate decline (compared to Figure 8) after each period. This indicates that the harvest blocks tend to be farther from the delivery locations after each period.

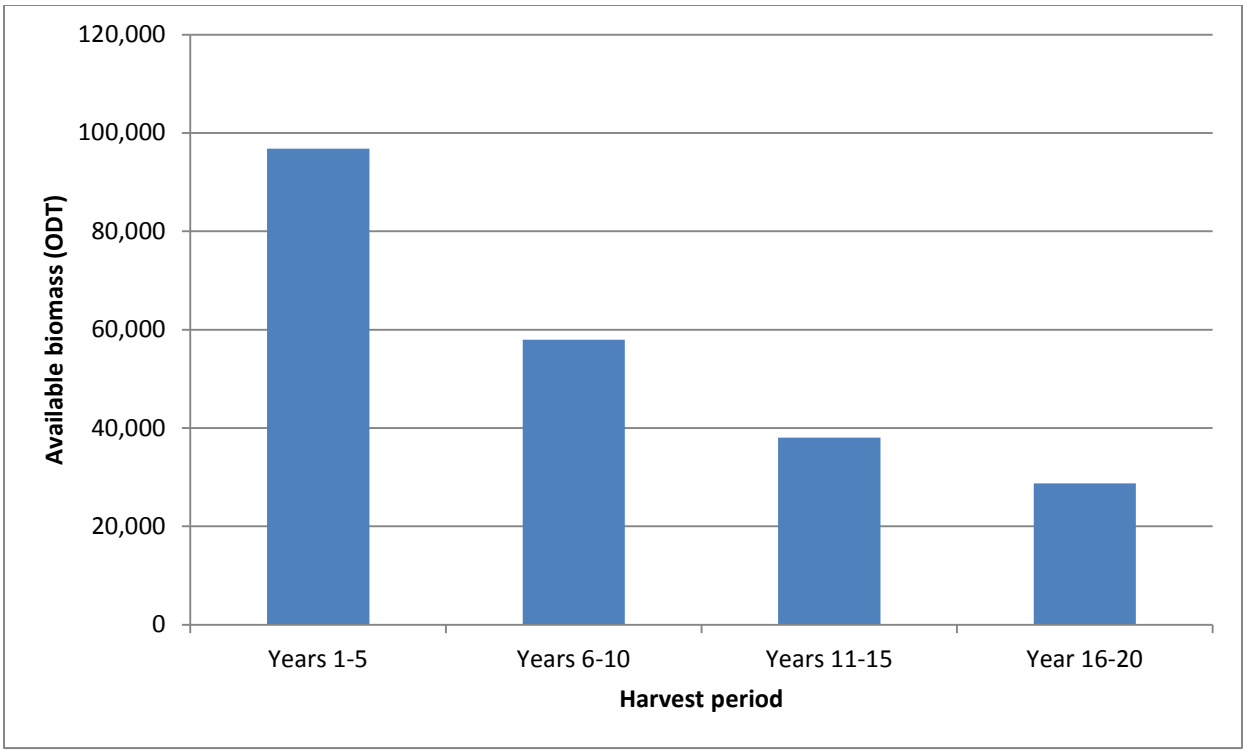


Figure 9. Availability of economic biomass in the Fraser TSA, by 5-year harvest period, at ≤ $60/oven-dried tonne.

The cost availability of biomass is shown by period and $10 increments in Tables 9 and 10 for the base case and low-cost scenarios, respectively.

Table 9. Cost availability of biomass in the Fraser TSA, by 5-year period: base case

	Period 1 (years1–5)		Period 2 (years 6–10)		Period 3 (years 11–15)		Period 4 (years 16–20)	
Cost ($/ODT)[a]	Total (ODT)	Annual (ODT)	Total (ODT)	Annual (ODT)	Total (ODT)	Annual (ODT)	Total (ODT)	Annual (ODT)
10	–	–	–	–	–	–	–	–
20	–	–	–	–	–	–	–	–
30	–	–	–	–	–	–	–	–
40	–	–	–	–	–	–	–	–
50	5 662	1 132	740	148	1 934	387	1 165	233
60[b]	96 806	19 361	57 967	11 593	38 061	7 612	28 737	5 747
70	214 968	42 994	169 200	33 840	140 965	28 193	102 206	20 441
80	303 574	60 715	250 265	50 053	218 174	43 635	176 031	35 206
90	332 417	66 483	309 257	61 851	292 627	58 525	250 330	50 066
100	342 495	68 499	344 210	68 842	318 207	63 641	298 087	59 617
110	345 669	69 134	360 339	72 068	345 034	69 007	321 030	64 206
120	349 092	69 818	372 873	74 575	372 992	74 598	332 178	66 436
130	349 593	69 919	380 864	76 173	380 616	76 123	346 794	69 359
140	350 082	70 016	389 225	77 845	383 692	76 738	356 654	71 331
150	350 129	70 026	396 773	79 355	387 442	77 488	363 235	72 647
160	350 129	70 026	400 178	80 036	388 670	77 734	366 773	73 355
170	350 255	70 051	401 443	80 289	388 913	77 783	369 383	73 877
180	–	–	401 940	80 388	389 558	77 912	370 865	74 173
190	–	–	402 108	80 422	–	–	371 096	74 219
200	–	–	402 186	80 437	–	–	372 690	74 538
210	–	–	402 215	80 443	–	–	373 882	74 776

[a] ODT: oven-dried tonne

[b] Presumed market rate

Table 10. Cost availability of biomass in the Fraser TSA, by 5-year period: low-cost grinding scenario

	Period 1 (years1–5)		Period 2 (years 6–10)		Period 3 (years 11–15)		Period 4 (years 16–20)	
Cost ($/ODT)[a]	Total (ODT)	Annual (ODT)	Total (ODT)	Annual (ODT)	Total (ODT)	Annual (ODT)	Total (ODT)	Annual (ODT)
10	–	–	–	-–	–	–	–	–
20	–	–	–	–	–	–	–	–
30	–	–	–	–	–	–	–	–
40	–	–	–	–	–	–	–	–
50	31 911	6 382	10 650	2 130	10 502	2 100	6 921	1 384
60[b]	163 141	32 628	122 240	24 448	81 011	16 202	63 020	12 604
70	268 768	53 754	218 940	43 788	170 829	34 166	141 613	28 323
80	319 069	63 814	283 984	56 797	253 987	50 797	215 577	43 115
90	340 275	68 055	326 125	65 225	310 480	62 096	281 966	56 393
100	344 927	68 985	353 681	70 736	332 809	66 562	306 657	61 331
110	346 391	69 278	367 686	73 537	361 631	72 326	329 073	65 815
120	349 340	69 868	378 974	75 795	376 087	75 217	334 886	66 977
130	350 014	70 003	387 770	77 554	383 059	76 612	352 789	70 558
140	350 129	70 026	393 675	78 735	386 597	77 319	359 700	71 940
150	350 129	70 026	397 947	79 589	388 516	77 703	364 628	72 926
160	350 255	70 051	401 058	80 212	388 783	77 757	367 602	73 520
170	–	–	401 899	80 380	389 442	77 888	370 865	74 173
180	–	–	402 023	80 405	389 558	77 912	371 042	74 208
190	–	–	402 123	80 425	–	–	371 922	74 384
200	–	–	402 215	80 443	–	–	373 882	74 776

[a] ODT: oven-dried tonne

[b] Presumed market rate

Results appendix

The runs performed in FPInterface and their results are included in Appendix 1.

6 Conclusion

The biomass yield per hectare from harvest residues in the Fraser TSA is predicted to be 39.9 ODT/ha. Over the next 20 years, a total of 1.52 million ODT of available biomass are predicted to be generated by harvest in the Fraser TSA, or approximately 75 000 ODT/year. Of this amount, approximately 15% of the total or 221 500 ODT, or 11 000 ODT/year, are expected to be available at the economic price of

$60/ODT. While at $90/ODT, 80% of the total or 1.18 million ODT, or 59 000 ODT/year, are expected to be available. The biomass ratio (the ratio of recovered biomass to recovered merchantable roundwood) is estimated at 14.8%.

Development of a low-cost scenario was attempted using grinding costs that were reduced by $5.05/ODT. At the economic rate of $60/ODT, availability of biomass increased by approximately 200 000 ODT over 20 years, or about 10 000 ODT/year. If increases in efficiency or lowered costs can be realized, there could be an increase in available biomass by these amounts.

Most biomass that is considered to be economically available (≤ $60/ODT) is closest to the delivery points. The amount of economically available biomass decreases considerably after each 5-year period. This may be attributed to an increased distance to planned harvest blocks.

7 References

Friesen, C., & Goodison, A. (2018). *Using FPInterface to estimate available forest-origin biomass in British Columbia: Quesnel TSA* (Technical Report No. 7). Vancouver, British Columbia: FPInnovations.

Lambert, M-C., Ung, C-H., & Raulier, R. (2005). Canadian national tree aboveground biomass equations. *Canadian Journal of Forest Research* 35,1996–2018.

Mellgren, P.G. (1980) *Terrain classification for Canadian forestry*. Canadian Pulp and Paper Association.

Ung, C.-H., Bernier, P., & Guo, X.-J. (2008). Canadian national biomass equations: New parameter estimates that include British Columbia data. *Canadian Journal of Forest Research* 35,1123–1132.

8 Appendix

- Biomass - Fraser Feb7th BaseP1.pdf
- Biomass - Fraser Feb7th BaseP2.pdf
- Biomass - Fraser Feb7th BaseP3.pdf
- Biomass - Fraser Feb7th BaseP4.pdf
- Biomass - Fraser Feb7th.pdf
- Biomass - Fraser Feb7th-LowCost.pdf
- Biomass - Fraser Feb7th-LowCostP1.pdf
- Biomass - Fraser Feb7th-LowCostP2.pdf
- Biomass - Fraser Feb7th-LowCostP3.pdf
- Biomass - Fraser Feb7th-LowCostP4.pdf
- Forest supply - Fraser Feb7th BaseP1.pdf
- Forest supply - Fraser Feb7th BaseP2.pdf
- Forest supply - Fraser Feb7th BaseP3.pdf
- Forest supply - Fraser Feb7th BaseP4.pdf
- Forest supply - Fraser Feb7th.pdf

Territory:	Unknown territory
Sector:	Unknown sector
Cut block:	<Multiple selection>

Statistics - Selected Items

Area	8,110.1 ha
Number of cut blocks	1649
Recovered biomass	350,255.1 odt
Biomass yield	43.2 odt/ha
Biomass odt / Merchantable m^3	0.0534 odt/m^3
Delivered products	
• Chips	100 %
• Bundles	0 %
• Trunks and Residues	0 %
Energy balance	35 : 1
Available energy	1,324,574 MWh
Fuel consumption	12.3 L/odt

Cost

Harvesting	0.00 $/odt
Biomass recovery	27.55 $/odt
Transfer yard	0.00 $/odt
Transportation	30.47 $/odt
Loading/unloading	9.30 $/odt
Stumpage fees	0.00 $/odt
Road network - Maintenance	0.96 $/odt
Indirect costs	0.00 $/odt
Total	68.28 $/odt

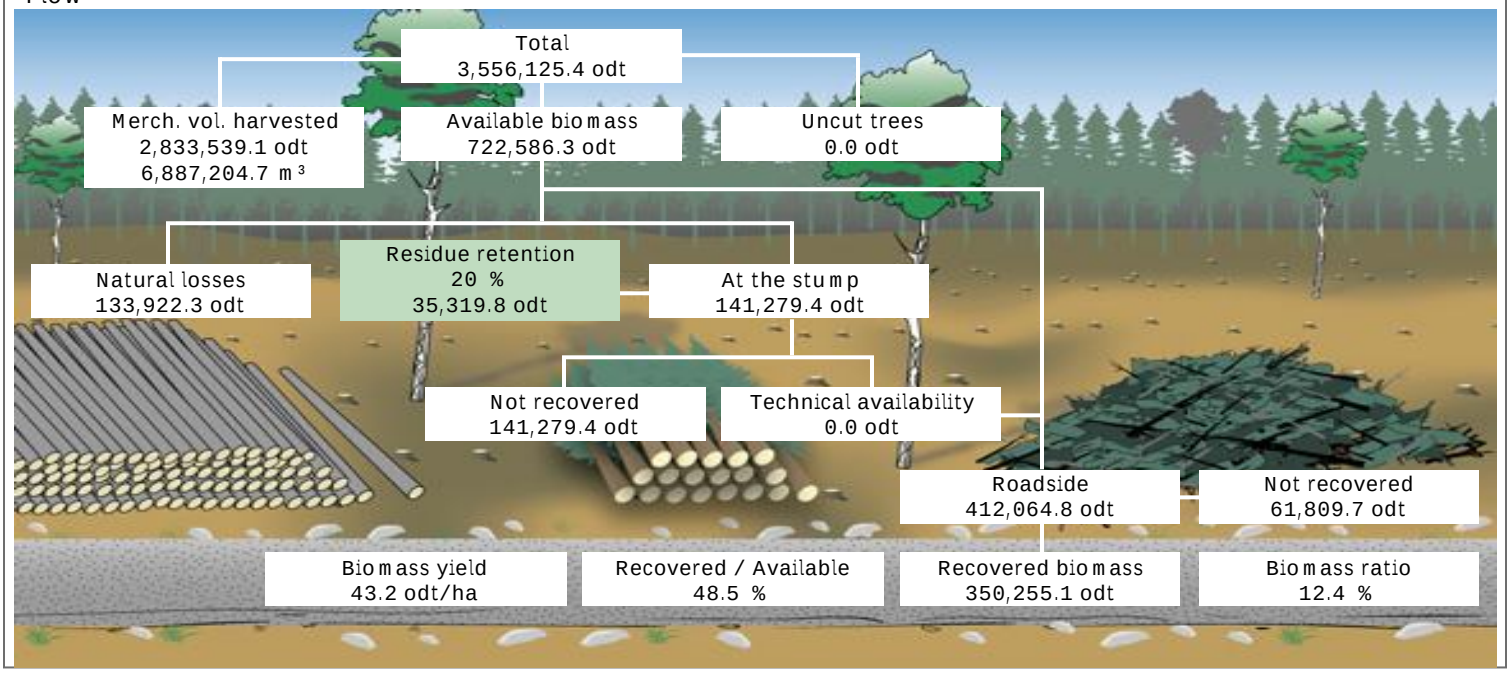
Revenue

Sale value	0.00 $/odt
Silvicultural discount	0.00 $/odt

Net

Profit	-68.28 $/odt

Flow



Products

Product name	odt	odt/m³	odt/ha
Western Hemlock (residues)	116,867.0	0.0508	14.41
Douglas Fir (residues)	112,604.1	0.0597	13.88
Amabilis Fir (residues)	49,234.0	0.0394	6.07
Western Red Cedar (residues)	36,973.1	0.0552	4.56
Red Alder (residues)	28,634.2	0.0957	3.53
Yellow Cedar (residues)	3,379.5	0.0295	0.42
Trembling Aspen (residues)	1,309.8	0.0629	0.16
Lodgepole Pine (residues)	900.0	0.0483	0.11
White Spruce (residues)	349.4	0.0546	0.04
Western White Pine (residues)	4.1	0.0642	0.00
	350,255.1	0.0534	43.19

Recovery summary

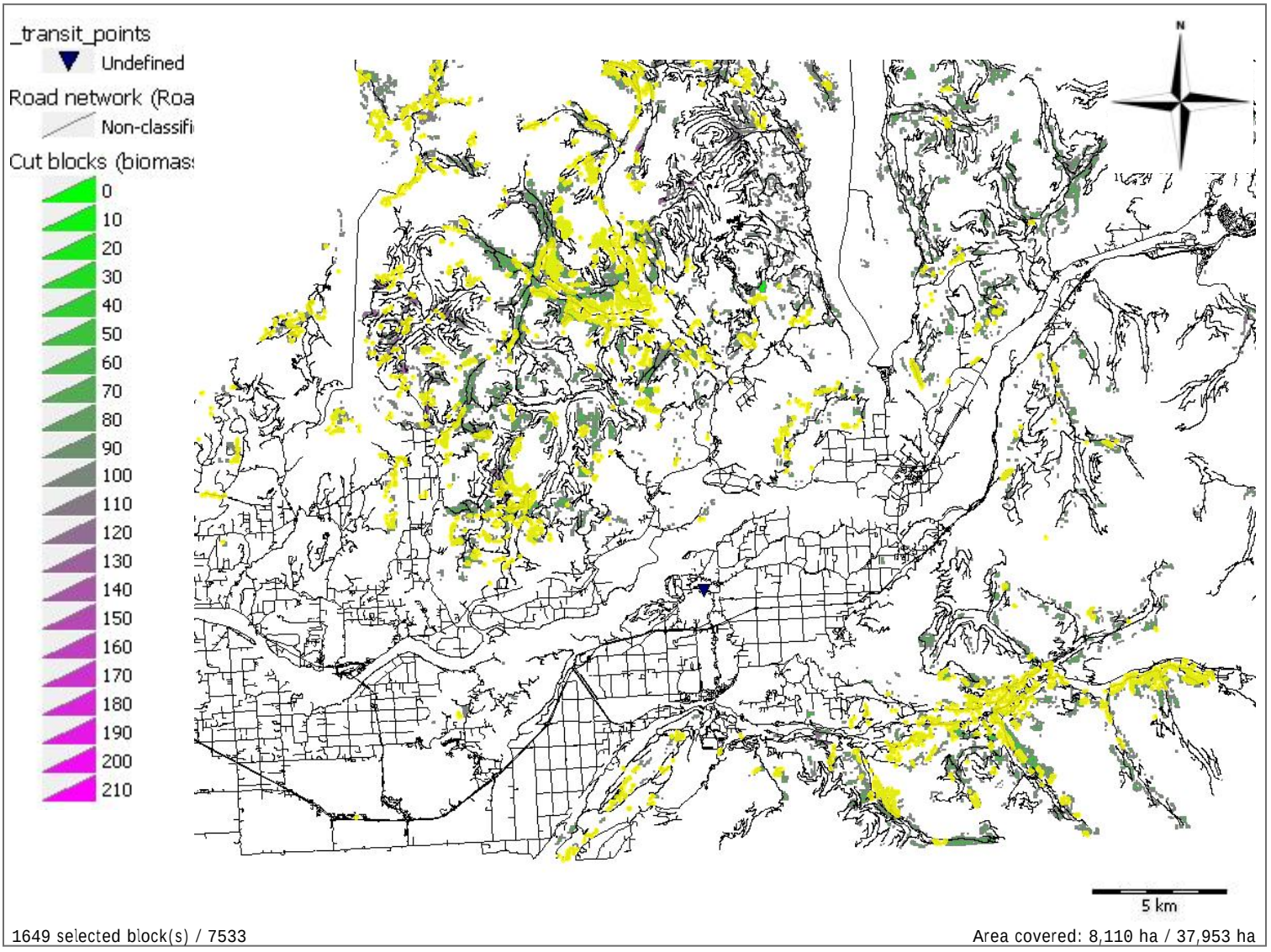
	Volume(odt)	Area(ha)	Number of cut blocks
• Biomass recovery location			
At the stump	0.0	0.0	0
Roadside	350,255.1	8,110.1	1,649
• Recovery season			
Summer	0.0	0.0	0
Winter	350,255.1	8,110.1	1,649
• Residue freshness			
Fresh	0.0	0.0	0
Brown	350,255.1	8,110.1	1,649
Brittle	0.0	0.0	0

Supply summary

Recovered biomass to	Merchantable volume (odt)	Residues (odt)	Total biomass (odt)
10 $/odt	0.0	0.0	0.0
20 $/odt	0.0	0.0	0.0
30 $/odt	0.0	0.0	0.0
40 $/odt	0.0	0.0	0.0
50 $/odt	0.0	5,661.5	5,661.5
60 $/odt	0.0	96,805.6	96,805.6
70 $/odt	0.0	214,967.7	214,967.7
80 $/odt	0.0	303,573.6	303,573.6
90 $/odt	0.0	332,417.0	332,417.0
100 $/odt	0.0	342,495.4	342,495.4
110 $/odt	0.0	345,668.8	345,668.8
120 $/odt	0.0	349,091.6	349,091.6
130 $/odt	0.0	349,593.1	349,593.1
140 $/odt	0.0	350,081.8	350,081.8
150 $/odt	0.0	350,129.4	350,129.4
160 $/odt	0.0	350,129.4	350,129.4
170 $/odt	0.0	350,255.1	350,255.1
Maximum cost	0.00 $/odt	164.89 $/odt	

Delivery to mills

Destination	Product	Format	odt	Transport average distance (Km)
Richmond				
	Amabilis Fir (residues)	Chips	212	81
	Douglas Fir (residues)	Chips	8,307	56
	Red Alder (residues)	Chips	1,474	69
	Trembling Aspen (residues)	Chips	177	65
	Western Hemlock (residues)	Chips	8,497	64
	Western Red Cedar (residues)	Chips	3,546	67
	White Spruce (residues)	Chips	59	82
	Yellow Cedar (residues)	Chips	0	80
			22,272	62
Chilliwack				
	Amabilis Fir (residues)	Chips	49,022	79
	Douglas Fir (residues)	Chips	104,297	63
	Lodgepole Pine (residues)	Chips	900	92
	Red Alder (residues)	Chips	27,160	66
	Trembling Aspen (residues)	Chips	1,133	45
	Western Hemlock (residues)	Chips	108,370	70
	Western Red Cedar (residues)	Chips	33,427	73
	Western White Pine (residues)	Chips	4	55
	White Spruce (residues)	Chips	291	102
	Yellow Cedar (residues)	Chips	3,379	74
			327,984	69
			350,255	68



1649 selected block(s) / 7533

Area covered: 8,110 ha / 37,953 ha

Territory:	Unknown territory
Sector:	Unknown sector
Cut block:	<Multiple selection>

Statistics - Selected Items

Area	10,117.9 ha
Number of cut blocks	2030
Recovered biomass	402,215.3 odt
Biomass yield	39.8 odt/ha
Biomass odt / Merchantable m^3	0.0664 odt/m^3
Delivered products	
• Chips	100 %
• Bundles	0 %
• Trunks and Residues	0 %
Energy balance	34 : 1
Available energy	1,526,414 MWh
Fuel consumption	12.8 L/odt

Cost

Harvesting	0.00 $/odt
Biomass recovery	27.55 $/odt
Transfer yard	0.00 $/odt
Transportation	35.81 $/odt
Loading/unloading	15.25 $/odt
Stumpage fees	0.00 $/odt
Road network - Maintenance	0.93 $/odt
Indirect costs	0.00 $/odt
Total	79.54 $/odt

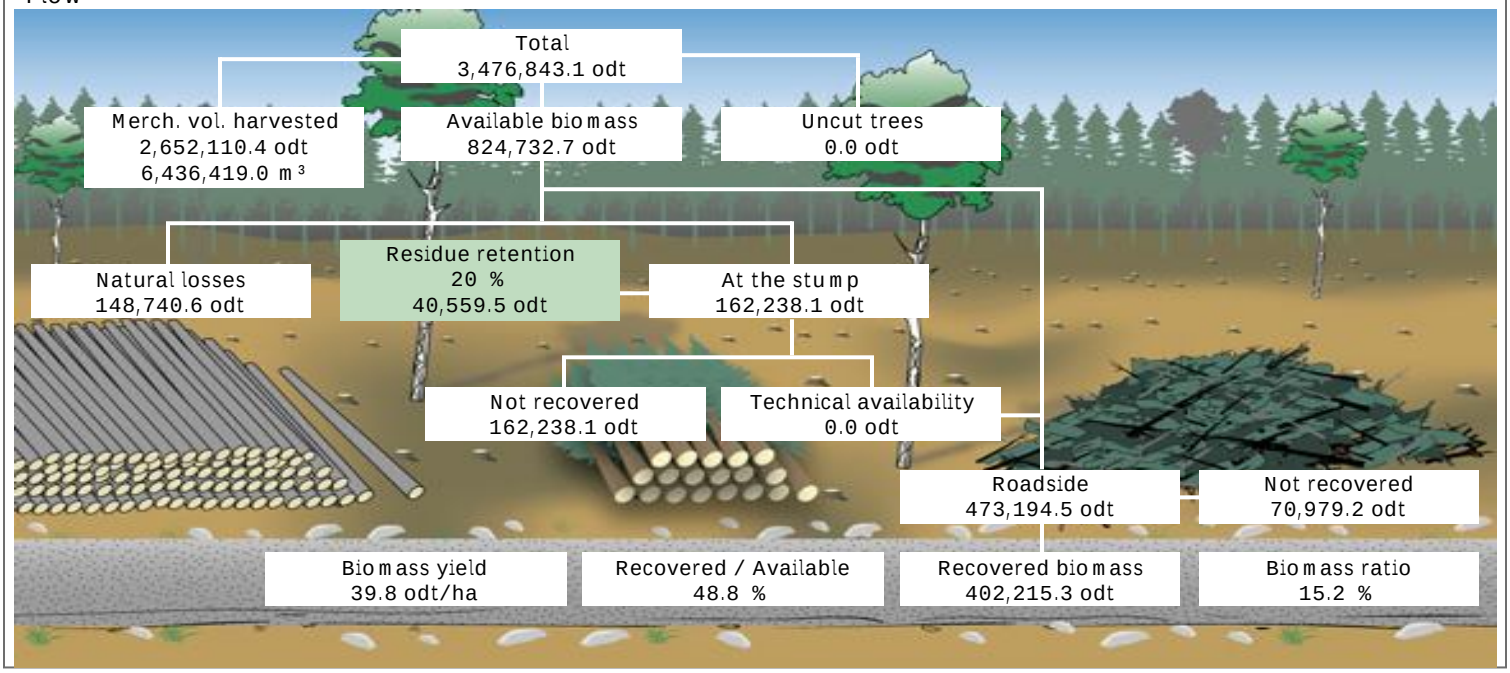
Revenue

Sale value	0.00 $/odt
Silvicultural discount	0.00 $/odt

Net

Profit	-79.54 $/odt

Flow



Products

Product name	odt	odt/m³	odt/ha
Douglas Fir (residues)	154,533.6	0.0830	15.27
Western Hemlock (residues)	116,432.5	0.0587	11.51
Amabilis Fir (residues)	51,092.3	0.0450	5.05
Western Red Cedar (residues)	40,077.3	0.0680	3.96
Red Alder (residues)	32,952.4	0.1054	3.26
Yellow Cedar (residues)	5,447.1	0.0351	0.54
Trembling Aspen (residues)	817.8	0.0649	0.08
Lodgepole Pine (residues)	681.0	0.0744	0.07
White Spruce (residues)	171.2	0.0620	0.02
Western White Pine (residues)	10.0	0.0584	0.00
	402,215.3	0.0664	39.75

Recovery summary

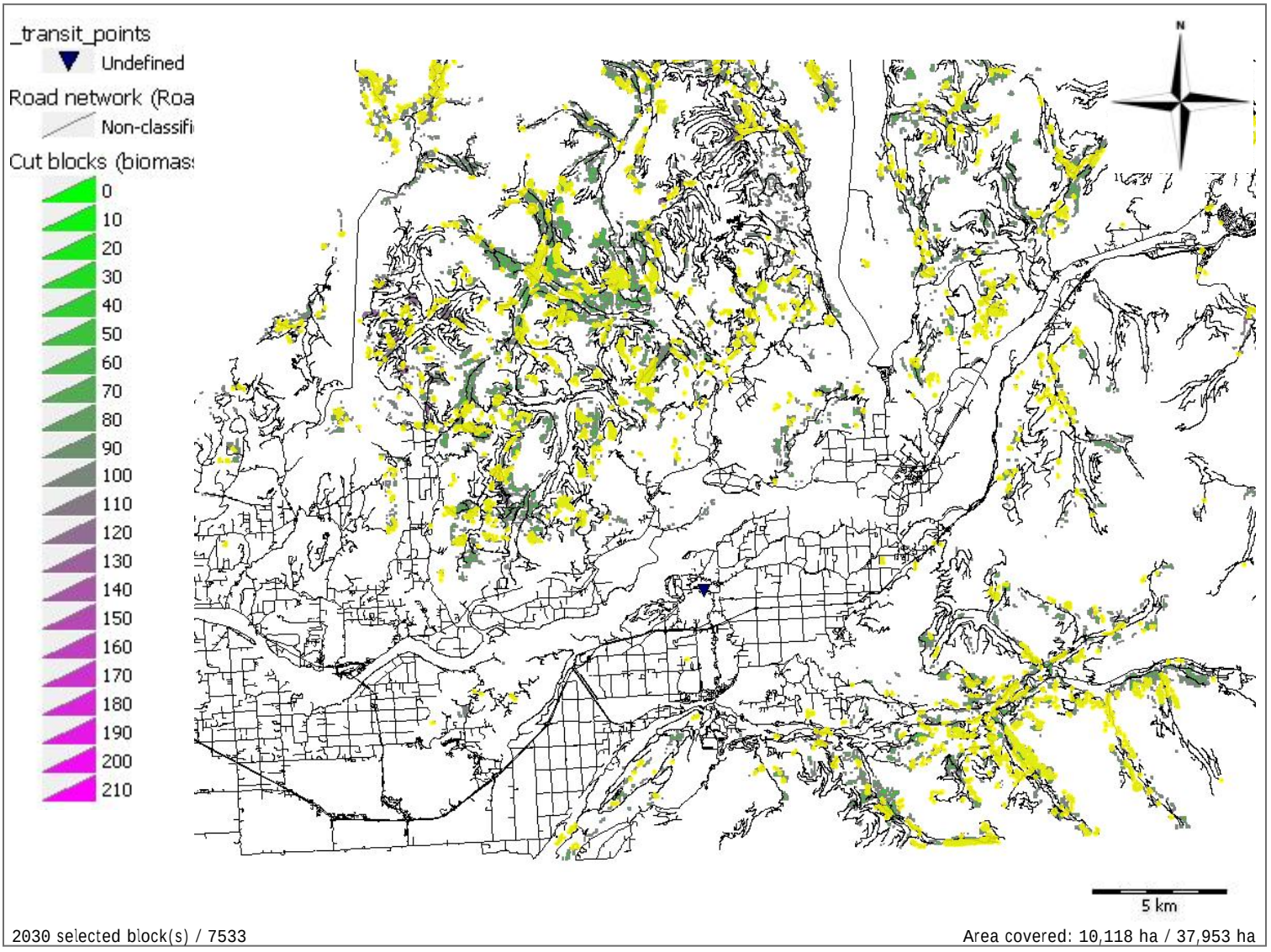
	Volume(odt)	Area(ha)	Number of cut blocks
• Biomass recovery location			
At the stump	0.0	0.0	0
Roadside	402,215.3	10,117.9	2,030
• Recovery season			
Summer	0.0	0.0	0
Winter	402,215.3	10,117.9	2,030
• Residue freshness			
Fresh	0.0	0.0	0
Brown	402,215.3	10,117.9	2,030
Brittle	0.0	0.0	0

Supply summary

Recovered biomass to	Merchantable volume (odt)	Residues (odt)	Total biomass (odt)
10 $/odt	0.0	0.0	0.0
20 $/odt	0.0	0.0	0.0
30 $/odt	0.0	0.0	0.0
40 $/odt	0.0	0.0	0.0
50 $/odt	0.0	740.0	740.0
60 $/odt	0.0	57,967.3	57,967.3
70 $/odt	0.0	169,199.7	169,199.7
80 $/odt	0.0	250,264.9	250,264.9
90 $/odt	0.0	309,257.0	309,257.0
100 $/odt	0.0	344,210.3	344,210.3
110 $/odt	0.0	360,339.0	360,339.0
120 $/odt	0.0	372,872.5	372,872.5
130 $/odt	0.0	380,863.6	380,863.6
140 $/odt	0.0	389,225.4	389,225.4
150 $/odt	0.0	396,772.7	396,772.7
160 $/odt	0.0	400,177.9	400,177.9
170 $/odt	0.0	401,443.3	401,443.3
180 $/odt	0.0	401,940.4	401,940.4
190 $/odt	0.0	402,107.6	402,107.6
200 $/odt	0.0	402,185.8	402,185.8
210 $/odt	0.0	402,215.3	402,215.3
Maximum cost	0.00 $/odt	201.37 $/odt	

Delivery to mills

Destination	Product	Format	odt	Transport average distance (Km)
Richmond				
	Amabilis Fir (residues)	Chips	830	95
	Douglas Fir (residues)	Chips	9,330	62
	Lodgepole Pine (residues)	Chips	0	83
	Red Alder (residues)	Chips	2,044	71
	Trembling Aspen (residues)	Chips	155	95
	Western Hemlock (residues)	Chips	7,698	71
	Western Red Cedar (residues)	Chips	3,016	68
	White Spruce (residues)	Chips	34	89
	Yellow Cedar (residues)	Chips	2	100
			23,109	68
Chilliwack				
	Amabilis Fir (residues)	Chips	50,262	72
	Douglas Fir (residues)	Chips	145,204	70
	Lodgepole Pine (residues)	Chips	681	99
	Red Alder (residues)	Chips	30,909	68
	Trembling Aspen (residues)	Chips	663	56
	Western Hemlock (residues)	Chips	108,734	73
	Western Red Cedar (residues)	Chips	37,062	76
	Western White Pine (residues)	Chips	10	65
	White Spruce (residues)	Chips	138	67
	Yellow Cedar (residues)	Chips	5,445	73
			379,106	72
			402,215	71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5 km
2030 selected block(s) / 7533
Area covered: 10,118 ha / 37,953 ha

Territory:	Unknown territory
Sector:	Unknown sector
Cut block:	<Multiple selection>

Statistics - Selected Items

Area	9,928.5 ha
Number of cut blocks	1873
Recovered biomass	389,558.3 odt
Biomass yield	39.2 odt/ha
Biomass odt / Merchantable m^3	0.0675 odt/m^3
Delivered products	
• Chips	100 %
• Bundles	0 %
• Trunks and Residues	0 %
Energy balance	34 : 1
Available energy	1,478,027 MWh
Fuel consumption	13.0 L/odt

Cost

Harvesting	0.00 $/odt
Biomass recovery	27.55 $/odt
Transfer yard	0.00 $/odt
Transportation	36.42 $/odt
Loading/unloading	16.22 $/odt
Stumpage fees	0.00 $/odt
Road network - Maintenance	0.97 $/odt
Indirect costs	0.00 $/odt
Total	81.16 $/odt

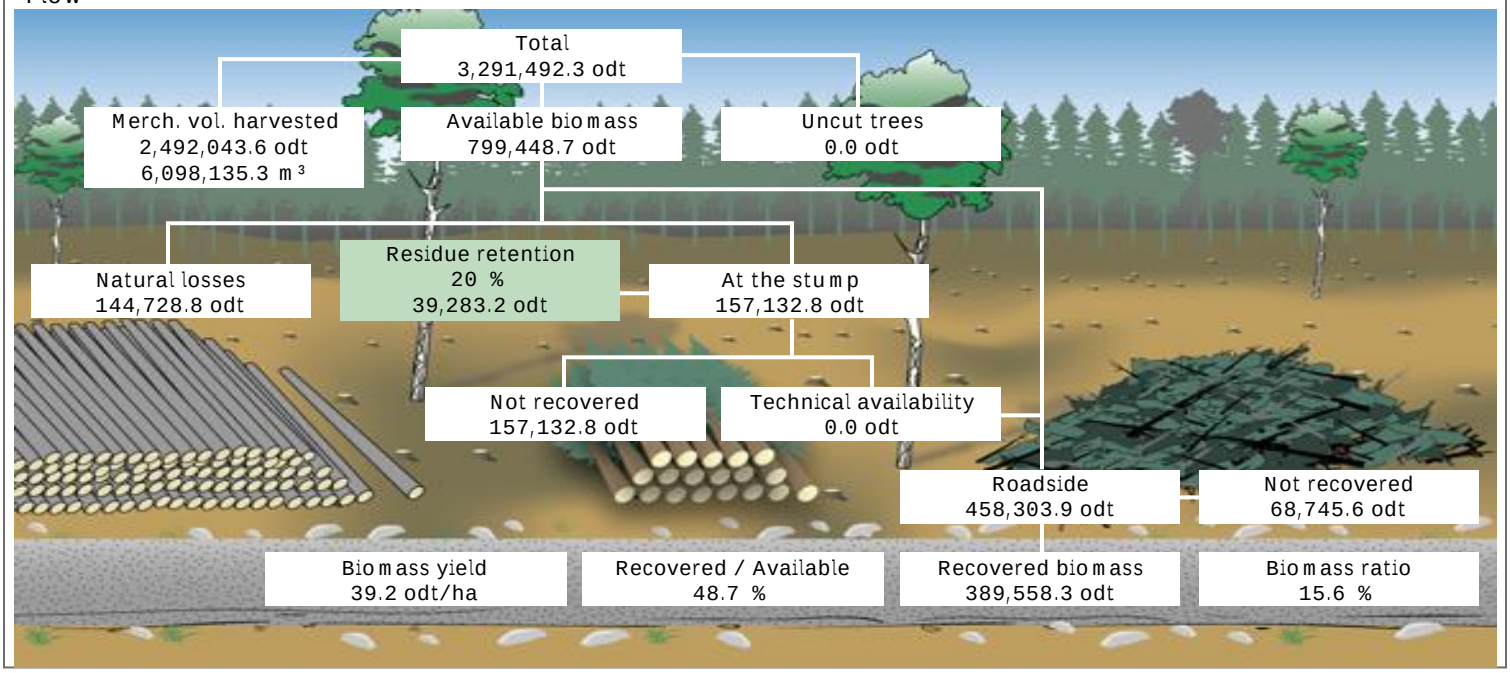
Revenue

Sale value	0.00 $/odt
Silvicultural discount	0.00 $/odt

Net

Profit	-81.16 $/odt

Flow



Products

Product name	odt	odt/m³	odt/ha
Douglas Fir (residues)	130,952.9	0.0899	13.19
Western Hemlock (residues)	122,743.0	0.0605	12.36
Amabilis Fir (residues)	57,387.9	0.0481	5.78
Western Red Cedar (residues)	44,601.0	0.0686	4.49
Red Alder (residues)	26,630.7	0.1037	2.68
Yellow Cedar (residues)	6,207.4	0.0358	0.63
Trembling Aspen (residues)	449.4	0.0695	0.05
Lodgepole Pine (residues)	425.6	0.0751	0.04
White Spruce (residues)	148.6	0.0655	0.01
Western White Pine (residues)	11.7	0.0745	0.00
	389,558.3	0.0675	39.24

Recovery summary

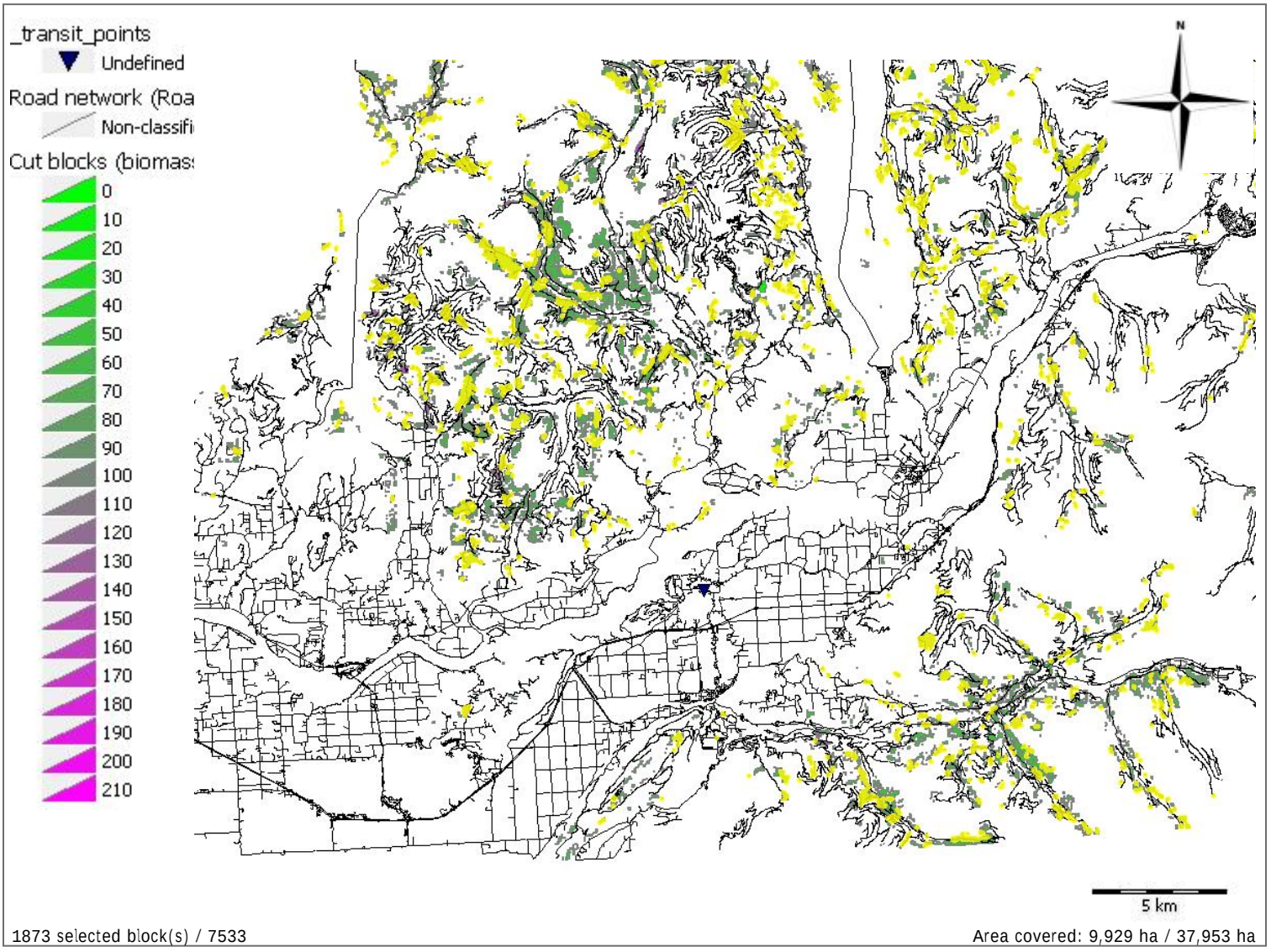
	Volume(odt)	Area(ha)	Number of cut blocks
• Biomass recovery location			
At the stump	0.0	0.0	0
Roadside	389,558.3	9,928.5	1,873
• Recovery season			
Summer	0.0	0.0	0
Winter	389,558.3	9,928.5	1,873
• Residue freshness			
Fresh	0.0	0.0	0
Brown	389,558.3	9,928.5	1,873
Brittle	0.0	0.0	0

Supply summary

Recovered biomass to	Merchantable volume (odt)	Residues (odt)	Total biomass (odt)
10 $/odt	0.0	0.0	0.0
20 $/odt	0.0	0.0	0.0
30 $/odt	0.0	0.0	0.0
40 $/odt	0.0	0.0	0.0
50 $/odt	0.0	1,934.0	1,934.0
60 $/odt	0.0	38,060.8	38,060.8
70 $/odt	0.0	140,964.9	140,964.9
80 $/odt	0.0	218,174.3	218,174.3
90 $/odt	0.0	292,626.9	292,626.9
100 $/odt	0.0	318,207.4	318,207.4
110 $/odt	0.0	345,034.1	345,034.1
120 $/odt	0.0	372,992.3	372,992.3
130 $/odt	0.0	380,615.7	380,615.7
140 $/odt	0.0	383,692.4	383,692.4
150 $/odt	0.0	387,441.8	387,441.8
160 $/odt	0.0	388,669.5	388,669.5
170 $/odt	0.0	388,913.3	388,913.3
180 $/odt	0.0	389,558.3	389,558.3
Maximum cost	0.00 $/odt	175.88 $/odt	

Delivery to mills

Destination	Product	Format	odt	Transport average distance (Km)
Richmond				
	Amabilis Fir (residues)	Chips	4,347	97
	Douglas Fir (residues)	Chips	8,340	94
	Lodgepole Pine (residues)	Chips	1	80
	Red Alder (residues)	Chips	1,546	91
	Trembling Aspen (residues)	Chips	91	91
	Western Hemlock (residues)	Chips	14,987	94
	Western Red Cedar (residues)	Chips	6,266	92
	White Spruce (residues)	Chips	35	45
	Yellow Cedar (residues)	Chips	51	84
			35,664	94
Chilliwack				
	Amabilis Fir (residues)	Chips	53,041	71
	Douglas Fir (residues)	Chips	122,613	69
	Lodgepole Pine (residues)	Chips	425	84
	Red Alder (residues)	Chips	25,085	70
	Trembling Aspen (residues)	Chips	358	51
	Western Hemlock (residues)	Chips	107,756	72
	Western Red Cedar (residues)	Chips	38,335	74
	Western White Pine (residues)	Chips	12	66
	White Spruce (residues)	Chips	113	72
	Yellow Cedar (residues)	Chips	6,156	80
			353,894	71
			389,558	73



1873 selected block(s) / 7533

Area covered: 9,929 ha / 37,953 ha

Territory:	Unknown territory
Sector:	Unknown sector
Cut block:	<Multiple selection>

Statistics - Selected Items

Area	9,796.2 ha
Number of cut blocks	1981
Recovered biomass	373,882.2 odt
Biomass yield	38.2 odt/ha
Biomass odt / Merchantable m^3	0.0718 odt/m^3
Delivered products	
• Chips	100 %
• Bundles	0 %
• Trunks and Residues	0 %
Energy balance	33 : 1
Available energy	1,419,163 MWh
Fuel consumption	13.3 L/odt

Cost

Harvesting	0.00 $/odt
Biomass recovery	27.55 $/odt
Transfer yard	0.00 $/odt
Transportation	39.55 $/odt
Loading/unloading	18.58 $/odt
Stumpage fees	0.00 $/odt
Road network - Maintenance	0.97 $/odt
Indirect costs	0.00 $/odt
Total	86.66 $/odt

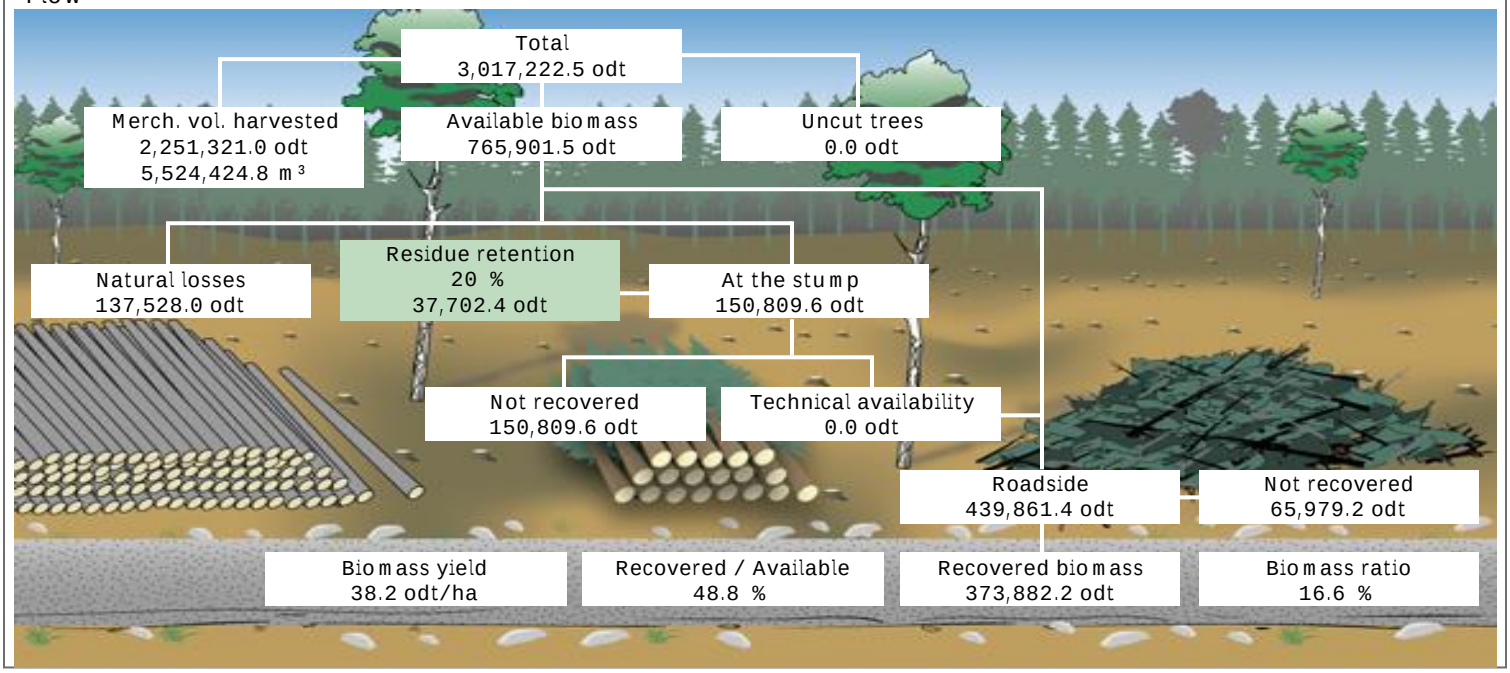
Revenue

Sale value	0.00 $/odt
Silvicultural discount	0.00 $/odt

Net

Profit	-86.66 $/odt

Flow



Products

Product name	odt	odt/m³	odt/ha
Douglas Fir (residues)	128,640.4	0.0999	13.13
Western Hemlock (residues)	116,995.8	0.0632	11.94
Amabilis Fir (residues)	53,001.3	0.0488	5.41
Western Red Cedar (residues)	44,214.0	0.0707	4.51
Red Alder (residues)	24,169.1	0.1132	2.47
Yellow Cedar (residues)	4,162.8	0.0374	0.42
White Spruce (residues)	933.5	0.0787	0.10
Lodgepole Pine (residues)	860.6	0.0793	0.09
Trembling Aspen (residues)	761.9	0.0697	0.08
Western White Pine (residues)	142.8	0.0818	0.01
	373,882.2	0.0718	38.17

Recovery summary

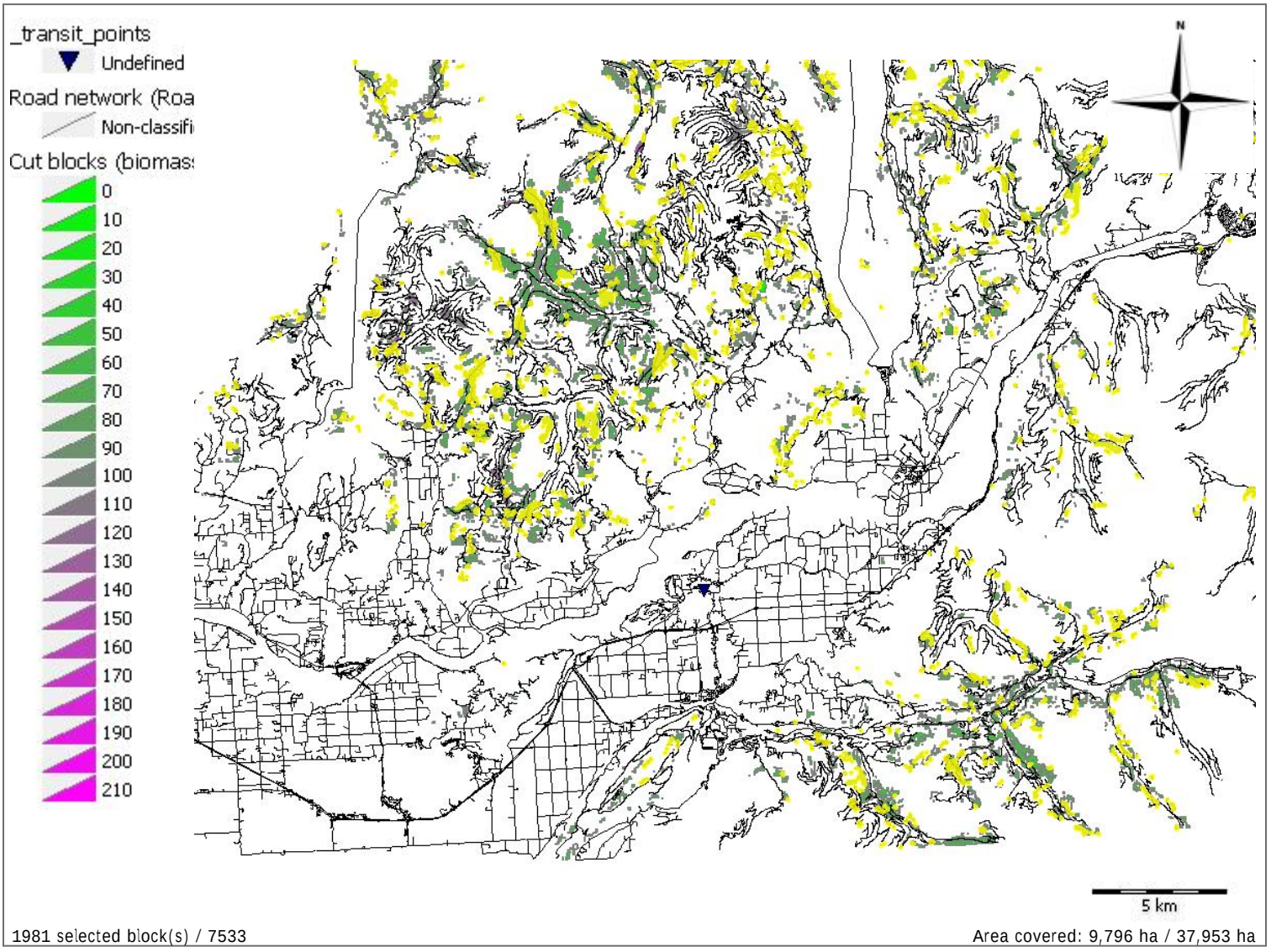
	Volume(odt)	Area(ha)	Number of cut blocks
• Biomass recovery location			
At the stump	0.0	0.0	0
Roadside	373,882.2	9,796.2	1,981
• Recovery season			
Summer	0.0	0.0	0
Winter	373,882.2	9,796.2	1,981
• Residue freshness			
Fresh	0.0	0.0	0
Brown	373,882.2	9,796.2	1,981
Brittle	0.0	0.0	0

Supply summary

Recovered biomass to	Merchantable volume (odt)	Residues (odt)	Total biomass (odt)
10 $/odt	0.0	0.0	0.0
20 $/odt	0.0	0.0	0.0
30 $/odt	0.0	0.0	0.0
40 $/odt	0.0	0.0	0.0
50 $/odt	0.0	1,164.6	1,164.6
60 $/odt	0.0	28,737.4	28,737.4
70 $/odt	0.0	102,205.5	102,205.5
80 $/odt	0.0	176,031.2	176,031.2
90 $/odt	0.0	250,329.7	250,329.7
100 $/odt	0.0	298,086.6	298,086.6
110 $/odt	0.0	321,029.9	321,029.9
120 $/odt	0.0	332,178.2	332,178.2
130 $/odt	0.0	346,793.5	346,793.5
140 $/odt	0.0	356,653.7	356,653.7
150 $/odt	0.0	363,235.1	363,235.1
160 $/odt	0.0	366,772.9	366,772.9
170 $/odt	0.0	369,382.6	369,382.6
180 $/odt	0.0	370,864.5	370,864.5
190 $/odt	0.0	371,095.9	371,095.9
200 $/odt	0.0	372,690.1	372,690.1
210 $/odt	0.0	373,882.2	373,882.2
Maximum cost	0.00 $/odt	202.29 $/odt	

Delivery to mills

Destination	Product	Format	odt	Transport average distance (Km)
Richmond				
	Amabilis Fir (residues)	Chips	3,983	102
	Douglas Fir (residues)	Chips	11,113	85
	Lodgepole Pine (residues)	Chips	1	91
	Red Alder (residues)	Chips	1,819	81
	Trembling Aspen (residues)	Chips	405	96
	Western Hemlock (residues)	Chips	13,908	89
	Western Red Cedar (residues)	Chips	8,779	87
	Western White Pine (residues)	Chips	0	103
	White Spruce (residues)	Chips	237	95
	Yellow Cedar (residues)	Chips	114	109
			40,359	88
Chilliwack				
	Amabilis Fir (residues)	Chips	49,018	72
	Douglas Fir (residues)	Chips	117,527	72
	Lodgepole Pine (residues)	Chips	859	80
	Red Alder (residues)	Chips	22,350	73
	Trembling Aspen (residues)	Chips	357	74
	Western Hemlock (residues)	Chips	103,088	74
	Western Red Cedar (residues)	Chips	35,435	75
	Western White Pine (residues)	Chips	143	72
	White Spruce (residues)	Chips	696	95
	Yellow Cedar (residues)	Chips	4,049	81
			333,523	73
			373,882	75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5 km
1981 selected block(s) / 7533
Area covered: 9,796 ha / 37,953 ha

Territory:	Unknown territory
Sector:	Unknown sector
Cut block:	<Multiple selection>

Statistics - Selected Items

Area	37,952.7 ha
Number of cut blocks	7533
Recovered biomass	1,515,910.9 odt
Biomass yield	39.9 odt/ha
Biomass odt / Merchantable m^3	0.0642 odt/m^3
Delivered products	
• Chips	100 %
• Bundles	0 %
• Trunks and Residues	0 %
Energy balance	34 : 1
Available energy	5,748,177 MWh
Fuel consumption	12.8 L/odt

Cost

Harvesting	0.00 $/odt
Biomass recovery	27.55 $/odt
Transfer yard	0.00 $/odt
Transportation	35.66 $/odt
Loading/unloading	14.95 $/odt
Stumpage fees	0.00 $/odt
Road network - Maintenance	0.96 $/odt
Indirect costs	0.00 $/odt
Total	79.11 $/odt

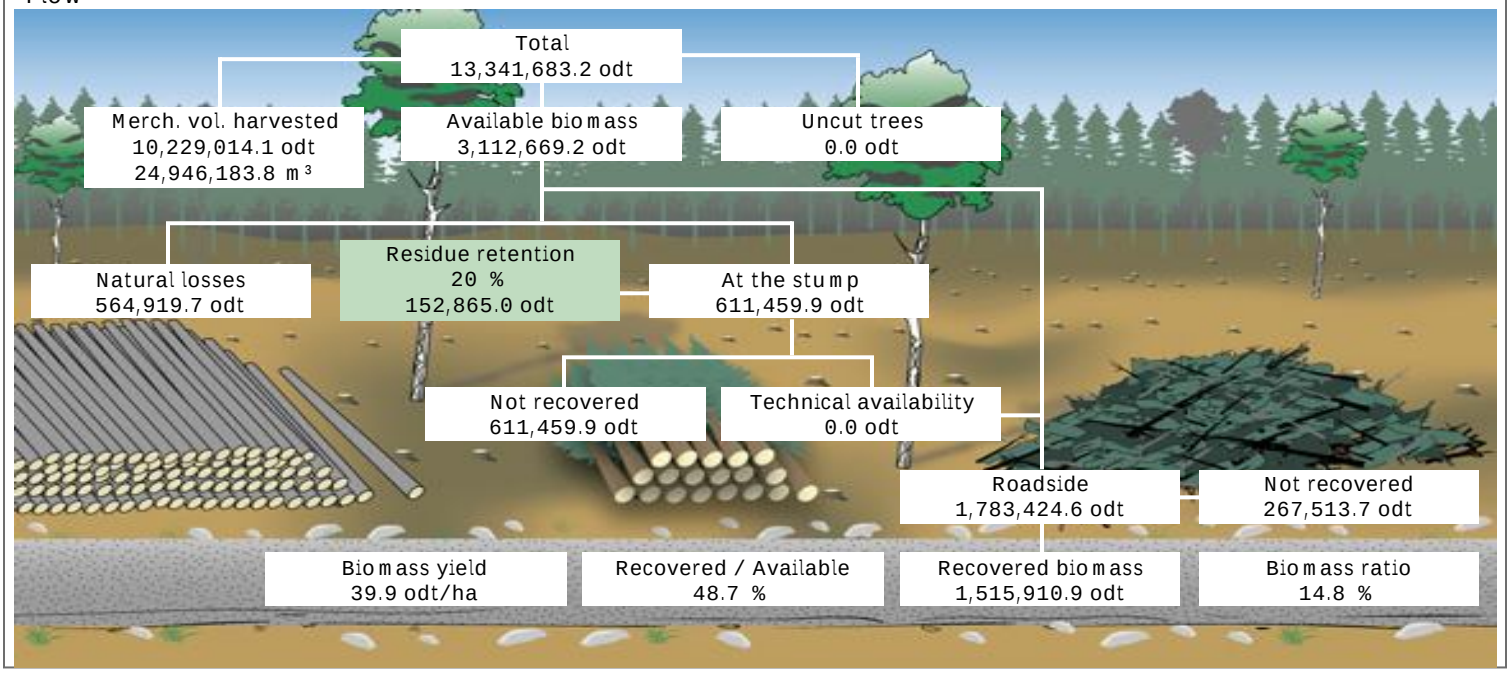
Revenue

Sale value	0.00 $/odt
Silvicultural discount	0.00 $/odt

Net

Profit	-79.11 $/odt

Flow



Products

Product name	odt	odt/m³	odt/ha
Douglas Fir (residues)	526,731.0	0.0811	13.88
Western Hemlock (residues)	473,038.3	0.0580	12.46
Amabilis Fir (residues)	210,715.4	0.0452	5.55
Western Red Cedar (residues)	165,865.4	0.0654	4.37
Red Alder (residues)	112,386.4	0.1039	2.96
Yellow Cedar (residues)	19,196.8	0.0346	0.51
Trembling Aspen (residues)	3,338.9	0.0657	0.09
Lodgepole Pine (residues)	2,867.2	0.0647	0.08
White Spruce (residues)	1,602.7	0.0688	0.04
Western White Pine (residues)	168.7	0.0789	0.00
	1,515,910.9	0.0642	39.94

Recovery summary

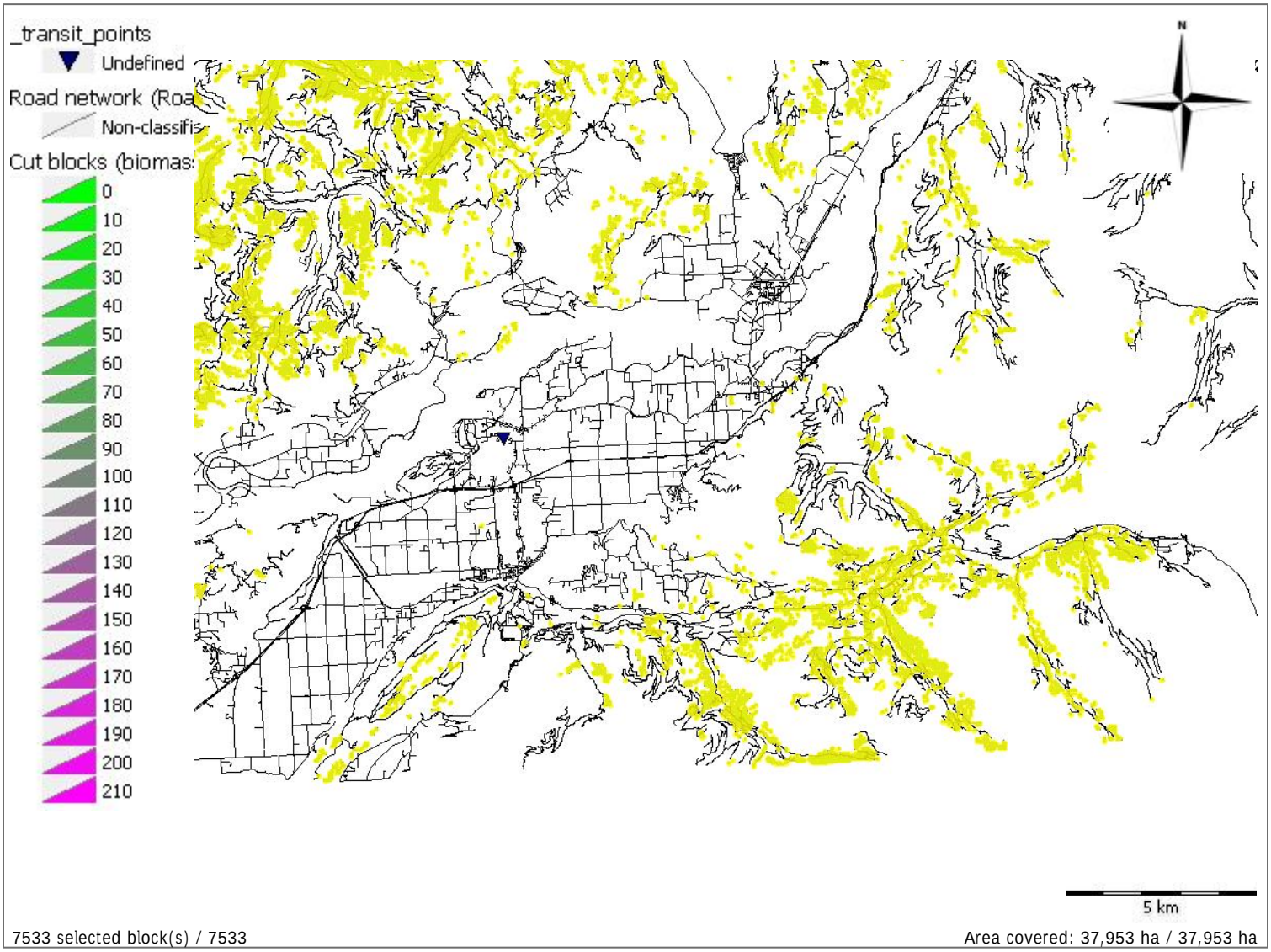
	Volume(odt)	Area(ha)	Number of cut blocks
• Biomass recovery location			
At the stump	0.0	0.0	0
Roadside	1,515,910.9	37,952.7	7,533
• Recovery season			
Summer	0.0	0.0	0
Winter	1,515,910.9	37,952.7	7,533
• Residue freshness			
Fresh	0.0	0.0	0
Brown	1,515,910.9	37,952.7	7,533
Brittle	0.0	0.0	0

Supply summary

Recovered biomass to	Merchantable volume (odt)	Residues (odt)	Total biomass (odt)
10 $/odt	0.0	0.0	0.0
20 $/odt	0.0	0.0	0.0
30 $/odt	0.0	0.0	0.0
40 $/odt	0.0	0.0	0.0
50 $/odt	0.0	9,500.0	9,500.0
60 $/odt	0.0	221,571.2	221,571.2
70 $/odt	0.0	627,337.9	627,337.9
80 $/odt	0.0	948,044.1	948,044.1
90 $/odt	0.0	1,184,630.6	1,184,630.6
100 $/odt	0.0	1,302,999.8	1,302,999.8
110 $/odt	0.0	1,372,071.8	1,372,071.8
120 $/odt	0.0	1,427,134.6	1,427,134.6
130 $/odt	0.0	1,457,866.0	1,457,866.0
140 $/odt	0.0	1,479,653.3	1,479,653.3
150 $/odt	0.0	1,497,579.2	1,497,579.2
160 $/odt	0.0	1,505,749.7	1,505,749.7
170 $/odt	0.0	1,509,994.3	1,509,994.3
180 $/odt	0.0	1,512,618.4	1,512,618.4
190 $/odt	0.0	1,513,017.0	1,513,017.0
200 $/odt	0.0	1,514,689.3	1,514,689.3
210 $/odt	0.0	1,515,910.9	1,515,910.9
Maximum cost	0.00 $/odt	202.29 $/odt	

Delivery to mills

Destination	Product	Format	odt	Transport average distance (Km)
Richmond				
	Amabilis Fir (residues)	Chips	9,372	98
	Douglas Fir (residues)	Chips	37,090	75
	Lodgepole Pine (residues)	Chips	3	85
	Red Alder (residues)	Chips	6,883	78
	Trembling Aspen (residues)	Chips	828	89
	Western Hemlock (residues)	Chips	45,091	83
	Western Red Cedar (residues)	Chips	21,607	82
	Western White Pine (residues)	Chips	0	103
	White Spruce (residues)	Chips	365	88
	Yellow Cedar (residues)	Chips	167	101
			121,404	81
Chilliwack				
	Amabilis Fir (residues)	Chips	201,343	73
	Douglas Fir (residues)	Chips	489,641	69
	Lodgepole Pine (residues)	Chips	2,865	89
	Red Alder (residues)	Chips	105,504	69
	Trembling Aspen (residues)	Chips	2,511	53
	Western Hemlock (residues)	Chips	427,948	72
	Western Red Cedar (residues)	Chips	144,259	74
	Western White Pine (residues)	Chips	169	71
	White Spruce (residues)	Chips	1,238	91
	Yellow Cedar (residues)	Chips	19,030	77
			1,394,507	71
			1,515,911	72



7533 selected block(s) / 7533

Area covered: 37,953 ha / 37,953 ha

Territory:	Unknown territory
Sector:	Unknown sector
Cut block:	<Multiple selection>

Statistics - Selected Items

Area	37,952.7 ha
Number of cut blocks	7533
Recovered biomass	1,515,910.9 odt
Biomass yield	39.9 odt/ha
Biomass odt / Merchantable m^3	0.0642 odt/m^3
Delivered products	
• Chips	100 %
• Bundles	0 %
• Trunks and Residues	0 %
Energy balance	38 : 1
Available energy	5,748,177 MWh
Fuel consumption	11.4 L/odt

Cost

Harvesting	0.00 $/odt
Biomass recovery	22.50 $/odt
Transfer yard	0.00 $/odt
Transportation	35.66 $/odt
Loading/unloading	14.95 $/odt
Stumpage fees	0.00 $/odt
Road network - Maintenance	0.96 $/odt
Indirect costs	0.00 $/odt
Total	74.06 $/odt

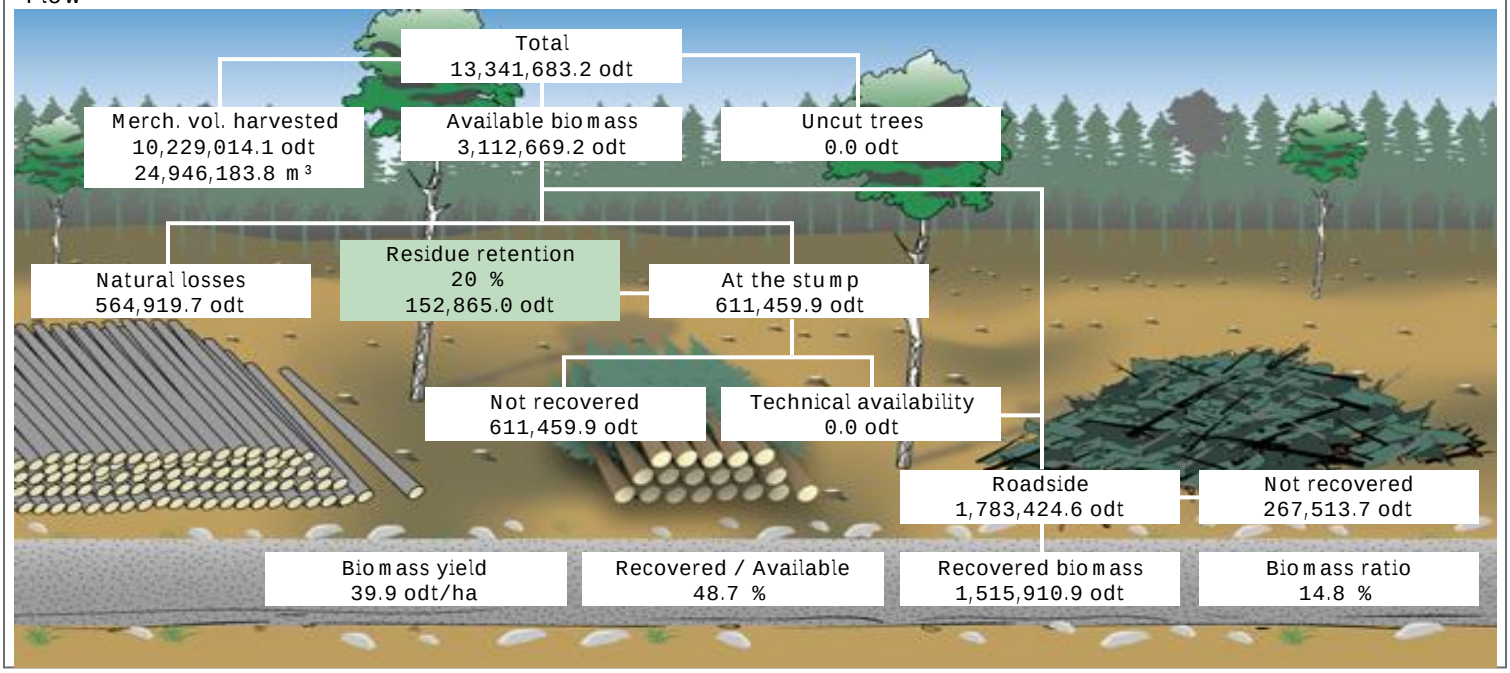
Revenue

Sale value	0.00 $/odt
Silvicultural discount	0.00 $/odt

Net

Profit	-74.06 $/odt

Flow



Products

Product name	odt	odt/m³	odt/ha
Douglas Fir (residues)	526,731.0	0.0811	13.88
Western Hemlock (residues)	473,038.3	0.0580	12.46
Amabilis Fir (residues)	210,715.4	0.0452	5.55
Western Red Cedar (residues)	165,865.4	0.0654	4.37
Red Alder (residues)	112,386.4	0.1039	2.96
Yellow Cedar (residues)	19,196.8	0.0346	0.51
Trembling Aspen (residues)	3,338.9	0.0657	0.09
Lodgepole Pine (residues)	2,867.2	0.0647	0.08
White Spruce (residues)	1,602.7	0.0688	0.04
Western White Pine (residues)	168.7	0.0789	0.00
	1,515,910.9	0.0642	39.94

Recovery summary

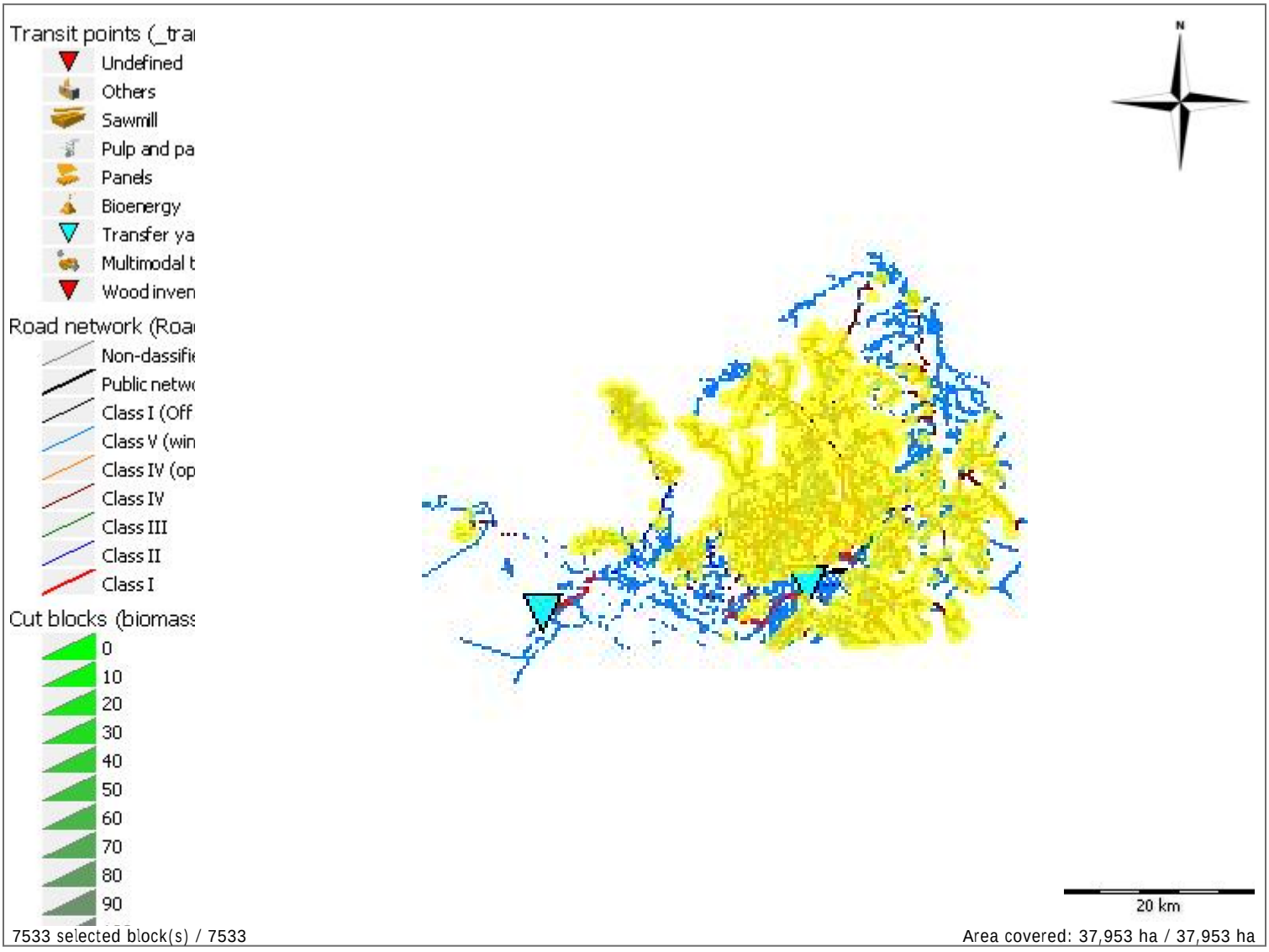
	Volume(odt)	Area(ha)	Number of cut blocks
• Biomass recovery location			
At the stump	0.0	0.0	0
Roadside	1,515,910.9	37,952.7	7,533
• Recovery season			
Summer	0.0	0.0	0
Winter	1,515,910.9	37,952.7	7,533
• Residue freshness			
Fresh	0.0	0.0	0
Brown	1,515,910.9	37,952.7	7,533
Brittle	0.0	0.0	0

Supply summary

Recovered biomass to	Merchantable volume (odt)	Residues (odt)	Total biomass (odt)
10 $/odt	0.0	0.0	0.0
20 $/odt	0.0	0.0	0.0
30 $/odt	0.0	0.0	0.0
40 $/odt	0.0	0.0	0.0
50 $/odt	0.0	59,984.3	59,984.3
60 $/odt	0.0	429,412.6	429,412.6
70 $/odt	0.0	800,151.1	800,151.1
80 $/odt	0.0	1,072,616.2	1,072,616.2
90 $/odt	0.0	1,258,845.0	1,258,845.0
100 $/odt	0.0	1,338,073.8	1,338,073.8
110 $/odt	0.0	1,404,780.2	1,404,780.2
120 $/odt	0.0	1,439,286.3	1,439,286.3
130 $/odt	0.0	1,473,631.3	1,473,631.3
140 $/odt	0.0	1,490,101.3	1,490,101.3
150 $/odt	0.0	1,501,220.5	1,501,220.5
160 $/odt	0.0	1,507,698.6	1,507,698.6
170 $/odt	0.0	1,512,459.7	1,512,459.7
180 $/odt	0.0	1,512,878.0	1,512,878.0
190 $/odt	0.0	1,513,858.0	1,513,858.0
200 $/odt	0.0	1,515,910.9	1,515,910.9
Maximum cost	0.00 $/odt	197.24 $/odt	

Delivery to mills

Destination	Product	Format	odt	Transport average distance (Km)
Richmond				
	Amabilis Fir (residues)	Chips	9,372	98
	Douglas Fir (residues)	Chips	37,090	75
	Lodgepole Pine (residues)	Chips	3	85
	Red Alder (residues)	Chips	6,883	78
	Trembling Aspen (residues)	Chips	828	89
	Western Hemlock (residues)	Chips	45,091	83
	Western Red Cedar (residues)	Chips	21,607	82
	Western White Pine (residues)	Chips	0	103
	White Spruce (residues)	Chips	365	88
	Yellow Cedar (residues)	Chips	167	101
			121,404	81
Chilliwack				
	Amabilis Fir (residues)	Chips	201,343	73
	Douglas Fir (residues)	Chips	489,641	69
	Lodgepole Pine (residues)	Chips	2,865	89
	Red Alder (residues)	Chips	105,504	69
	Trembling Aspen (residues)	Chips	2,511	53
	Western Hemlock (residues)	Chips	427,948	72
	Western Red Cedar (residues)	Chips	144,259	74
	Western White Pine (residues)	Chips	169	71
	White Spruce (residues)	Chips	1,238	91
	Yellow Cedar (residues)	Chips	19,030	77
			1,394,507	71
			1,515,911	72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Cut blocks (biomass
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N
20 km
7533 selected block(s) / 7533
Area covered: 37,953 ha / 37,953 ha

Territory: Unknown territory
Sector: Unknown sector
Cut block: <Multiple selection>

Statistics - Selected Items

Area	8,110.1 ha
Number of cut blocks	1649
Recovered biomass	350,255.1 odt
Biomass yield	43.2 odt/ha
Biomass odt / Merchantable m^3	0.0534 odt/m^3
Delivered products	
• Chips	100 %
• Bundles	0 %
• Trunks and Residues	0 %
Energy balance	40 : 1
Available energy	1,324,574 MWh
Fuel consumption	10.9 L/odt

Cost

Harvesting	0.00 $/odt
Biomass recovery	22.50 $/odt
Transfer yard	0.00 $/odt
Transportation	30.47 $/odt
Loading/unloading	9.30 $/odt
Stumpage fees	0.00 $/odt
Road network - Maintenance	0.96 $/odt
Indirect costs	0.00 $/odt
Total	63.23 $/odt

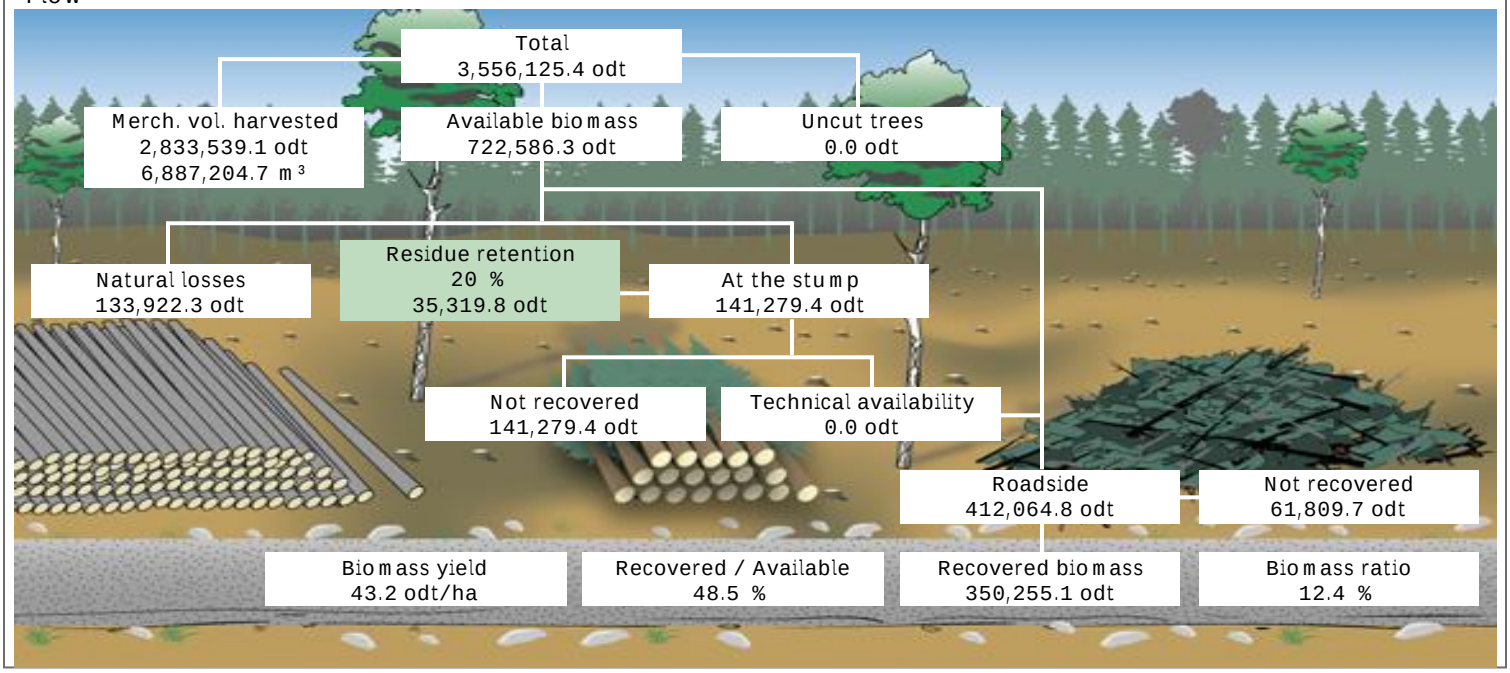
Revenue

Sale value	0.00 $/odt
Silvicultural discount	0.00 $/odt

Net

Profit	-63.23 $/odt

Flow



Products

Product name	odt	odt/m³	odt/ha
Western Hemlock (residues)	116,867.0	0.0508	14.41
Douglas Fir (residues)	112,604.1	0.0597	13.88
Amabilis Fir (residues)	49,234.0	0.0394	6.07
Western Red Cedar (residues)	36,973.1	0.0552	4.56
Red Alder (residues)	28,634.2	0.0957	3.53
Yellow Cedar (residues)	3,379.5	0.0295	0.42
Trembling Aspen (residues)	1,309.8	0.0629	0.16
Lodgepole Pine (residues)	900.0	0.0483	0.11
White Spruce (residues)	349.4	0.0546	0.04
Western White Pine (residues)	4.1	0.0642	0.00
	350,255.1	0.0534	43.19

Recovery summary

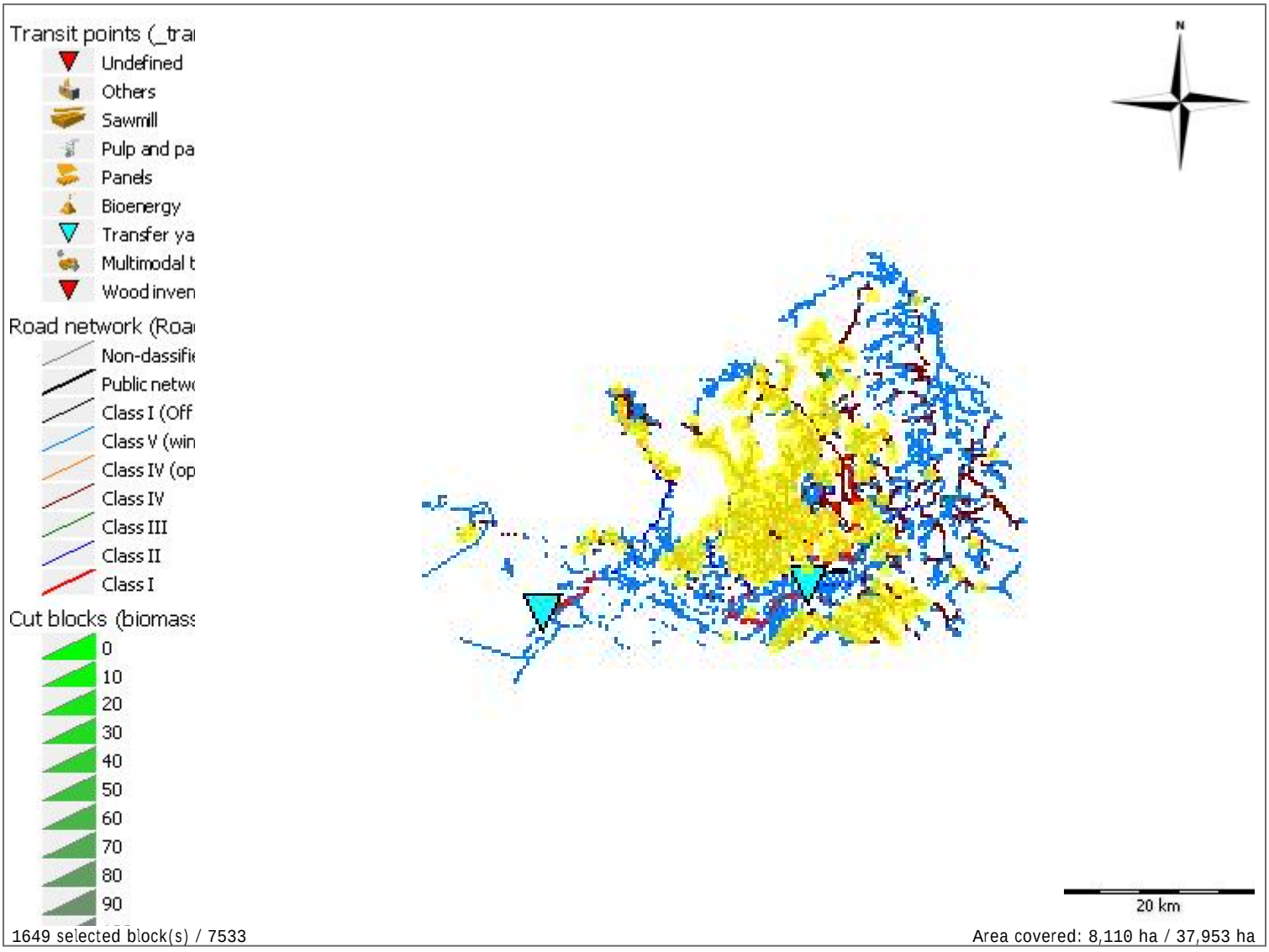
	Volume(odt)	Area(ha)	Number of cut blocks
• Biomass recovery location			
At the stump	0.0	0.0	0
Roadside	350,255.1	8,110.1	1,649
• Recovery season			
Summer	0.0	0.0	0
Winter	350,255.1	8,110.1	1,649
• Residue freshness			
Fresh	0.0	0.0	0
Brown	350,255.1	8,110.1	1,649
Brittle	0.0	0.0	0

Supply summary

Recovered biomass to	Merchantable volume (odt)	Residues (odt)	Total biomass (odt)
10 $/odt	0.0	0.0	0.0
20 $/odt	0.0	0.0	0.0
30 $/odt	0.0	0.0	0.0
40 $/odt	0.0	0.0	0.0
50 $/odt	0.0	31,911.0	31,911.0
60 $/odt	0.0	163,140.9	163,140.9
70 $/odt	0.0	268,768.3	268,768.3
80 $/odt	0.0	319,069.3	319,069.3
90 $/odt	0.0	340,274.6	340,274.6
100 $/odt	0.0	344,926.8	344,926.8
110 $/odt	0.0	346,390.5	346,390.5
120 $/odt	0.0	349,339.5	349,339.5
130 $/odt	0.0	350,013.6	350,013.6
140 $/odt	0.0	350,129.4	350,129.4
150 $/odt	0.0	350,129.4	350,129.4
160 $/odt	0.0	350,255.1	350,255.1
Maximum cost	0.00 $/odt	159.84 $/odt	

Delivery to mills

Destination	Product	Format	odt	Transport average distance (Km)
Richmond				
	Amabilis Fir (residues)	Chips	212	81
	Douglas Fir (residues)	Chips	8,307	56
	Red Alder (residues)	Chips	1,474	69
	Trembling Aspen (residues)	Chips	177	65
	Western Hemlock (residues)	Chips	8,497	64
	Western Red Cedar (residues)	Chips	3,546	67
	White Spruce (residues)	Chips	59	82
	Yellow Cedar (residues)	Chips	0	80
			22,272	62
Chilliwack				
	Amabilis Fir (residues)	Chips	49,022	79
	Douglas Fir (residues)	Chips	104,297	63
	Lodgepole Pine (residues)	Chips	900	92
	Red Alder (residues)	Chips	27,160	66
	Trembling Aspen (residues)	Chips	1,133	45
	Western Hemlock (residues)	Chips	108,370	70
	Western Red Cedar (residues)	Chips	33,427	73
	Western White Pine (residues)	Chips	4	55
	White Spruce (residues)	Chips	291	102
	Yellow Cedar (residues)	Chips	3,379	74
			327,984	69
			350,255	68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Others
Sawmill
Pulp and pa
Panels
Bioenergy
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Wood inven
Road network (Roa
Non-dassifi
Public netw
Class I (Off
Class V (win
Class IV (op
Class IV
Class III
Class II
Class I
Cut blocks (biomass
0
10
20
30
40
50
60
70
80
90
N
20 km
1649 selected block(s) / 7533
Area covered: 8,110 ha / 37,953 ha

Territory:	Unknown territory
Sector:	Unknown sector
Cut block:	<Multiple selection>

Statistics - Selected Items

Area	10,117.9 ha
Number of cut blocks	2030
Recovered biomass	402,215.3 odt
Biomass yield	39.8 odt/ha
Biomass odt / Merchantable m^3	0.0664 odt/m^3
Delivered products	
• Chips	100 %
• Bundles	0 %
• Trunks and Residues	0 %
Energy balance	38 : 1
Available energy	1,526,414 MWh
Fuel consumption	11.4 L/odt

Cost

Harvesting	0.00 $/odt
Biomass recovery	22.50 $/odt
Transfer yard	0.00 $/odt
Transportation	35.81 $/odt
Loading/unloading	15.25 $/odt
Stumpage fees	0.00 $/odt
Road network - Maintenance	0.93 $/odt
Indirect costs	0.00 $/odt
Total	74.49 $/odt

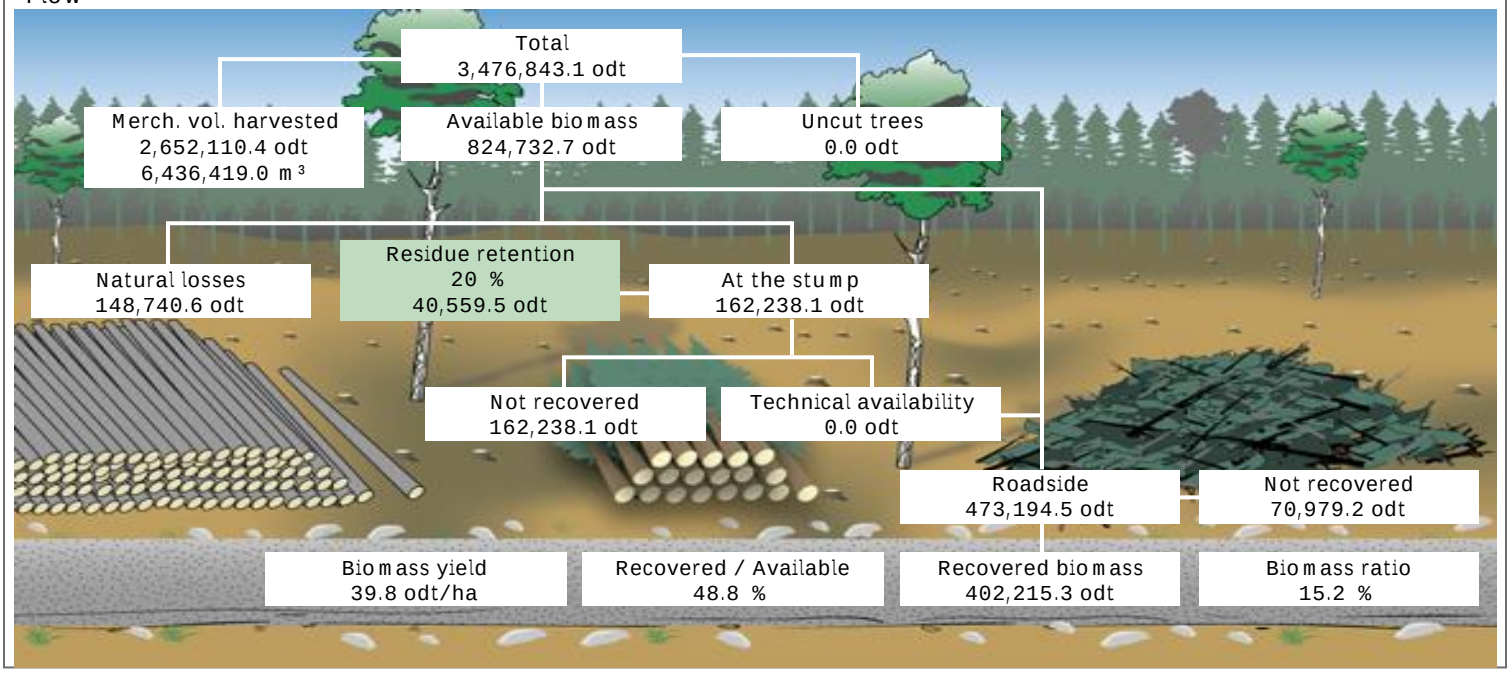
Revenue

Sale value	0.00 $/odt
Silvicultural discount	0.00 $/odt

Net

Profit	-74.49 $/odt

Flow



Products

Product name	odt	odt/m³	odt/ha
Douglas Fir (residues)	154,533.6	0.0830	15.27
Western Hemlock (residues)	116,432.5	0.0587	11.51
Amabilis Fir (residues)	51,092.3	0.0450	5.05
Western Red Cedar (residues)	40,077.3	0.0680	3.96
Red Alder (residues)	32,952.4	0.1054	3.26
Yellow Cedar (residues)	5,447.1	0.0351	0.54
Trembling Aspen (residues)	817.8	0.0649	0.08
Lodgepole Pine (residues)	681.0	0.0744	0.07
White Spruce (residues)	171.2	0.0620	0.02
Western White Pine (residues)	10.0	0.0584	0.00
	402,215.3	0.0664	39.75

Recovery summary

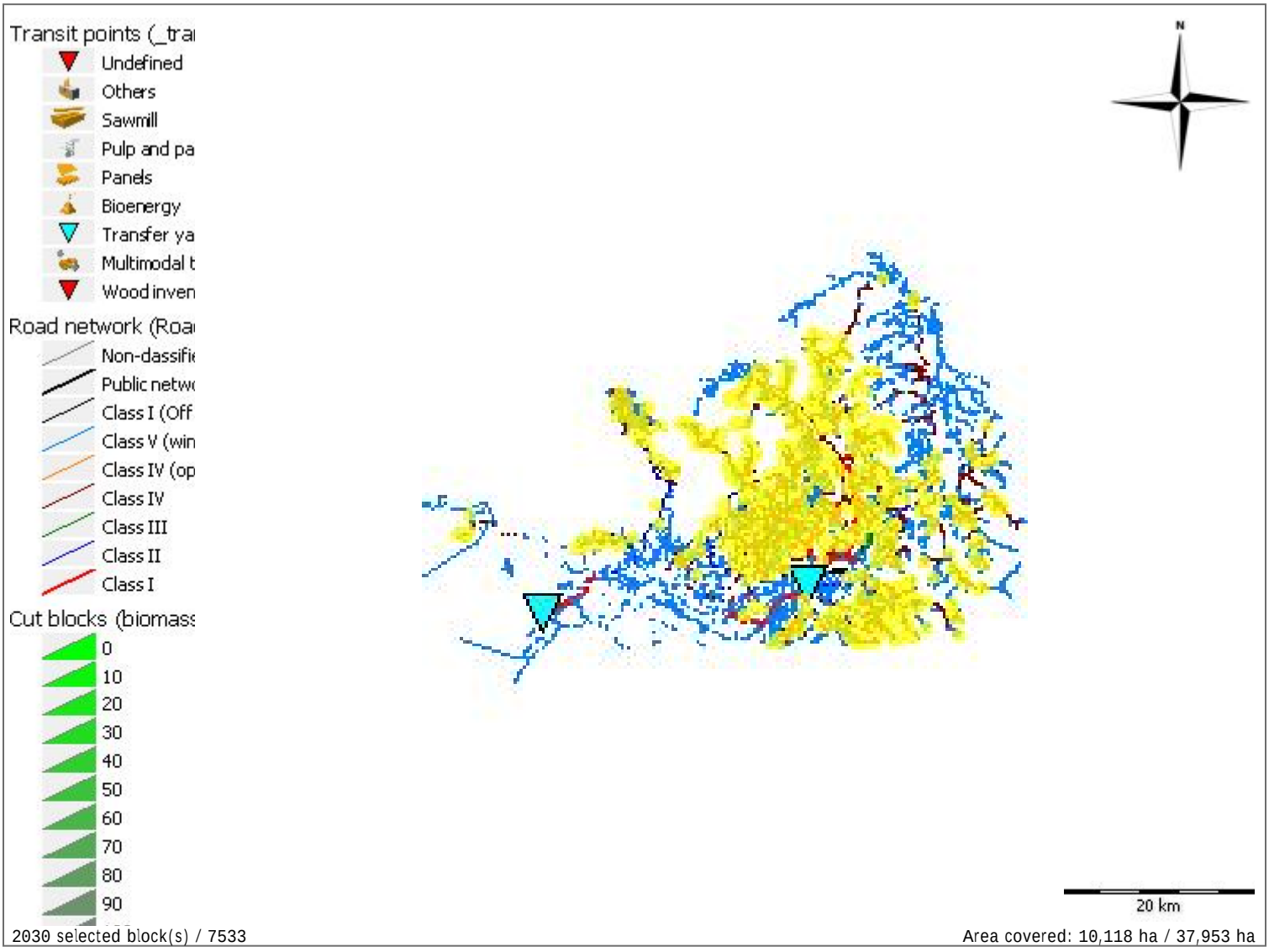
	Volume(odt)	Area(ha)	Number of cut blocks
• Biomass recovery location			
At the stump	0.0	0.0	0
Roadside	402,215.3	10,117.9	2,030
• Recovery season			
Summer	0.0	0.0	0
Winter	402,215.3	10,117.9	2,030
• Residue freshness			
Fresh	0.0	0.0	0
Brown	402,215.3	10,117.9	2,030
Brittle	0.0	0.0	0

Supply summary

Recovered biomass to	Merchantable volume (odt)	Residues (odt)	Total biomass (odt)
10 $/odt	0.0	0.0	0.0
20 $/odt	0.0	0.0	0.0
30 $/odt	0.0	0.0	0.0
40 $/odt	0.0	0.0	0.0
50 $/odt	0.0	10,649.7	10,649.7
60 $/odt	0.0	122,240.1	122,240.1
70 $/odt	0.0	218,940.4	218,940.4
80 $/odt	0.0	283,983.5	283,983.5
90 $/odt	0.0	326,124.5	326,124.5
100 $/odt	0.0	353,681.4	353,681.4
110 $/odt	0.0	367,686.0	367,686.0
120 $/odt	0.0	378,974.0	378,974.0
130 $/odt	0.0	387,770.4	387,770.4
140 $/odt	0.0	393,675.3	393,675.3
150 $/odt	0.0	397,947.4	397,947.4
160 $/odt	0.0	401,058.2	401,058.2
170 $/odt	0.0	401,898.6	401,898.6
180 $/odt	0.0	402,022.5	402,022.5
190 $/odt	0.0	402,123.0	402,123.0
200 $/odt	0.0	402,215.3	402,215.3
Maximum cost	0.00 $/odt	196.32 $/odt	

Delivery to mills

Destination	Product	Format	odt	Transport average distance (Km)
Richmond				
	Amabilis Fir (residues)	Chips	830	95
	Douglas Fir (residues)	Chips	9,330	62
	Lodgepole Pine (residues)	Chips	0	83
	Red Alder (residues)	Chips	2,044	71
	Trembling Aspen (residues)	Chips	155	95
	Western Hemlock (residues)	Chips	7,698	71
	Western Red Cedar (residues)	Chips	3,016	68
	White Spruce (residues)	Chips	34	89
	Yellow Cedar (residues)	Chips	2	100
			23,109	68
Chilliwack				
	Amabilis Fir (residues)	Chips	50,262	72
	Douglas Fir (residues)	Chips	145,204	70
	Lodgepole Pine (residues)	Chips	681	99
	Red Alder (residues)	Chips	30,909	68
	Trembling Aspen (residues)	Chips	663	56
	Western Hemlock (residues)	Chips	108,734	73
	Western Red Cedar (residues)	Chips	37,062	76
	Western White Pine (residues)	Chips	10	65
	White Spruce (residues)	Chips	138	67
	Yellow Cedar (residues)	Chips	5,445	73
			379,106	72
			402,215	71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Cut blocks (biomass
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90
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20 km
2030 selected block(s) / 7533
Area covered: 10,118 ha / 37,953 ha

Territory:	Unknown territory
Sector:	Unknown sector
Cut block:	<Multiple selection>

Statistics - Selected Items

Area	9,928.5 ha
Number of cut blocks	1873
Recovered biomass	389,558.3 odt
Biomass yield	39.2 odt/ha
Biomass odt / Merchantable m^3	0.0675 odt/m^3
Delivered products	
• Chips	100 %
• Bundles	0 %
• Trunks and Residues	0 %
Energy balance	38 : 1
Available energy	1,478,027 MWh
Fuel consumption	11.5 L/odt

Cost

Harvesting	0.00 $/odt
Biomass recovery	22.50 $/odt
Transfer yard	0.00 $/odt
Transportation	36.42 $/odt
Loading/unloading	16.22 $/odt
Stumpage fees	0.00 $/odt
Road network - Maintenance	0.97 $/odt
Indirect costs	0.00 $/odt
Total	76.10 $/odt

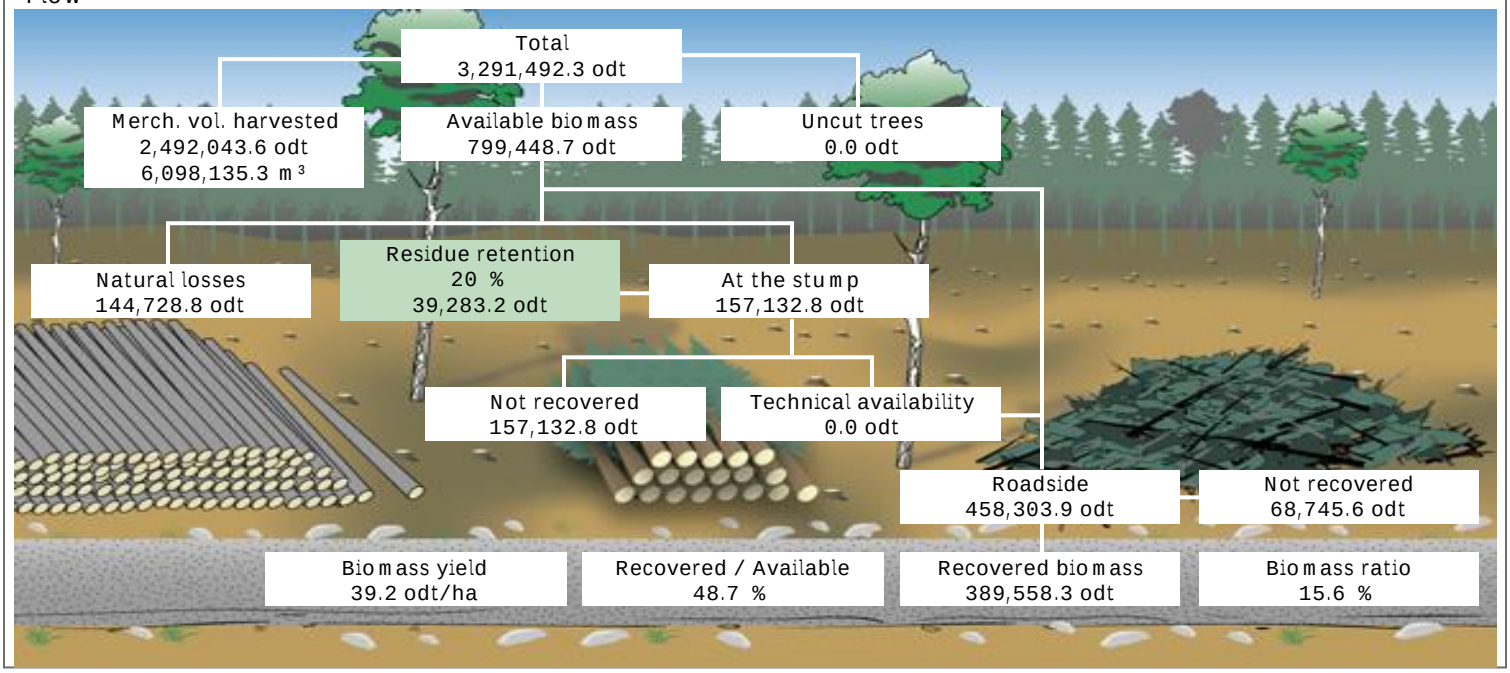
Revenue

Sale value	0.00 $/odt
Silvicultural discount	0.00 $/odt

Net

Profit	-76.10 $/odt

Flow



Products

Product name	odt	odt/m³	odt/ha
Douglas Fir (residues)	130,952.9	0.0899	13.19
Western Hemlock (residues)	122,743.0	0.0605	12.36
Amabilis Fir (residues)	57,387.9	0.0481	5.78
Western Red Cedar (residues)	44,601.0	0.0686	4.49
Red Alder (residues)	26,630.7	0.1037	2.68
Yellow Cedar (residues)	6,207.4	0.0358	0.63
Trembling Aspen (residues)	449.4	0.0695	0.05
Lodgepole Pine (residues)	425.6	0.0751	0.04
White Spruce (residues)	148.6	0.0655	0.01
Western White Pine (residues)	11.7	0.0745	0.00
	389,558.3	0.0675	39.24

Recovery summary

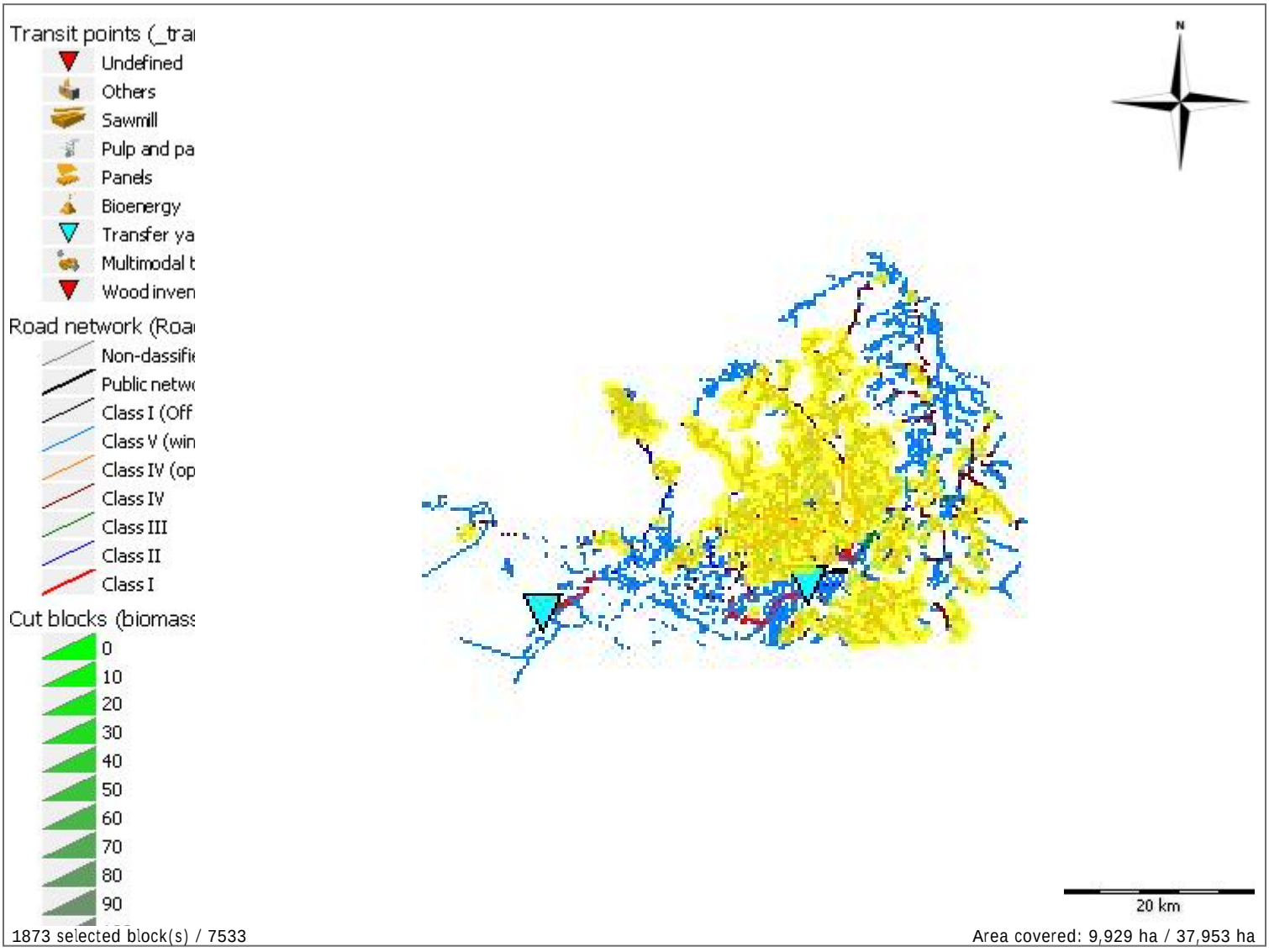
	Volume(odt)	Area(ha)	Number of cut blocks
• Biomass recovery location			
At the stump	0.0	0.0	0
Roadside	389,558.3	9,928.5	1,873
• Recovery season			
Summer	0.0	0.0	0
Winter	389,558.3	9,928.5	1,873
• Residue freshness			
Fresh	0.0	0.0	0
Brown	389,558.3	9,928.5	1,873
Brittle	0.0	0.0	0

Supply summary

Recovered biomass to	Merchantable volume (odt)	Residues (odt)	Total biomass (odt)
10 $/odt	0.0	0.0	0.0
20 $/odt	0.0	0.0	0.0
30 $/odt	0.0	0.0	0.0
40 $/odt	0.0	0.0	0.0
50 $/odt	0.0	10,502.2	10,502.2
60 $/odt	0.0	81,011.3	81,011.3
70 $/odt	0.0	170,829.3	170,829.3
80 $/odt	0.0	253,986.6	253,986.6
90 $/odt	0.0	310,479.8	310,479.8
100 $/odt	0.0	332,809.0	332,809.0
110 $/odt	0.0	361,631.2	361,631.2
120 $/odt	0.0	376,087.0	376,087.0
130 $/odt	0.0	383,058.6	383,058.6
140 $/odt	0.0	386,597.1	386,597.1
150 $/odt	0.0	388,516.0	388,516.0
160 $/odt	0.0	388,783.4	388,783.4
170 $/odt	0.0	389,441.5	389,441.5
180 $/odt	0.0	389,558.3	389,558.3
Maximum cost	0.00 $/odt	170.83 $/odt	

Delivery to mills

Destination	Product	Format	odt	Transport average distance (Km)
Richmond				
	Amabilis Fir (residues)	Chips	4,347	97
	Douglas Fir (residues)	Chips	8,340	94
	Lodgepole Pine (residues)	Chips	1	80
	Red Alder (residues)	Chips	1,546	91
	Trembling Aspen (residues)	Chips	91	91
	Western Hemlock (residues)	Chips	14,987	94
	Western Red Cedar (residues)	Chips	6,266	92
	White Spruce (residues)	Chips	35	45
	Yellow Cedar (residues)	Chips	51	84
			35,664	94
Chilliwack				
	Amabilis Fir (residues)	Chips	53,041	71
	Douglas Fir (residues)	Chips	122,613	69
	Lodgepole Pine (residues)	Chips	425	84
	Red Alder (residues)	Chips	25,085	70
	Trembling Aspen (residues)	Chips	358	51
	Western Hemlock (residues)	Chips	107,756	72
	Western Red Cedar (residues)	Chips	38,335	74
	Western White Pine (residues)	Chips	12	66
	White Spruce (residues)	Chips	113	72
	Yellow Cedar (residues)	Chips	6,156	80
			353,894	71
			389,558	73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Cut blocks (biomass
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60
70
80
90
N
20 km
1873 selected block(s) / 7533
Area covered: 9,929 ha / 37,953 ha

Territory:	Unknown territory
Sector:	Unknown sector
Cut block:	<Multiple selection>

Statistics - Selected Items

Area	9,796.2 ha
Number of cut blocks	1981
Recovered biomass	373,882.2 odt
Biomass yield	38.2 odt/ha
Biomass odt / Merchantable m^3	0.0718 odt/m^3
Delivered products	
• Chips	100 %
• Bundles	0 %
• Trunks and Residues	0 %
Energy balance	37 : 1
Available energy	1,419,163 MWh
Fuel consumption	11.9 L/odt

Cost

Harvesting	0.00 $/odt
Biomass recovery	22.50 $/odt
Transfer yard	0.00 $/odt
Transportation	39.55 $/odt
Loading/unloading	18.58 $/odt
Stumpage fees	0.00 $/odt
Road network - Maintenance	0.97 $/odt
Indirect costs	0.00 $/odt
Total	81.60 $/odt

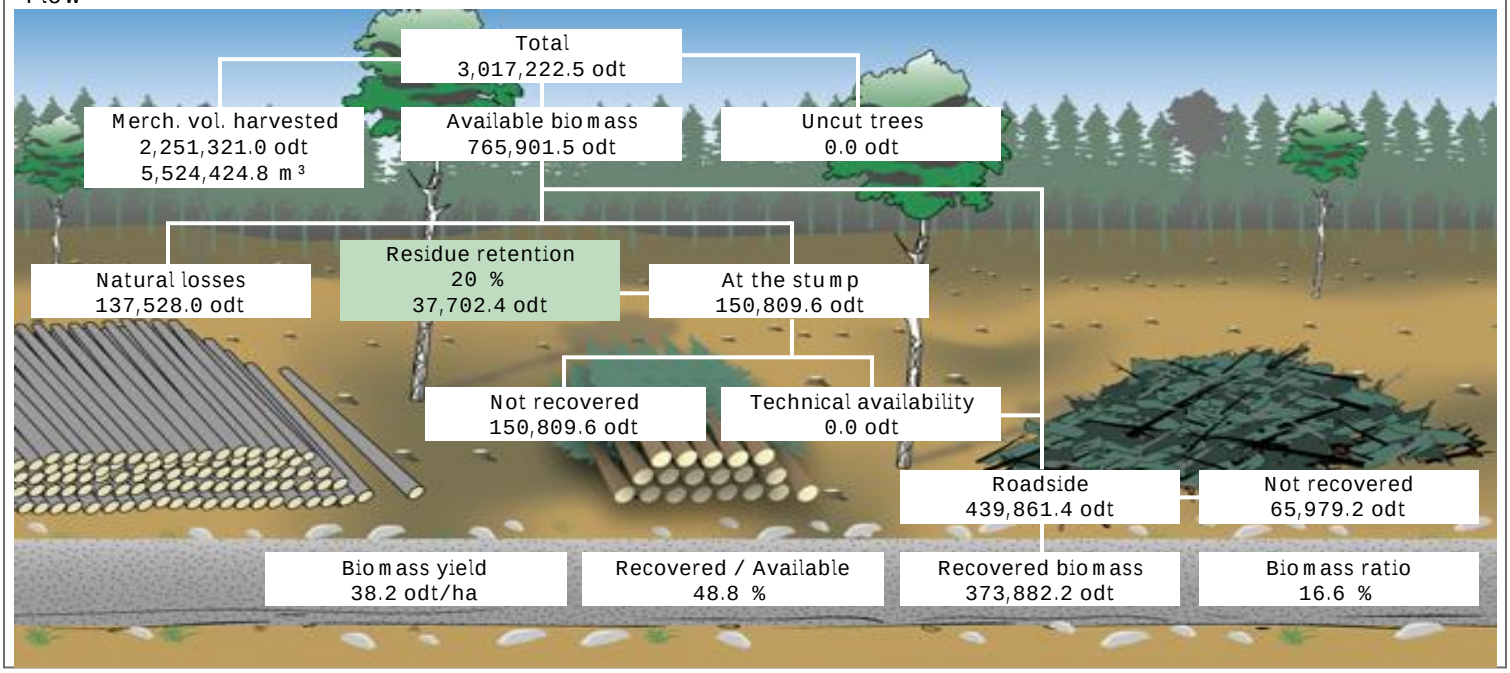
Revenue

Sale value	0.00 $/odt
Silvicultural discount	0.00 $/odt

Net

Profit	-81.60 $/odt

Flow



Products

Product name	odt	odt/m³	odt/ha
Douglas Fir (residues)	128,640.4	0.0999	13.13
Western Hemlock (residues)	116,995.8	0.0632	11.94
Amabilis Fir (residues)	53,001.3	0.0488	5.41
Western Red Cedar (residues)	44,214.0	0.0707	4.51
Red Alder (residues)	24,169.1	0.1132	2.47
Yellow Cedar (residues)	4,162.8	0.0374	0.42
White Spruce (residues)	933.5	0.0787	0.10
Lodgepole Pine (residues)	860.6	0.0793	0.09
Trembling Aspen (residues)	761.9	0.0697	0.08
Western White Pine (residues)	142.8	0.0818	0.01
	373,882.2	0.0718	38.17

Recovery summary

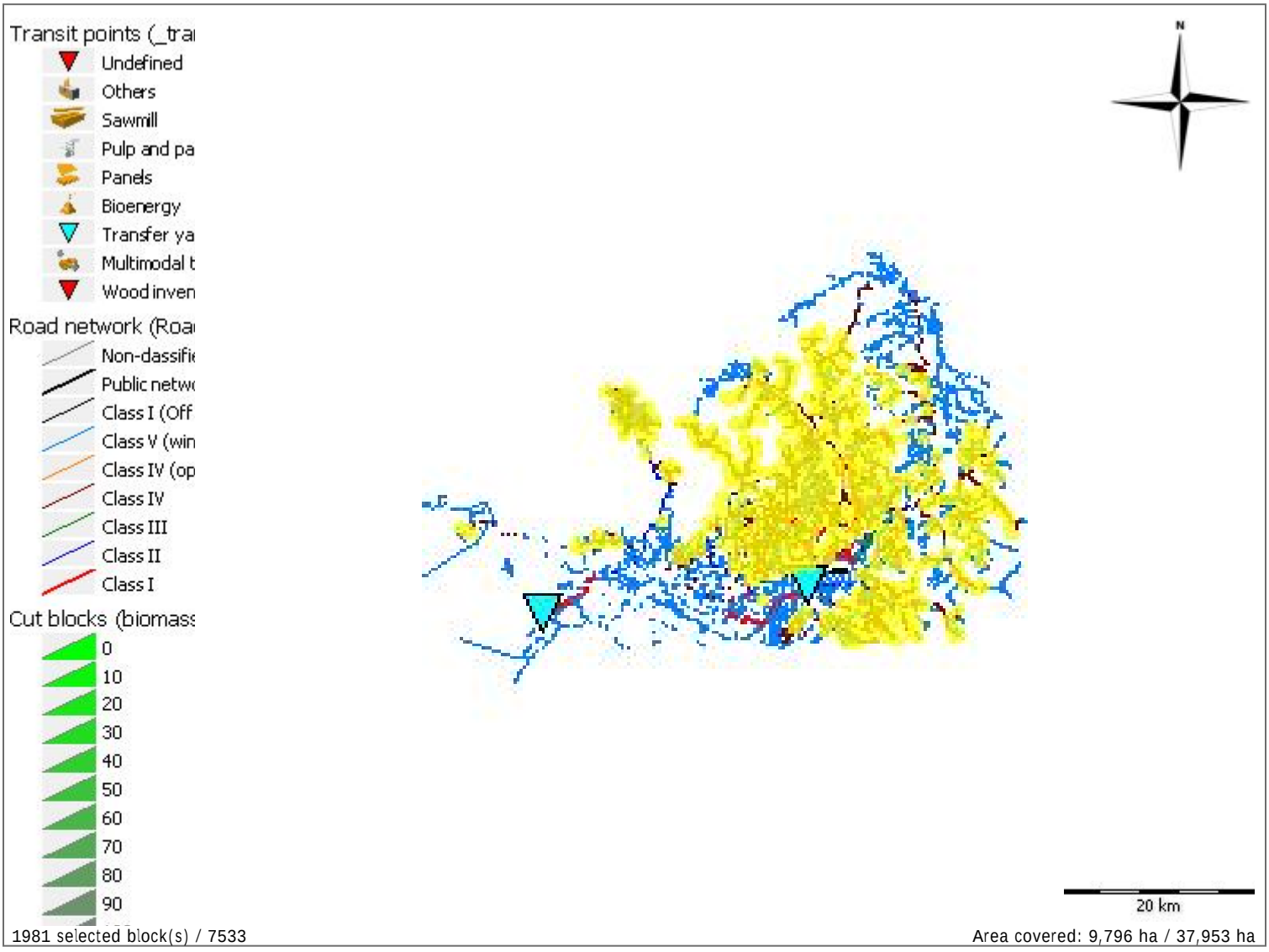
	Volume(odt)	Area(ha)	Number of cut blocks
• Biomass recovery location			
At the stump	0.0	0.0	0
Roadside	373,882.2	9,796.2	1,981
• Recovery season			
Summer	0.0	0.0	0
Winter	373,882.2	9,796.2	1,981
• Residue freshness			
Fresh	0.0	0.0	0
Brown	373,882.2	9,796.2	1,981
Brittle	0.0	0.0	0

Supply summary

Recovered biomass to	Merchantable volume (odt)	Residues (odt)	Total biomass (odt)
10 $/odt	0.0	0.0	0.0
20 $/odt	0.0	0.0	0.0
30 $/odt	0.0	0.0	0.0
40 $/odt	0.0	0.0	0.0
50 $/odt	0.0	6,921.3	6,921.3
60 $/odt	0.0	63,020.2	63,020.2
70 $/odt	0.0	141,613.2	141,613.2
80 $/odt	0.0	215,576.8	215,576.8
90 $/odt	0.0	281,966.0	281,966.0
100 $/odt	0.0	306,656.6	306,656.6
110 $/odt	0.0	329,072.6	329,072.6
120 $/odt	0.0	334,885.7	334,885.7
130 $/odt	0.0	352,788.7	352,788.7
140 $/odt	0.0	359,699.5	359,699.5
150 $/odt	0.0	364,627.6	364,627.6
160 $/odt	0.0	367,601.9	367,601.9
170 $/odt	0.0	370,864.5	370,864.5
180 $/odt	0.0	371,042.0	371,042.0
190 $/odt	0.0	371,921.6	371,921.6
200 $/odt	0.0	373,882.2	373,882.2
Maximum cost	0.00 $/odt	197.24 $/odt	

Delivery to mills

Destination	Product	Format	odt	Transport average distance (Km)
Richmond				
	Amabilis Fir (residues)	Chips	3,983	102
	Douglas Fir (residues)	Chips	11,113	85
	Lodgepole Pine (residues)	Chips	1	91
	Red Alder (residues)	Chips	1,819	81
	Trembling Aspen (residues)	Chips	405	96
	Western Hemlock (residues)	Chips	13,908	89
	Western Red Cedar (residues)	Chips	8,779	87
	Western White Pine (residues)	Chips	0	103
	White Spruce (residues)	Chips	237	95
	Yellow Cedar (residues)	Chips	114	109
			40,359	88
Chilliwack				
	Amabilis Fir (residues)	Chips	49,018	72
	Douglas Fir (residues)	Chips	117,527	72
	Lodgepole Pine (residues)	Chips	859	80
	Red Alder (residues)	Chips	22,350	73
	Trembling Aspen (residues)	Chips	357	74
	Western Hemlock (residues)	Chips	103,088	74
	Western Red Cedar (residues)	Chips	35,435	75
	Western White Pine (residues)	Chips	143	72
	White Spruce (residues)	Chips	696	95
	Yellow Cedar (residues)	Chips	4,049	81
			333,523	73
			373,882	75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Cut blocks (biomass
0
10
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90
N
20 km
1981 selected block(s) / 7533
Area covered: 9,796 ha / 37,953 ha

Territory:	Unknown territory
Sector:	Unknown sector
Cut block:	<Multiple selection>

Cut blocks

Area	8,110.1 ha
Number of cut blocks	1649
Harvested volume	6,565,207 m^3
Average skidding dist.	250 m
Volume/km	0 m^3/km
Area/km	0 ha/km

Cut type

Clearcut	8,110.1 ha

Harvesting system

Full-tree with roadside processing	8,110.1 ha

Costs

Harvesting	9.75 $/$m^3$
Equipment transport	0.75 $/$m^3$
Road network - Construction	0.00 $/$m^3$
Road network - Repair	0.00 $/$m^3$
Road network - Improvement	0.00 $/$m^3$
Road network - Maintenance	0.39 $/$m^3$
Transportation	10.01 $/$m^3$
Loading/unloading	2.50 $/$m^3$
Transfer yard	0.00 $/$m^3$
Stumpage fees	0.00 $/$m^3$
Indirect costs	0.00 $/$m^3$
Stand establishment	N/A
Total	23.40 $/$m^3$

Revenue

Value	0.00 $/$m^3$
Reimbursements (silv.)	N/A

Net

Profit	-23.40 $/$m^3$

Products

Name	Format	m³	m³/ha	m³/stem	%/total
Western Hemlock	Logs	2,298,514	283.4	1.155	35
Douglas Fir	Logs	1,886,088	232.6	1.033	29
Amabilis Fir	Logs	1,251,089	154.3	1.773	19
Western Red Cedar	Logs	670,023	82.6	1.093	10
Red Alder	Logs	299,160	36.9	0.825	5
Yellow Cedar	Logs	114,421	14.1	2.008	2
Trembling Aspen	Logs	20,815	2.6	1.058	0
Lodgepole Pine	Logs	18,638	2.3	0.626	0
White Spruce	Logs	6,395	0.8	2.826	0
Western White Pine	Logs	64	0.0	0.804	0
		6,565,207	809.5	1.171	100

Delivery to mills

Destination	Product	Format	m³	Transport average distance (Km)
Richmond				
	Amabilis Fir	Logs	5,161	81
	Douglas Fir	Logs	180,335	55
	Red Alder	Logs	16,672	69
	Trembling Aspen	Logs	3,025	64
	Western Hemlock	Logs	182,740	63
	Western Red Cedar	Logs	68,963	67
	White Spruce	Logs	929	82
	Yellow Cedar	Logs	10	80
			457,835	61

Chilliwack

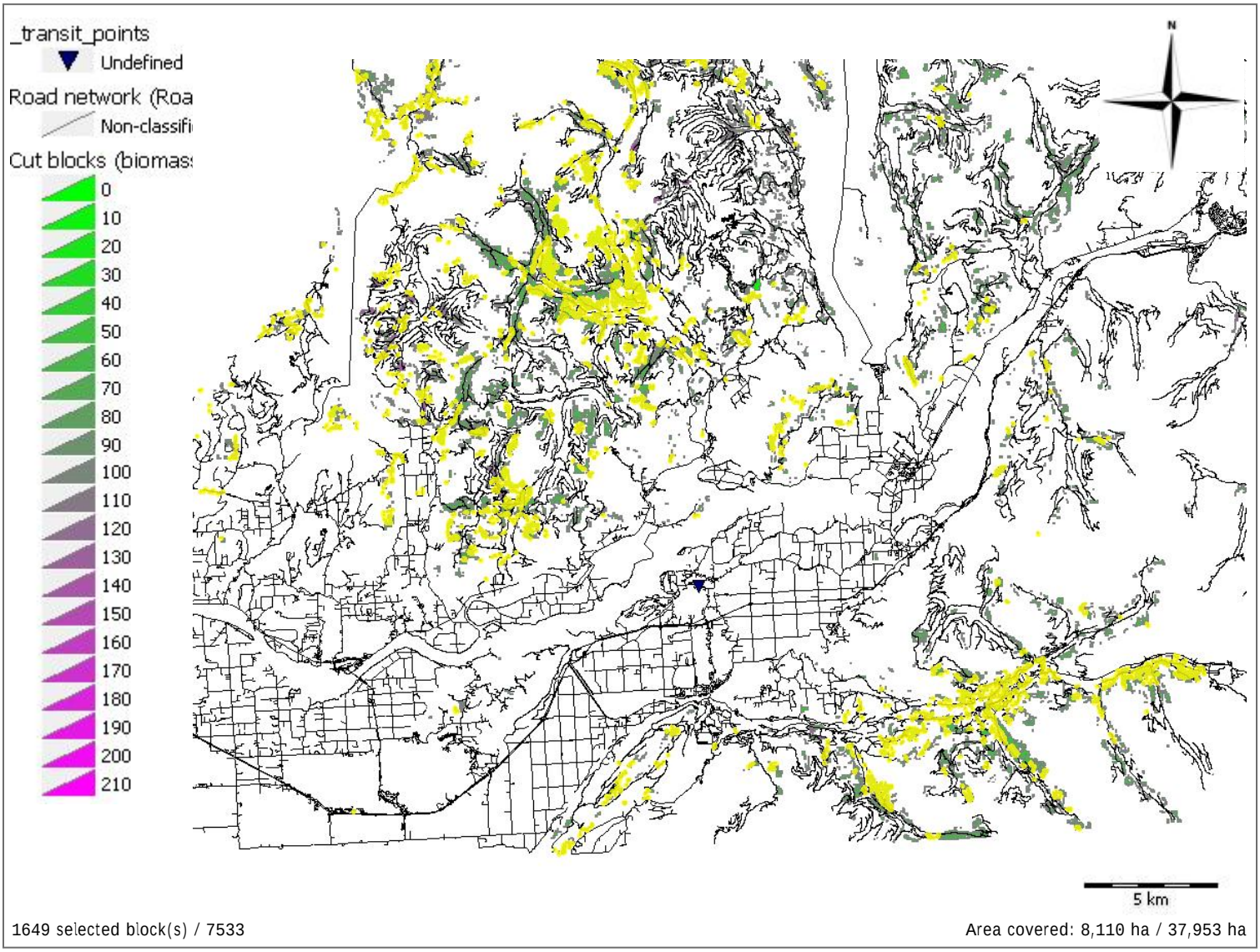
Amabilis Fir	Logs	1,245,928	79
Douglas Fir	Logs	1,705,753	60
Lodgepole Pine	Logs	18,638	91
Red Alder	Logs	282,489	64
Trembling Aspen	Logs	17,789	42
Western Hemlock	Logs	2,115,774	70
Western Red Cedar	Logs	601,059	73
Western White Pine	Logs	64	56
White Spruce	Logs	5,467	102
Yellow Cedar	Logs	114,411	74
		6,107,373	69
		6,565,207	69

Harvesting season

	m^3	ha
Summer	0	0.0
Fall	0	0.0
Winter	6,565,207	8,110.1
	6,565,207	8,110.1

Terrain conditions

CPPA class	Ground strength (%)	Roughness (%)	Slope (%)
1	-	-	-
2	-	-	-
3	100	100	100
4	-	-	-
5	-	-	-



1649 selected block(s) / 7533

Area covered: 8,110 ha / 37,953 ha

Territory:	Unknown territory
Sector:	Unknown sector
Cut block:	<Multiple selection>

Cut blocks

Area	10,117.9 ha
Number of cut blocks	2030
Harvested volume	6,066,299 m³
Average skidding dist.	250 m
Volume/km	0 m³/km
Area/km	0 ha/km

Cut type

Clearcut	10,117.9 ha

Harvesting system

Full-tree with roadside processing	10,117.9 ha

Costs

Harvesting	12.61 $/m³
Equipment transport	0.75 $/m³
Road network - Construction	0.00 $/m³
Road network - Repair	0.00 $/m³
Road network - Improvement	0.00 $/m³
Road network - Maintenance	0.37 $/m³
Transportation	10.56 $/m³
Loading/unloading	2.50 $/m³
Transfer yard	0.00 $/m³
Stumpage fees	0.00 $/m³
Indirect costs	0.00 $/m³
Stand establishment	N/A
Total	26.79 $/m³

Revenue

Value	0.00 $/m³
Reimbursements (silv.)	N/A

Net

Profit	-26.79 $/m³

Products

Name	Format	m³	m³/ha	m³/stem	%/total
Western Hemlock	Logs	1,983,970	196.1	0.841	33
Douglas Fir	Logs	1,864,300	184.3	0.581	31
Amabilis Fir	Logs	1,134,777	112.2	1.105	19
Western Red Cedar	Logs	589,306	58.2	0.670	10
Red Alder	Logs	313,979	31.0	0.522	5
Yellow Cedar	Logs	155,171	15.3	1.335	3
Trembling Aspen	Logs	12,605	1.2	0.964	0
Lodgepole Pine	Logs	9,256	0.9	0.315	0
White Spruce	Logs	2,764	0.3	1.366	0
Western White Pine	Logs	172	0.0	1.011	0
		6,066,299	599.6	0.737	100

Delivery to mills

Destination	Product	Format	m³	Transport average distance (Km)
Richmond				
	Amabilis Fir	Logs	18,930	95
	Douglas Fir	Logs	190,061	60
	Lodgepole Pine	Logs	15	83
	Red Alder	Logs	23,014	70
	Trembling Aspen	Logs	2,617	95
	Western Hemlock	Logs	163,983	70
	Western Red Cedar	Logs	58,273	68
	White Spruce	Logs	591	89
	Yellow Cedar	Logs	67	100
			457,552	67

Chilliwack

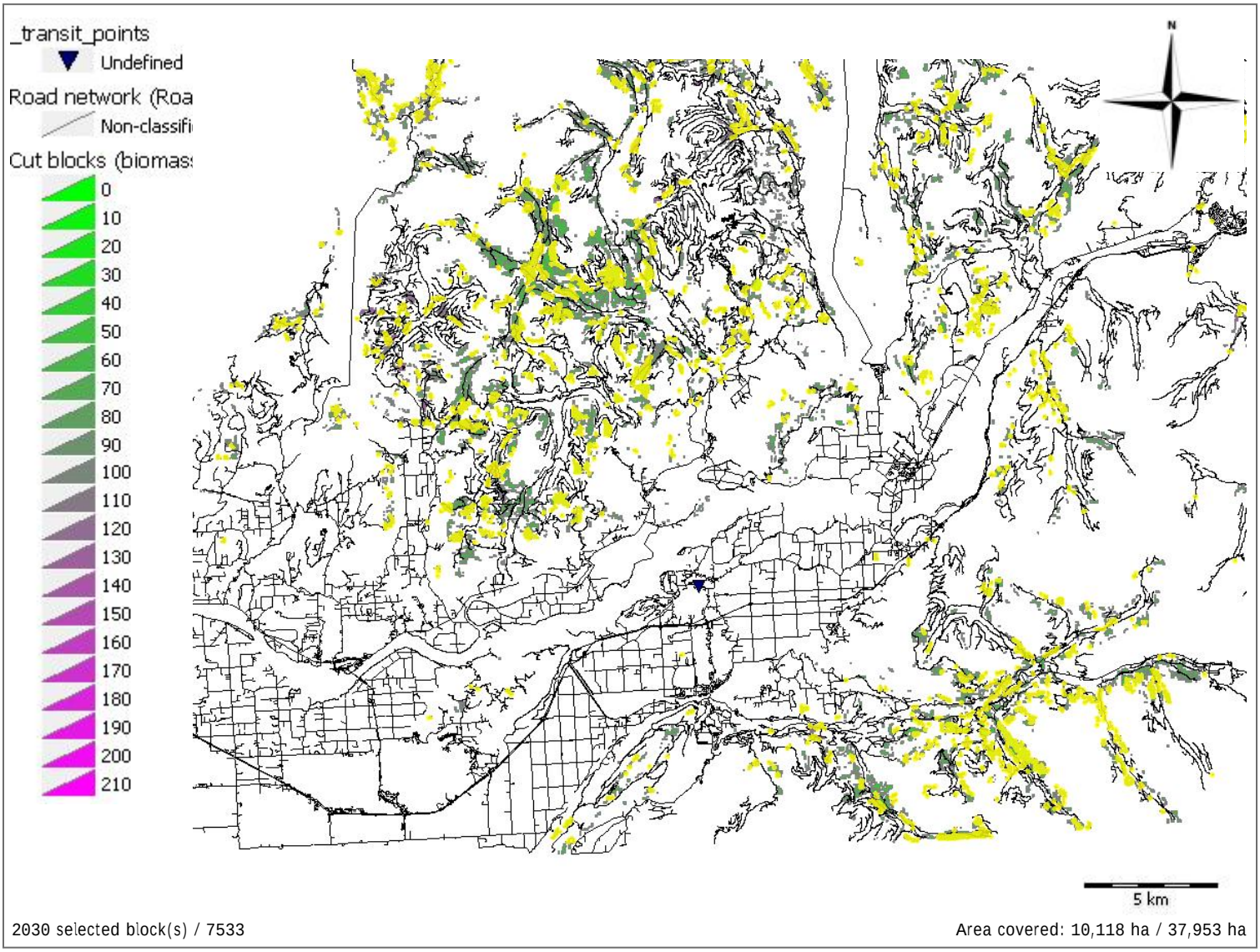
	Amabilis Fir	Logs	1,115,847	72
	Douglas Fir	Logs	1,674,239	65
	Lodgepole Pine	Logs	9,241	98
	Red Alder	Logs	290,966	66
	Trembling Aspen	Logs	9,988	55
	Western Hemlock	Logs	1,819,987	72
	Western Red Cedar	Logs	531,033	74
	Western White Pine	Logs	172	65
	White Spruce	Logs	2,172	66
	Yellow Cedar	Logs	155,104	74
			5,608,748	70
			6,066,299	69

Harvesting season

	m^3	ha
Summer	0	0.0
Fall	0	0.0
Winter	6,066,299	10,117.9
	6,066,299	10,117.9

Terrain conditions

CPPA class	Ground strength (%)	Roughness (%)	Slope (%)
1	-	-	-
2	-	-	-
3	100	100	100
4	-	-	-
5	-	-	-



2030 selected block(s) / 7533

Area covered: 10,118 ha / 37,953 ha

Territory:	Unknown territory
Sector:	Unknown sector
Cut block:	<Multiple selection>

Cut blocks

Area	9,928.5 ha
Number of cut blocks	1873
Harvested volume	5,776,110 m^3
Average skidding dist.	250 m
Volume/km	0 m^3/km
Area/km	0 ha/km

Cut type

Clearcut	9,928.5 ha

Harvesting system

Full-tree with roadside processing	9,928.5 ha

Costs

Harvesting	12.99 $/$m^3$
Equipment transport	0.75 $/$m^3$
Road network - Construction	0.00 $/$m^3$
Road network - Repair	0.00 $/$m^3$
Road network - Improvement	0.00 $/$m^3$
Road network - Maintenance	0.39 $/$m^3$
Transportation	10.88 $/$m^3$
Loading/unloading	2.50 $/$m^3$
Transfer yard	0.00 $/$m^3$
Stumpage fees	0.00 $/$m^3$
Indirect costs	0.00 $/$m^3$
Stand establishment	N/A
Total	27.51 $/$m^3$

Revenue

Value	0.00 $/$m^3$
Reimbursements (silv.)	N/A

Net

Profit	-27.51 $/$m^3$

Products

Name	Format	m³	m³/ha	m³/stem	%/total
Western Hemlock	Logs	2,029,434	204.4	0.796	35
Douglas Fir	Logs	1,457,305	146.8	0.523	25
Amabilis Fir	Logs	1,194,000	120.3	0.927	21
Western Red Cedar	Logs	650,083	65.5	0.661	11
Red Alder	Logs	257,354	25.9	0.566	4
Yellow Cedar	Logs	173,312	17.5	1.277	3
Trembling Aspen	Logs	6,470	0.7	0.777	0
Lodgepole Pine	Logs	5,725	0.6	0.309	0
White Spruce	Logs	2,270	0.2	1.131	0
Western White Pine	Logs	158	0.0	0.593	0
		5,776,110	581.8	0.702	100

Delivery to mills

Destination	Product	Format	m³	Transport average distance (Km)
Richmond				
	Amabilis Fir	Logs	99,481	97
	Douglas Fir	Logs	118,636	93
	Lodgepole Pine	Logs	22	80
	Red Alder	Logs	16,105	91
	Trembling Aspen	Logs	1,384	90
	Western Hemlock	Logs	279,981	93
	Western Red Cedar	Logs	105,996	92
	White Spruce	Logs	562	45
	Yellow Cedar	Logs	1,089	86
			623,257	94

Chilliwack

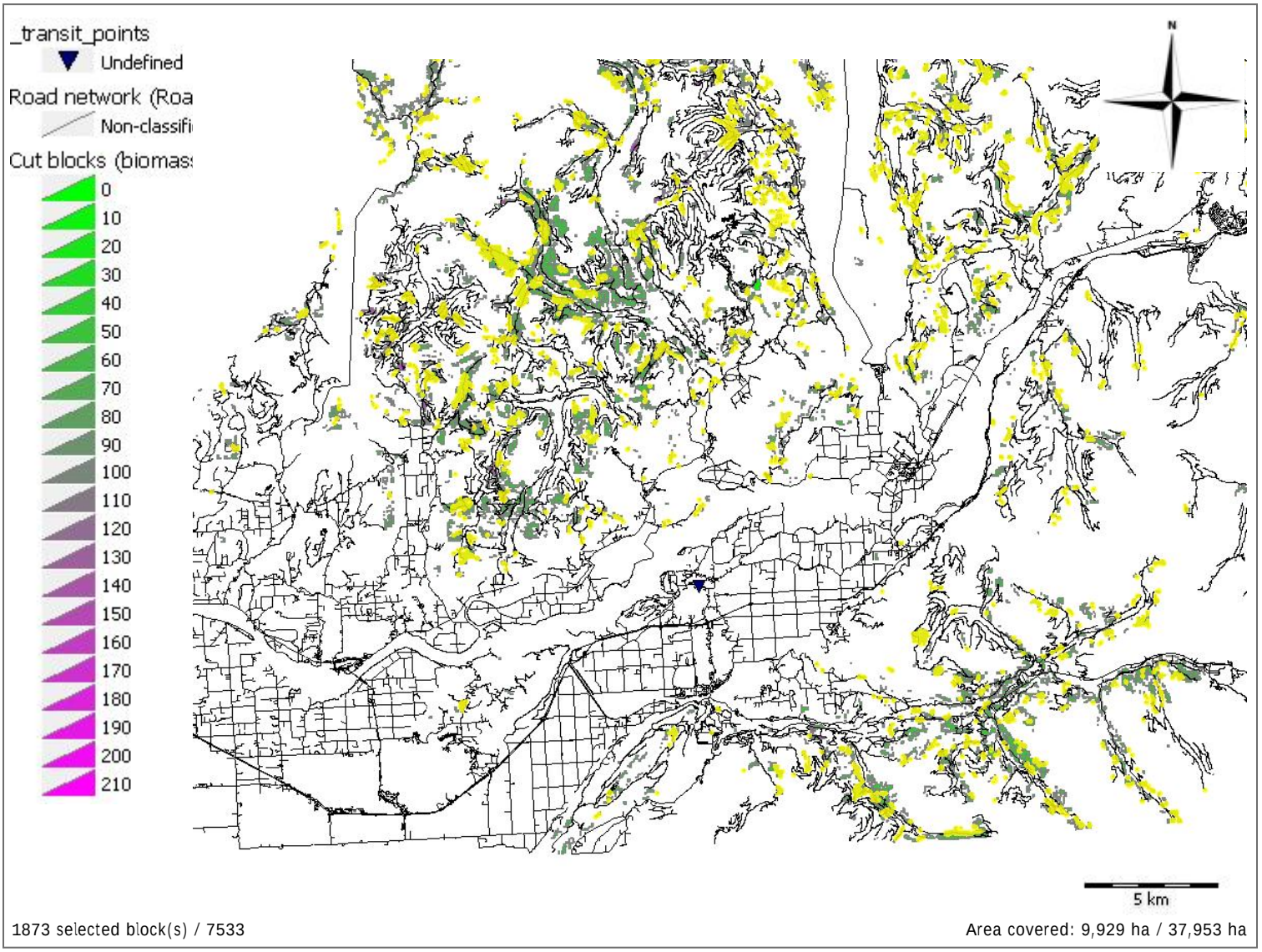
	Amabilis Fir	Logs	1,094,519	71
	Douglas Fir	Logs	1,338,669	66
	Lodgepole Pine	Logs	5,703	78
	Red Alder	Logs	241,249	70
	Trembling Aspen	Logs	5,086	53
	Western Hemlock	Logs	1,749,453	72
	Western Red Cedar	Logs	544,087	73
	Western White Pine	Logs	158	66
	White Spruce	Logs	1,707	74
	Yellow Cedar	Logs	172,223	80
			5,152,853	71
			5,776,110	73

Harvesting season

	m^3	ha
Summer	0	0.0
Fall	0	0.0
Winter	5,776,110	9,928.5
	5,776,110	9,928.5

Terrain conditions

CPPA class	Ground strength (%)	Roughness (%)	Slope (%)
1	-	-	-
2	-	-	-
3	100	100	100
4	-	-	-
5	-	-	-



1873 selected block(s) / 7533

Area covered: 9,929 ha / 37,953 ha

Territory:	Unknown territory
Sector:	Unknown sector
Cut block:	<Multiple selection>

Cut blocks

Area	9,796.2 ha
Number of cut blocks	1981
Harvested volume	5,213,581 m³
Average skidding dist.	250 m
Volume/km	0 m³/km
Area/km	0 ha/km

Cut type

Clearcut	9,796.2 ha

Harvesting system

Full-tree with roadside processing	9,796.2 ha

Costs

Harvesting	13.76 $/m³
Equipment transport	0.75 $/m³
Road network - Construction	0.00 $/m³
Road network - Repair	0.00 $/m³
Road network - Improvement	0.00 $/m³
Road network - Maintenance	0.39 $/m³
Transportation	11.29 $/m³
Loading/unloading	2.50 $/m³
Transfer yard	0.00 $/m³
Stumpage fees	0.00 $/m³
Indirect costs	0.00 $/m³
Stand establishment	N/A
Total	28.69 $/m³

Revenue

Value	0.00 $/m³
Reimbursements (silv.)	N/A

Net

Profit	-28.69 $/m³

Products

Name	Format	m³	m³/ha	m³/stem	%/total
Western Hemlock	Logs	1,851,449	189.0	0.730	36
Douglas Fir	Logs	1,288,784	131.6	0.444	25
Amabilis Fir	Logs	1,085,460	110.8	0.885	21
Western Red Cedar	Logs	626,141	63.9	0.617	12
Red Alder	Logs	214,693	21.9	0.414	4
Yellow Cedar	Logs	111,375	11.4	1.169	2
White Spruce	Logs	11,864	1.2	0.588	0
Trembling Aspen	Logs	11,170	1.1	0.612	0
Lodgepole Pine	Logs	10,901	1.1	0.298	0
Western White Pine	Logs	1,745	0.2	0.499	0
		5,213,581	532.2	0.623	100

Delivery to mills

Destination	Product	Format	m³	Transport average distance (Km)
Richmond				
	Amabilis Fir	Logs	88,600	102
	Douglas Fir	Logs	154,732	80
	Lodgepole Pine	Logs	27	89
	Red Alder	Logs	19,100	80
	Trembling Aspen	Logs	5,859	96
	Western Hemlock	Logs	253,351	89
	Western Red Cedar	Logs	154,562	87
	Western White Pine	Logs	1	103
	White Spruce	Logs	3,445	95
	Yellow Cedar	Logs	3,907	109
			683,582	88

Chilliwack

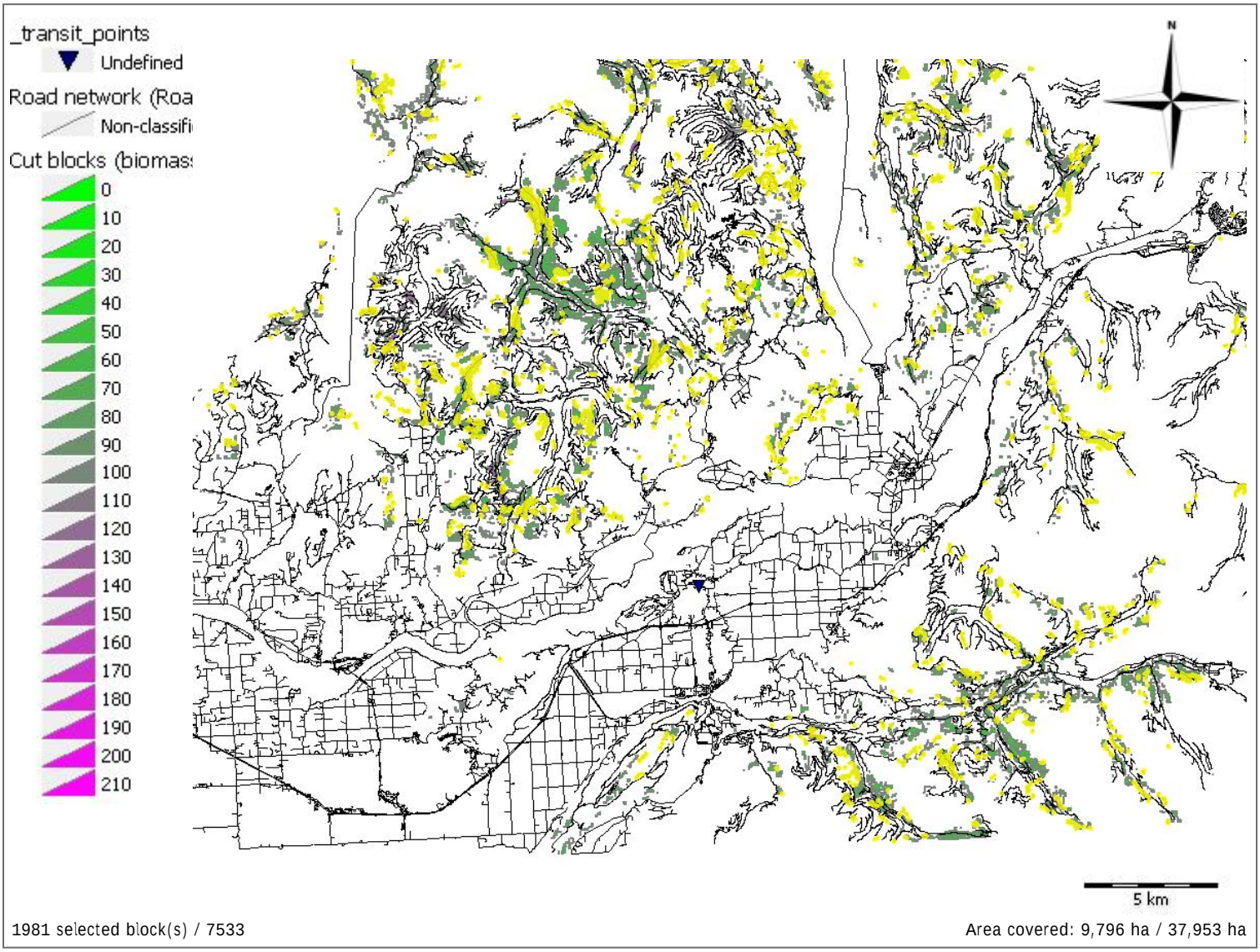
	Amabilis Fir	Logs	996,860	72
	Douglas Fir	Logs	1,134,053	67
	Lodgepole Pine	Logs	10,874	78
	Red Alder	Logs	195,593	71
	Trembling Aspen	Logs	5,311	76
	Western Hemlock	Logs	1,598,098	73
	Western Red Cedar	Logs	471,579	74
	Western White Pine	Logs	1,744	72
	White Spruce	Logs	8,419	94
	Yellow Cedar	Logs	107,468	82
			4,529,998	72
			5,213,581	74

Harvesting season

	m^3	ha
Summer	0	0.0
Fall	0	0.0
Winter	5,213,581	9,796.2
	5,213,581	9,796.2

Terrain conditions

CPPA class	Ground strength (%)	Roughness (%)	Slope (%)
1	-	-	-
2	-	-	-
3	100	100	100
4	-	-	-
5	-	-	-



1981 selected block(s) / 7533

Area covered: 9,796 ha / 37,953 ha

Territory:	Unknown territory
Sector:	Unknown sector
Cut block:	<Multiple selection>

Cut blocks

Area	37,952.7 ha
Number of cut blocks	7533
Harvested volume	23,621,198 m^3
Average skidding dist.	250 m
Volume/km	0 m^3/km
Area/km	0 ha/km

Cut type

Clearcut	37,952.7 ha

Harvesting system

Full-tree with roadside processing	37,952.7 ha

Costs

Harvesting	12.16 $/$m^3$
Equipment transport	0.75 $/$m^3$
Road network - Construction	0.00 $/$m^3$
Road network - Repair	0.00 $/$m^3$
Road network - Improvement	0.00 $/$m^3$
Road network - Maintenance	0.38 $/$m^3$
Transportation	10.65 $/$m^3$
Loading/unloading	2.50 $/$m^3$
Transfer yard	0.00 $/$m^3$
Stumpage fees	0.00 $/$m^3$
Indirect costs	0.00 $/$m^3$
Stand establishment	N/A
Total	26.44 $/$m^3$

Revenue

Value	0.00 $/$m^3$
Reimbursements (silv.)	N/A

Net

Profit	-26.44 $/$m^3$

Products

Name	Format	m³	m³/ha	m³/stem	%/total
Western Hemlock	Logs	8,163,367	215.1	0.865	35
Douglas Fir	Logs	6,496,477	171.2	0.606	28
Amabilis Fir	Logs	4,665,326	122.9	1.099	20
Western Red Cedar	Logs	2,535,552	66.8	0.726	11
Red Alder	Logs	1,085,187	28.6	0.560	5
Yellow Cedar	Logs	554,278	14.6	1.371	2
Trembling Aspen	Logs	51,060	1.3	0.860	0
Lodgepole Pine	Logs	44,521	1.2	0.390	0
White Spruce	Logs	23,293	0.6	0.879	0
Western White Pine	Logs	2,139	0.1	0.533	0
		23,621,198	622.4	0.776	100

Delivery to mills

Destination	Product	Format	m³	Transport average distance (Km)
Richmond				
	Amabilis Fir	Logs	212,172	98
	Douglas Fir	Logs	643,763	69
	Lodgepole Pine	Logs	65	84
	Red Alder	Logs	74,891	77
	Trembling Aspen	Logs	12,885	88
	Western Hemlock	Logs	880,055	81
	Western Red Cedar	Logs	387,795	82
	Western White Pine	Logs	1	103
	White Spruce	Logs	5,527	87
	Yellow Cedar	Logs	5,072	104
			2,222,226	80

Chilliwack

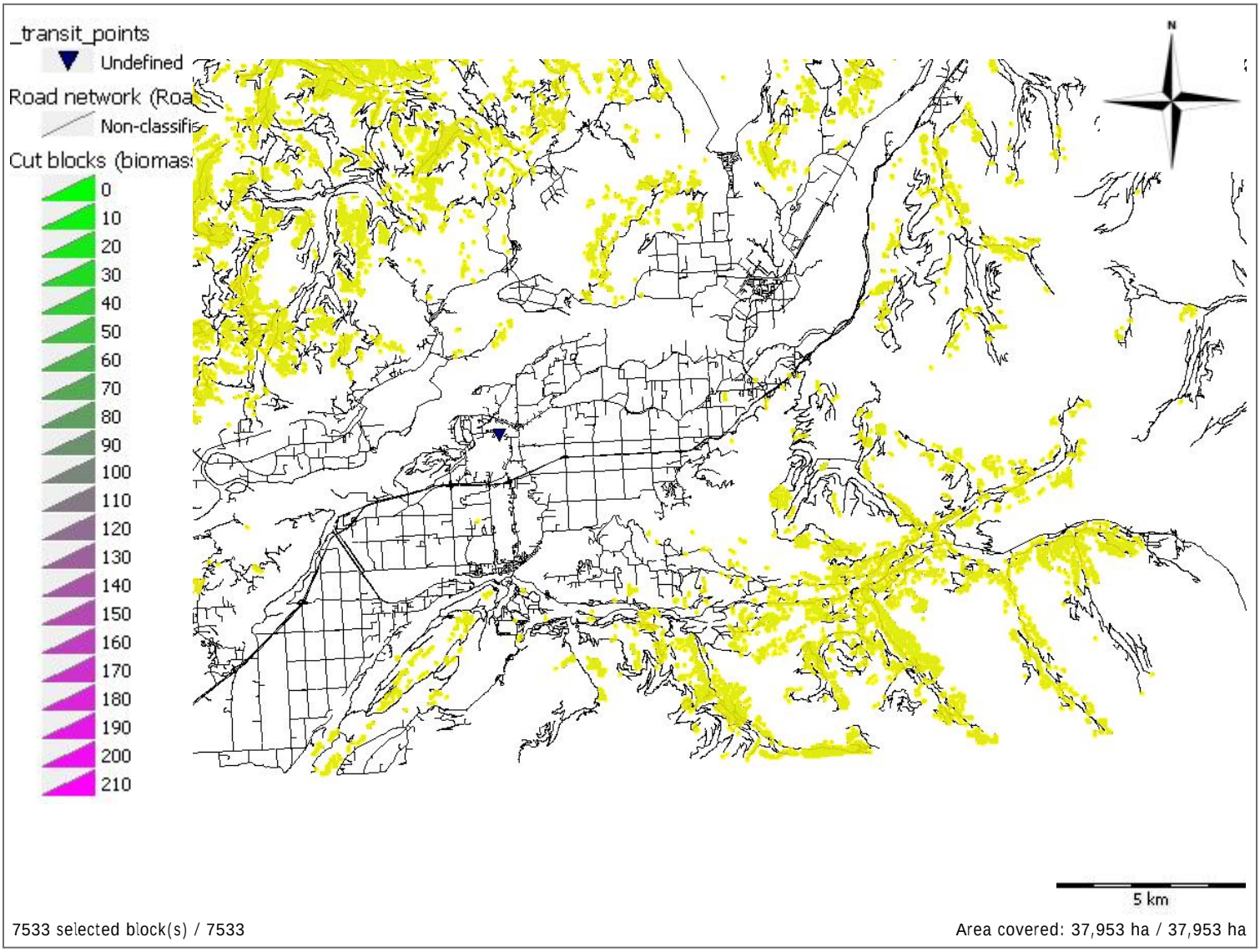
	Amabilis Fir	Logs	4,453,153	74
	Douglas Fir	Logs	5,852,714	64
	Lodgepole Pine	Logs	44,456	88
	Red Alder	Logs	1,010,296	67
	Trembling Aspen	Logs	38,174	51
	Western Hemlock	Logs	7,283,312	72
	Western Red Cedar	Logs	2,147,758	74
	Western White Pine	Logs	2,138	71
	White Spruce	Logs	17,766	91
	Yellow Cedar	Logs	549,205	78
			21,398,972	70
			23,621,198	71

Harvesting season

	m^3	ha
Summer	0	0.0
Fall	0	0.0
Winter	23,621,198	37,952.7
	23,621,198	37,952.7

Terrain conditions

CPPA class	Ground strength (%)	Roughness (%)	Slope (%)
1	-	-	-
2	-	-	-
3	100	100	100
4	-	-	-
5	-	-	-



7533 selected block(s) / 7533

Area covered: 37,953 ha / 37,953 ha

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