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Using FPInterface to Estimate Availability of Forest-Origin Biomass in British Columbia: Strathcona 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 Strathcona Timber Supply Area, a total of 73 000 ODT/year was projected to be available, while only 15 000 ODT/year were expected to be available at the economic price of $60/ODT.

Acknowledgements

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1. Executive summary

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

The yield of biomass from harvest residues for the Strathcona TSA was estimated at 33.7 oven-dried tonnes (ODT) per hectare.

The biomass ratio, which is the ratio of recovered biomass to recovered merchantable roundwood, was estimated at 14.6%. Over the next 20 years, an estimated total of 1.47 million ODT of available biomass could be generated by harvest in the Strathcona TSA, or approximately 73 000 ODT/year. Of this amount, approximately 294 800 ODT in total, or 15 000 ODT/year, is expected to be available at the economic price of $60/ODT. Approximately 50% of the total predicted volume is expected to be available at $90/ODT, which amounts to a total of 720 000 ODT, or 36 000 ODT/year.

A low-cost scenario was attempted by reducing the grinding cost by $5.05/ODT. At the economic rate of $60/ODT, availability increases by approximately 120 000 ODT over 20 years, or about 6 000 ODT/year. If increases in efficiency or decreases in cost can be realized, the biomass available could be increased by this amount.

Most of the biomass that is considered economically available (≤ $60/ODT) is located closer to the TSA's delivery point (Campbell River). The amount of economically available biomass decreases consistently over time, from approximately 20 000 ODT/year in years 1 to 5 to 7 500 ODT/year in years 15 to 20. This decrease may be due to an increased distance between the planned harvest area and the delivery location in later periods.

2. Introduction

FPInnovations estimated the amount of forest-origin, harvest residue biomass from the Strathcona Timber Supply Area (TSA), largely following the process previously established for other TSAs in B.C. using FPInterface between 2010 and 2017. The biomass inventory was based on 20-year harvest and road network plans for Crown land provided by B.C.'s Ministry of Forests, Lands and Natural Resource Operations (FLNRO) and excludes Woodlot Licences, Tree Farm Licences (TFLs), Community Forest Agreements (CFAs), and First Nations tenures.

Detailed introductory statements applying to this project and the greater project as a whole may be found in Friesen & Goodison (2018).

3. Objective

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

Specific deliverables include:

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 price points. A value of $60 for one oven-dried tonne (ODT) is regarded as the market value for biomass, in accordance with previous analyses.

4. Methods

Overall process

The basic methodology for determining biomass supply in western Canada was established during analysis of the Quesnel and Williams Lake TSAs. The methodology is reviewed below.

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

Additionally, small-piece size stands that are not considered merchantable were also excluded from 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 analyses have shown that harvesting these stands is not yet profitable.

The process map in Figure 1 displays the steps taken to build the final inventory of economically available biomass for the Quesnel TSA. A similar process was used for the Strathcona TSA.

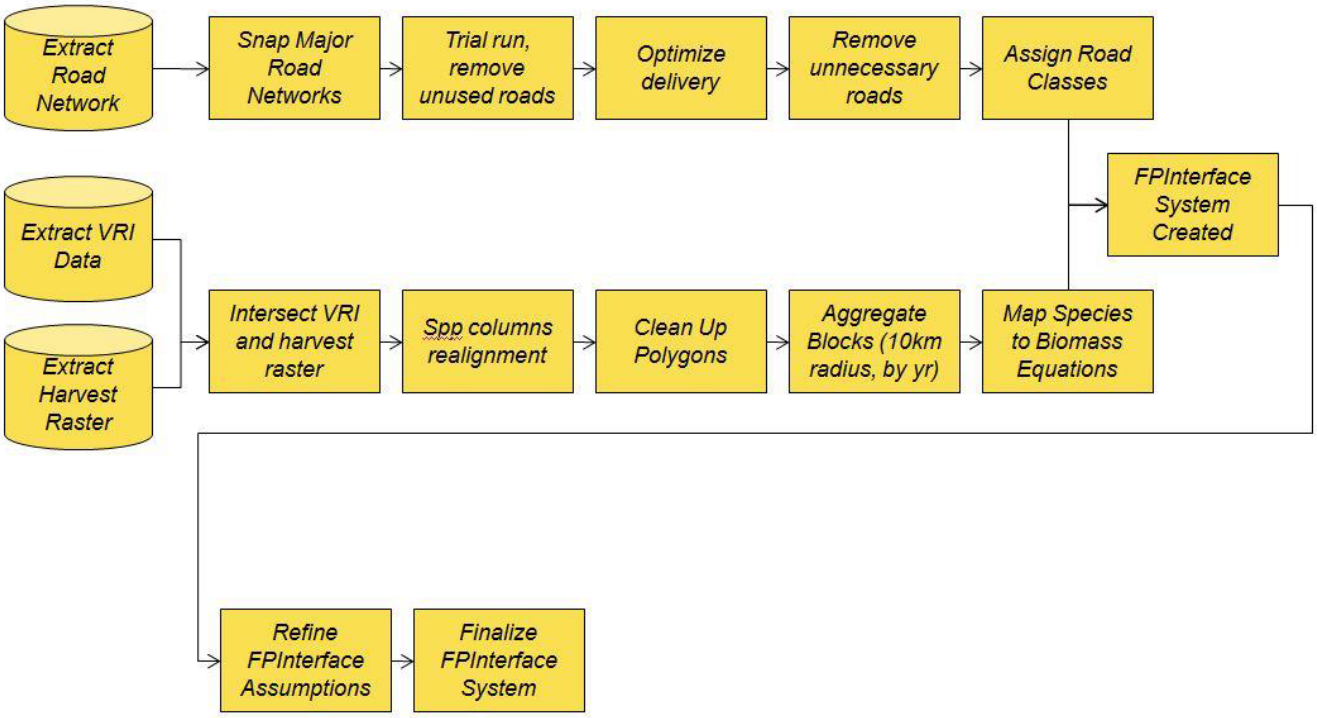


Figure 1. The steps taken to build the final inventory of economically available biomass.

Data acquisition

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

The total 20-year harvest raster 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 horizon. 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 queue built into it, indicating which polygons are to be cut in which time period. To calculate biomass amounts, FPInterface requires both 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 associate the species in the resultant with the species names in FPInterface.

To expedite 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 of each other.

FPInterface calculates cost in part by finding a transport route from a product's origin within a polygon (block) to the mill or delivery site. It relies on a continuous path along the road network. If digital road segments are not joined together (snapped), the program cannot find a path between block and mill, or may find a sub-optimal, 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 indicated in the inventory are tied to single-tree biomass equations in FPInterface. For the Quesnel analysis in 2010–11, these equations were based on "Canadian national tree aboveground biomass equations" (Lambert et al., 2005). Although this equation set includes trees from across Canada, including western and northern Canada, very few samples were from B.C. More recently, Ung et al. (2008) have released tree equations for BC (accepted by FLNRO), and these were incorporated into FPInterface for the Williams Lake and subsequent analyses, including this one.

FPInterface parameters

Tree species associations

Table 1 shows the species associations that were made.

Table 1. Species associations

FPInterface species	System label	Named	Original data set
Spruce, white	S	White spruce	S, SS
Aspen, trembling	AT	Trembling aspen	AC, AT, ACT
Fir, alpine	BA	Subalpine fir	BA, BL, B, BG
Cedar, western red	CW	Western redcedar	CW
Douglas-fir	FD	Douglas-fir	FD
Hemlock, western	HW	Western hemlock	H, HW, HM
Pine, lodgepole	PL	Lodgepole pine	PL, PLC, PA
Pine, western white	PW	Western white pine	PW
Alder, red	DR	Red alder	DR, MB, RA
Cedar, yellow	YC	Yellow cedar	YC

Road classes

Unlike the Quesnel data set, the Strathcona 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 road. The volume hauled is for merchantable volume, as calculated by FPInterface. To create a continuous road network from harvest blocks on islands to the delivery location, roads were created over water in the Strathcona TSA. The roads over water used the same classification system as the land-based roads. Although transport over water is generally less expensive than by road, the costs of loading and unloading associated with water transport over shorter distances tend to cancel the savings. Over long distances, water transport is cheaper, but for the distances required in this TSA, the costs were thought to be about equal, on average. The volume and speeds associated with each road class were assigned as shown 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 is an approximate medium-term average.

The program'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 for the Strathcona TSA was assigned CPPA Class 3 (20 to 32%). Ground strength was rated CPPA Class 3 (moderate), and ground roughness was rated CPPA Class 3 (uneven).

Comminution cost

The working time for BC conditions was based on previous base case studies and consists of one 12-hour shift per day, 200 days per year. Grinder utilization was set at 60% and fuel used per productive machine hour (PMH) for the grinder was the standard 135 L/PMH. The same standard base case parameters were used in previous FPInnovations studies and enable comparison to those studies. Here, they 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, to represent the new conditions. This produced a grinding cost of $22.50/ODT. This is thought to be achievable for an experienced operator under the Strathcona TSA conditions.

Topping diameter

Although BC regulations require a topping diameter of 10.0 cm for most merchantable species, this analysis used 12.5 cm to reflect the more common industrial practice. Topping diameter can have a significant impact on the volume of a tree available for biomass use.

Parameters as entered into FPInterface

A summary of some of the parameters entered into FPInterface for the base case, which produces grinding costs of $27.55/ODT, is presented in Table 3. An alternative, low-cost scenario (Strathcona – LowCostAll) was also modelled, producing 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 3. FPInterface parameters: Base case

Run descriptor	Value
run name	Strathcona Jan24th
output name	Biomass - Strathcona Jan24th
block system	biomass_blocks_STR.shp
road system	roads_v2.shp
transfer yard(s)	Campbell River
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	Campbell River
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 location

All harvest residues from in-woods operations (not from mills) were directed to large industrial areas in the Strathcona TSA. In this model, Campbell River was used as the delivery location. Initial comminution was set to take place at the roadside, and costs were calculated for biomass transported to the delivery location.

Biomass calculations

The biomass calculations in FPInterface produce a volume of total biomass available once merchantable roundwood has been removed. For this project, only biomass transported to the roadside was considered recoverable, and biomass that was likely to remain at the stump or dispersed on the cutblock was not. Once it is transported to the roadside, some biomass becomes unavailable due to handling and technical losses. The remainder is considered recovered biomass. Figure 2 shows this breakdown with the values from the 20-year harvest of the base case with normal grinder utilization of 60% and fuel use of 135 L/PMH.

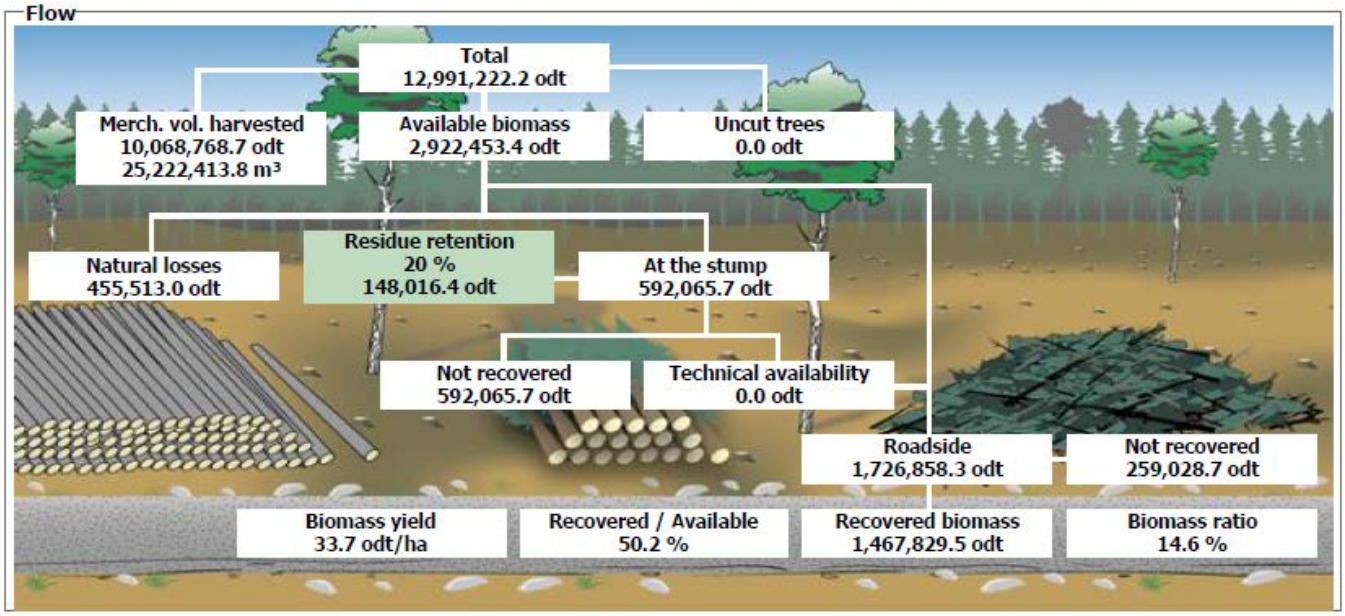


Figure 2. Recoverable biomass at delivery location.

5. Results and discussion

Summary of key results

All results from the runs performed in FPInterface are summarized in Appendix 1. The FPInterface analysis of biomass supply in the Strathcona TSA, based on inventory information and the road network supplied by the FLNRO, indicates an average biomass yield of 33.7 ODT/ha for the base case. This is in the form of comminuted hog fuel and comes from harvest residues only – tops, branches, and other roadside logging waste. The model does not calculate estimates of mill residues.

Amount of biomass available

For the base case (normal grinder utilization of 60% and fuel usage of 135 L/PMH), an estimated total of 1 467 830 ODT of biomass can be recovered from the roadside and transported to the delivery location over the course of 20 years. The amount of available biomass at any price point is relatively consistent throughout the first 3 periods (years 1-15), with the last period seeing an increase. Despite a lower planned harvest volume, the last period, years 16-20, has a greater amount of available biomass mainly due to its higher biomass ratio of 18.5% compared to the average ratio of 13.5% during the first 3 periods. The amount of biomass available each year works out to approximately 73 000 ODT/year at any price point in the study area. However, the amount of biomass available in each 5-year period varies from as much as 84 000 ODT/year in period 4 to as low as 67 000 ODT/year in period 2. The economically available volume is estimated at 15 000 ODT/year (Table 4).

Table 4. Key amounts of biomass available in the Strathcona TSA

	Volume at $60/ODT (ODT)[a]	Volume at $90/ODT (ODT)	Total volume ($240/ODT) (ODT)
Over 20-year period	294 801	720 407	1 467 830
Per year	14 740	36 020	73 391

[a] ODT: oven-dried tonne

Additionally, the model indicates that there are about 1 195 595 ODT of biomass that would be left on the cutblock and would not make it to the 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 81% 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. Further, 259 000 ODT of biomass material that makes it to the roadside is not recovered due to technical handling efficiencies; that is, the material is too small or too large for machine handling or is incorrectly positioned for economic accessibility.

Biomass ratio

The biomass ratio, which is the ratio of recovered biomass to recovered merchantable roundwood, is 14.6% for the base case scenario. In this case, 10 068 769 ODT of roundwood is expected, along with 1 467 830 ODT of biomass. Knowing the biomass ratio for an area can be useful in estimating the amount of harvest residue available if the amount of merchantable timber harvest is known.

Cost availability

FPInterface conveniently breaks down the available supply into delivered cost in $10 increments. At the presumed market rate of $60/ODT, the estimated amount available over 20 years is 294 801 ODT, or about 15 000 ODT/year. The complete results in $10 increments for the entire 20-year period are presented in Table 5 and Figure 3.

Table 5. Cost availability of biomass in the Strathcona TSA: Base case

Cost ($/ODT)[a]	Total (ODT)	Annual (ODT)
10	–	–
20	–	–
30	–	–
40	13 053.5	652.7
50	106 803.5	5 340.2
60	294 800.9	14 740.0
70	509 270.2	25 463.5
80	634 448.7	31 722.4
90	720 406.6	36 020.3
100	795 199.5	39 760.0
110	928 807.8	46 440.4
120	1 067 378.1	53 368.9
130	1 214 040.3	60 702.0
140	1 315 317.3	65 765.9
150	1 381 175.7	69 058.8
160	1 412 966.6	70 648.3
170	1 439 380.8	71 969.0
180	1 442 673.2	72 133.7
190	1 454 291.0	72 714.6
200	1 459 391.2	72 969.6
210	1 467 186.8	73 359.3
220	1 467 186.8	73 359.3
230	1 467 195.4	73 359.8
240	1 467 829.5	73 391.5

[a] 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/ODT and $60/ODT.

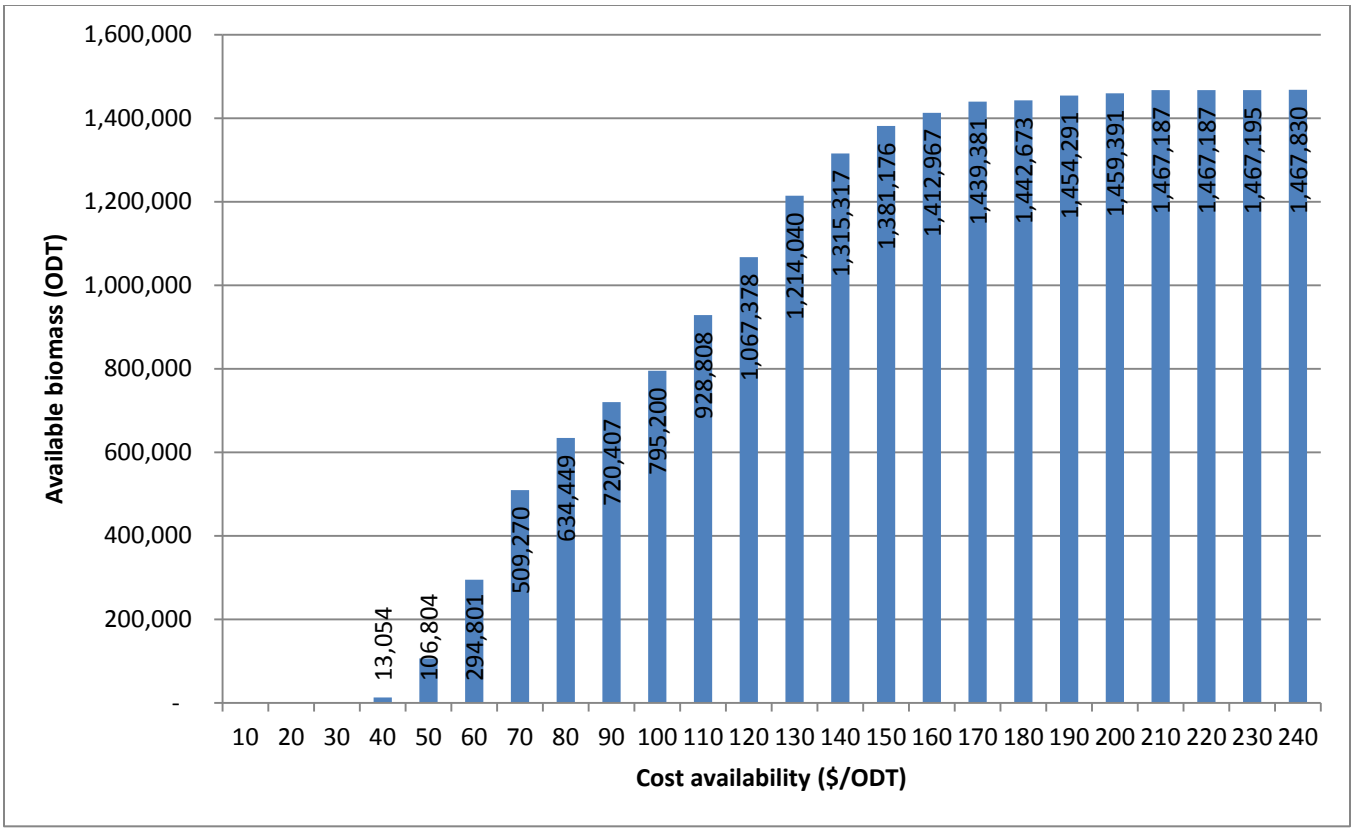


Figure 3. Cost availability of biomass in the Strathcona TSA, over 20 years: Base case.

Low-cost scenario

In addition to the base case scenario, with a grinding cost of $27.55/ODT, a scenario with a grinding cost of $22.50/ODT was examined ($5.05 less than 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 6 and Figure 4).

Table 6. Cost availability of biomass in the Strathcona TSA: Comparison of the base case and low-cost scenarios

	Base case (grinding cost of 27.55/ODT)		Low-cost scenario (grinding cost of $22.50/ODT)	
Cost ($/ODT)[a]	Total (ODT)	Annual (ODT)	Total (ODT)	Annual (ODT)
10	–	–	–	–
20	–	–	–	–
30	–	–	–	–
40	13 054	653	46 933	2 347
50	106 804	5 340	183 843	9 192
60	294 801	14 740	415 838	20 792
70	509 270	25 464	570 245	28 512
80	634 449	31 722	665 504	33 275
90	720 407	36 020	755 097	37 755
100	795 200	39 760	852 145	42 607
110	928 808	46 440	996 757	49 838
120	1 067 378	53 369	1 144 778	57 239
130	1 214 040	60 702	1 256 756	62 838
140	1 315 317	65 766	1 347 980	67 399
150	1 381 176	69 059	1 399 576	69 979
160	1 412 967	70 648	1 429 686	71 484
170	1 439 381	71 969	1 441 380	72 069
180	1 442 673	72 134	1 444 326	72 216
190	1 454 291	72 715	1 456 451	72 823
200	1 459 391	72 970	1 467 187	73 359
210	1 467 187	73 359	1 467 187	73 359
220	1 467 187	73 359	1 467 187	73 359
230	1 467 195	73 360	1 467 195	73 360
240	1 467 830	73 391	1 467 830	73 391

[a] ODT: oven-dried tonne

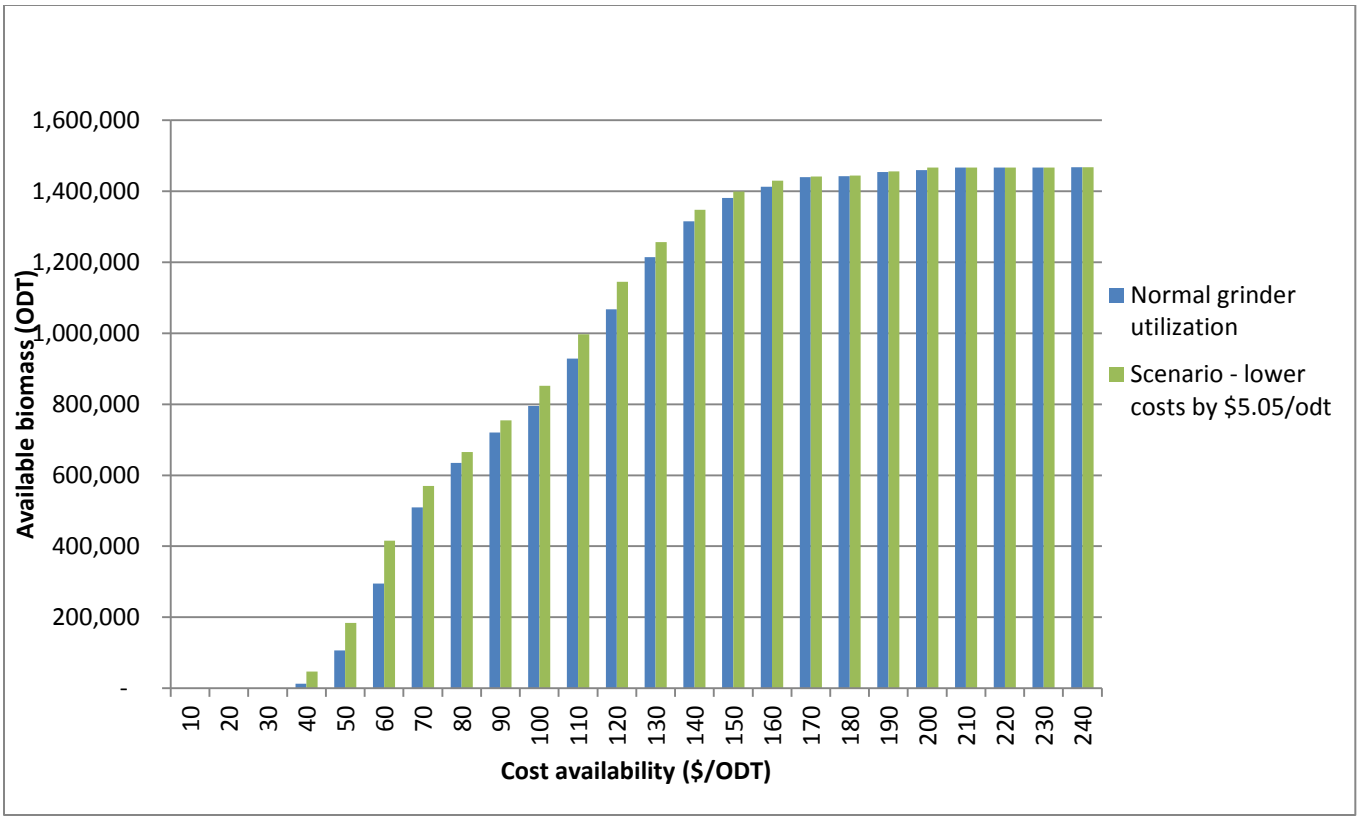


Figure 4. Cost availability of biomass in the Strathcona TSA over 20-year period: Comparison of the base case and low-cost grinding scenarios.

Decreasing costs by $5.05/ODT produces some large increases in availability. At $60/ODT, more than 120 000 ODT of biomass would be available over 20 years at the lower grinding costs; approximately 40% more would be available than in the base case. This equates to over 6 000 ODT more per year. This difference of availability at $60/ODT, the presumed market rate for biomass, is highlighted in Figure 5.

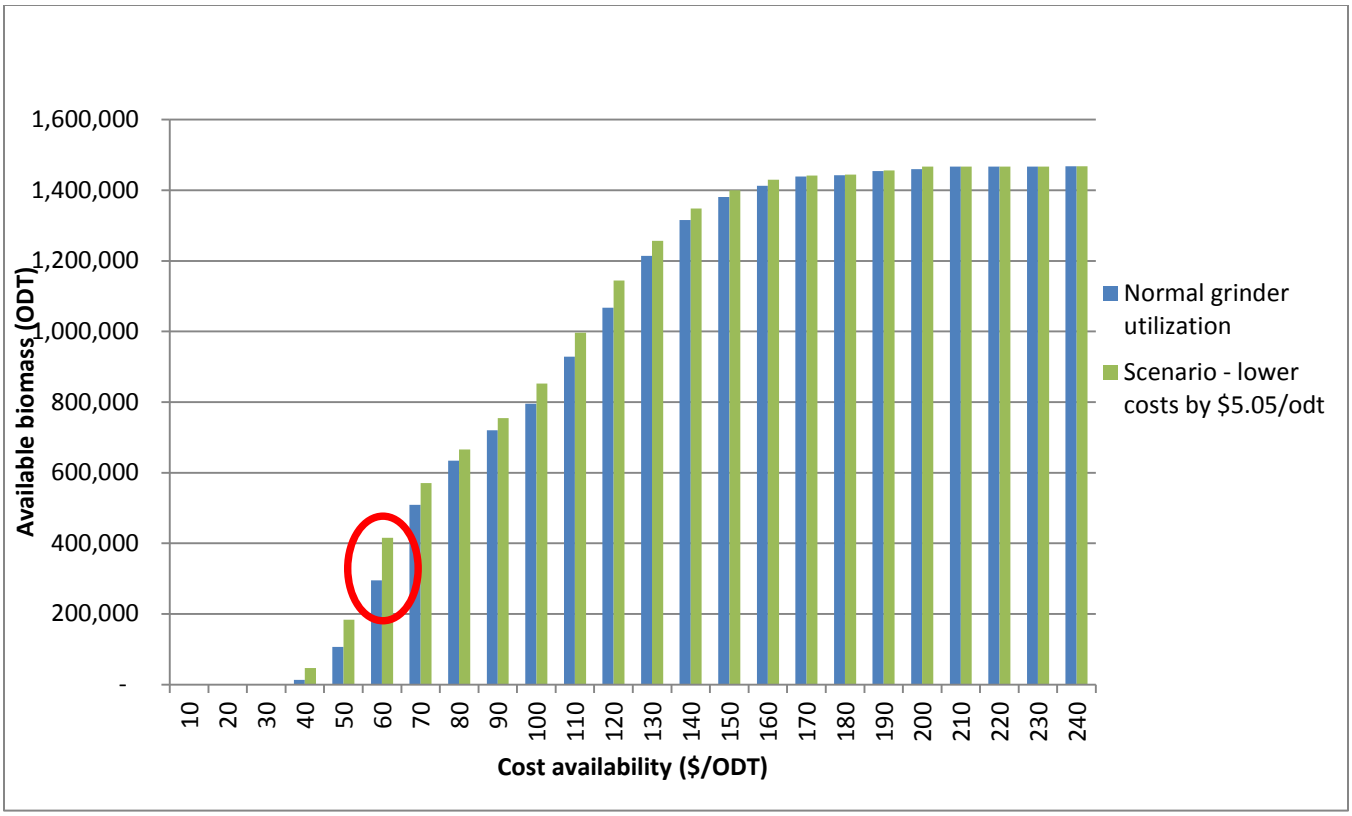


Figure 5. Cost availability of biomass in the Strathcona TSA, over 20-year period: Comparison of the base case and low-cost grinding scenarios, with the difference at $60/ODT highlighted.

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 impact this has on availability is much greater because of the spatial distribution of biomass. The average price for delivered biomass across the study area is shown in Table 7. The higher-than-normal average costs are due to a large number of harvest blocks being located a long distance from the delivery location.

Table 7. Average cost of delivered biomass across entire study area

Fuel price	Average cost of delivered biomass
Base case – Grinding at $27.55/ODT[a]	$95.02
Low-cost scenario – Grinding at $22.50/ODT	$89.97

[a] ODT: oven-dried tonne

Mapping

FPInterface shows the distribution of costs by cutblock graphically with a colour scale ranging from lime to pink, as seen in Figure 6. The costs range up to $239/ODT for the blocks farthest from the delivery point. The blocks are indicated in colour increments, with the greenest points representing the lowest delivered biomass costs, and the pinkest ones being the highest, with a gray transition in the middle.

Figure 6. Cost of delivered biomass in the Strathcona TSA, in increments $10/ODT, as shown in FPInterface.

The delivery point (Campbell River) is represented by the blue triangle. All biomass from the study area was scheduled for delivery to this point.

Showing the roads on the map makes it a little more difficult to distinguish the blocks, but these are shown in Figure 7.

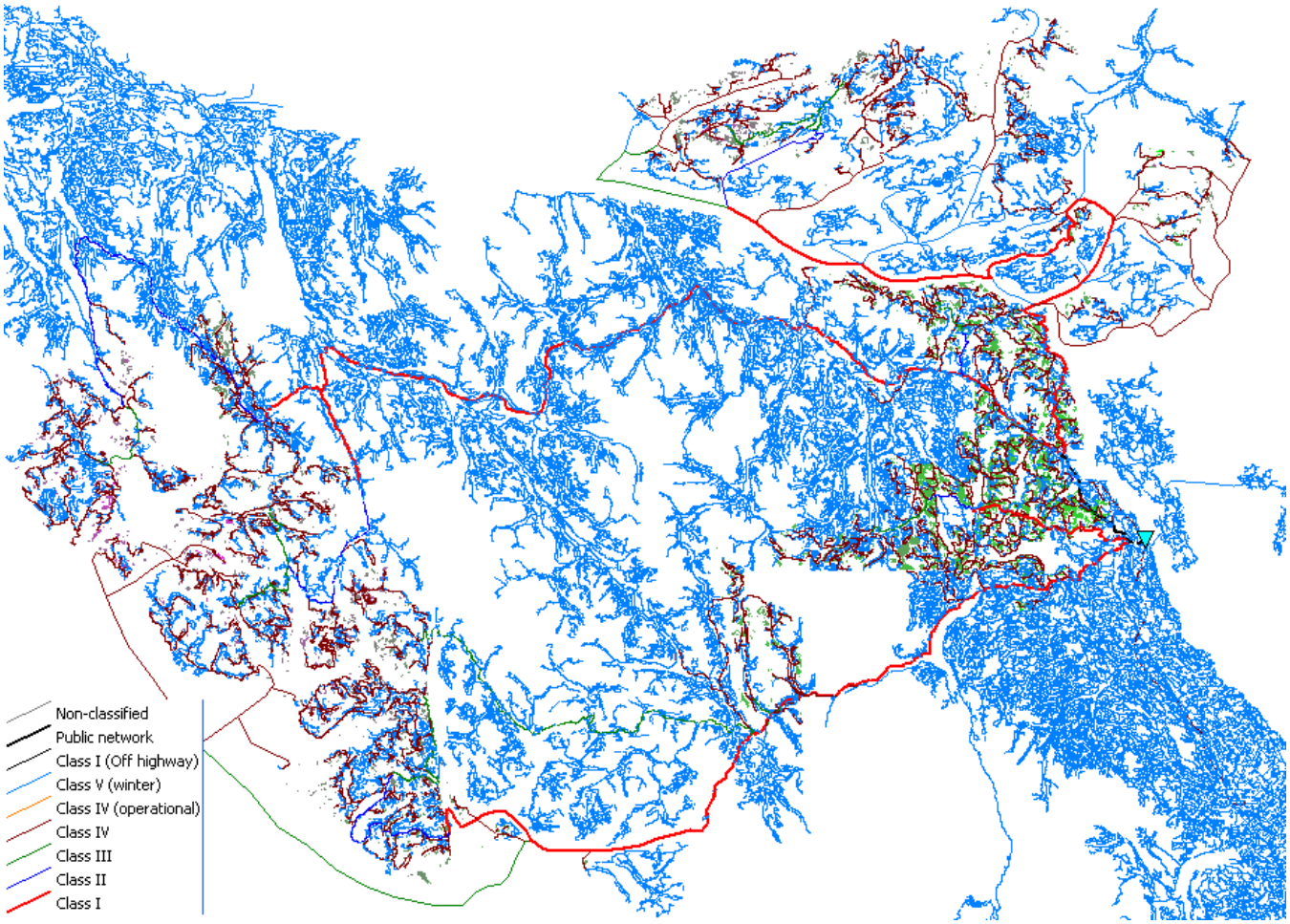


Figure 7. Blocks with road access in the Strathcona TSA, as shown in FPInterface.

The colours associated with the roads represent different road classes. Each road class has a unique set of speed associations for loaded and empty trucks that help to determine the cycle times used to calculate the delivery cost for biomass (Table 2). Most of the slowest roads are in blue on this map, while the fastest ones are in red and black. Road class is determined by the amount of harvest that passes over the road. As previously mentioned, some roads were created over water in order to access the islands in the Strathcona TSA.

Temporal distribution of harvest

The harvest data contains a temporal period assigned to each cutblock. There are four periods in the data representing 5-year periods. The first period covers the first five years of harvest cutblocks, and so on.

The harvest projection shows a relatively steady supply of biomass available between each harvest period, with an increase in period 4, as shown in Figure 8.

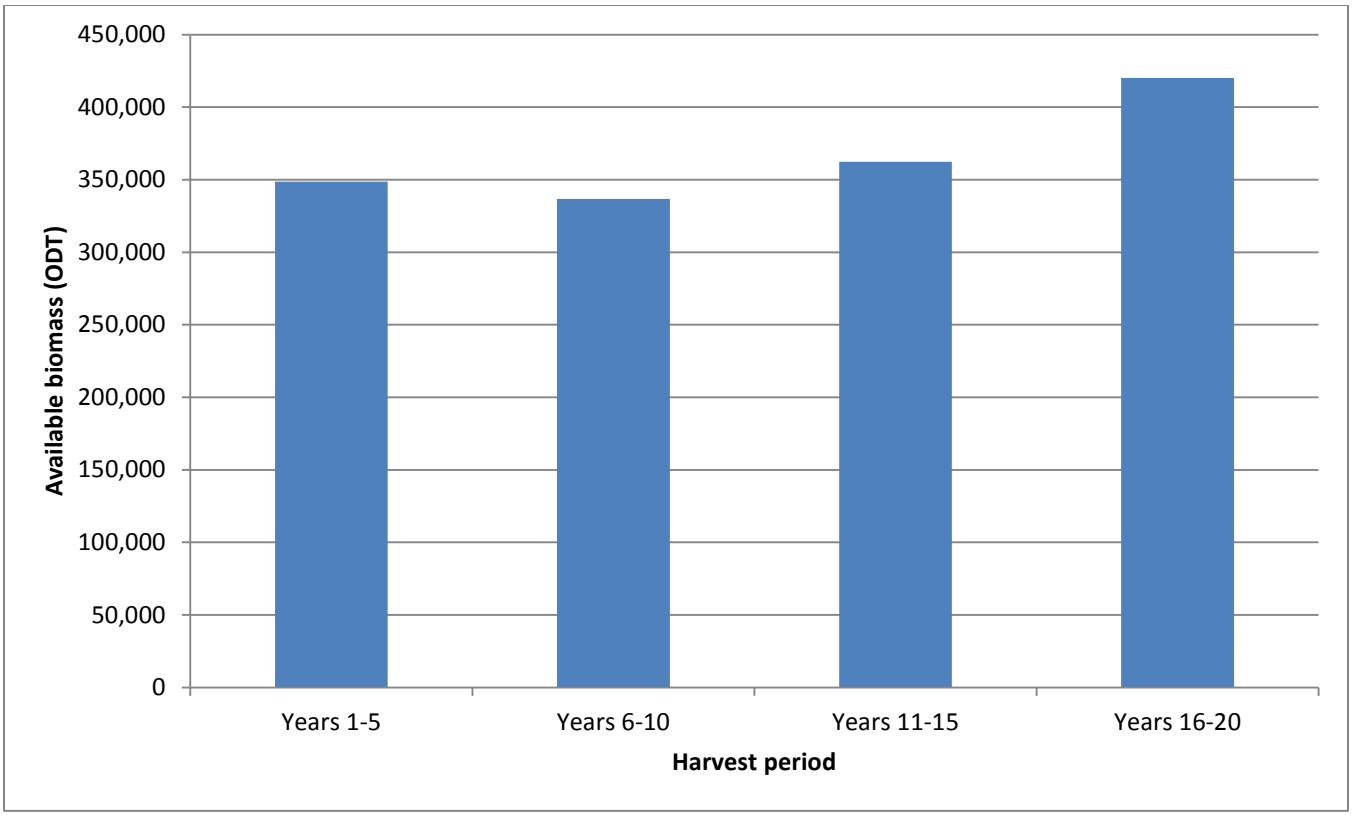


Figure 8. Availability of biomass in the Strathcona TSA, by 5-year harvest period.

Looking at the economic harvest available, which is the amount of biomass available at $60/ODT, as seen in Figure 9, there is a disproportionate decline after each period (compared to Figure 8). This indicates that the harvest blocks tend to be farther from the delivery location after each period.

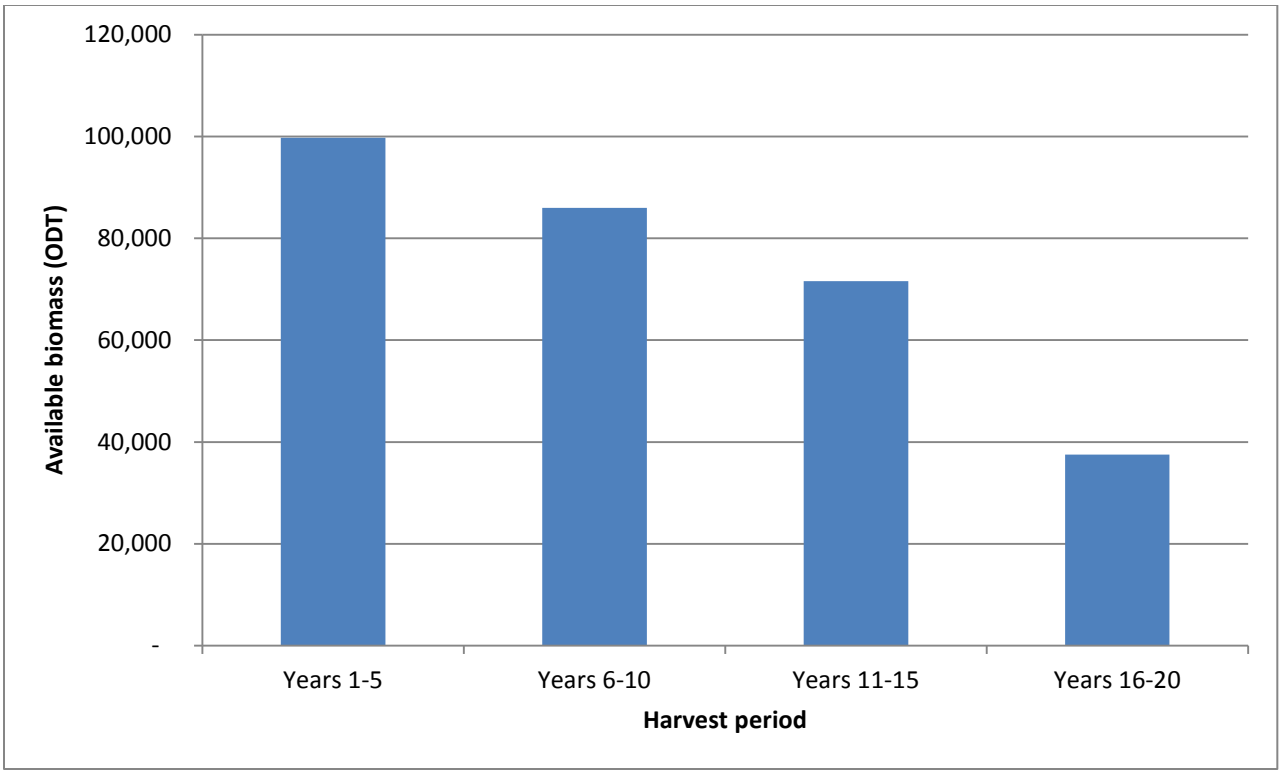


Figure 9. Availability of economic biomass in the Strathcona TSA, by 5-year harvest period, at ≤$60/ODT.

The data for cost availability by period at all price points in $10 increments is shown in Tables 8 and 9 for both the base case and the low-cost scenario.

Table 8. Cost availability of biomass in the Strathcona TSA, by 5-year harvest period: Base case

	Period 1 (years 1-5)		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	3 610	722	4 264	853	5 061	1 012	118	24
50	29 332	5 866	31 283	6 257	36 245	7 249	9 944	1 989
60	99 720	19 944	85 963	17 193	71 583	14 317	37 534	7 507
70	168 430	33 686	153 131	30 626	114 679	22 936	73 030	14 606
80	199 165	39 833	181 708	36 342	141 276	28 255	112 301	22 460
90	216 416	43 283	197 246	39 449	166 872	33 374	139 873	27 975
100	228 855	45 771	213 448	42 690	193 219	38 644	159 678	31 936
110	264 499	52 900	246 061	49 212	223 418	44 684	194 830	38 966
120	297 477	59 495	274 666	54 933	257 189	51 438	238 047	47 609
130	323 913	64 783	310 727	62 145	290 367	58 073	289 033	57 807
140	334 449	66 890	327 191	65 438	325 308	65 062	328 370	65 674
150	342 271	68 454	332 123	66 425	348 042	69 608	358 740	71 748
160	346 279	69 256	335 349	67 070	357 205	71 441	374 134	74 827
170	347 953	69 591	336 354	67 271	360 625	72 125	394 449	78 890
180	348 152	69 630	336 418	67 284	362 195	72 439	395 908	79 182
190	348 620	69 724	336 798	67 360	362 195	72 439	406 678	81 336
200	–	–	–	–	362 368	72 474	411 606	82 321
210	–	–	–	–	–	–	419 402	83 880
220	–	–	–	–	–	–	419 402	83 880
230	–	–	–	–	–	–	419 410	83 882
240	–	–	–	–	–	–	420 044	84 009

[a] ODT: oven-dried tonne

Table 9. Cost availability of biomass in the Strathcona TSA, by 5-year harvest period: Low-cost scenario

	Period 1 (years 1-5)		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	10 651	2 130	14 324	2 865	17 212	3 442	4 747	949
50	68 595	13 719	48 531	9 706	51 385	10 277	15 332	3 066
60	142 540	28 508	125 860	25 172	87 130	17 426	60 308	12 062
70	181 751	36 350	169 437	33 887	130 403	26 081	88 654	17 731
80	204 444	40 889	184 423	36 885	154 030	30 806	122 608	24 522
90	218 948	43 790	202 623	40 525	183 256	36 651	150 270	30 054
100	240 989	48 198	230 295	46 059	204 288	40 858	176 574	35 315
110	277 146	55 429	257 217	51 443	241 828	48 366	220 565	44 113
120	309 188	61 838	299 868	59 974	271 152	54 230	264 571	52 914
130	329 251	65 850	317 488	63 498	306 069	61 214	303 948	60 790
140	339 411	67 882	329 848	65 970	338 234	67 647	340 488	68 098
150	346 279	69 256	333 667	66 733	352 401	70 480	367 230	73 446
160	347 113	69 423	336 348	67 270	358 816	71 763	387 409	77 482
170	347 959	69 592	336 418	67 284	362 195	72 439	394 808	78 962
180	348 300	69 660	336 798	67 360	362 195	72 439	397 033	79 407
190	348 620	69 724	–	–	362 293	72 459	408 741	81 748
200	–	–	–	–	362 368	72 474	419 402	83 880
210	–	–	–	–	–	–	419 402	83 880
220	–	–	–	–	–	–	419 402	83 880
230	–	–	–	–	–	–	419 410	83 882
240	–	–	–	–	–	–	420 044	84 009

[a] ODT: oven-dried tonne

Results appendices

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

6. Conclusion

The estimated yield of biomass from harvest residues for the Strathcona TSA is 33.7 ODT/ha. Over the next 20 years, a total of 1.47 million ODT of available biomass could be generated by harvest in the TSA, or approximately 73 000 ODT/year. Of this amount, approximately 294 800 ODT in total, or 15 000 ODT/year, is expected to be available at the economic price of $60/ODT. Approximately one half of the available amount is expected to be available at $90/ODT: a total of 720 000 ODT, or 36 000 ODT/year. The biomass ratio, which is the ratio of recovered biomass to recovered merchantable roundwood, is estimated at 14.6%.

A low-cost scenario was attempted, with grinding costs reduced by $5.05/ODT. At the economic rate of $60/ODT, availability of biomass increased by approximately 120 000 ODT over 20 years, or about 6 000 ODT/year. If increases in efficiency or decreases in cost can be realized, the biomass available could be increased by this amount.

Most of the biomass that is considered economically available (≤ $60/ODT) is closer to the TSA's delivery point. The amount of economically available biomass decreases considerably after each 5-year period. This decrease may be attributed to an increased distance between the planned harvest blocks and the delivery location.

7. References

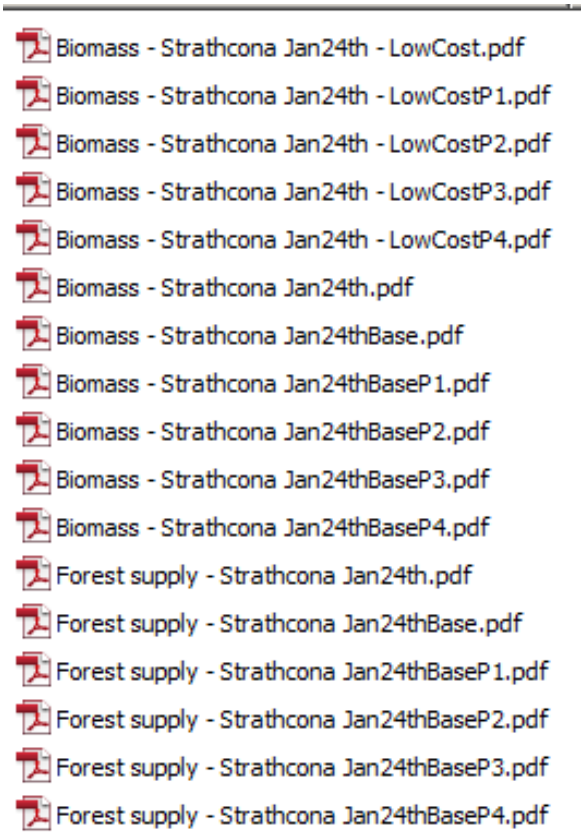
Friesen, C., & Goodison, A. (2018). *Using FPInterface to estimate available forest-origin biomass in British Columbia: Quesnel TSA* (Technical Report No. 7). Vancouver, British Columbia: FPInnovations.

Lambert, M.-C., Ung, C.-H., & Raulier, F. (2005). Canadian national tree aboveground biomass equations. *Canadian Journal of Forest Research, 35(8)*, 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, 38(5)*, 1123-1132.

8. Appendix


Biomass - Strathcona Jan24th - LowCost.pdf
Biomass - Strathcona Jan24th - LowCostP1.pdf
Biomass - Strathcona Jan24th - LowCostP2.pdf
Biomass - Strathcona Jan24th - LowCostP3.pdf
Biomass - Strathcona Jan24th - LowCostP4.pdf
Biomass - Strathcona Jan24th.pdf
Biomass - Strathcona Jan24thBase.pdf
Biomass - Strathcona Jan24thBaseP1.pdf
Biomass - Strathcona Jan24thBaseP2.pdf
Biomass - Strathcona Jan24thBaseP3.pdf
Biomass - Strathcona Jan24thBaseP4.pdf
Forest supply - Strathcona Jan24th.pdf
Forest supply - Strathcona Jan24thBase.pdf
Forest supply - Strathcona Jan24thBaseP1.pdf
Forest supply - Strathcona Jan24thBaseP2.pdf
Forest supply - Strathcona Jan24thBaseP3.pdf
Forest supply - Strathcona Jan24thBaseP4.pdf

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

Statistics - Selected Items

Area	43,568.7 ha
Number of cut blocks	3333
Recovered biomass	1,467,829.5 odt
Biomass yield	33.7 odt/ha
Biomass odt / Merchantable m^3	0.0670 odt/m^3
Delivered products	
• Chips	100 %
• Bundles	0 %
• Trunks and Residues	0 %
Energy balance	28 : 1
Available energy	5,572,622 MWh
Fuel consumption	15.4 L/odt

Cost

Harvesting	0.00 $/odt
Biomass recovery	22.50 $/odt
Transfer yard	0.00 $/odt
Transportation	50.31 $/odt
Loading/unloading	15.14 $/odt
Stumpage fees	0.00 $/odt
Road network - Maintenance	2.02 $/odt
Indirect costs	0.00 $/odt
Total	89.97 $/odt

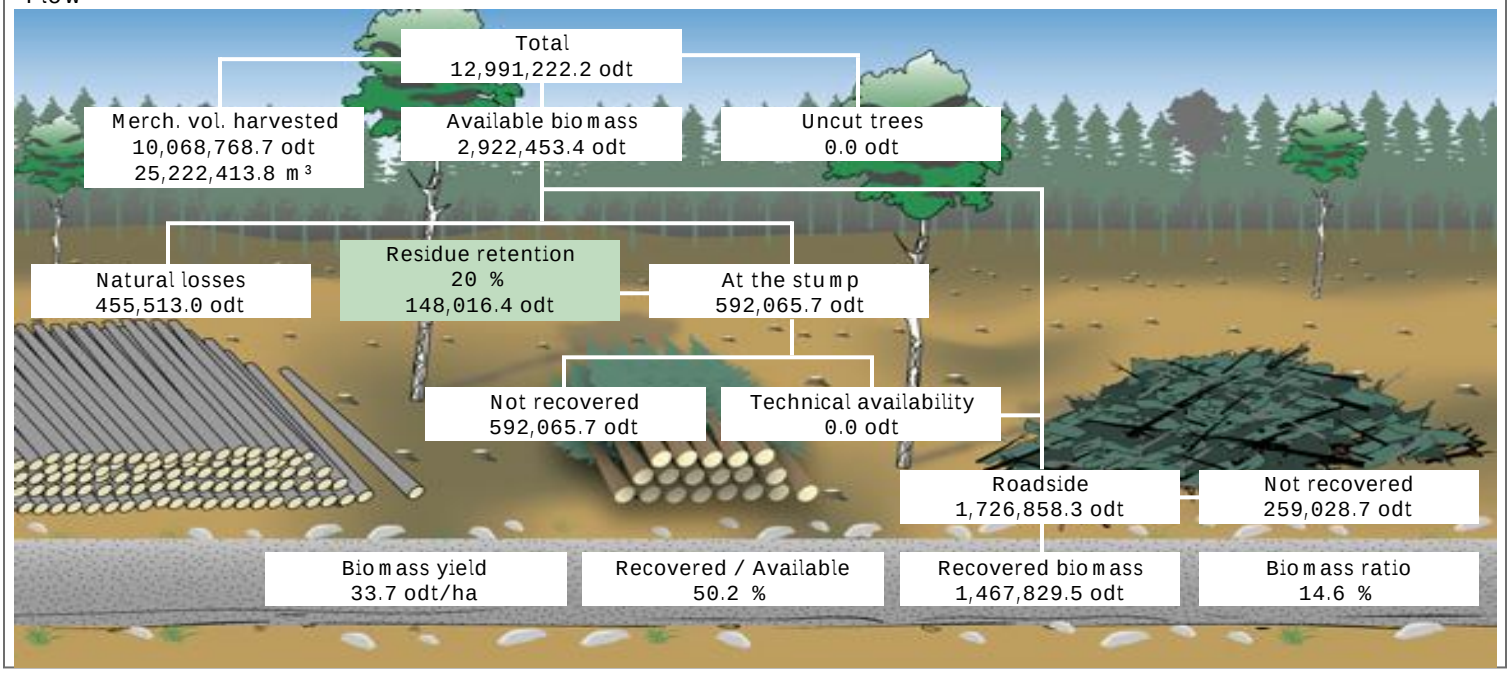
Revenue

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

Net

Profit	-89.97 $/odt

Flow



Products

Product name	odt	odt/m³	odt/ha
Western Hemlock (residues)	628,323.3	0.0656	14.42
Douglas Fir (residues)	340,577.0	0.0721	7.82
Western Red Cedar (residues)	230,989.9	0.0690	5.30
Subalpine Fir (residues)	149,681.9	0.0582	3.44
Red Alder (residues)	71,102.0	0.1006	1.63
Yellow Cedar (residues)	32,095.2	0.0422	0.74
White Spruce (residues)	11,331.5	0.0726	0.26
Lodgepole Pine (residues)	2,527.7	0.0529	0.06
Western White Pine (residues)	869.6	0.0719	0.02
Trembling Aspen (residues)	331.4	0.0776	0.01
	1,467,829.5	0.0670	33.69

Recovery summary

	Volume(odt)	Area(ha)	Number of cut blocks
• Biomass recovery location			
At the stump	0.0	0.0	0
Roadside	1,467,829.5	43,568.7	3,333
• Recovery season			
Summer	0.0	0.0	0
Winter	1,467,829.5	43,568.7	3,333
• Residue freshness			
Fresh	0.0	0.0	0
Brown	1,467,829.5	43,568.7	3,333
Brittle	0.0	0.0	0

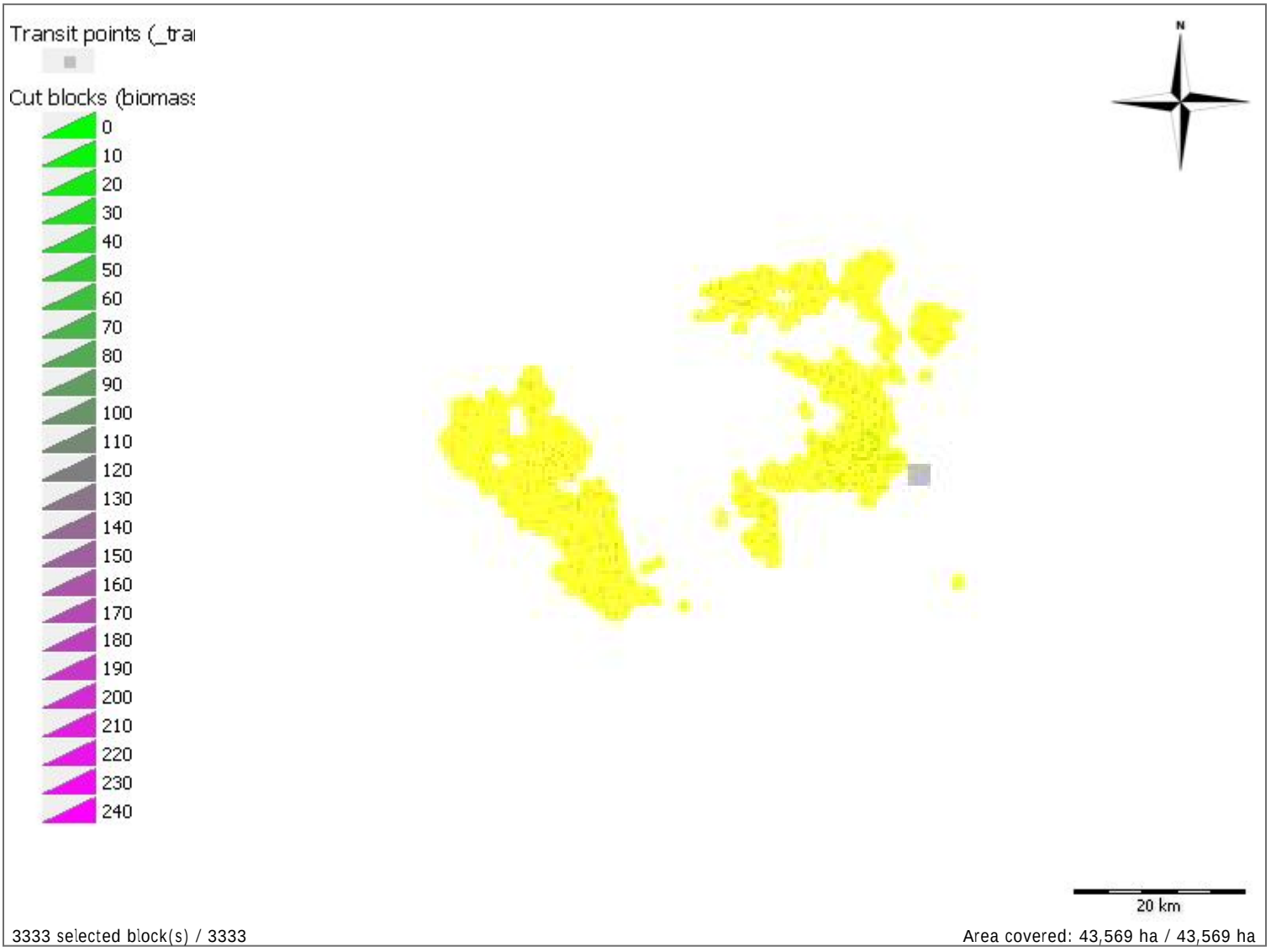
Supply summary

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	46,933.0	46,933.0
50 $/odt	0.0	183,842.7	183,842.7
60 $/odt	0.0	415,838.0	415,838.0
70 $/odt	0.0	570,245.3	570,245.3
80 $/odt	0.0	665,504.2	665,504.2
90 $/odt	0.0	755,097.0	755,097.0
100 $/odt	0.0	852,144.9	852,144.9
110 $/odt	0.0	996,757.1	996,757.1
120 $/odt	0.0	1,144,778.2	1,144,778.2
130 $/odt	0.0	1,256,755.5	1,256,755.5
140 $/odt	0.0	1,347,979.9	1,347,979.9
150 $/odt	0.0	1,399,575.8	1,399,575.8
160 $/odt	0.0	1,429,685.9	1,429,685.9
170 $/odt	0.0	1,441,380.4	1,441,380.4
180 $/odt	0.0	1,444,325.9	1,444,325.9
190 $/odt	0.0	1,456,451.0	1,456,451.0
200 $/odt	0.0	1,467,186.8	1,467,186.8
210 $/odt	0.0	1,467,186.8	1,467,186.8
220 $/odt	0.0	1,467,186.8	1,467,186.8
230 $/odt	0.0	1,467,195.4	1,467,195.4
240 $/odt	0.0	1,467,829.5	1,467,829.5

Maximum cost	0.00 $/odt	233.86 $/odt

Delivery to mills

Destination	Product	Format	odt	Transport average distance (Km)
Campbell River				
	Douglas Fir (residues)	Chips	340,577	61
	Lodgepole Pine (residues)	Chips	2,528	75
	Red Alder (residues)	Chips	71,102	102
	Subalpine Fir (residues)	Chips	149,682	146
	Trembling Aspen (residues)	Chips	331	151
	Western Hemlock (residues)	Chips	628,323	127
	Western Red Cedar (residues)	Chips	230,990	157
	Western White Pine (residues)	Chips	870	36
	White Spruce (residues)	Chips	11,332	203
	Yellow Cedar (residues)	Chips	32,095	150
			1,467,830	118
			1,467,830	118


Transit points (_trai
Cut blocks (biomass
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
210
220
230
240
N
20 km
3333 selected block(s) / 3333
Area covered: 43,569 ha / 43,569 ha

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

Statistics - Selected Items

Area	11,105.1 ha
Number of cut blocks	625
Recovered biomass	348,619.5 odt
Biomass yield	31.4 odt/ha
Biomass odt / Merchantable m^3	0.0588 odt/m^3
Delivered products	
• Chips	100 %
• Bundles	0 %
• Trunks and Residues	0 %
Energy balance	31 : 1
Available energy	1,325,699 MWh
Fuel consumption	14.1 L/odt

Cost

Harvesting	0.00 $/odt
Biomass recovery	22.50 $/odt
Transfer yard	0.00 $/odt
Transportation	43.41 $/odt
Loading/unloading	10.88 $/odt
Stumpage fees	0.00 $/odt
Road network - Maintenance	1.78 $/odt
Indirect costs	0.00 $/odt
Total	78.57 $/odt

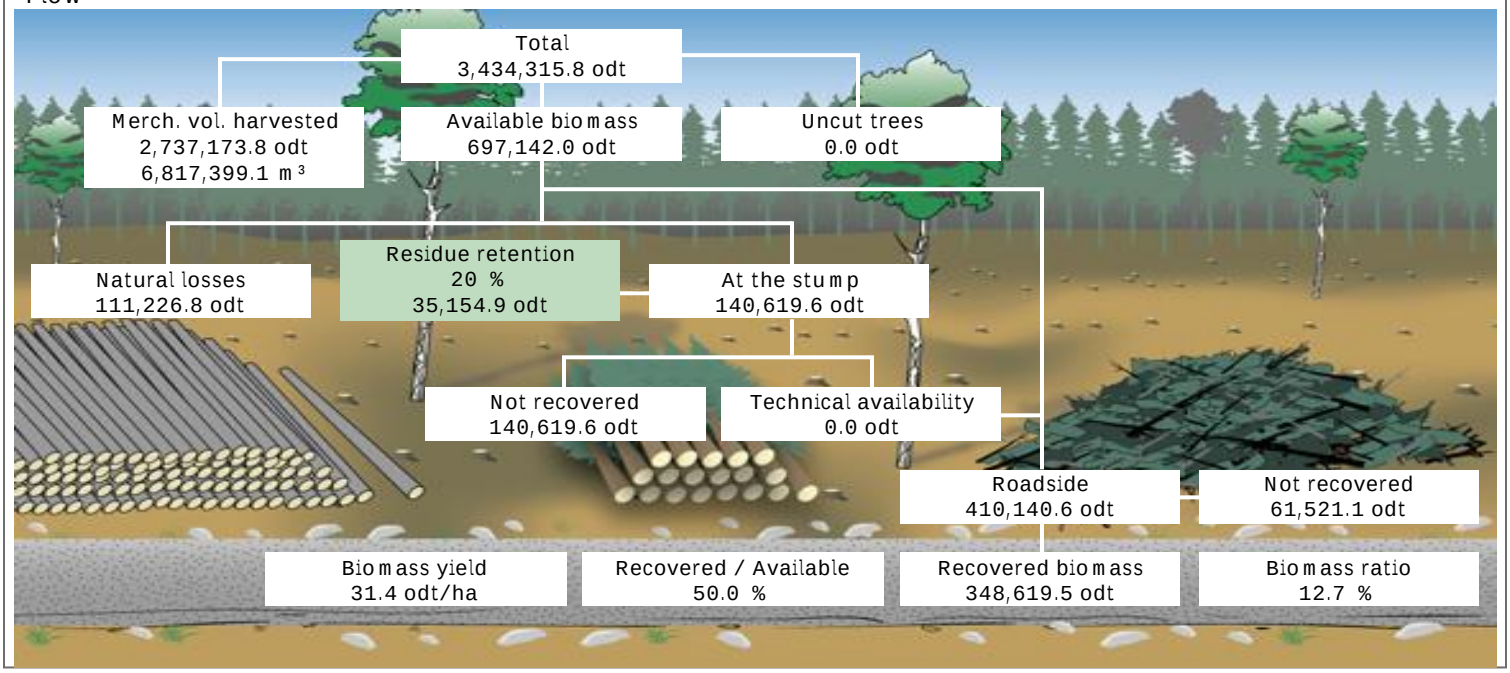
Revenue

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

Net

Profit	-78.57 $/odt

Flow



Products

Product name	odt	odt/m³	odt/ha
Western Hemlock (residues)	144,422.8	0.0565	13.01
Douglas Fir (residues)	87,894.8	0.0633	7.91
Western Red Cedar (residues)	50,597.4	0.0610	4.56
Subalpine Fir (residues)	38,174.3	0.0544	3.44
Red Alder (residues)	13,839.9	0.0948	1.25
Yellow Cedar (residues)	10,823.3	0.0415	0.97
White Spruce (residues)	2,321.9	0.0671	0.21
Lodgepole Pine (residues)	369.0	0.0403	0.03
Western White Pine (residues)	144.8	0.0644	0.01
Trembling Aspen (residues)	31.5	0.0488	0.00
	348,619.5	0.0588	31.39

Recovery summary

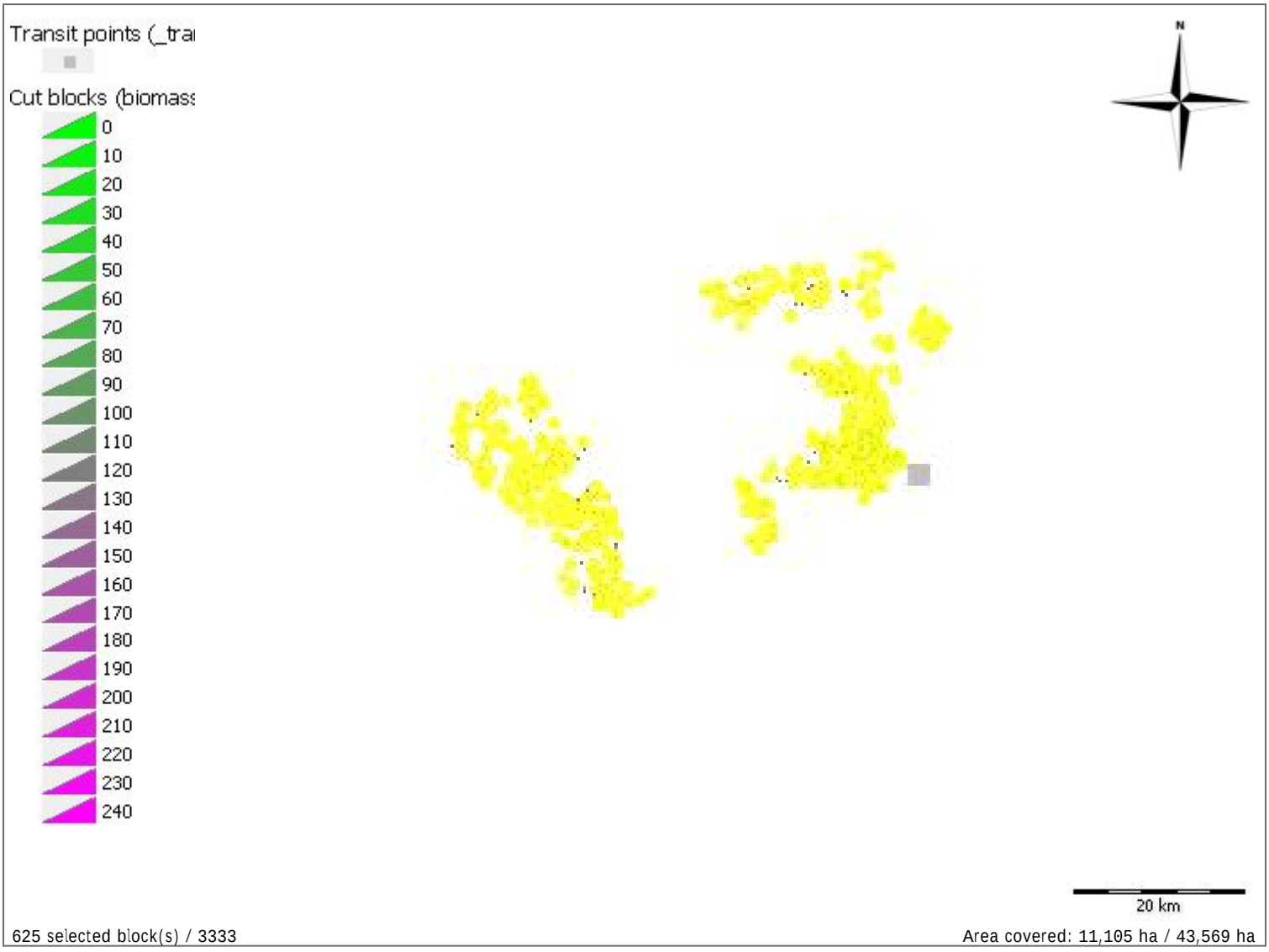
	Volume(odt)	Area(ha)	Number of cut blocks
• Biomass recovery location			
At the stump	0.0	0.0	0
Roadside	348,619.5	11,105.1	625
• Recovery season			
Summer	0.0	0.0	0
Winter	348,619.5	11,105.1	625
• Residue freshness			
Fresh	0.0	0.0	0
Brown	348,619.5	11,105.1	625
Brittle	0.0	0.0	0

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	10,650.5	10,650.5
50 $/odt	0.0	68,595.0	68,595.0
60 $/odt	0.0	142,540.4	142,540.4
70 $/odt	0.0	181,750.9	181,750.9
80 $/odt	0.0	204,443.5	204,443.5
90 $/odt	0.0	218,948.3	218,948.3
100 $/odt	0.0	240,988.7	240,988.7
110 $/odt	0.0	277,146.2	277,146.2
120 $/odt	0.0	309,187.7	309,187.7
130 $/odt	0.0	329,250.7	329,250.7
140 $/odt	0.0	339,410.7	339,410.7
150 $/odt	0.0	346,278.5	346,278.5
160 $/odt	0.0	347,113.4	347,113.4
170 $/odt	0.0	347,959.0	347,959.0
180 $/odt	0.0	348,299.8	348,299.8
190 $/odt	0.0	348,619.5	348,619.5
Maximum cost	0.00 $/odt	184.17 $/odt	

Delivery to mills

Destination	Product	Format	odt	Transport average distance (Km)
Campbell River				
	Douglas Fir (residues)	Chips	87,895	46
	Lodgepole Pine (residues)	Chips	369	73
	Red Alder (residues)	Chips	13,840	79
	Subalpine Fir (residues)	Chips	38,174	145
	Trembling Aspen (residues)	Chips	31	204
	Western Hemlock (residues)	Chips	144,423	113
	Western Red Cedar (residues)	Chips	50,597	148
	Western White Pine (residues)	Chips	145	34
	White Spruce (residues)	Chips	2,322	193
	Yellow Cedar (residues)	Chips	10,823	148
			348,620	105
			348,620	105


Transit points (_trai
Cut blocks (biomass
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
210
220
230
240
N
20 km
625 selected block(s) / 3333
Area covered: 11,105 ha / 43,569 ha

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

Statistics - Selected Items

Area	10,603.8 ha
Number of cut blocks	721
Recovered biomass	336,797.9 odt
Biomass yield	31.8 odt/ha
Biomass odt / Merchantable m^3	0.0600 odt/m^3
Delivered products	
• Chips	100 %
• Bundles	0 %
• Trunks and Residues	0 %
Energy balance	30 : 1
Available energy	1,278,415 MWh
Fuel consumption	14.4 L/odt

Cost

Harvesting	0.00 $/odt
Biomass recovery	22.50 $/odt
Transfer yard	0.00 $/odt
Transportation	44.66 $/odt
Loading/unloading	11.26 $/odt
Stumpage fees	0.00 $/odt
Road network - Maintenance	1.85 $/odt
Indirect costs	0.00 $/odt
Total	80.27 $/odt

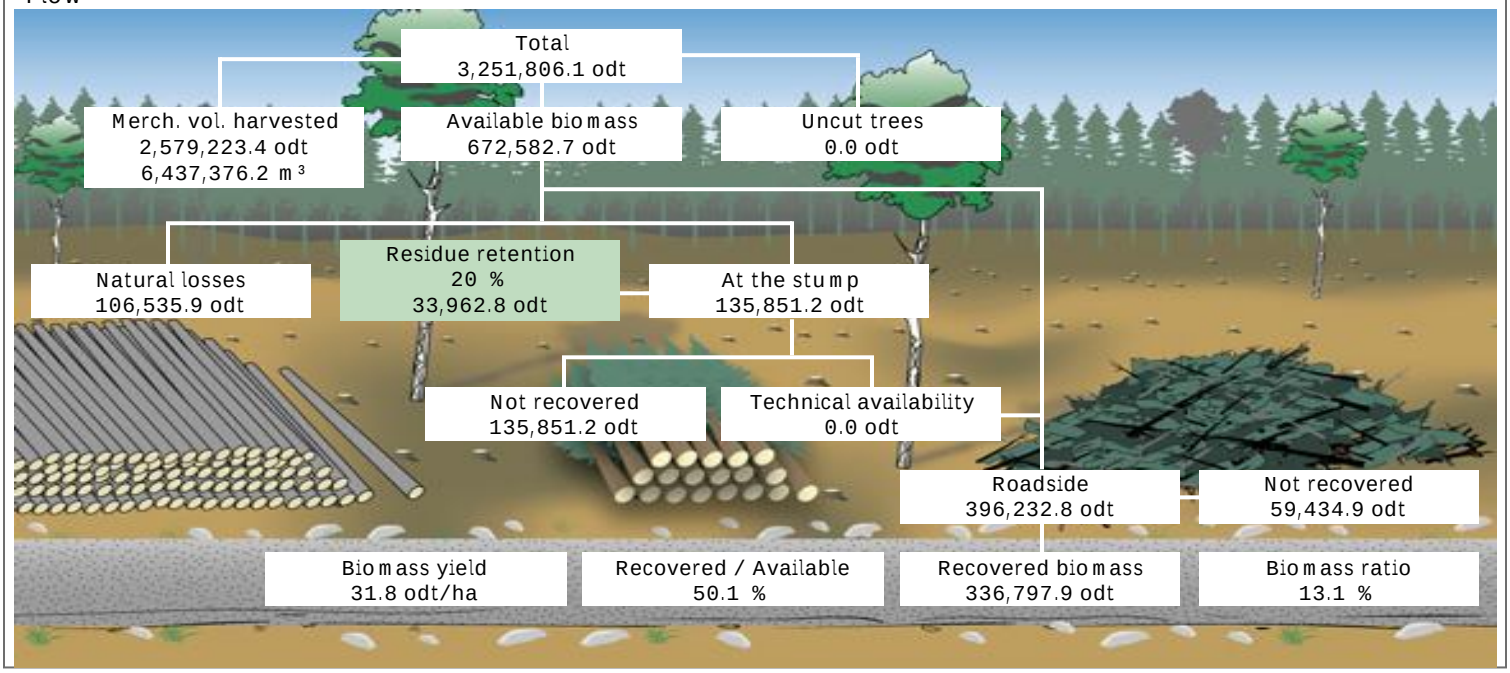
Revenue

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

Net

Profit	-80.27 $/odt

Flow



Products

Product name	odt	odt/m³	odt/ha
Western Hemlock (residues)	139,060.2	0.0571	13.11
Douglas Fir (residues)	85,578.4	0.0660	8.07
Western Red Cedar (residues)	48,480.0	0.0602	4.57
Subalpine Fir (residues)	36,608.1	0.0549	3.45
Red Alder (residues)	16,996.7	0.0953	1.60
Yellow Cedar (residues)	7,525.7	0.0410	0.71
White Spruce (residues)	1,792.8	0.0654	0.17
Lodgepole Pine (residues)	472.6	0.0432	0.04
Western White Pine (residues)	232.0	0.0684	0.02
Trembling Aspen (residues)	51.5	0.0596	0.00
	336,797.9	0.0600	31.76

Recovery summary

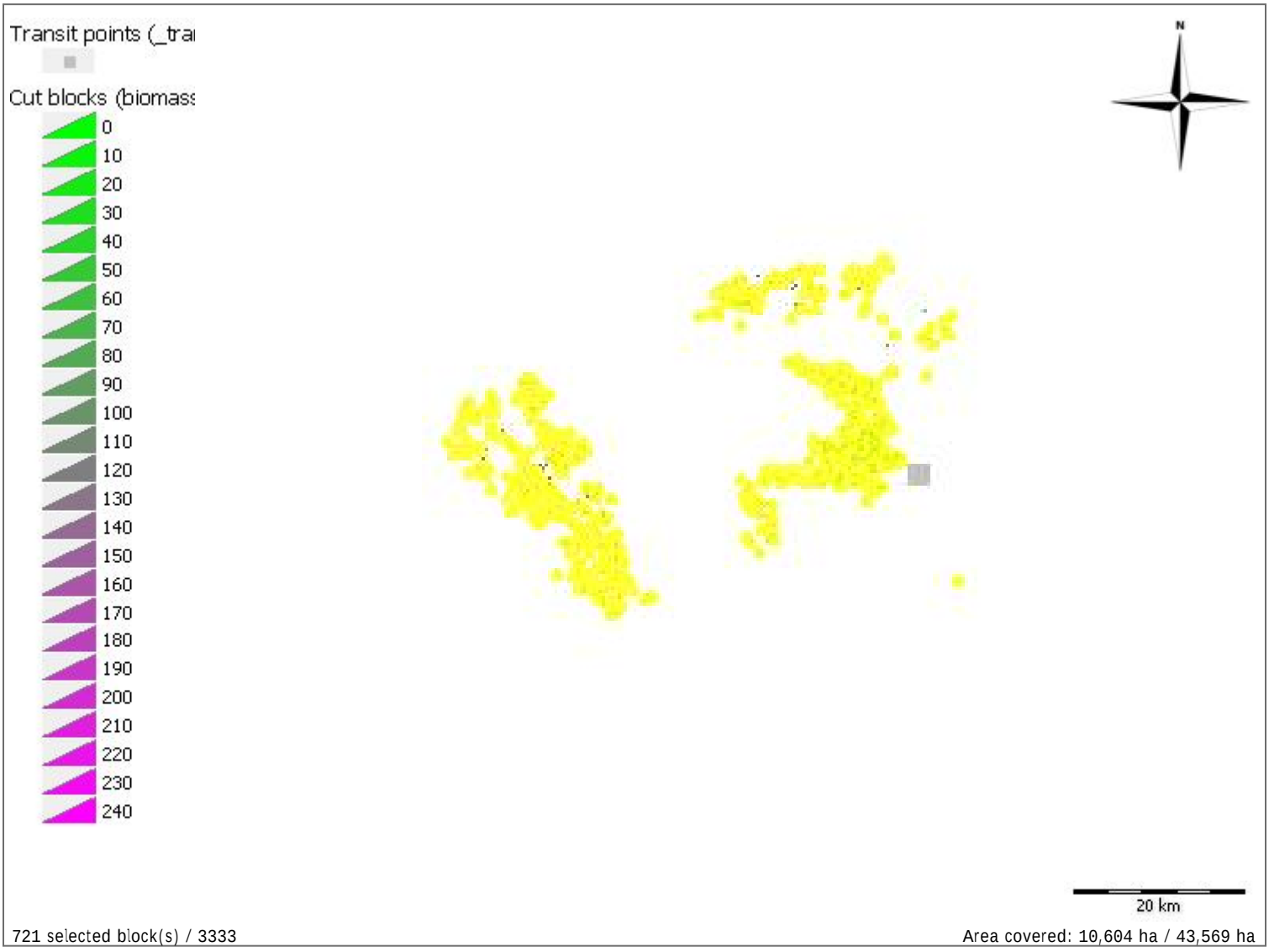
	Volume(odt)	Area(ha)	Number of cut blocks
• Biomass recovery location			
At the stump	0.0	0.0	0
Roadside	336,797.9	10,603.8	721
• Recovery season			
Summer	0.0	0.0	0
Winter	336,797.9	10,603.8	721
• Residue freshness			
Fresh	0.0	0.0	0
Brown	336,797.9	10,603.8	721
Brittle	0.0	0.0	0

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	14,323.6	14,323.6
50 $/odt	0.0	48,530.7	48,530.7
60 $/odt	0.0	125,860.3	125,860.3
70 $/odt	0.0	169,437.3	169,437.3
80 $/odt	0.0	184,422.5	184,422.5
90 $/odt	0.0	202,623.3	202,623.3
100 $/odt	0.0	230,294.8	230,294.8
110 $/odt	0.0	257,217.4	257,217.4
120 $/odt	0.0	299,867.8	299,867.8
130 $/odt	0.0	317,487.8	317,487.8
140 $/odt	0.0	329,847.9	329,847.9
150 $/odt	0.0	333,667.0	333,667.0
160 $/odt	0.0	336,348.0	336,348.0
170 $/odt	0.0	336,418.2	336,418.2
180 $/odt	0.0	336,797.9	336,797.9
Maximum cost	0.00 $/odt	179.23 $/odt	

Delivery to mills

Destination	Product	Format	odt	Transport average distance (Km)
Campbell River				
	Douglas Fir (residues)	Chips	85,578	44
	Lodgepole Pine (residues)	Chips	473	73
	Red Alder (residues)	Chips	16,997	92
	Subalpine Fir (residues)	Chips	36,608	154
	Trembling Aspen (residues)	Chips	51	20
	Western Hemlock (residues)	Chips	139,060	117
	Western Red Cedar (residues)	Chips	48,480	155
	Western White Pine (residues)	Chips	232	39
	White Spruce (residues)	Chips	1,793	219
	Yellow Cedar (residues)	Chips	7,526	144
			336,798	108
			336,798	108


Transit points (_trai
Cut blocks (biomass
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
210
220
230
240
N
20 km
721 selected block(s) / 3333
Area covered: 10,604 ha / 43,569 ha

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

Statistics - Selected Items

Area	10,665.3 ha
Number of cut blocks	885
Recovered biomass	362,367.8 odt
Biomass yield	34.0 odt/ha
Biomass odt / Merchantable m^3	0.0670 odt/m^3
Delivered products	
• Chips	100 %
• Bundles	0 %
• Trunks and Residues	0 %
Energy balance	28 : 1
Available energy	1,376,275 MWh
Fuel consumption	15.7 L/odt

Cost

Harvesting	0.00 $/odt
Biomass recovery	22.50 $/odt
Transfer yard	0.00 $/odt
Transportation	51.12 $/odt
Loading/unloading	14.70 $/odt
Stumpage fees	0.00 $/odt
Road network - Maintenance	2.07 $/odt
Indirect costs	0.00 $/odt
Total	90.40 $/odt

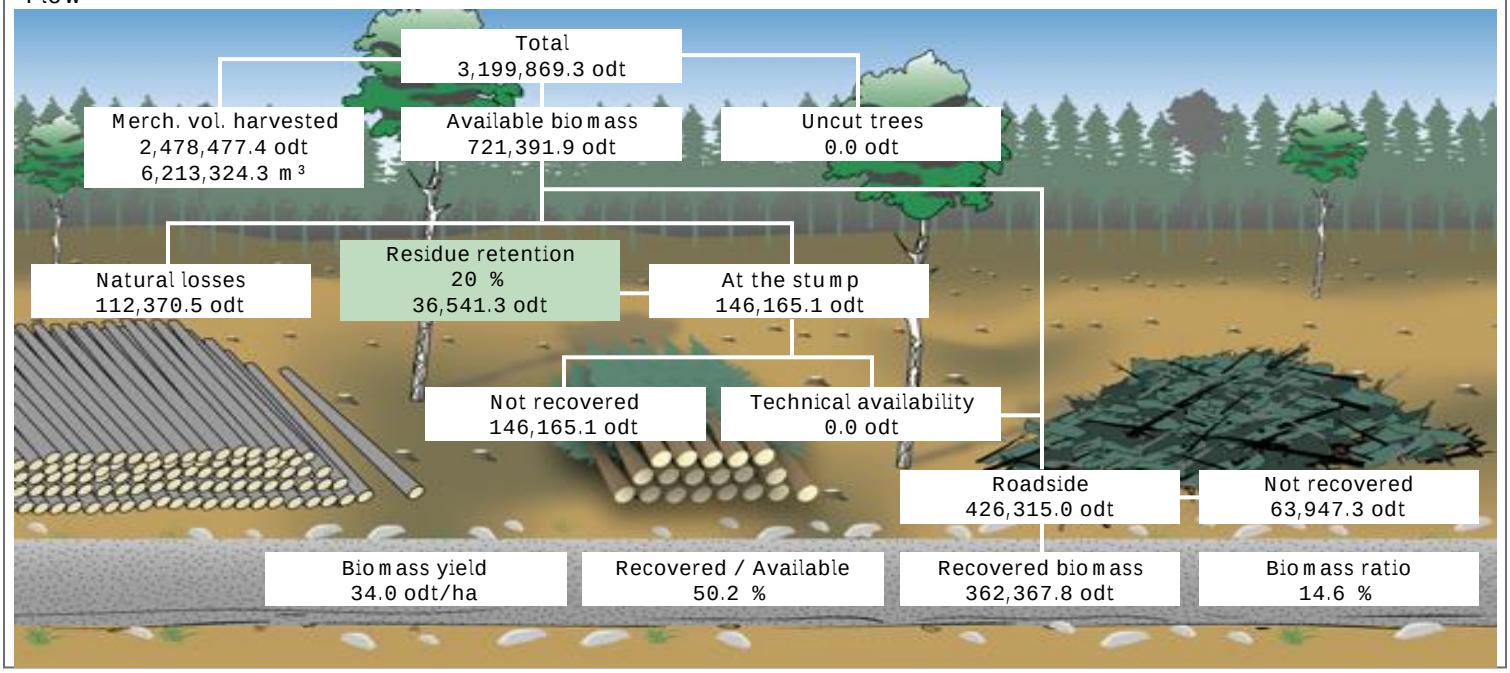
Revenue

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

Net

Profit	-90.40 $/odt

Flow



Products

Product name	odt	odt/m³	odt/ha
Western Hemlock (residues)	151,484.1	0.0660	14.20
Douglas Fir (residues)	86,019.4	0.0703	8.07
Western Red Cedar (residues)	60,095.2	0.0684	5.63
Subalpine Fir (residues)	35,648.6	0.0585	3.34
Red Alder (residues)	19,483.9	0.1001	1.83
Yellow Cedar (residues)	6,812.8	0.0419	0.64
White Spruce (residues)	2,057.2	0.0741	0.19
Lodgepole Pine (residues)	468.9	0.0440	0.04
Western White Pine (residues)	219.4	0.0907	0.02
Trembling Aspen (residues)	78.2	0.0885	0.01
	362,367.8	0.0670	33.98

Recovery summary

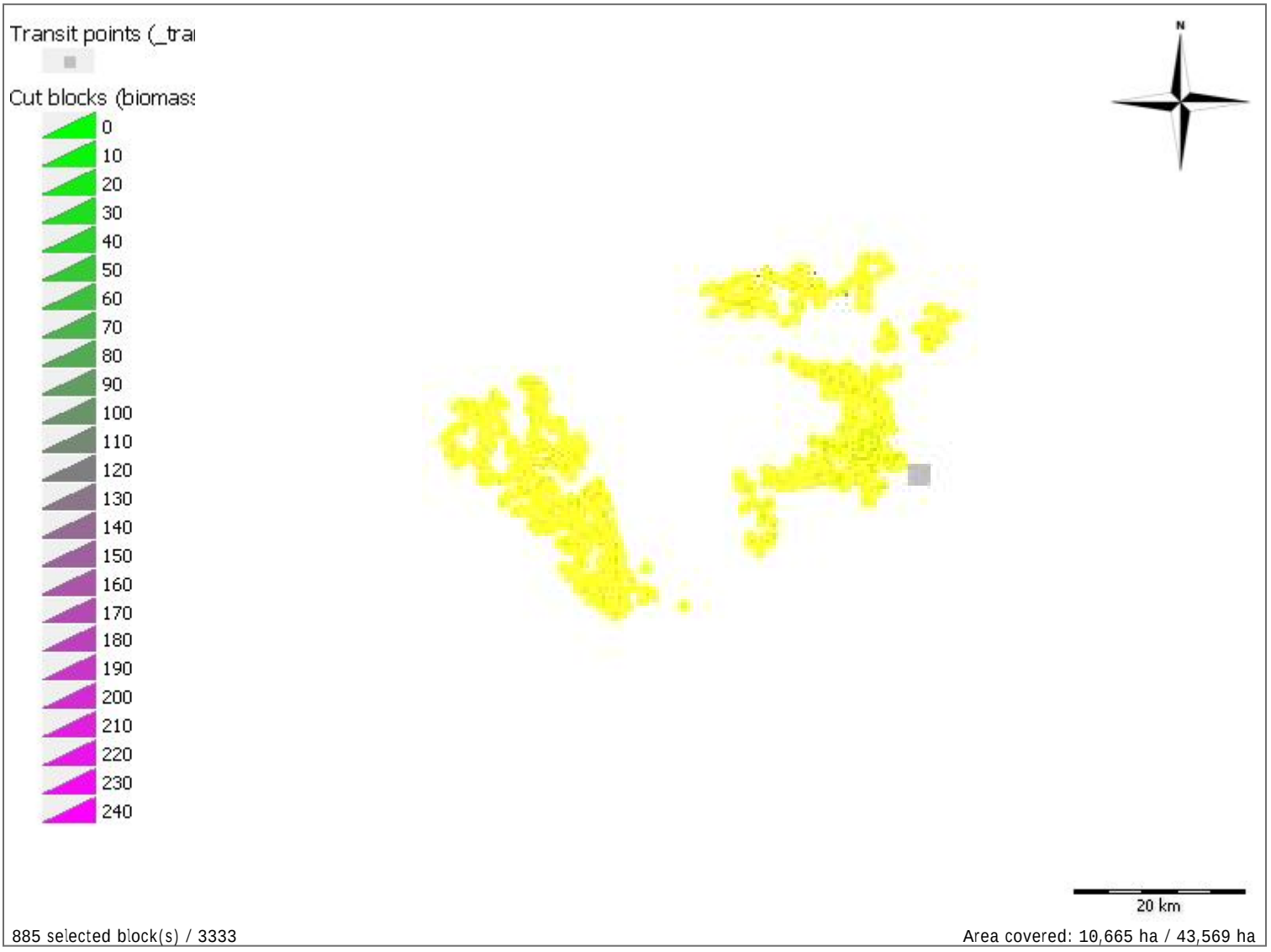
	Volume(odt)	Area(ha)	Number of cut blocks
• Biomass recovery location			
At the stump	0.0	0.0	0
Roadside	362,367.8	10,665.3	885
• Recovery season			
Summer	0.0	0.0	0
Winter	362,367.8	10,665.3	885
• Residue freshness			
Fresh	0.0	0.0	0
Brown	362,367.8	10,665.3	885
Brittle	0.0	0.0	0

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	17,211.9	17,211.9
50 $/odt	0.0	51,385.0	51,385.0
60 $/odt	0.0	87,129.6	87,129.6
70 $/odt	0.0	130,402.7	130,402.7
80 $/odt	0.0	154,030.2	154,030.2
90 $/odt	0.0	183,255.7	183,255.7
100 $/odt	0.0	204,287.8	204,287.8
110 $/odt	0.0	241,828.3	241,828.3
120 $/odt	0.0	271,152.2	271,152.2
130 $/odt	0.0	306,068.9	306,068.9
140 $/odt	0.0	338,233.6	338,233.6
150 $/odt	0.0	352,400.5	352,400.5
160 $/odt	0.0	358,816.0	358,816.0
170 $/odt	0.0	362,195.1	362,195.1
180 $/odt	0.0	362,195.1	362,195.1
190 $/odt	0.0	362,292.9	362,292.9
200 $/odt	0.0	362,367.8	362,367.8
Maximum cost	0.00 $/odt	193.17 $/odt	

Delivery to mills

Destination	Product	Format	odt	Transport average distance (Km)
Campbell River				
	Douglas Fir (residues)	Chips	86,019	62
	Lodgepole Pine (residues)	Chips	469	94
	Red Alder (residues)	Chips	19,484	104
	Subalpine Fir (residues)	Chips	35,649	144
	Trembling Aspen (residues)	Chips	78	185
	Western Hemlock (residues)	Chips	151,484	132
	Western Red Cedar (residues)	Chips	60,095	163
	Western White Pine (residues)	Chips	219	35
	White Spruce (residues)	Chips	2,057	188
	Yellow Cedar (residues)	Chips	6,813	152
			362,368	121
			362,368	121


Transit points (_trai
Cut blocks (biomass
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
210
220
230
240
N
20 km
885 selected block(s) / 3333
Area covered: 10,665 ha / 43,569 ha

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

Statistics - Selected Items

Area	11,194.5 ha
Number of cut blocks	1102
Recovered biomass	420,044.4 odt
Biomass yield	37.5 odt/ha
Biomass odt / Merchantable m^3	0.0845 odt/m^3
Delivered products	
• Chips	100 %
• Bundles	0 %
• Trunks and Residues	0 %
Energy balance	25 : 1
Available energy	1,592,233 MWh
Fuel consumption	17.1 L/odt

Cost

Harvesting	0.00 $/odt
Biomass recovery	22.50 $/odt
Transfer yard	0.00 $/odt
Transportation	59.85 $/odt
Loading/unloading	22.18 $/odt
Stumpage fees	0.00 $/odt
Road network - Maintenance	2.32 $/odt
Indirect costs	0.00 $/odt
Total	106.85 $/odt

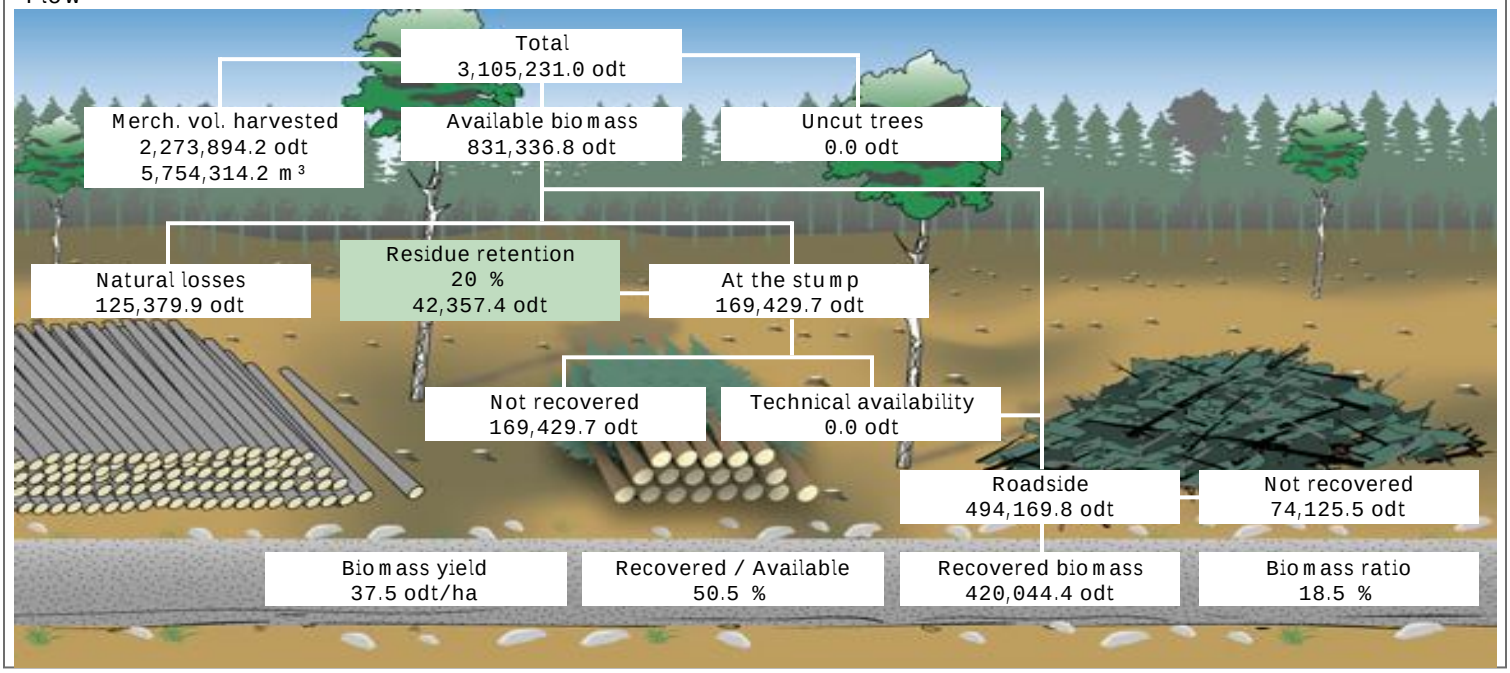
Revenue

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

Net

Profit	-106.85 $/odt

Flow



Products

Product name	odt	odt/m³	odt/ha
Western Hemlock (residues)	193,356.3	0.0841	17.27
Douglas Fir (residues)	81,084.4	0.0997	7.24
Western Red Cedar (residues)	71,817.3	0.0861	6.42
Subalpine Fir (residues)	39,250.8	0.0659	3.51
Red Alder (residues)	20,781.4	0.1107	1.86
Yellow Cedar (residues)	6,933.5	0.0452	0.62
White Spruce (residues)	5,159.7	0.0777	0.46
Lodgepole Pine (residues)	1,217.2	0.0715	0.11
Western White Pine (residues)	273.4	0.0677	0.02
Trembling Aspen (residues)	170.3	0.0906	0.02
	420,044.4	0.0845	37.52

Recovery summary

	Volume(odt)	Area(ha)	Number of cut blocks
• Biomass recovery location			
At the stump	0.0	0.0	0
Roadside	420,044.4	11,194.5	1,102
• Recovery season			
Summer	0.0	0.0	0
Winter	420,044.4	11,194.5	1,102
• Residue freshness			
Fresh	0.0	0.0	0
Brown	420,044.4	11,194.5	1,102
Brittle	0.0	0.0	0

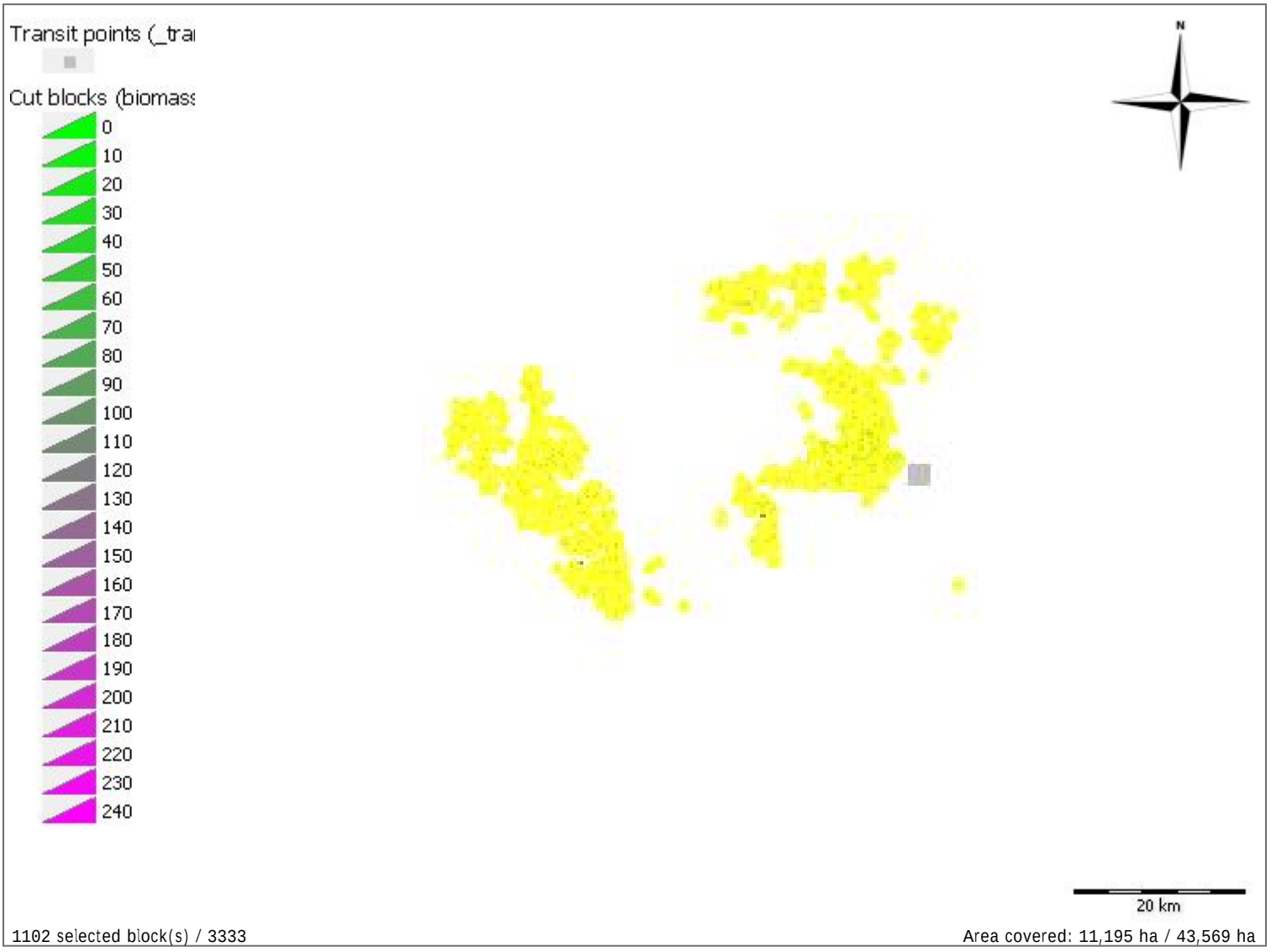
Supply summary

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	4,747.1	4,747.1
50 $/odt	0.0	15,332.0	15,332.0
60 $/odt	0.0	60,307.6	60,307.6
70 $/odt	0.0	88,654.4	88,654.4
80 $/odt	0.0	122,608.0	122,608.0
90 $/odt	0.0	150,269.6	150,269.6
100 $/odt	0.0	176,573.6	176,573.6
110 $/odt	0.0	220,565.2	220,565.2
120 $/odt	0.0	264,570.5	264,570.5
130 $/odt	0.0	303,948.0	303,948.0
140 $/odt	0.0	340,487.7	340,487.7
150 $/odt	0.0	367,229.8	367,229.8
160 $/odt	0.0	387,408.5	387,408.5
170 $/odt	0.0	394,808.1	394,808.1
180 $/odt	0.0	397,033.1	397,033.1
190 $/odt	0.0	408,740.8	408,740.8
200 $/odt	0.0	419,401.6	419,401.6
210 $/odt	0.0	419,401.6	419,401.6
220 $/odt	0.0	419,401.6	419,401.6
230 $/odt	0.0	419,410.2	419,410.2
240 $/odt	0.0	420,044.4	420,044.4

Maximum cost	0.00 $/odt	233.86 $/odt

Delivery to mills

Destination	Product	Format	odt	Transport average distance (Km)
Campbell River				
	Douglas Fir (residues)	Chips	81,084	93
	Lodgepole Pine (residues)	Chips	1,217	69
	Red Alder (residues)	Chips	20,781	123
	Subalpine Fir (residues)	Chips	39,251	141
	Trembling Aspen (residues)	Chips	170	166
	Western Hemlock (residues)	Chips	193,356	142
	Western Red Cedar (residues)	Chips	71,817	161
	Western White Pine (residues)	Chips	273	35
	White Spruce (residues)	Chips	5,160	207
	Yellow Cedar (residues)	Chips	6,934	157
			420,044	136
			420,044	136


Transit points (_trai
Cut blocks (biomass
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
210
220
230
240
N
20 km
1102 selected block(s) / 3333
Area covered: 11,195 ha / 43,569 ha

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

Statistics - Selected Items

Area	43,568.7 ha
Number of cut blocks	3333
Recovered biomass	1,467,829.5 odt
Biomass yield	33.7 odt/ha
Biomass odt / Merchantable m^3	0.0670 odt/m^3
Delivered products	
• Chips	100 %
• Bundles	0 %
• Trunks and Residues	0 %
Energy balance	26 : 1
Available energy	5,572,622 MWh
Fuel consumption	16.8 L/odt

Cost

Harvesting	0.00 $/odt
Biomass recovery	27.55 $/odt
Transfer yard	0.00 $/odt
Transportation	50.31 $/odt
Loading/unloading	15.14 $/odt
Stumpage fees	0.00 $/odt
Road network - Maintenance	2.02 $/odt
Indirect costs	0.00 $/odt
Total	95.02 $/odt

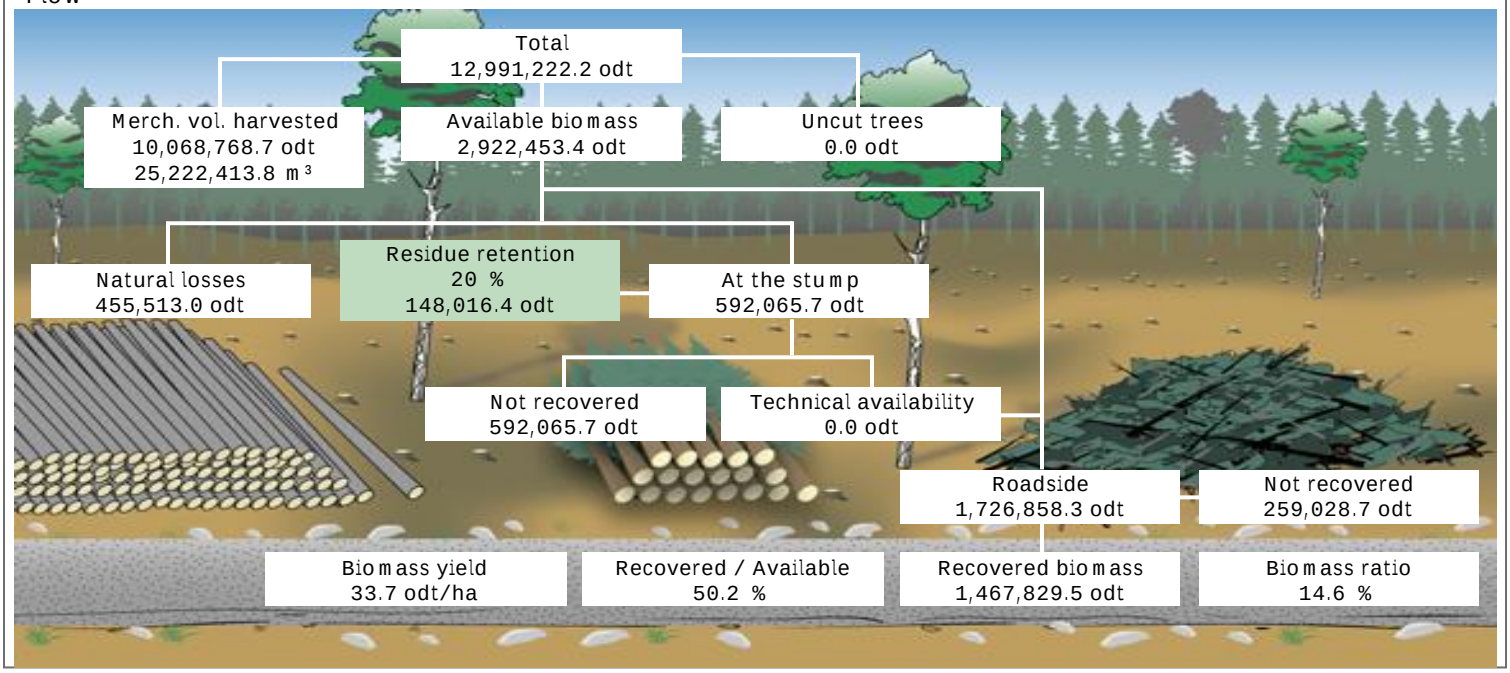
Revenue

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

Net

Profit	-95.02 $/odt

Flow



Products

Product name	odt	odt/m³	odt/ha
Western Hemlock (residues)	628,323.3	0.0656	14.42
Douglas Fir (residues)	340,577.0	0.0721	7.82
Western Red Cedar (residues)	230,989.9	0.0690	5.30
Subalpine Fir (residues)	149,681.9	0.0582	3.44
Red Alder (residues)	71,102.0	0.1006	1.63
Yellow Cedar (residues)	32,095.2	0.0422	0.74
White Spruce (residues)	11,331.5	0.0726	0.26
Lodgepole Pine (residues)	2,527.7	0.0529	0.06
Western White Pine (residues)	869.6	0.0719	0.02
Trembling Aspen (residues)	331.4	0.0776	0.01
	1,467,829.5	0.0670	33.69

Recovery summary

	Volume(odt)	Area(ha)	Number of cut blocks
• Biomass recovery location			
At the stump	0.0	0.0	0
Roadside	1,467,829.5	43,568.7	3,333
• Recovery season			
Summer	0.0	0.0	0
Winter	1,467,829.5	43,568.7	3,333
• Residue freshness			
Fresh	0.0	0.0	0
Brown	1,467,829.5	43,568.7	3,333
Brittle	0.0	0.0	0

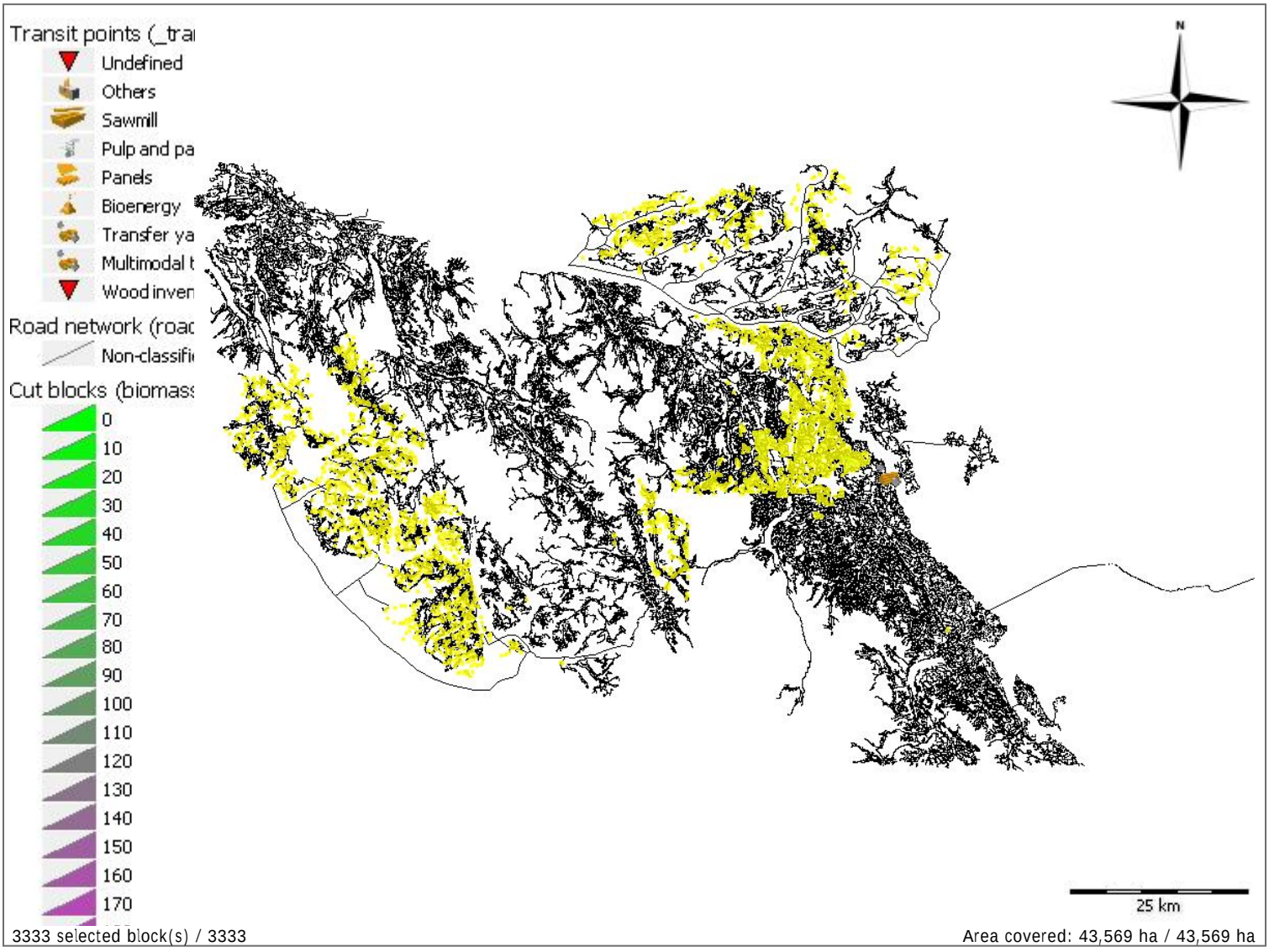
Supply summary

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	12,900.3	12,900.3
50 $/odt	0.0	101,789.6	101,789.6
60 $/odt	0.0	289,036.9	289,036.9
70 $/odt	0.0	503,393.6	503,393.6
80 $/odt	0.0	628,572.1	628,572.1
90 $/odt	0.0	714,486.4	714,486.4
100 $/odt	0.0	789,279.3	789,279.3
110 $/odt	0.0	925,677.0	925,677.0
120 $/odt	0.0	1,066,820.8	1,066,820.8
130 $/odt	0.0	1,213,931.8	1,213,931.8
140 $/odt	0.0	1,315,273.7	1,315,273.7
150 $/odt	0.0	1,381,175.7	1,381,175.7
160 $/odt	0.0	1,412,966.6	1,412,966.6
170 $/odt	0.0	1,439,380.8	1,439,380.8
180 $/odt	0.0	1,442,673.2	1,442,673.2
190 $/odt	0.0	1,454,291.0	1,454,291.0
200 $/odt	0.0	1,459,391.2	1,459,391.2
210 $/odt	0.0	1,467,186.8	1,467,186.8
220 $/odt	0.0	1,467,186.8	1,467,186.8
230 $/odt	0.0	1,467,195.4	1,467,195.4
240 $/odt	0.0	1,467,829.5	1,467,829.5

Maximum cost	0.00 $/odt	238.91 $/odt

Delivery to mills

Destination	Product	Format	odt	Transport average distance (Km)
Campbell River				
	Douglas Fir (residues)	Chips	340,577	61
	Lodgepole Pine (residues)	Chips	2,528	75
	Red Alder (residues)	Chips	71,102	102
	Subalpine Fir (residues)	Chips	149,682	146
	Trembling Aspen (residues)	Chips	331	151
	Western Hemlock (residues)	Chips	628,323	127
	Western Red Cedar (residues)	Chips	230,990	157
	Western White Pine (residues)	Chips	870	36
	White Spruce (residues)	Chips	11,332	203
	Yellow Cedar (residues)	Chips	32,095	150
			1,467,830	118
			1,467,830	118


Transit points (_trai
Undefined
Others
Sawmill
Pulp and pa
Panels
Bioenergy
Transfer ya
Multimodal t
Wood inven
Road network (roac
Non-classifi
Cut blocks (biomass
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
N
25 km
3333 selected block(s) / 3333
Area covered: 43,569 ha / 43,569 ha

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

Statistics - Selected Items

Area	43,568.7 ha
Number of cut blocks	3333
Recovered biomass	1,467,829.5 odt
Biomass yield	33.7 odt/ha
Biomass odt / Merchantable m^3	0.0670 odt/m^3
Delivered products	
• Chips	100 %
• Bundles	0 %
• Trunks and Residues	0 %
Energy balance	26 : 1
Available energy	5,572,622 MWh
Fuel consumption	16.8 L/odt

Cost

Harvesting	0.00 $/odt
Biomass recovery	27.55 $/odt
Transfer yard	0.00 $/odt
Transportation	50.05 $/odt
Loading/unloading	15.14 $/odt
Stumpage fees	0.00 $/odt
Road network - Maintenance	2.02 $/odt
Indirect costs	0.00 $/odt
Total	94.77 $/odt

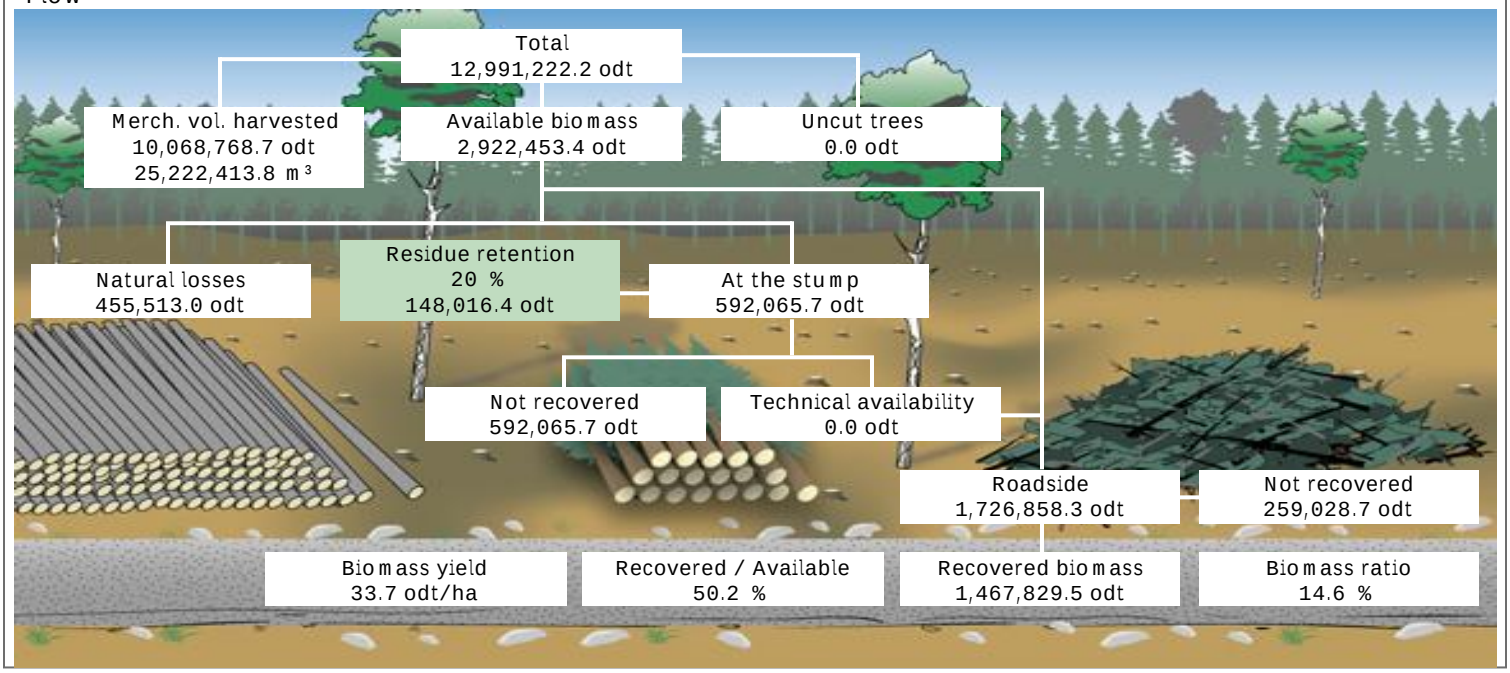
Revenue

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

Net

Profit	-94.77 $/odt

Flow



Products

Product name	odt	odt/m³	odt/ha
Western Hemlock (residues)	628,323.3	0.0656	14.42
Douglas Fir (residues)	340,577.0	0.0721	7.82
Western Red Cedar (residues)	230,989.9	0.0690	5.30
Subalpine Fir (residues)	149,681.9	0.0582	3.44
Red Alder (residues)	71,102.0	0.1006	1.63
Yellow Cedar (residues)	32,095.2	0.0422	0.74
White Spruce (residues)	11,331.5	0.0726	0.26
Lodgepole Pine (residues)	2,527.7	0.0529	0.06
Western White Pine (residues)	869.6	0.0719	0.02
Trembling Aspen (residues)	331.4	0.0776	0.01
	1,467,829.5	0.0670	33.69

Recovery summary

	Volume(odt)	Area(ha)	Number of cut blocks
• Biomass recovery location			
At the stump	0.0	0.0	0
Roadside	1,467,829.5	43,568.7	3,333
• Recovery season			
Summer	0.0	0.0	0
Winter	1,467,829.5	43,568.7	3,333
• Residue freshness			
Fresh	0.0	0.0	0
Brown	1,467,829.5	43,568.7	3,333
Brittle	0.0	0.0	0

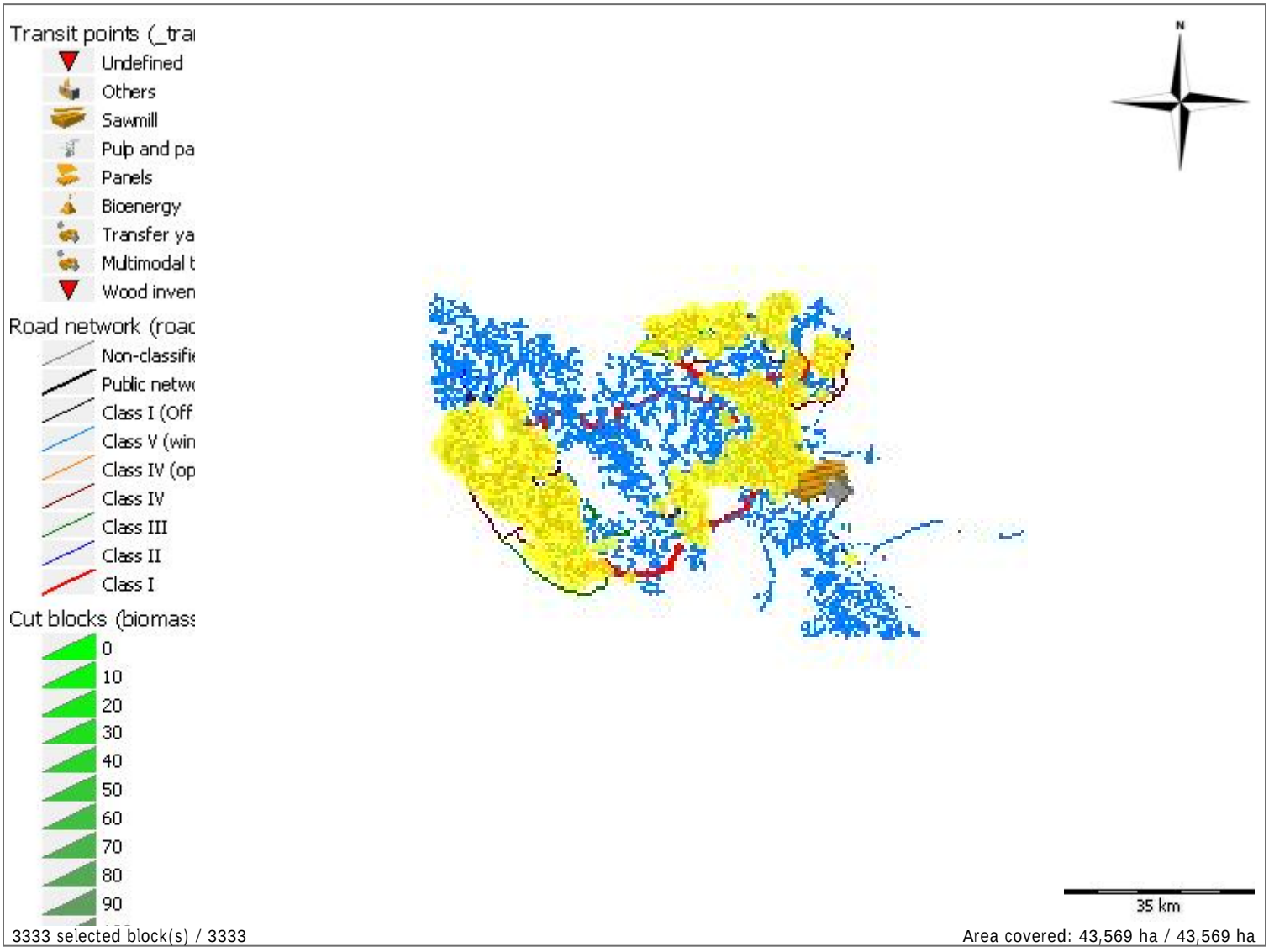
Supply summary

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	13,053.5	13,053.5
50 $/odt	0.0	106,803.5	106,803.5
60 $/odt	0.0	294,800.9	294,800.9
70 $/odt	0.0	509,270.2	509,270.2
80 $/odt	0.0	634,448.7	634,448.7
90 $/odt	0.0	720,406.6	720,406.6
100 $/odt	0.0	795,199.5	795,199.5
110 $/odt	0.0	928,807.8	928,807.8
120 $/odt	0.0	1,067,378.1	1,067,378.1
130 $/odt	0.0	1,214,040.3	1,214,040.3
140 $/odt	0.0	1,315,317.3	1,315,317.3
150 $/odt	0.0	1,381,175.7	1,381,175.7
160 $/odt	0.0	1,412,966.6	1,412,966.6
170 $/odt	0.0	1,439,380.8	1,439,380.8
180 $/odt	0.0	1,442,673.2	1,442,673.2
190 $/odt	0.0	1,454,291.0	1,454,291.0
200 $/odt	0.0	1,459,391.2	1,459,391.2
210 $/odt	0.0	1,467,186.8	1,467,186.8
220 $/odt	0.0	1,467,186.8	1,467,186.8
230 $/odt	0.0	1,467,195.4	1,467,195.4
240 $/odt	0.0	1,467,829.5	1,467,829.5

Maximum cost	0.00 $/odt	238.91 $/odt

Delivery to mills

Destination	Product	Format	odt	Transport average distance (Km)
Campbell River				
	Douglas Fir (residues)	Chips	340,577	61
	Lodgepole Pine (residues)	Chips	2,528	75
	Red Alder (residues)	Chips	71,102	102
	Subalpine Fir (residues)	Chips	149,682	145
	Trembling Aspen (residues)	Chips	331	151
	Western Hemlock (residues)	Chips	628,323	127
	Western Red Cedar (residues)	Chips	230,990	156
	Western White Pine (residues)	Chips	870	36
	White Spruce (residues)	Chips	11,332	203
	Yellow Cedar (residues)	Chips	32,095	147
			1,467,830	118
			1,467,830	118


Transit points (_trai
Undefined
Others
Sawmill
Pulp and pa
Panels
Bioenergy
Transfer ya
Multimodal t
Wood inven
Road network (roac
Non-classifi
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
35 km
3333 selected block(s) / 3333
Area covered: 43,569 ha / 43,569 ha

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

Statistics - Selected Items

Area	11,105.1 ha
Number of cut blocks	625
Recovered biomass	348,619.5 odt
Biomass yield	31.4 odt/ha
Biomass odt / Merchantable m^3	0.0588 odt/m^3
Delivered products	
• Chips	100 %
• Bundles	0 %
• Trunks and Residues	0 %
Energy balance	28 : 1
Available energy	1,325,699 MWh
Fuel consumption	15.4 L/odt

Cost

Harvesting	0.00 $/odt
Biomass recovery	27.55 $/odt
Transfer yard	0.00 $/odt
Transportation	43.12 $/odt
Loading/unloading	10.88 $/odt
Stumpage fees	0.00 $/odt
Road network - Maintenance	1.78 $/odt
Indirect costs	0.00 $/odt
Total	83.33 $/odt

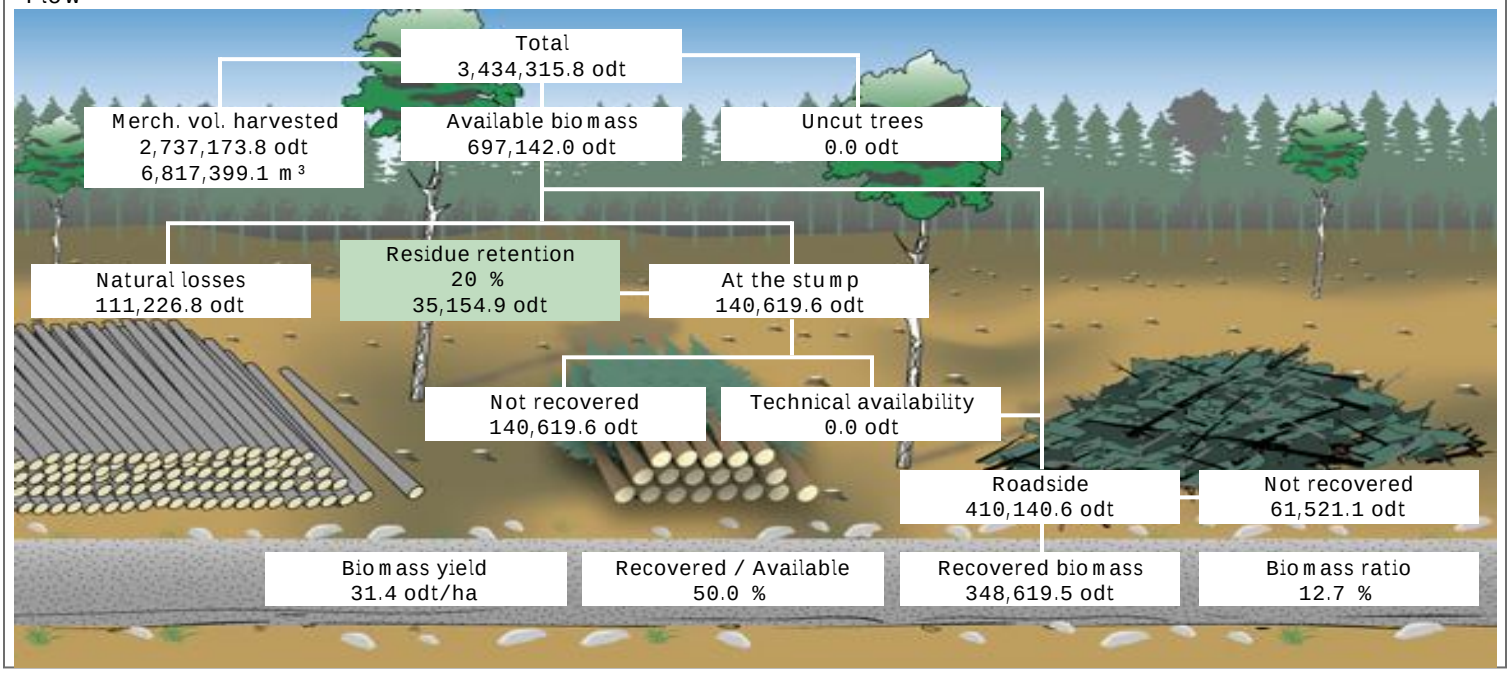
Revenue

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

Net

Profit	-83.33 $/odt

Flow



Products

Product name	odt	odt/m³	odt/ha
Western Hemlock (residues)	144,422.8	0.0565	13.01
Douglas Fir (residues)	87,894.8	0.0633	7.91
Western Red Cedar (residues)	50,597.4	0.0610	4.56
Subalpine Fir (residues)	38,174.3	0.0544	3.44
Red Alder (residues)	13,839.9	0.0948	1.25
Yellow Cedar (residues)	10,823.3	0.0415	0.97
White Spruce (residues)	2,321.9	0.0671	0.21
Lodgepole Pine (residues)	369.0	0.0403	0.03
Western White Pine (residues)	144.8	0.0644	0.01
Trembling Aspen (residues)	31.5	0.0488	0.00
	348,619.5	0.0588	31.39

Recovery summary

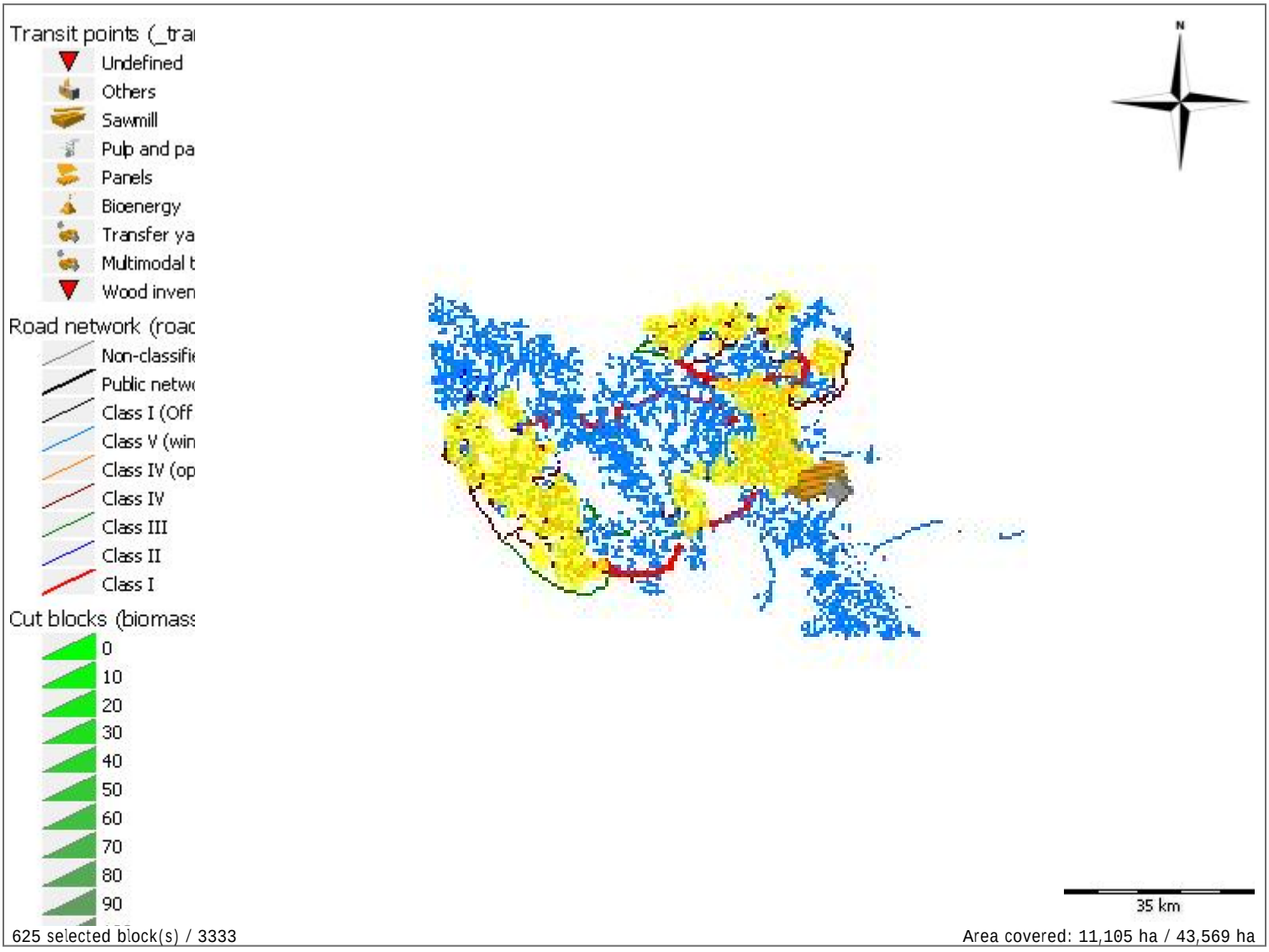
	Volume(odt)	Area(ha)	Number of cut blocks
• Biomass recovery location			
At the stump	0.0	0.0	0
Roadside	348,619.5	11,105.1	625
• Recovery season			
Summer	0.0	0.0	0
Winter	348,619.5	11,105.1	625
• Residue freshness			
Fresh	0.0	0.0	0
Brown	348,619.5	11,105.1	625
Brittle	0.0	0.0	0

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	3,609.8	3,609.8
50 $/odt	0.0	29,331.8	29,331.8
60 $/odt	0.0	99,720.3	99,720.3
70 $/odt	0.0	168,430.2	168,430.2
80 $/odt	0.0	199,164.6	199,164.6
90 $/odt	0.0	216,415.7	216,415.7
100 $/odt	0.0	228,855.2	228,855.2
110 $/odt	0.0	264,498.8	264,498.8
120 $/odt	0.0	297,476.8	297,476.8
130 $/odt	0.0	323,913.4	323,913.4
140 $/odt	0.0	334,448.7	334,448.7
150 $/odt	0.0	342,270.9	342,270.9
160 $/odt	0.0	346,278.5	346,278.5
170 $/odt	0.0	347,952.5	347,952.5
180 $/odt	0.0	348,152.4	348,152.4
190 $/odt	0.0	348,619.5	348,619.5
Maximum cost	0.00 $/odt	189.22 $/odt	

Delivery to mills

Destination	Product	Format	odt	Transport average distance (Km)
Campbell River				
	Douglas Fir (residues)	Chips	87,895	46
	Lodgepole Pine (residues)	Chips	369	73
	Red Alder (residues)	Chips	13,840	79
	Subalpine Fir (residues)	Chips	38,174	144
	Trembling Aspen (residues)	Chips	31	204
	Western Hemlock (residues)	Chips	144,423	112
	Western Red Cedar (residues)	Chips	50,597	148
	Western White Pine (residues)	Chips	145	34
	White Spruce (residues)	Chips	2,322	193
	Yellow Cedar (residues)	Chips	10,823	144
			348,620	104
			348,620	104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Class I
Cut blocks (biomass
0
10
20
30
40
50
60
70
80
90
N
35 km
625 selected block(s) / 3333
Area covered: 11,105 ha / 43,569 ha

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

Statistics - Selected Items

Area	10,603.8 ha
Number of cut blocks	721
Recovered biomass	336,797.9 odt
Biomass yield	31.8 odt/ha
Biomass odt / Merchantable m^3	0.0600 odt/m^3
Delivered products	
• Chips	100 %
• Bundles	0 %
• Trunks and Residues	0 %
Energy balance	28 : 1
Available energy	1,278,415 MWh
Fuel consumption	15.7 L/odt

Cost

Harvesting	0.00 $/odt
Biomass recovery	27.55 $/odt
Transfer yard	0.00 $/odt
Transportation	44.33 $/odt
Loading/unloading	11.26 $/odt
Stumpage fees	0.00 $/odt
Road network - Maintenance	1.85 $/odt
Indirect costs	0.00 $/odt
Total	84.99 $/odt

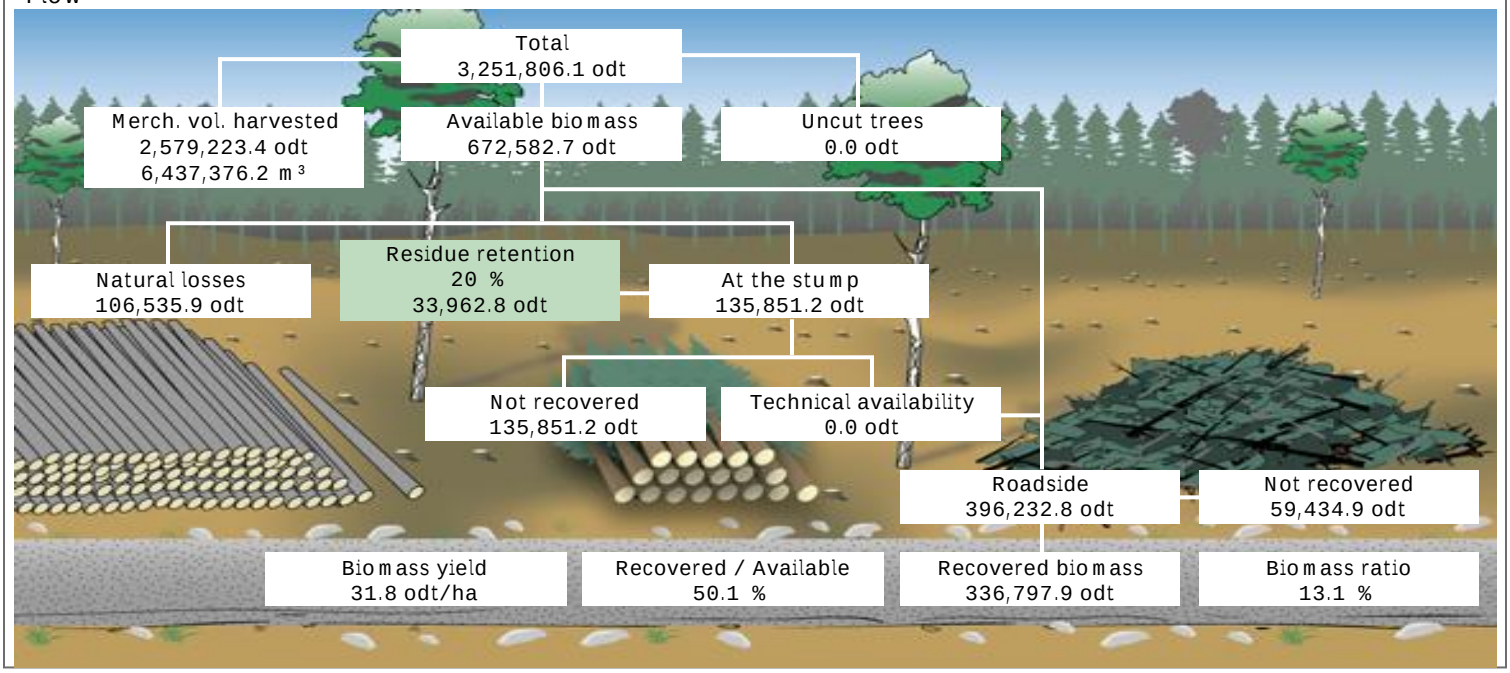
Revenue

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

Net

Profit	-84.99 $/odt

Flow



Products

Product name	odt	odt/m³	odt/ha
Western Hemlock (residues)	139,060.2	0.0571	13.11
Douglas Fir (residues)	85,578.4	0.0660	8.07
Western Red Cedar (residues)	48,480.0	0.0602	4.57
Subalpine Fir (residues)	36,608.1	0.0549	3.45
Red Alder (residues)	16,996.7	0.0953	1.60
Yellow Cedar (residues)	7,525.7	0.0410	0.71
White Spruce (residues)	1,792.8	0.0654	0.17
Lodgepole Pine (residues)	472.6	0.0432	0.04
Western White Pine (residues)	232.0	0.0684	0.02
Trembling Aspen (residues)	51.5	0.0596	0.00
	336,797.9	0.0600	31.76

Recovery summary

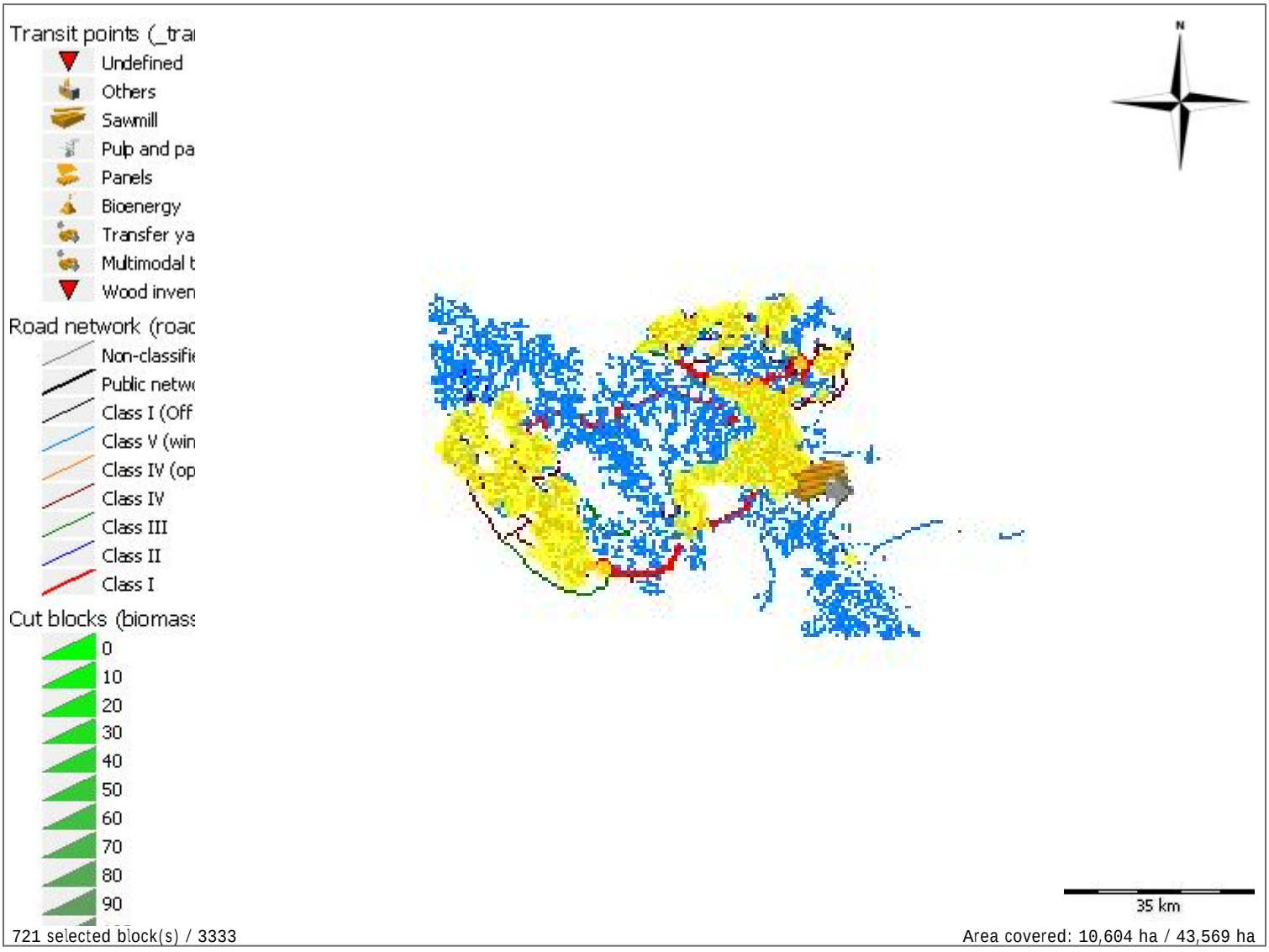
	Volume(odt)	Area(ha)	Number of cut blocks
• Biomass recovery location			
At the stump	0.0	0.0	0
Roadside	336,797.9	10,603.8	721
• Recovery season			
Summer	0.0	0.0	0
Winter	336,797.9	10,603.8	721
• Residue freshness			
Fresh	0.0	0.0	0
Brown	336,797.9	10,603.8	721
Brittle	0.0	0.0	0

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	4,264.2	4,264.2
50 $/odt	0.0	31,282.9	31,282.9
60 $/odt	0.0	85,963.1	85,963.1
70 $/odt	0.0	153,130.9	153,130.9
80 $/odt	0.0	181,707.8	181,707.8
90 $/odt	0.0	197,245.9	197,245.9
100 $/odt	0.0	213,448.1	213,448.1
110 $/odt	0.0	246,061.4	246,061.4
120 $/odt	0.0	274,665.7	274,665.7
130 $/odt	0.0	310,726.7	310,726.7
140 $/odt	0.0	327,190.7	327,190.7
150 $/odt	0.0	332,122.5	332,122.5
160 $/odt	0.0	335,348.7	335,348.7
170 $/odt	0.0	336,353.8	336,353.8
180 $/odt	0.0	336,418.2	336,418.2
190 $/odt	0.0	336,797.9	336,797.9
Maximum cost	0.00 $/odt	184.28 $/odt	

Delivery to mills

Destination	Product	Format	odt	Transport average distance (Km)
Campbell River				
	Douglas Fir (residues)	Chips	85,578	43
	Lodgepole Pine (residues)	Chips	473	73
	Red Alder (residues)	Chips	16,997	92
	Subalpine Fir (residues)	Chips	36,608	153
	Trembling Aspen (residues)	Chips	51	20
	Western Hemlock (residues)	Chips	139,060	117
	Western Red Cedar (residues)	Chips	48,480	154
	Western White Pine (residues)	Chips	232	39
	White Spruce (residues)	Chips	1,793	219
	Yellow Cedar (residues)	Chips	7,526	144
			336,798	107
			336,798	107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Class I
Cut blocks (biomass
0
10
20
30
40
50
60
70
80
90
N
35 km
721 selected block(s) / 3333
Area covered: 10,604 ha / 43,569 ha

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

Statistics - Selected Items

Area	10,665.3 ha
Number of cut blocks	885
Recovered biomass	362,367.8 odt
Biomass yield	34.0 odt/ha
Biomass odt / Merchantable m^3	0.0670 odt/m^3
Delivered products	
• Chips	100 %
• Bundles	0 %
• Trunks and Residues	0 %
Energy balance	26 : 1
Available energy	1,376,275 MWh
Fuel consumption	17.0 L/odt

Cost

Harvesting	0.00 $/odt
Biomass recovery	27.55 $/odt
Transfer yard	0.00 $/odt
Transportation	50.89 $/odt
Loading/unloading	14.70 $/odt
Stumpage fees	0.00 $/odt
Road network - Maintenance	2.07 $/odt
Indirect costs	0.00 $/odt
Total	95.21 $/odt

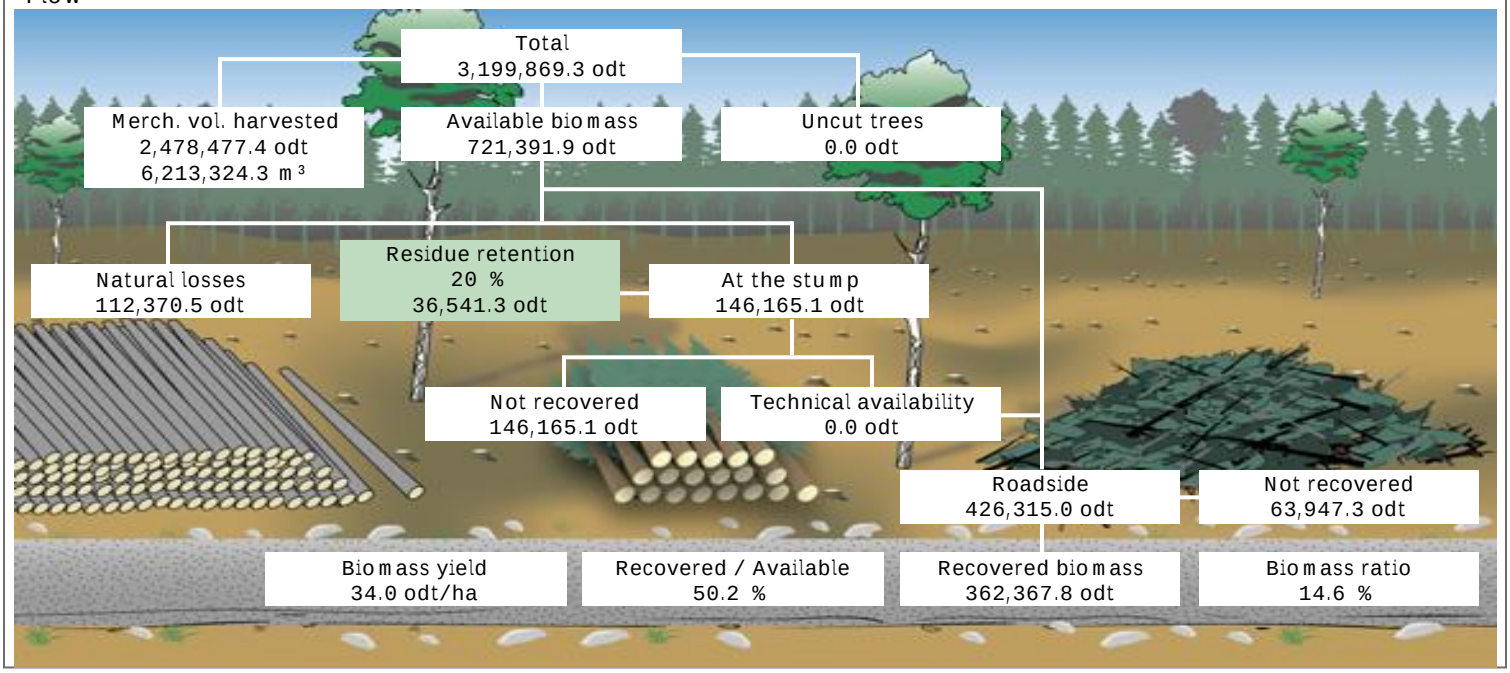
Revenue

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

Net

Profit	-95.21 $/odt

Flow



Products

Product name	odt	odt/m³	odt/ha
Western Hemlock (residues)	151,484.1	0.0660	14.20
Douglas Fir (residues)	86,019.4	0.0703	8.07
Western Red Cedar (residues)	60,095.2	0.0684	5.63
Subalpine Fir (residues)	35,648.6	0.0585	3.34
Red Alder (residues)	19,483.9	0.1001	1.83
Yellow Cedar (residues)	6,812.8	0.0419	0.64
White Spruce (residues)	2,057.2	0.0741	0.19
Lodgepole Pine (residues)	468.9	0.0440	0.04
Western White Pine (residues)	219.4	0.0907	0.02
Trembling Aspen (residues)	78.2	0.0885	0.01
	362,367.8	0.0670	33.98

Recovery summary

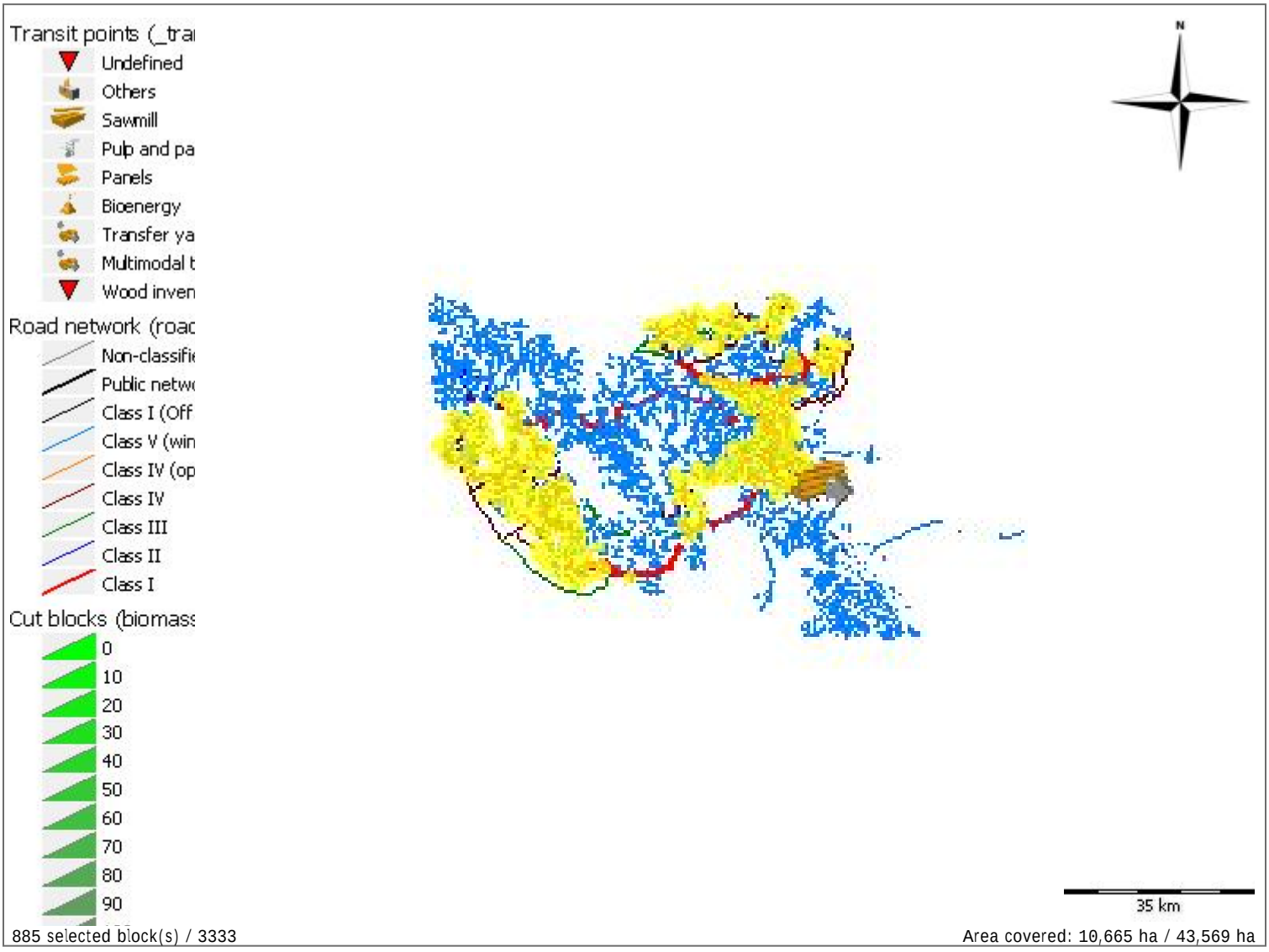
	Volume(odt)	Area(ha)	Number of cut blocks
• Biomass recovery location			
At the stump	0.0	0.0	0
Roadside	362,367.8	10,665.3	885
• Recovery season			
Summer	0.0	0.0	0
Winter	362,367.8	10,665.3	885
• Residue freshness			
Fresh	0.0	0.0	0
Brown	362,367.8	10,665.3	885
Brittle	0.0	0.0	0

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	5,061.2	5,061.2
50 $/odt	0.0	36,245.1	36,245.1
60 $/odt	0.0	71,583.2	71,583.2
70 $/odt	0.0	114,678.8	114,678.8
80 $/odt	0.0	141,275.7	141,275.7
90 $/odt	0.0	166,871.5	166,871.5
100 $/odt	0.0	193,218.5	193,218.5
110 $/odt	0.0	223,417.5	223,417.5
120 $/odt	0.0	257,189.0	257,189.0
130 $/odt	0.0	290,366.8	290,366.8
140 $/odt	0.0	325,307.8	325,307.8
150 $/odt	0.0	348,042.2	348,042.2
160 $/odt	0.0	357,205.2	357,205.2
170 $/odt	0.0	360,625.1	360,625.1
180 $/odt	0.0	362,195.1	362,195.1
190 $/odt	0.0	362,195.1	362,195.1
200 $/odt	0.0	362,367.8	362,367.8
Maximum cost	0.00 $/odt	198.22 $/odt	

Delivery to mills

Destination	Product	Format	odt	Transport average distance (Km)
Campbell River				
	Douglas Fir (residues)	Chips	86,019	62
	Lodgepole Pine (residues)	Chips	469	94
	Red Alder (residues)	Chips	19,484	104
	Subalpine Fir (residues)	Chips	35,649	143
	Trembling Aspen (residues)	Chips	78	185
	Western Hemlock (residues)	Chips	151,484	132
	Western Red Cedar (residues)	Chips	60,095	162
	Western White Pine (residues)	Chips	219	35
	White Spruce (residues)	Chips	2,057	188
	Yellow Cedar (residues)	Chips	6,813	148
			362,368	120
			362,368	120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Cut blocks (biomass
0
10
20
30
40
50
60
70
80
90
N
35 km
885 selected block(s) / 3333
Area covered: 10,665 ha / 43,569 ha

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

Statistics - Selected Items

Area	11,194.5 ha
Number of cut blocks	1102
Recovered biomass	420,044.4 odt
Biomass yield	37.5 odt/ha
Biomass odt / Merchantable m^3	0.0845 odt/m^3
Delivered products	
• Chips	100 %
• Bundles	0 %
• Trunks and Residues	0 %
Energy balance	24 : 1
Available energy	1,592,233 MWh
Fuel consumption	18.5 L/odt

Cost

Harvesting	0.00 $/odt
Biomass recovery	27.55 $/odt
Transfer yard	0.00 $/odt
Transportation	59.67 $/odt
Loading/unloading	22.18 $/odt
Stumpage fees	0.00 $/odt
Road network - Maintenance	2.32 $/odt
Indirect costs	0.00 $/odt
Total	111.72 $/odt

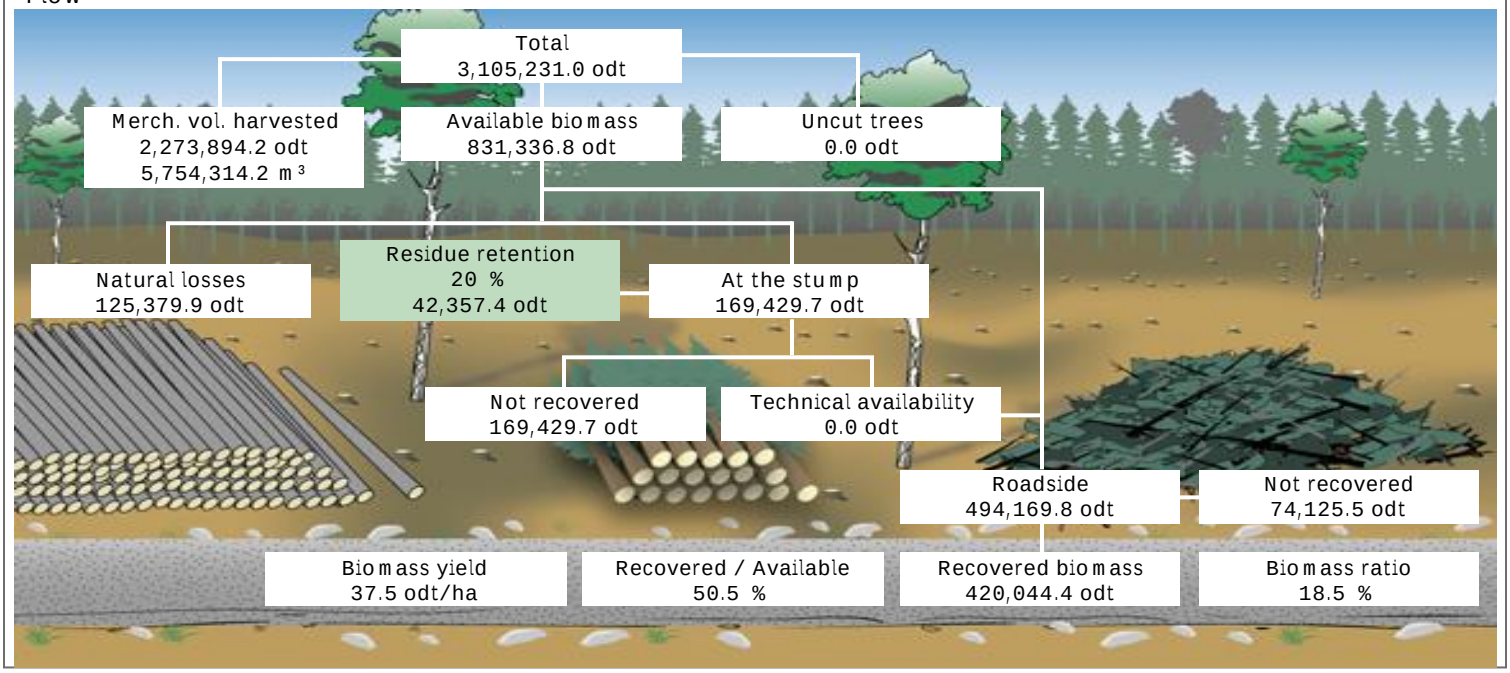
Revenue

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

Net

Profit	-111.72 $/odt

Flow



Products

Product name	odt	odt/m³	odt/ha
Western Hemlock (residues)	193,356.3	0.0841	17.27
Douglas Fir (residues)	81,084.4	0.0997	7.24
Western Red Cedar (residues)	71,817.3	0.0861	6.42
Subalpine Fir (residues)	39,250.8	0.0659	3.51
Red Alder (residues)	20,781.4	0.1107	1.86
Yellow Cedar (residues)	6,933.5	0.0452	0.62
White Spruce (residues)	5,159.7	0.0777	0.46
Lodgepole Pine (residues)	1,217.2	0.0715	0.11
Western White Pine (residues)	273.4	0.0677	0.02
Trembling Aspen (residues)	170.3	0.0906	0.02
	420,044.4	0.0845	37.52

Recovery summary

	Volume(odt)	Area(ha)	Number of cut blocks
• Biomass recovery location			
At the stump	0.0	0.0	0
Roadside	420,044.4	11,194.5	1,102
• Recovery season			
Summer	0.0	0.0	0
Winter	420,044.4	11,194.5	1,102
• Residue freshness			
Fresh	0.0	0.0	0
Brown	420,044.4	11,194.5	1,102
Brittle	0.0	0.0	0

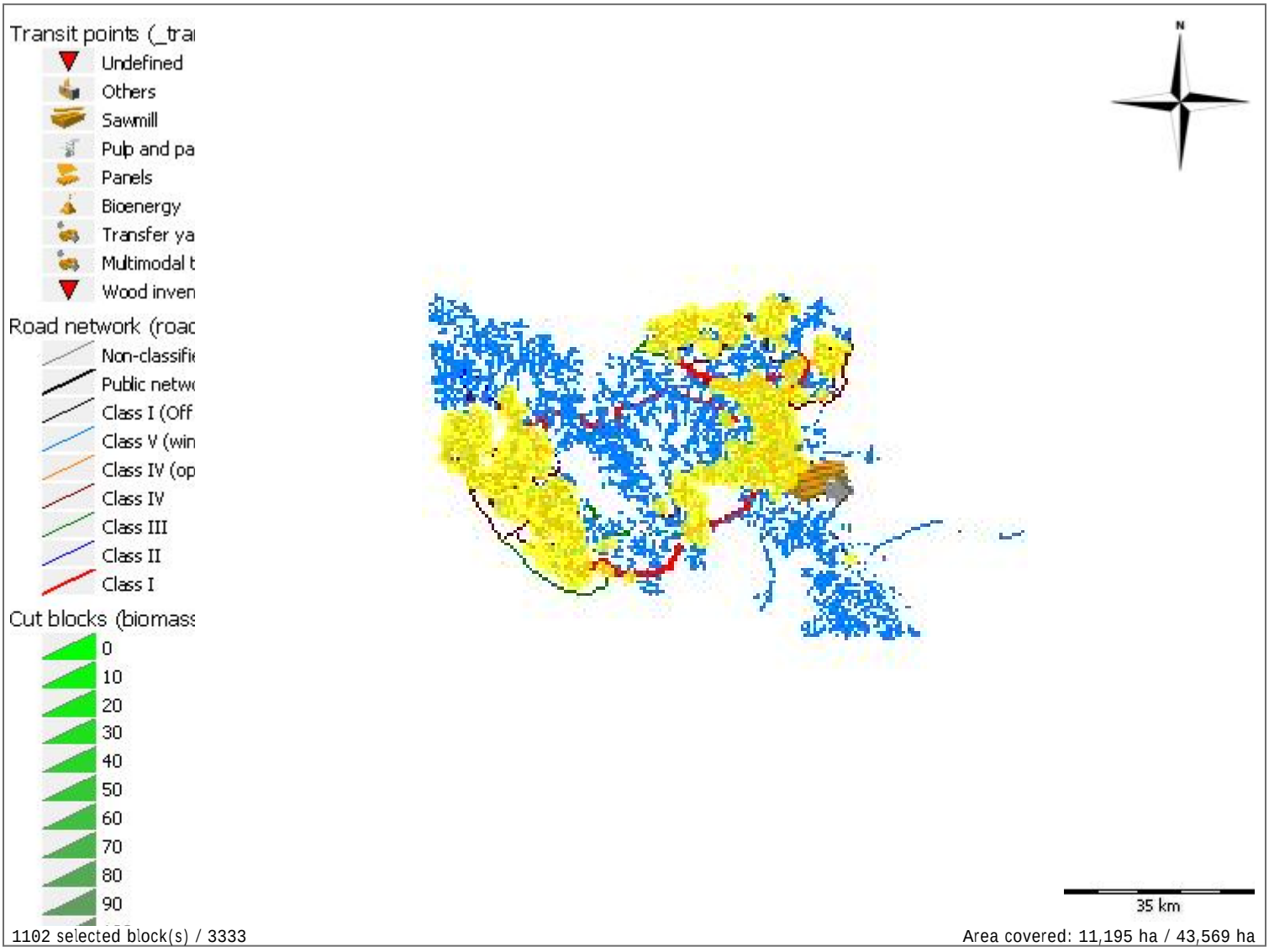
Supply summary

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	118.2	118.2
50 $/odt	0.0	9,943.7	9,943.7
60 $/odt	0.0	37,534.4	37,534.4
70 $/odt	0.0	73,030.3	73,030.3
80 $/odt	0.0	112,300.6	112,300.6
90 $/odt	0.0	139,873.4	139,873.4
100 $/odt	0.0	159,677.6	159,677.6
110 $/odt	0.0	194,830.1	194,830.1
120 $/odt	0.0	238,046.6	238,046.6
130 $/odt	0.0	289,033.4	289,033.4
140 $/odt	0.0	328,370.1	328,370.1
150 $/odt	0.0	358,740.1	358,740.1
160 $/odt	0.0	374,134.2	374,134.2
170 $/odt	0.0	394,449.4	394,449.4
180 $/odt	0.0	395,907.5	395,907.5
190 $/odt	0.0	406,678.4	406,678.4
200 $/odt	0.0	411,606.0	411,606.0
210 $/odt	0.0	419,401.6	419,401.6
220 $/odt	0.0	419,401.6	419,401.6
230 $/odt	0.0	419,410.2	419,410.2
240 $/odt	0.0	420,044.4	420,044.4

Maximum cost	0.00 $/odt	238.91 $/odt

Delivery to mills

Destination	Product	Format	odt	Transport average distance (Km)
Campbell River				
	Douglas Fir (residues)	Chips	81,084	93
	Lodgepole Pine (residues)	Chips	1,217	69
	Red Alder (residues)	Chips	20,781	123
	Subalpine Fir (residues)	Chips	39,251	140
	Trembling Aspen (residues)	Chips	170	166
	Western Hemlock (residues)	Chips	193,356	142
	Western Red Cedar (residues)	Chips	71,817	160
	Western White Pine (residues)	Chips	273	35
	White Spruce (residues)	Chips	5,160	207
	Yellow Cedar (residues)	Chips	6,934	156
			420,044	135
			420,044	135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Cut blocks (biomass
0
10
20
30
40
50
60
70
80
90
N
35 km
1102 selected block(s) / 3333
Area covered: 11,195 ha / 43,569 ha

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

Cut blocks

Area	43,568.7 ha
Number of cut blocks	3333
Harvested volume	24,942,133 m^3
Average skidding dist.	250 m
Volume/km	0 m^3/km
Area/km	0 ha/km

Cut type

Clearcut	43,568.7 ha

Harvesting system

Full-tree with roadside processing	43,568.7 ha

Costs

Harvesting	13.28 $/$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	0.71 $/$m^3$
Transportation	13.74 $/$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	30.99 $/$m^3$

Revenue

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

Net

Profit	-30.99 $/$m^3$

Products

Name	Format	m³	m³/ha	m³/stem	%/total
Western Hemlock	Logs	9,590,992	220.1	0.679	38
Douglas Fir	Logs	7,733,925	177.5	1.196	31
Western Red Cedar	Logs	3,352,477	76.9	0.647	13
Subalpine Fir	Logs	2,576,340	59.1	0.859	10
Yellow Cedar	Logs	761,073	17.5	0.930	3
Red Alder	Logs	707,000	16.2	0.650	3
White Spruce	Logs	156,193	3.6	0.794	1
Lodgepole Pine	Logs	47,762	1.1	0.545	0
Western White Pine	Logs	12,101	0.3	0.636	0
Trembling Aspen	Logs	4,270	0.1	0.572	0
		24,942,133	572.5	0.805	100

Delivery to mills

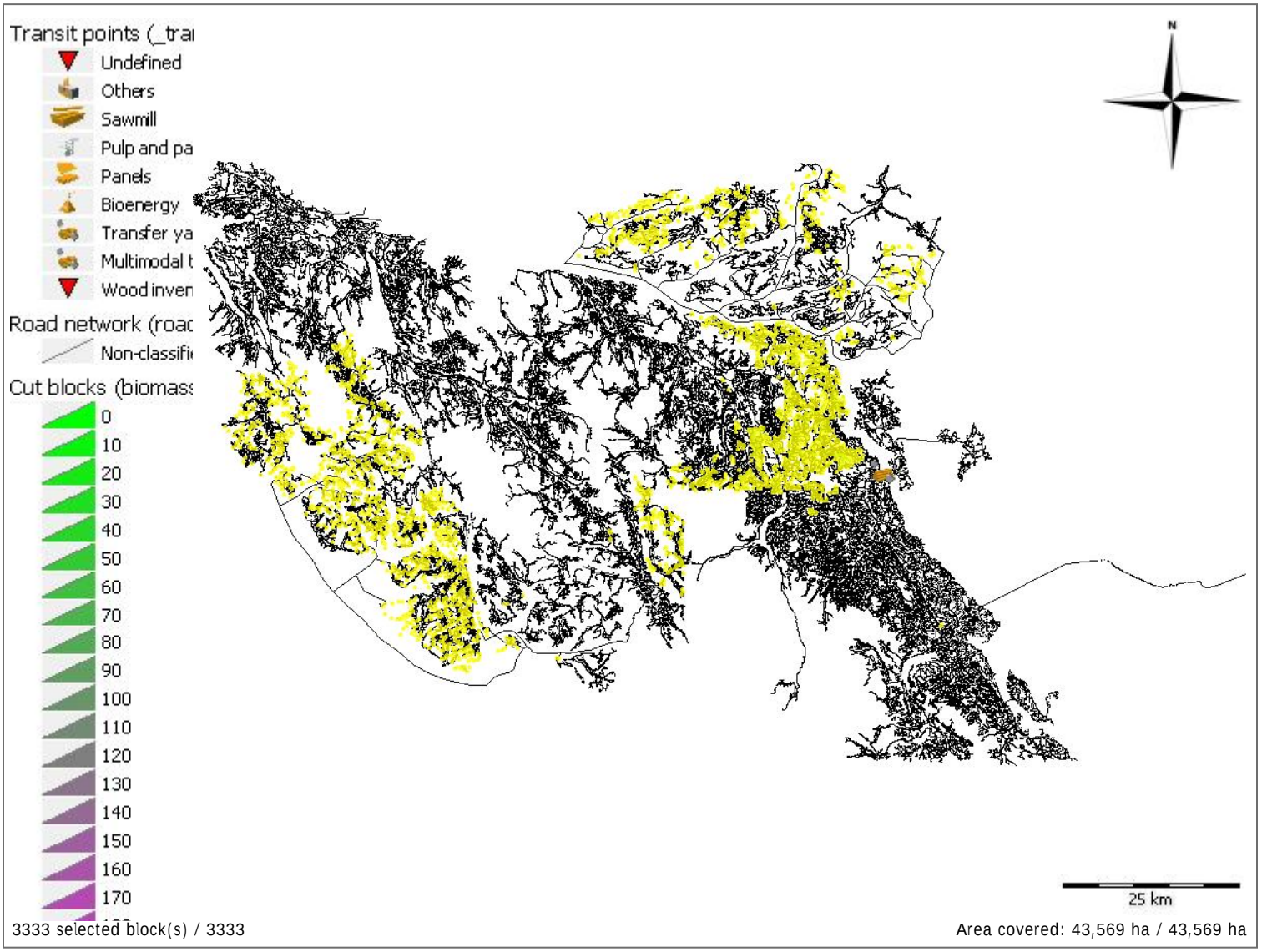
Destination	Product	Format	m³	Transport average distance (Km)
Campbell River				
	Douglas Fir	Logs	7,733,925	48
	Lodgepole Pine	Logs	47,762	74
	Red Alder	Logs	707,000	97
	Subalpine Fir	Logs	2,576,340	148
	Trembling Aspen	Logs	4,270	134
	Western Hemlock	Logs	9,590,992	126
	Western Red Cedar	Logs	3,352,477	159
	Western White Pine	Logs	12,101	36
	White Spruce	Logs	156,193	206
	Yellow Cedar	Logs	761,073	147
			24,942,133	109
			24,942,133	109

Harvesting season

	m³	ha
Summer	0	0.0
Fall	0	0.0
Winter	24,942,133	43,568.7
	24,942,133	43,568.7

Terrain conditions

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


Transit points (_trai
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Others
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Cut blocks (biomass
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
N
25 km
3333 selected block(s) / 3333
Area covered: 43,569 ha / 43,569 ha

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

Cut blocks

Area	43,568.7 ha
Number of cut blocks	3333
Harvested volume	24,942,133 m^3
Average skidding dist.	250 m
Volume/km	0 m^3/km
Area/km	0 ha/km

Cut type

Clearcut	43,568.7 ha

Harvesting system

Full-tree with roadside processing	43,568.7 ha

Costs

Harvesting	13.28 $/$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	0.71 $/$m^3$
Transportation	13.74 $/$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	30.99 $/$m^3$

Revenue

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

Net

Profit	-30.99 $/$m^3$

Products

Name	Format	m³	m³/ha	m³/stem	%/total
Western Hemlock	Logs	9,590,992	220.1	0.679	38
Douglas Fir	Logs	7,733,925	177.5	1.196	31
Western Red Cedar	Logs	3,352,477	76.9	0.647	13
Subalpine Fir	Logs	2,576,340	59.1	0.859	10
Yellow Cedar	Logs	761,073	17.5	0.930	3
Red Alder	Logs	707,000	16.2	0.650	3
White Spruce	Logs	156,193	3.6	0.794	1
Lodgepole Pine	Logs	47,762	1.1	0.545	0
Western White Pine	Logs	12,101	0.3	0.636	0
Trembling Aspen	Logs	4,270	0.1	0.572	0
		24,942,133	572.5	0.805	100

Delivery to mills

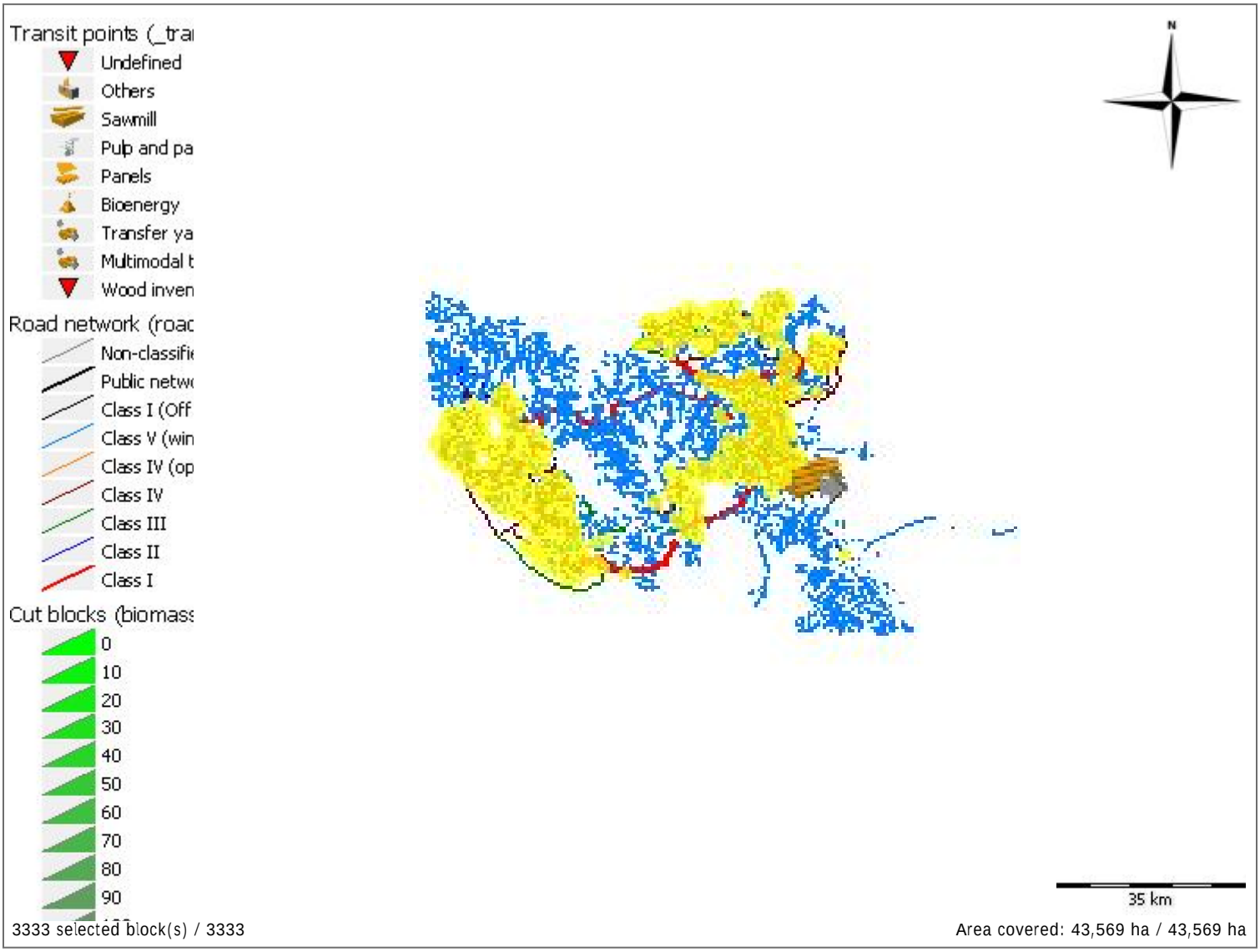
Destination	Product	Format	m³	Transport average distance (Km)
Campbell River				
	Douglas Fir	Logs	7,733,925	48
	Lodgepole Pine	Logs	47,762	74
	Red Alder	Logs	707,000	97
	Subalpine Fir	Logs	2,576,340	148
	Trembling Aspen	Logs	4,270	134
	Western Hemlock	Logs	9,590,992	126
	Western Red Cedar	Logs	3,352,477	159
	Western White Pine	Logs	12,101	36
	White Spruce	Logs	156,193	206
	Yellow Cedar	Logs	761,073	147
			24,942,133	109
			24,942,133	109

Harvesting season

	m³	ha
Summer	0	0.0
Fall	0	0.0
Winter	24,942,133	43,568.7
	24,942,133	43,568.7

Terrain conditions

CPPA class	Ground strength (%)	Roughness (%)	Slope (%)
1	-	-	-
2	-	-	-
3	100	100	100
4	-	-	-
5	-	-	-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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
35 km
3333 selected block(s) / 3333
Area covered: 43,569 ha / 43,569 ha

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

Cut blocks

Area	11,105.1 ha
Number of cut blocks	625
Harvested volume	6,900,326 m^3
Average skidding dist.	250 m
Volume/km	0 m^3/km
Area/km	0 ha/km

Cut type

Clearcut	11,105.1 ha

Harvesting system

Full-tree with roadside processing	11,105.1 ha

Costs

Harvesting	11.58 $/$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	0.63 $/$m^3$
Transportation	12.54 $/$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	28.00 $/$m^3$

Revenue

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

Net

Profit	-28.00 $/$m^3$

Products

Name	Format	m³	m³/ha	m³/stem	%/total
Western Hemlock	Logs	2,556,379	230.2	0.911	37
Douglas Fir	Logs	2,359,337	212.5	1.578	34
Western Red Cedar	Logs	829,521	74.7	0.867	12
Subalpine Fir	Logs	701,478	63.2	1.157	10
Yellow Cedar	Logs	260,922	23.5	0.969	4
Red Alder	Logs	145,997	13.1	0.867	2
White Spruce	Logs	34,632	3.1	1.024	1
Lodgepole Pine	Logs	9,167	0.8	0.880	0
Western White Pine	Logs	2,248	0.2	0.799	0
Trembling Aspen	Logs	645	0.1	3.479	0
		6,900,326	621.4	1.087	100

Delivery to mills

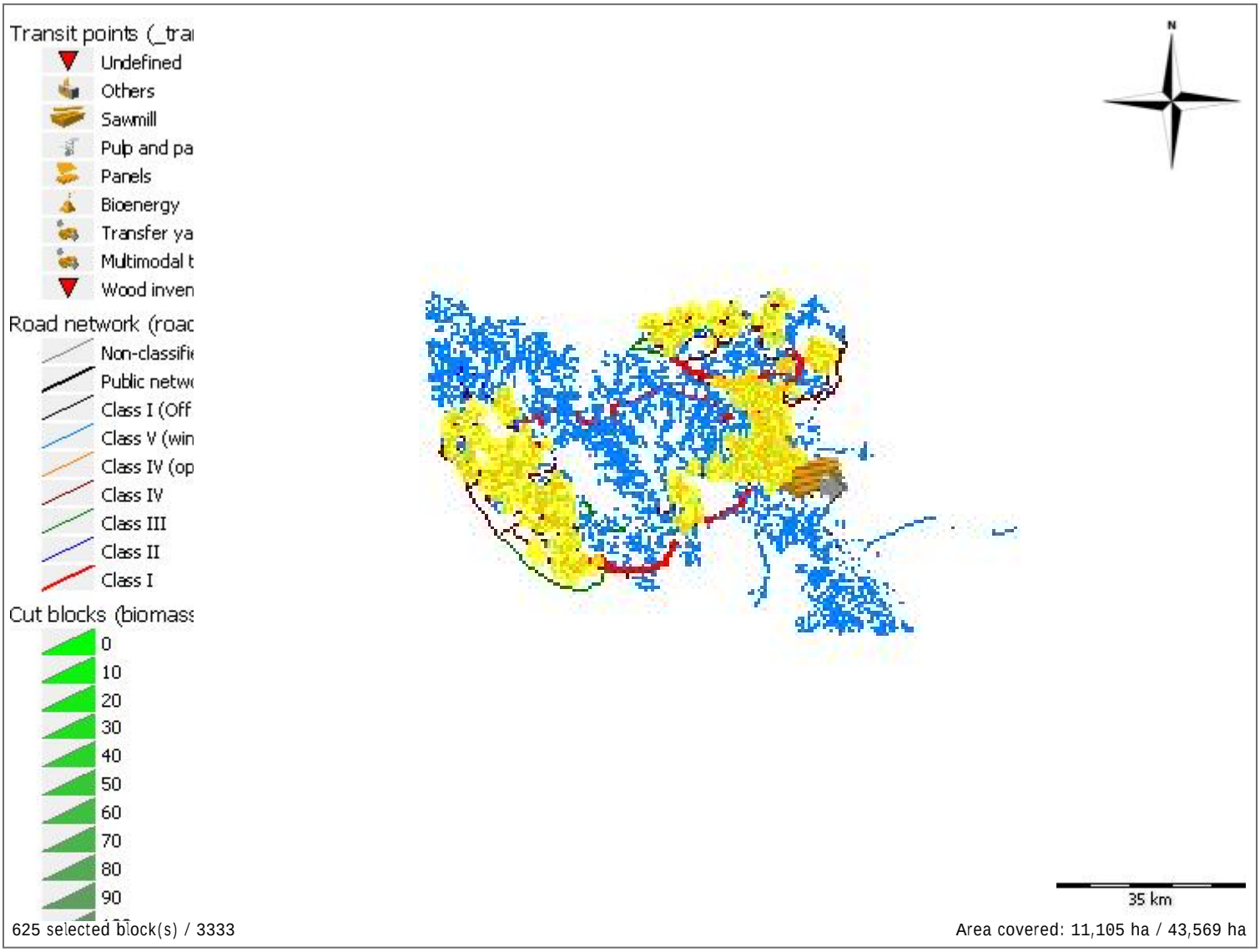
Destination	Product	Format	m³	Transport average distance (Km)
Campbell River				
	Douglas Fir	Logs	2,359,337	43
	Lodgepole Pine	Logs	9,167	67
	Red Alder	Logs	145,997	76
	Subalpine Fir	Logs	701,478	145
	Trembling Aspen	Logs	645	206
	Western Hemlock	Logs	2,556,379	114
	Western Red Cedar	Logs	829,521	150
	Western White Pine	Logs	2,248	33
	White Spruce	Logs	34,632	193
	Yellow Cedar	Logs	260,922	143
			6,900,326	98
			6,900,326	98

Harvesting season

	m³	ha
Summer	0	0.0
Fall	0	0.0
Winter	6,900,326	11,105.1
	6,900,326	11,105.1

Terrain conditions

CPPA class	Ground strength (%)	Roughness (%)	Slope (%)
1	-	-	-
2	-	-	-
3	100	100	100
4	-	-	-
5	-	-	-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Sawmill
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Wood inven
Road network (roac
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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
35 km
625 selected block(s) / 3333
Area covered: 11,105 ha / 43,569 ha

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

Cut blocks

Area	10,603.8 ha
Number of cut blocks	721
Harvested volume	6,451,847 m^3
Average skidding dist.	250 m
Volume/km	0 m^3/km
Area/km	0 ha/km

Cut type

Clearcut	10,603.8 ha

Harvesting system

Full-tree with roadside processing	10,603.8 ha

Costs

Harvesting	11.98 $/$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	0.68 $/$m^3$
Transportation	13.05 $/$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	28.95 $/$m^3$

Revenue

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

Net

Profit	-28.95 $/$m^3$

Products

Name	Format	m³	m³/ha	m³/stem	%/total
Western Hemlock	Logs	2,435,733	229.7	0.893	38
Douglas Fir	Logs	2,139,097	201.7	1.418	33
Western Red Cedar	Logs	804,832	75.9	0.890	12
Subalpine Fir	Logs	667,444	62.9	1.115	10
Yellow Cedar	Logs	183,778	17.3	0.986	3
Red Alder	Logs	178,371	16.8	0.843	3
White Spruce	Logs	27,407	2.6	1.143	0
Lodgepole Pine	Logs	10,928	1.0	0.769	0
Western White Pine	Logs	3,393	0.3	0.704	0
Trembling Aspen	Logs	863	0.1	1.304	0
		6,451,847	608.4	1.044	100

Delivery to mills

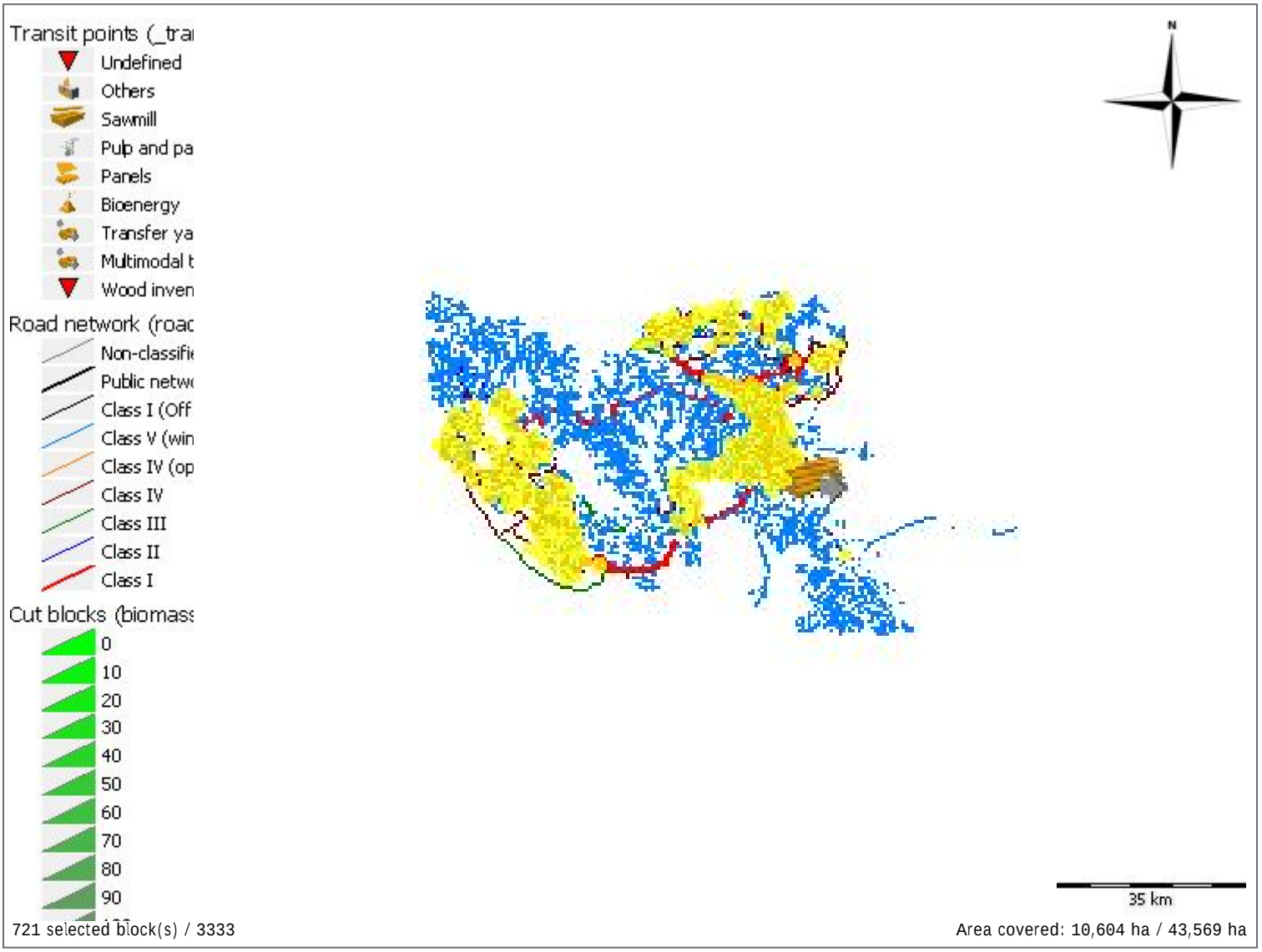
Destination	Product	Format	m³	Transport average distance (Km)
Campbell River				
	Douglas Fir	Logs	2,139,097	41
	Lodgepole Pine	Logs	10,928	77
	Red Alder	Logs	178,371	89
	Subalpine Fir	Logs	667,444	155
	Trembling Aspen	Logs	863	20
	Western Hemlock	Logs	2,435,733	121
	Western Red Cedar	Logs	804,832	160
	Western White Pine	Logs	3,393	39
	White Spruce	Logs	27,407	225
	Yellow Cedar	Logs	183,778	142
			6,451,847	103
			6,451,847	103

Harvesting season

	m³	ha
Summer	0	0.0
Fall	0	0.0
Winter	6,451,847	10,603.8
	6,451,847	10,603.8

Terrain conditions

CPPA class	Ground strength (%)	Roughness (%)	Slope (%)
1	-	-	-
2	-	-	-
3	100	100	100
4	-	-	-
5	-	-	-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Wood inven
Road network (roac
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Public netwo
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
35 km
721 selected block(s) / 3333
Area covered: 10,604 ha / 43,569 ha

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

Cut blocks

Area	10,665.3 ha
Number of cut blocks	885
Harvested volume	6,092,462 m³
Average skidding dist.	250 m
Volume/km	0 m³/km
Area/km	0 ha/km
Cut type	
Clearcut	10,665.3 ha
Harvesting system	
Full-tree with roadside processing	10,665.3 ha

Costs

Harvesting	13.28 $/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	0.74 $/m³
Transportation	14.12 $/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	31.39 $/m³

Revenue

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

Net

Profit	-31.39 $/m³

Products

Name	Format	m³	m³/ha	m³/stem	%/total
Western Hemlock	Logs	2,294,700	215.2	0.675	38
Douglas Fir	Logs	1,909,787	179.1	1.204	31
Western Red Cedar	Logs	879,239	82.4	0.674	14
Subalpine Fir	Logs	609,614	57.2	0.851	10
Red Alder	Logs	194,598	18.2	0.671	3
Yellow Cedar	Logs	162,796	15.3	0.932	3
White Spruce	Logs	27,777	2.6	0.762	0
Lodgepole Pine	Logs	10,647	1.0	0.744	0
Western White Pine	Logs	2,420	0.2	0.420	0
Trembling Aspen	Logs	883	0.1	0.442	0
		6,092,462	571.2	0.809	100

Delivery to mills

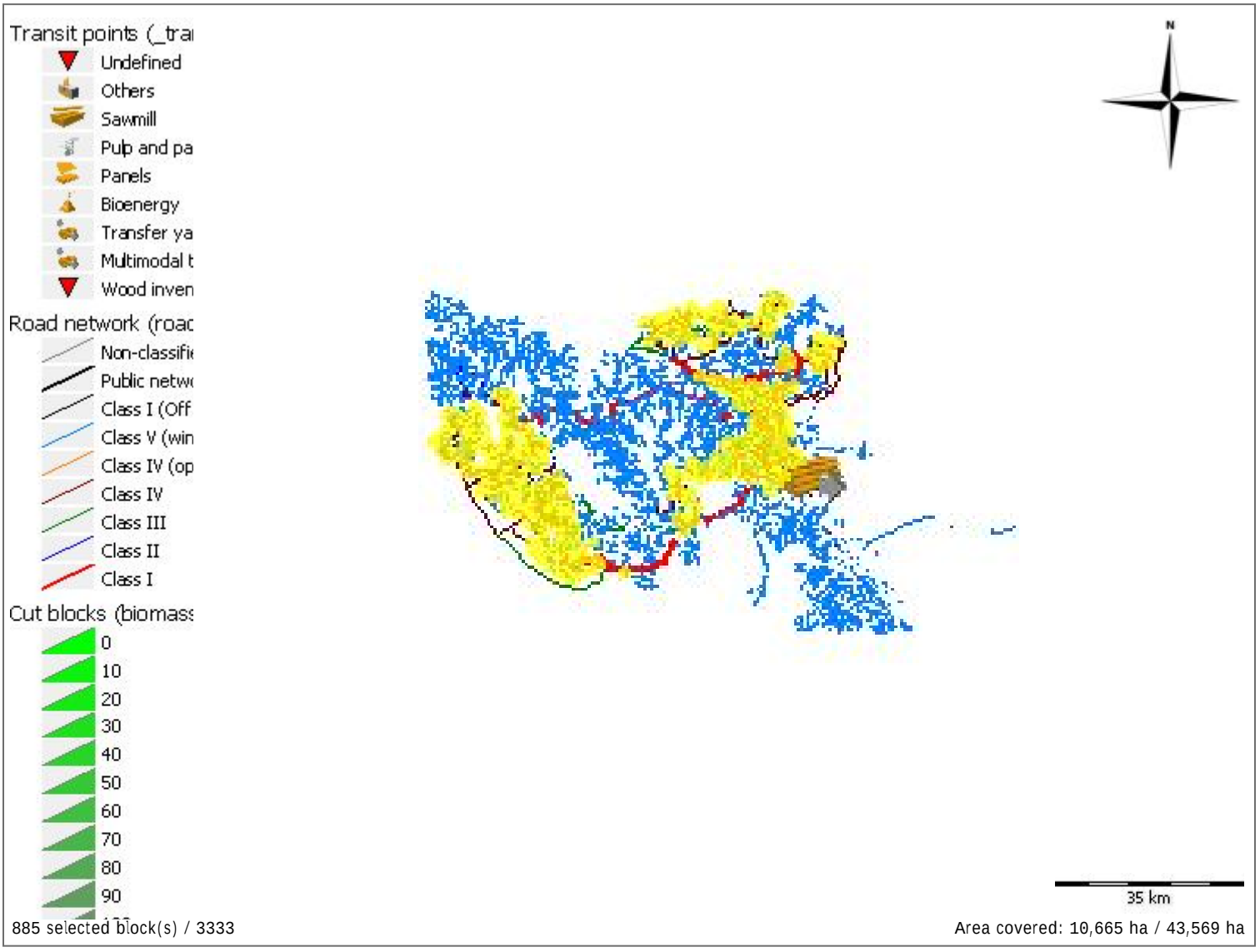
Destination	Product	Format	m³	Transport average distance (Km)
Campbell River				
	Douglas Fir	Logs	1,909,787	50
	Lodgepole Pine	Logs	10,647	86
	Red Alder	Logs	194,598	99
	Subalpine Fir	Logs	609,614	145
	Trembling Aspen	Logs	883	171
	Western Hemlock	Logs	2,294,700	132
	Western Red Cedar	Logs	879,239	166
	Western White Pine	Logs	2,420	36
	White Spruce	Logs	27,777	190
	Yellow Cedar	Logs	162,796	151
			6,092,462	112
			6,092,462	112

Harvesting season

	m³	ha
Summer	0	0.0
Fall	0	0.0
Winter	6,092,462	10,665.3
	6,092,462	10,665.3

Terrain conditions

CPPA class	Ground strength (%)	Roughness (%)	Slope (%)
1	-	-	-
2	-	-	-
3	100	100	100
4	-	-	-
5	-	-	-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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
35 km
885 selected block(s) / 3333
Area covered: 10,665 ha / 43,569 ha

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

Cut blocks

Area	11,194.5 ha
Number of cut blocks	1102
Harvested volume	5,497,498 m^3
Average skidding dist.	250 m
Volume/km	0 m^3/km
Area/km	0 ha/km

Cut type

Clearcut	11,194.5 ha

Harvesting system

Full-tree with roadside processing	11,194.5 ha

Costs

Harvesting	16.96 $/$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	0.84 $/$m^3$
Transportation	15.65 $/$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	36.70 $/$m^3$

Revenue

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

Net

Profit	-36.70 $/$m^3$

Products

Name	Format	m³	m³/ha	m³/stem	%/total
Western Hemlock	Logs	2,304,180	205.8	0.445	42
Douglas Fir	Logs	1,325,704	118.4	0.706	24
Western Red Cedar	Logs	838,886	74.9	0.417	15
Subalpine Fir	Logs	597,804	53.4	0.554	11
Red Alder	Logs	188,033	16.8	0.450	3
Yellow Cedar	Logs	153,576	13.7	0.818	3
White Spruce	Logs	66,377	5.9	0.648	1
Lodgepole Pine	Logs	17,021	1.5	0.349	0
Western White Pine	Logs	4,039	0.4	0.718	0
Trembling Aspen	Logs	1,879	0.2	0.407	0
		5,497,498	491.1	0.503	100

Delivery to mills

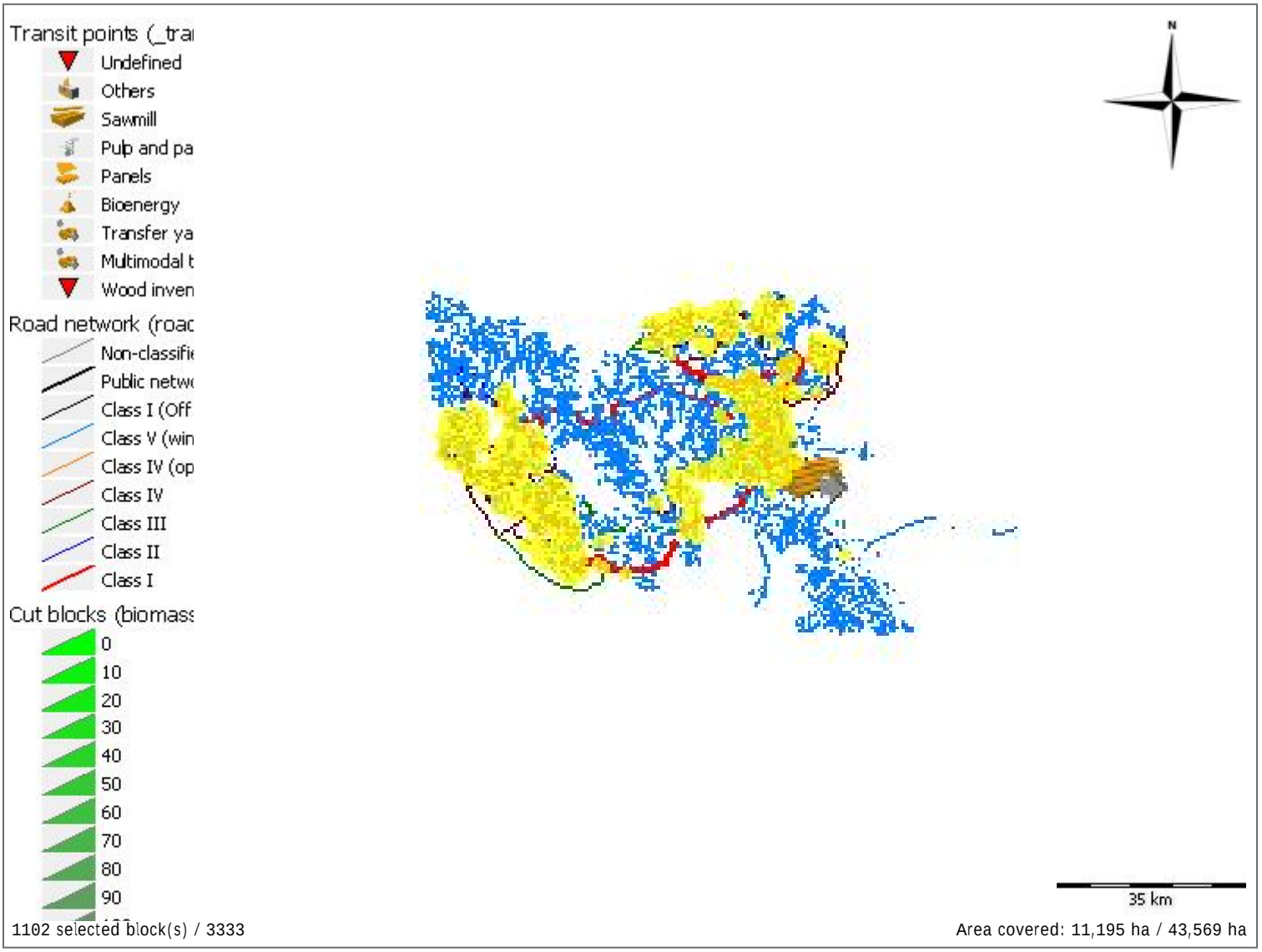
Destination	Product	Format	m³	Transport average distance (Km)
Campbell River				
	Douglas Fir	Logs	1,325,704	65
	Lodgepole Pine	Logs	17,021	68
	Red Alder	Logs	188,033	117
	Subalpine Fir	Logs	597,804	147
	Trembling Aspen	Logs	1,879	145
	Western Hemlock	Logs	2,304,180	140
	Western Red Cedar	Logs	838,886	160
	Western White Pine	Logs	4,039	35
	White Spruce	Logs	66,377	212
	Yellow Cedar	Logs	153,576	154
			5,497,498	126
			5,497,498	126

Harvesting season

	m³	ha
Summer	0	0.0
Fall	0	0.0
Winter	5,497,498	11,194.5
	5,497,498	11,194.5

Terrain conditions

CPPA class	Ground strength (%)	Roughness (%)	Slope (%)
1	-	-	-
2	-	-	-
3	100	100	100
4	-	-	-
5	-	-	-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Class I (Off
Class V (win
Class IV (op
Class IV
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Class II
Class I
Cut blocks (biomass
0
10
20
30
40
50
60
70
80
90
N
35 km
1102 selected block(s) / 3333
Area covered: 11,195 ha / 43,569 ha

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