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USING FPINTERFACE TO ESTIMATE AVAILABLE FOREST-ORIGIN BIOMASS IN BRITISH COLUMBIA:

ARROW, BOUNDARY, AND KOOTENAY LAKE TSA

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ABSTRACT:

Based on inventory information and a 10-year harvest queue, estimates of the amount of biomass available from forest harvest residues were estimated in $10 increments of delivered cost. For the study area (Arrow, Boundary, and Kootenay Lake TSA), a total of 154 000 ODT/year was projected to be available, while only 16 000 ODT/year were expected to be available at the economic price of $60/ODT.

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EXECUTIVE SUMMARY

FPInnovations estimated the amount of forest-origin harvest residue biomass available from the study area (Arrow, Boundary, and Kootenay Lake TSA), largely following the process previously established for several British Columbia TSAs using FPInterface between 2010 and 2017. The biomass inventory was based on 10-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 study area was 26.6 oven-dried tonnes per hectare (ODT/ha). The biomass ratio (the ratio of recovered biomass to recovered merchantable roundwood) was estimated at 20.2%. Over the next 10 years, a total of 1.54 million ODT of available biomass was predicted to be generated by harvest in the study area, or approximately 154 000 ODT/year. Of this, approximately 157 000 ODT in total, or 16 000 ODT/year, were expected to be available at the economic price of $60/ODT. Approximately 70% of the total predicted volume was expected to be available at $90/ODT: a total of 1.07 million ODT, or 107 000 ODT/year.

Biomass availability at $70/ODT, 382 000 ODT, is over double the amount calculated at $60/ODT. If increases in efficiency or decreases in cost can be realized, there could be a large increase in available biomass.

Most of the biomass that is considered economically available (≤ $60/ODT) is closer to the district's delivery points. Kelowna, Revelstoke, Grand Forks, Midway, Castlegar, Cranbrook, and Wynndel were used as delivery points. The amount of economically available biomass decreased through time from approximately 17 000 ODT/year in years 1 to 5 to 14 500 ODT/year in years 6 to 10. This decrease may be due to increased distances between planned harvest areas and the delivery locations in later periods.

INTRODUCTION

FPInnovations estimated the amount of forest-origin harvest residue biomass from an area encompassing Arrow, Boundary, and Kootenay Lake TSA (hereafter referred to as "the study area"). The study area largely followed the process previously established for several British Columbia TSA reports using FPInterface between 2010 and 2017. The biomass inventory was based on 10-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 Rural Development (FLNRORD), 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).

OBJECTIVE

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

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.

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 study area 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, stands with small diameter trees 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 study area.

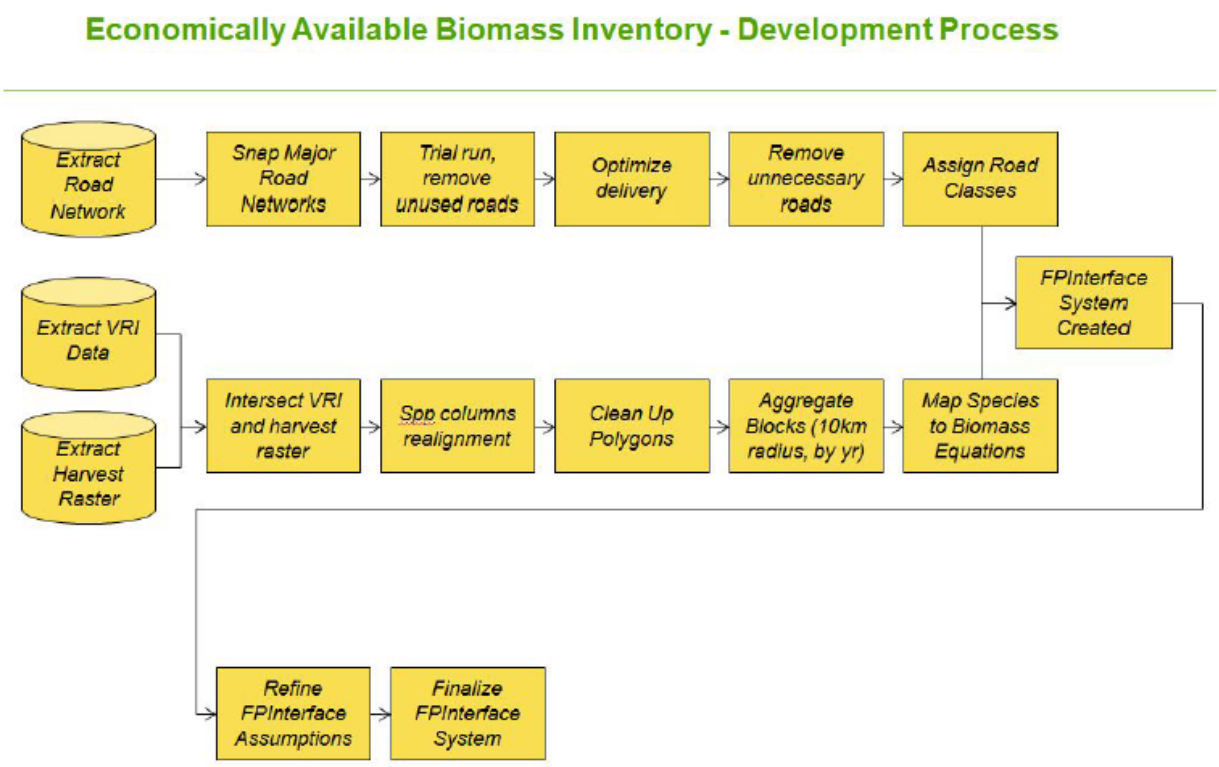

Figure 1. The steps taken to build the final inventory of economically available biomass.

Data Acquisition

Data layers for the study area were acquired from FLNRORD (excluding woodlots, TFLs, CFAs, and any First Nations tenures), and included Vegetation Resource Inventory (VRI) polygons with attributes, and road linework with attributes. The data layers were acquired from the three timber supply areas (TSA) within the study area. Arrow and Boundary TSA data layers included 20-year harvest queues while Kootenay Lake TSA included a 10-year harvest queue. The data layers were merged and only the first 10 years were used for the analysis due to Kootenay Lake TSA's shorter harvest queue. The 10-year polygon data was partitioned into 2 consecutive 5-year harvest periods. The total 10-year harvest queue is a point-in-time snapshot. It indicates which polygons are expected to be harvested in the next 10 years. No attempt was made to model possible growth or mortality during the 10-year period. Any projections of growth or mortality are already accounted for in the harvestable proportion contained in the polygon 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 tree size data (volume per stem) 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 queue layers. Aggregation rules dictated that blocks were grouped if they had an identical harvest year and were within a 5-km grid.

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	SX	white spruce	S, SX
Aspen, trembling	AT	trembling aspen	AT, ACB
Cedar, western red	CW	western red cedar	CW
Fir, subalpine	BL	subalpine fir	BA, BL, B,
Fir, grand	BG	grand fir	BG
Birch, white	EP	white birch	EP
Douglas-fir (interior)	FDI	Douglas-fir	FDI
Hemlock, western	HW	western hemlock	HW
Larch, western	LW	western larch	LW
Larch, eastern (tamarack)	LT	tamarack	LT
Pine, lodgepole	PL	lodgepole pine	PL, PLI, PA
Pine, western white	PW	western white pine	PW

Spruce, Engelmann	SE	Engelmann spruce	SE
Cottonwood, black	ACT	black cottonwood	ACT, AC
Pine, ponderosa	PY	yellow pine	PY

Road Classes

Unlike the Quesnel TSA data set, the Selkirk 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 for study area was assigned CPPA Class 3 (20–32%). Ground strength was rated CPPA Class 2 (good), and ground roughness was rated CPPA Class 2 (slightly even).

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 $26.82/ODT.

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 $26.82/ODT.

Table 3. FPInterface parameters

Run descriptor	Value
run name	SelkirkRunV1
output name	Biomass – SelkirkRunV1
block system	bio_5fn_merged_2P.shp
road system	Roads_28nov2018_250m_split.shp
transfer yard(s)	Kelowna, Revelstoke, Castlegar, Midway, Grand Forks, Wynndel
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	2 - good
ground roughness	2 – slightly even
average slope %	20–32
slash used for biomass	yes
full stem used for biomass	no
chip destination	Kelowna, Revelstoke, Castlegar, Midway, Grand Forks, Wynndel
topping diameter	12.5 cm
truck used for logs	3-axle

truck used for chips	Tridem B-train
harvesting fuel price/litre (x4)	$1.25
harvesting shifts/day (x4)	1
harvesting hours/shift (x4)	12
harvesting days/year (x4)	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
loader type	loader with log grapples
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)	$1.25
biomass hours/shift (x2)	12
biomass shifts/day (x2)	1
biomass days/year (x2)	200
grinder efficiency	60%
grinder fuel use (L/PMH)	135
indirect costs - biomass ($ value)	$0.00
indirect costs - harvesting ($ value)	$0.00

Delivery Locations

All harvest residues from in-woods operations (not from mills) were directed to large industrial areas in the study area. In this model, Kelowna, Revelstoke, Grand Forks, Midway, Castlegar, Cranbrook, and Wynndel were used as delivery locations. These locations were selected due to their large populations or wood mills. Initial comminution was set to take place at roadside, and costs are calculated for biomass delivered to the closest 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 10-year harvest of the base case with normal grinder utilization of 60% and fuel usage of 135 L/PMH.

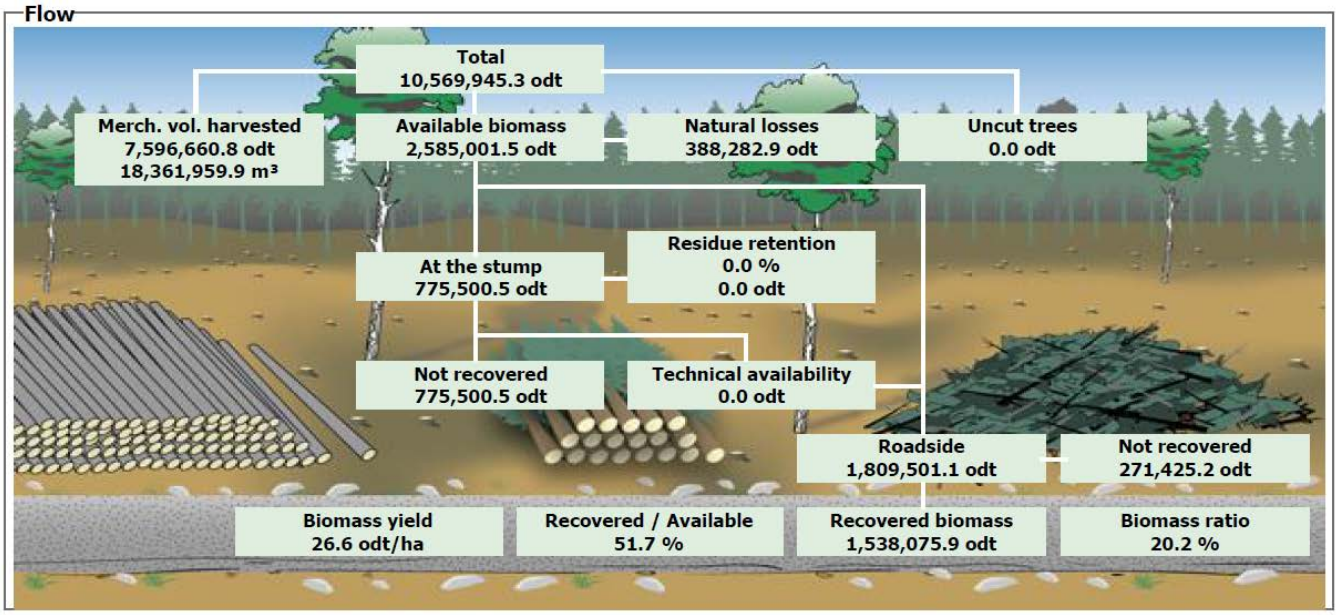

Figure 2. Recoverable biomass in the study area, delivered to closest delivery points.

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 study area, based on inventory information and the road network supplied by FLNRO, indicated an average biomass yield of 26.6 ODT/ha. 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, it was predicted that 1 538 076 ODT could be recovered from roadside and delivered to the delivery locations over the course of 10 years. The amount of available biomass was relatively consistent throughout both periods. The first 5-year period (years 1–5) had a lower amount of available biomass, possibly due to a lower biomass ratio of 19.7% compared to 20.8% for the second 5-year period (years 6-10). The amount of biomass available each year in the study area was approximately 154 000 ODT/year, at any price. However, the amount of economically available biomass available in each 5-year period varied from 85 000 ODT in the first 5-year period to 72 500 ODT in the second 5-year period. The economically available volume was estimated at 15 700 ODT/year (Table 4).

Table 4. Key amounts of biomass availability in the study area

	Volume at $60/ODT (ODT)[a]	Volume at $90/ODT (ODT)	Total volume ($203/ODT) (ODT)
Over 10-year period	157 140	1 072 156	1 538 075
Per year	15 714	107 216	153 808

[a] ODT: oven-dried tonne

Additionally, the model indicated that about 775 500 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 43% 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, 271 000 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 was 20.2% (Table 5).

Table 5. Calculation of the biomass ratio

Biomass ratio (ODT)[a]	
Recovered biomass	1 538 075
Recovered roundwood	7 596 661
Biomass ratio (%)	20.2

[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 10 years is predicted to be 157 140 ODT or about 16 000 ODT/year. The complete results in $10 increments for the entire 10-year period are presented in Table 6 and Figure 3.

Table 6. Cost availability of biomass in the study area

Normal grinder utilization at $60/ODT[ab]		
Cost ($/ODT)	**Total (ODT)**	**Annual (ODT)**
10	–	–
20	–	–
30	–	–
40	–	–
50	778.3	77.8
60	157140.0	15714.0
70	382238.9	38223.9
80	735522.7	73552.3
90	1072155.7	107215.6
100	1242878.4	124287.8
110	1354065.4	135406.5
120	1461756.0	146175.6
130	1496693.9	149669.4
140	1512123.5	151212.4
150	1522948.6	152294.9
160	1534549.1	153454.9
170	1536024.6	153602.5
180	1537353.0	153735.3
190	1537361.5	153736.2
200	1538068.7	153806.9
210	1538075.9	153807.6

[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.

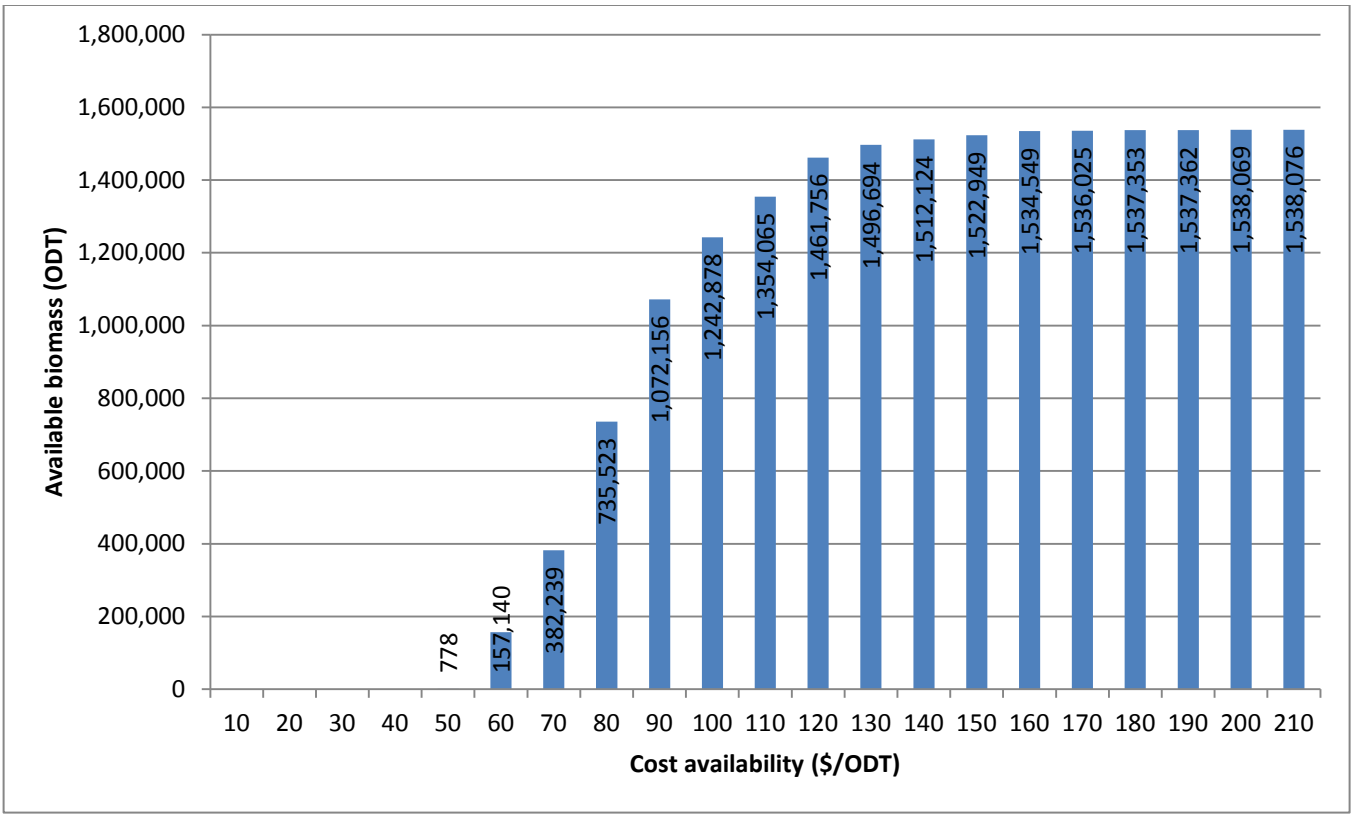

Figure 3. Cost availability of biomass in the study area, over 10 years (ODT: oven-dried tonne).

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 red (blocks with the most expensive costs); orange shows the transition between the two (Figure 4). The delivery points are represented by blue triangles. All biomass from the study area was scheduled for delivery to these points. The costs ranged up to $203/ODT for the blocks farthest from the delivery point.

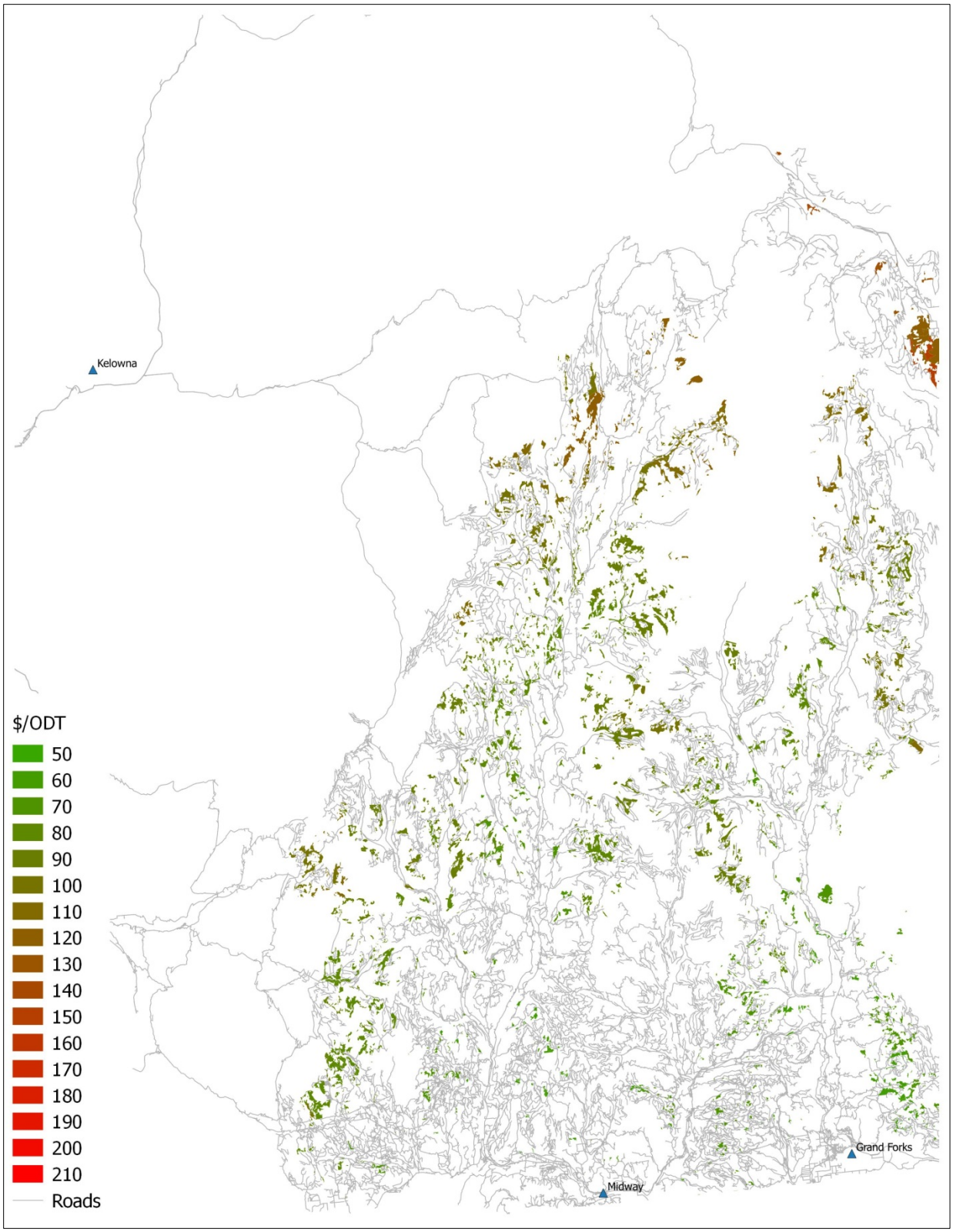

Figure 4. Cost of delivered biomass from point of origin to the delivery points, in increments of $10/oven-dried tonne (Kelowna, Midway, Grand Forks).

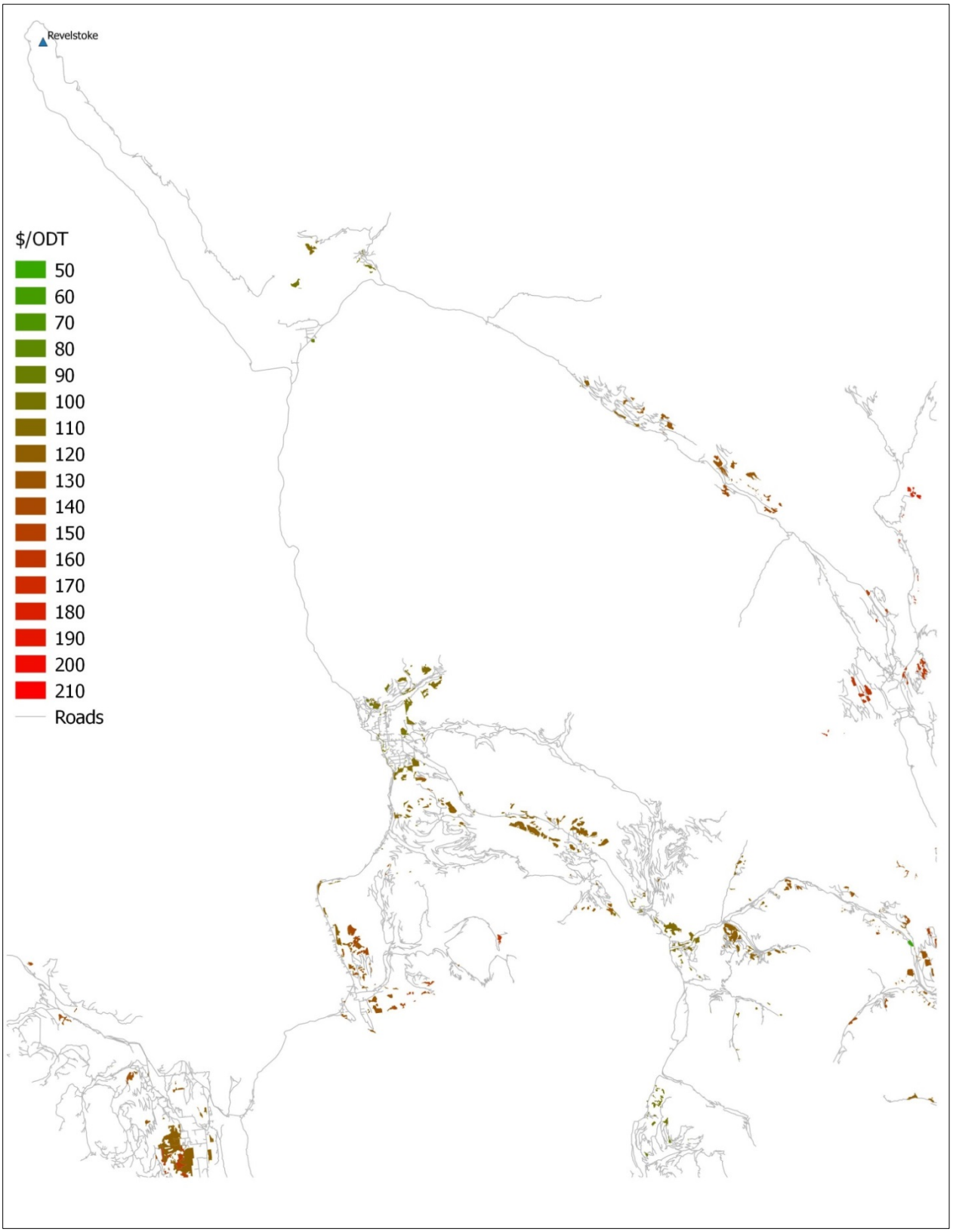

Figure 5. Cost of delivered biomass from point of origin to the delivery points, in increments of $10/oven-dried tonne (Revelstoke).

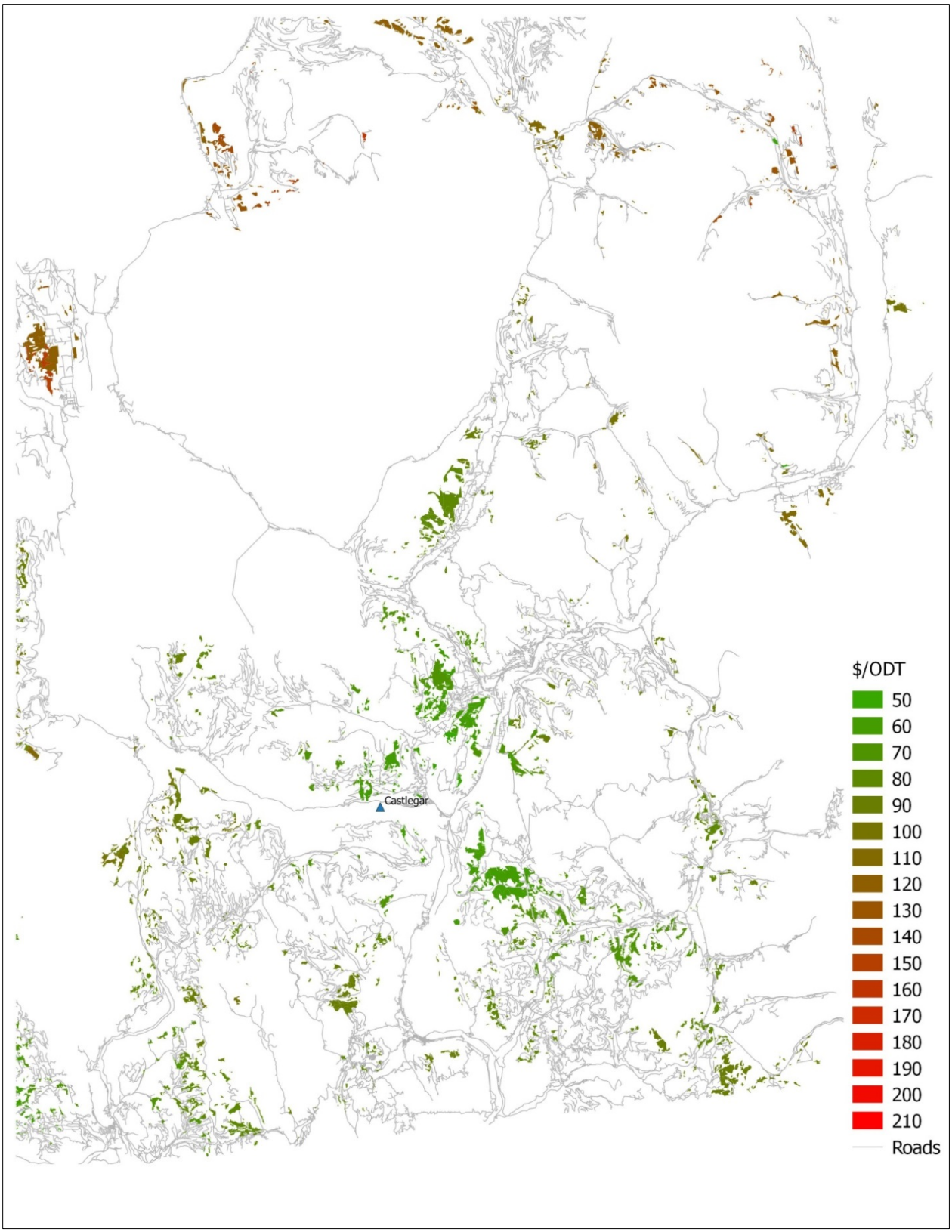

Figure 6. Cost of delivered biomass from point of origin to the delivery points, in increments of $10/oven-dried tonne (Castlegar).

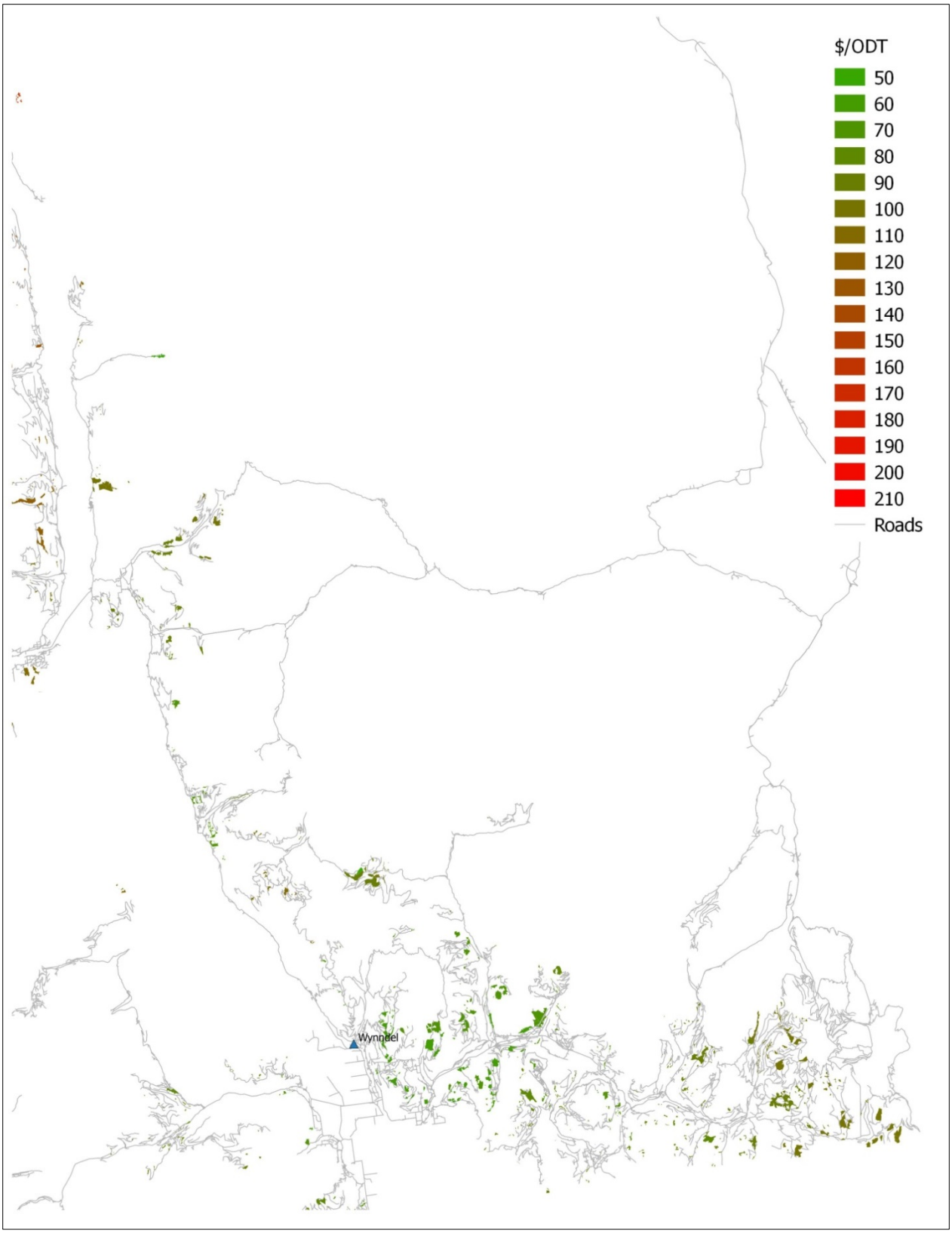

Figure 7. Cost of delivered biomass from point of origin to the delivery points, in increments of $10/oven-dried tonne (Wynndel).

Figure 8 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 grey; red and blue show roads with the fastest speeds.

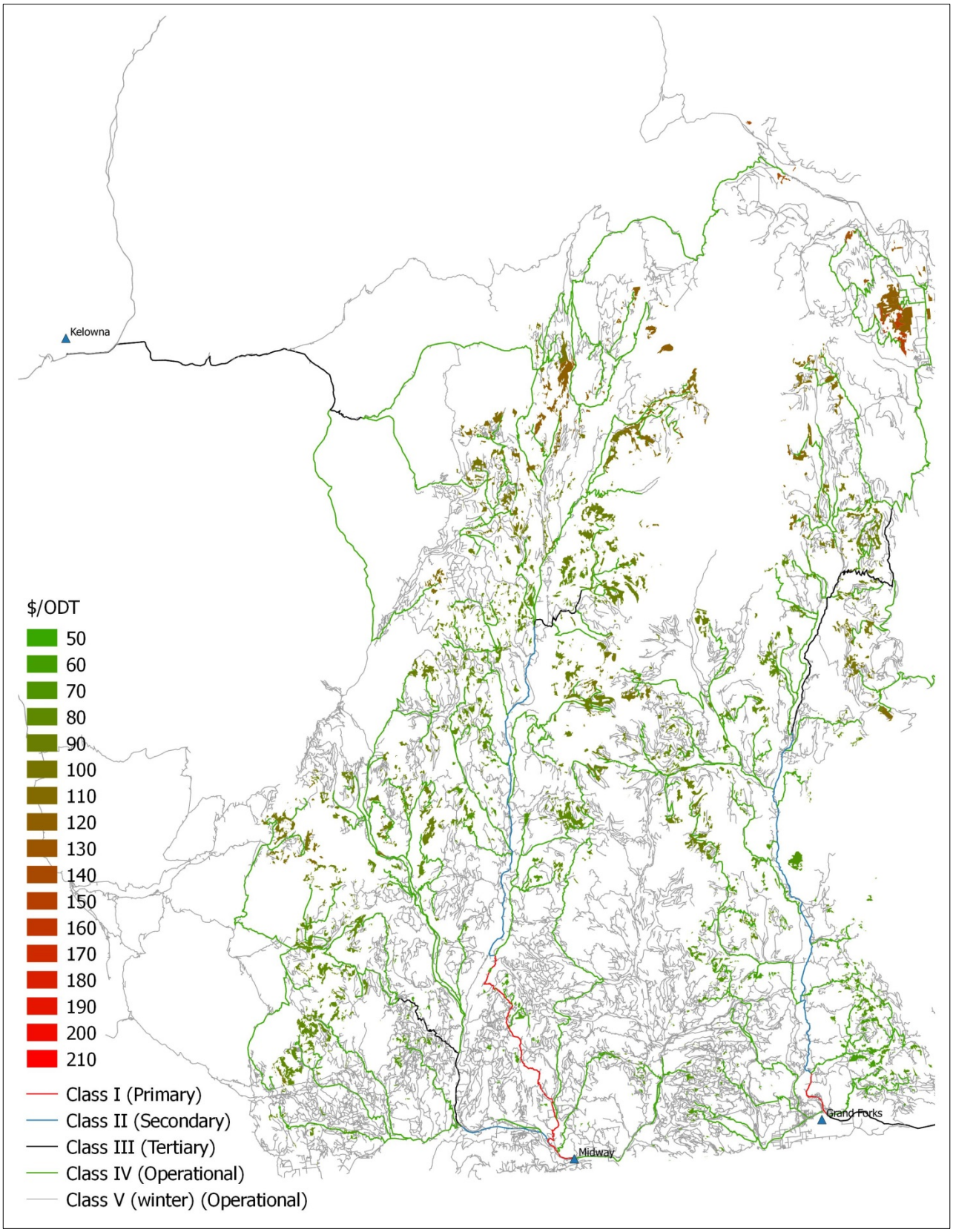

Figure 8. Blocks with road access in the study area (Kelowna, Midway, Grand Forks).

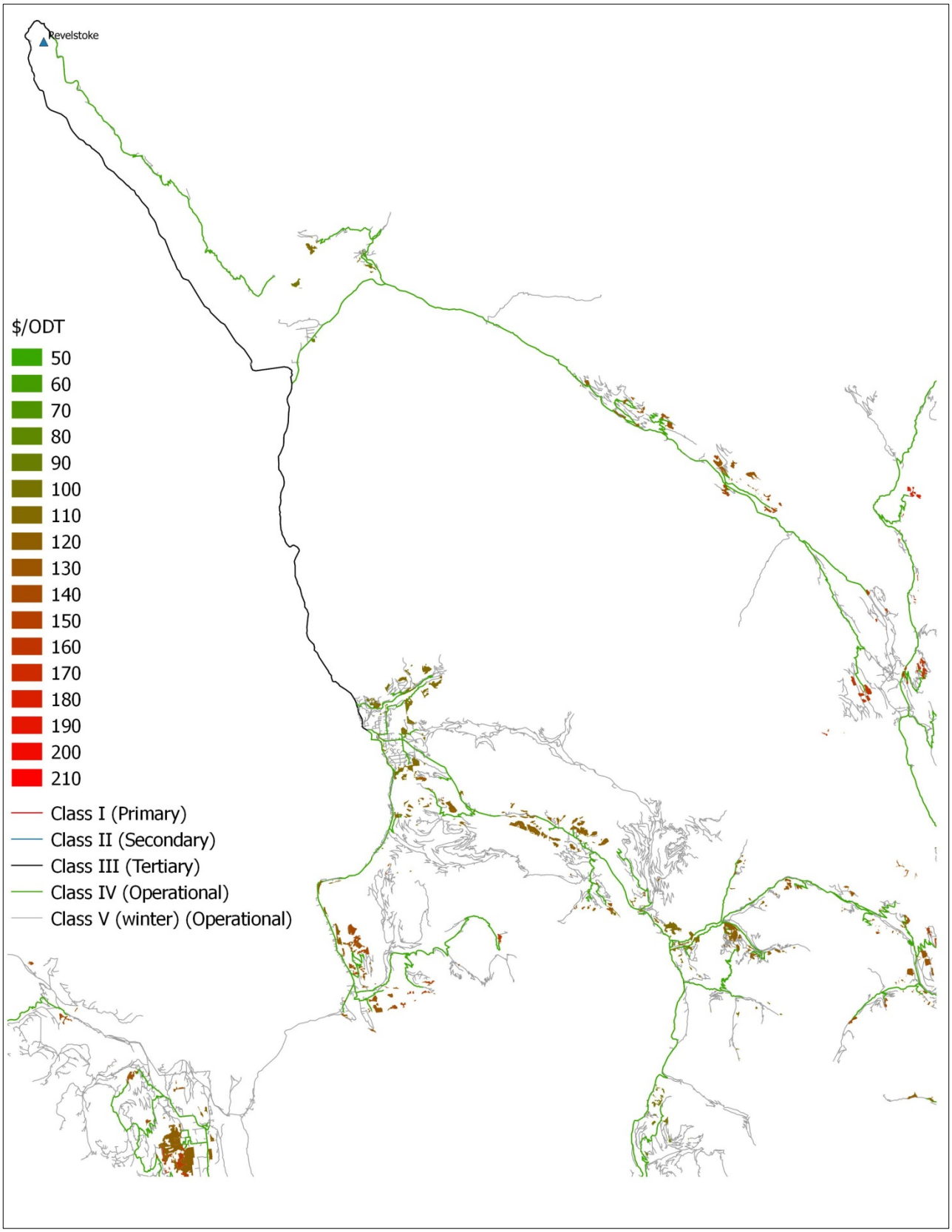

Figure 9. Blocks with road access in the study area (Revelstoke).

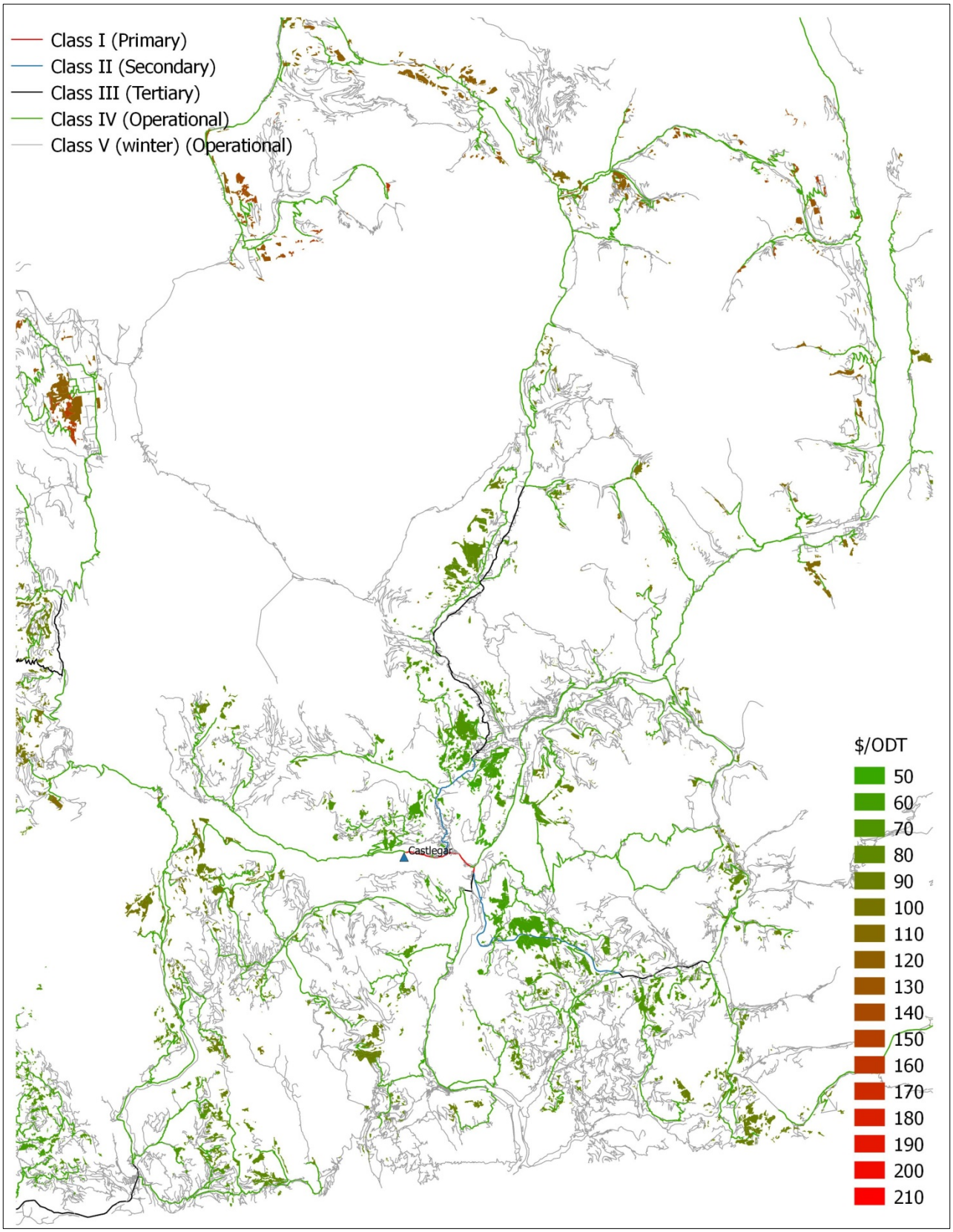

Figure 10. Blocks with road access in the study area (Castlegar).

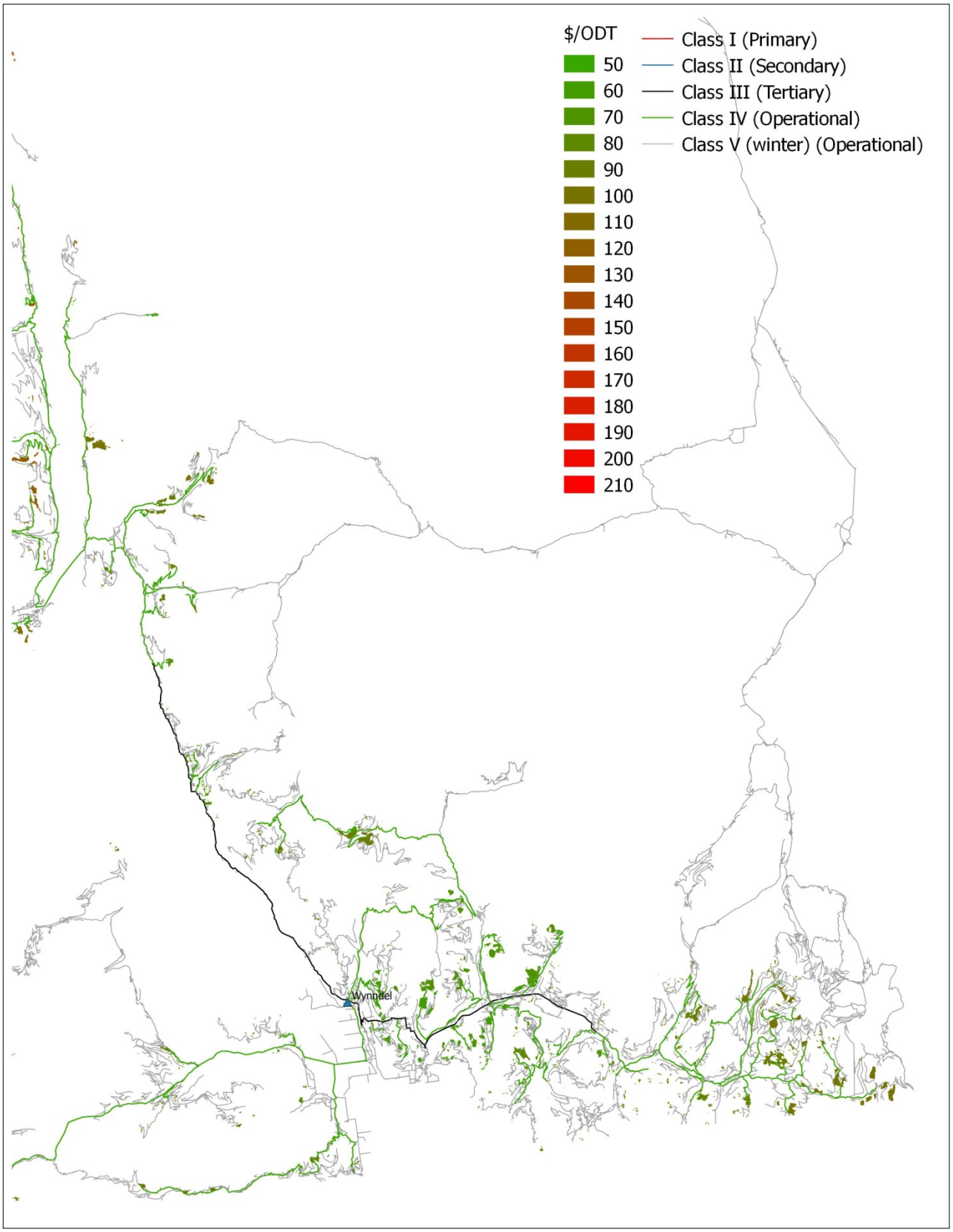

Figure 11. Blocks with road access in the study area (Wynndel).

Temporal Distribution of Harvest

The harvest data included a time period assigned to each cutblock. There are two 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 12).

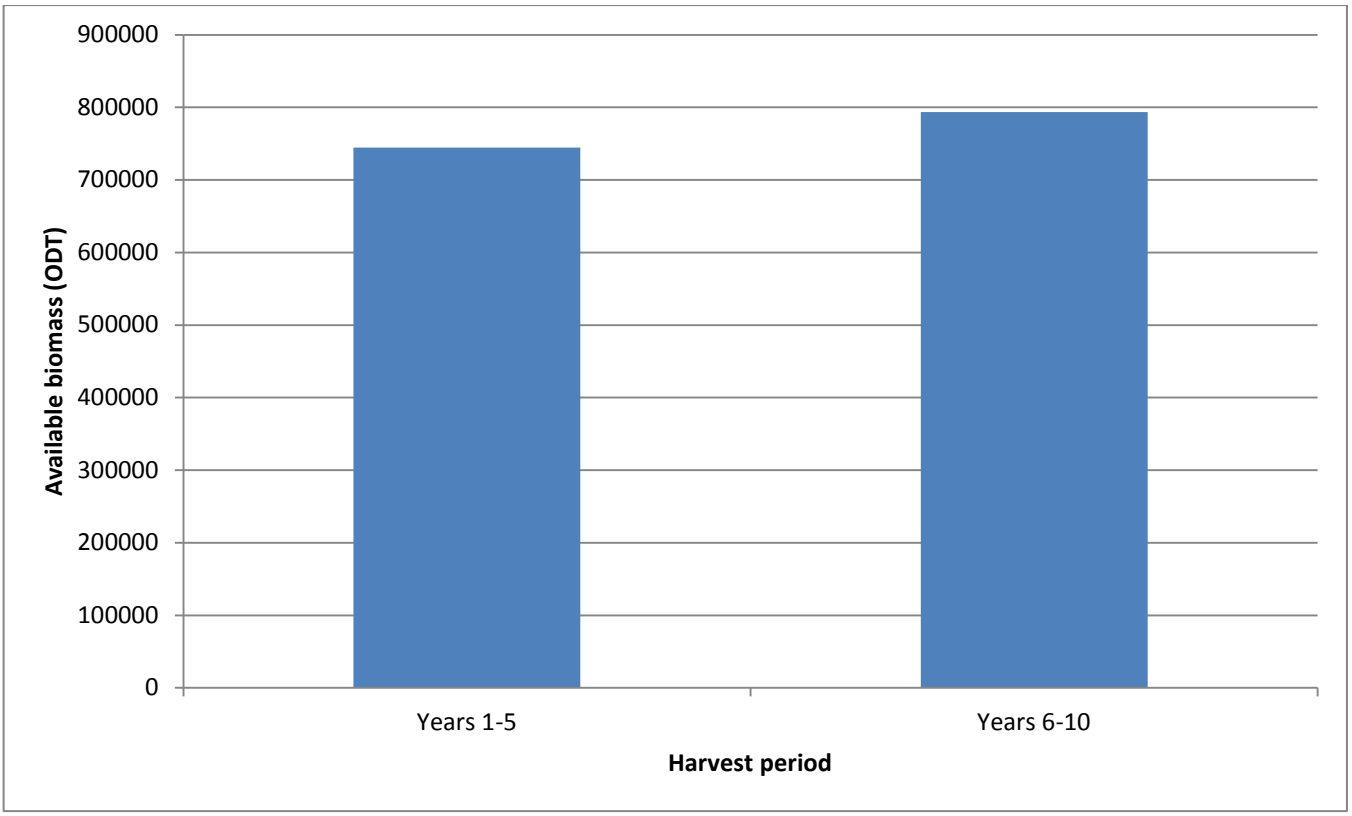

Figure 12. Availability of biomass in the study area, by 5-year harvest period.

The economic harvest available (amount of biomass at $60/ODT) in each 5-year period (Figure 13) showed a disproportionate decline (compared to Figure 6) in the second harvest period. This indicates that the harvest blocks tend to be farther from the delivery locations, increasing transportation costs.

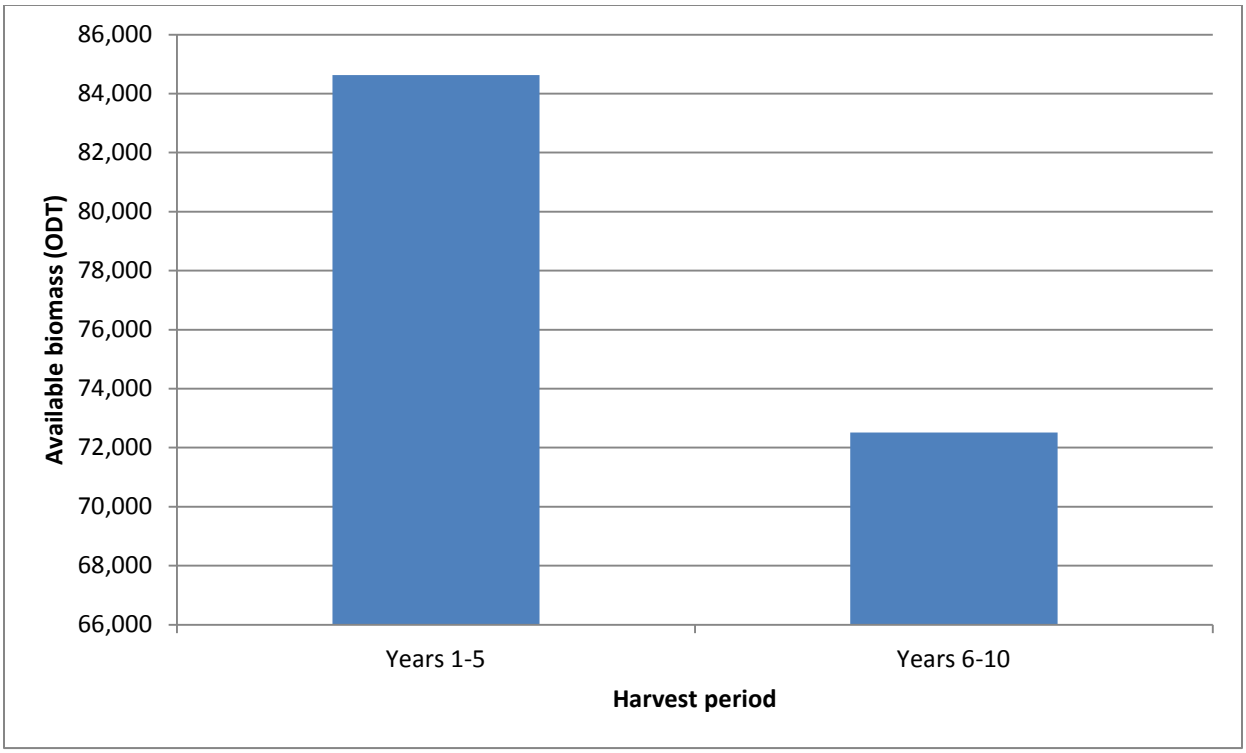

Figure 13. Availability of economic biomass in the study area, by 5-year harvest period, at ≤ $60/oven-dried tonne.

The cost availability of biomass is shown by period and $10 increments in Table 7.

Table 7. Cost availability of biomass in the study area, by 5-year period.

	Period 1 (years1–5)		Period 2 (years 6–10)	
Cost ($/ODT)[a]	Total (ODT)	Annual (ODT)	Total (ODT)	Annual (ODT)
10	–	–	–	–
20	–	–	–	–
30	–	–	–	–
40	–	–	–	–
50	132.3	26.5	646	129
60[b]	84 624	16 925	72 516	14 503
70	198 607	39 721	183 632	36 726
80	358 943	71 789	376 579	75 316
90	536 134	107 227	536 021	107 204
100	613 989	122 798	628 890	125 778
110	663 608	132 722	690 457	138 091
120	720 571	144 114	741 185	148 237
130	731 691	146 338	765 003	153 001
140	739 481	147 896	772 643	154 529
150	741 787	148 357	781 162	156 232
160	743 770	148 754	790 779	158 156
170	743 770	148 754	792 254	158 451
180	743 770	148 754	793 582	158 716
190	743 779	148 756	-	-
200	744 486	148 897	-	-
210	744 493	148 899	-	-

[a] ODT: oven-dried tonne

[b] Presumed market rate

Results Appendix

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

CONCLUSION

The biomass yield per hectare from harvest residues in the study area is predicted to be 26.6 ODT/ha. Over the next 10 years, a total of 1.54 million ODT of available biomass are predicted to be generated by harvest in the study area, or approximately 154 000 ODT/year. Of this amount, approximately 10% of the total or 157 000 ODT, or 15 700 ODT/year, are expected to be available at the economic price of $60/ODT. While at $90/ODT, 70% of the total or 1.07 million ODT, or 107 000 ODT/year, are expected to be available. The biomass ratio (the ratio of recovered biomass to recovered merchantable roundwood) is estimated at 20.2%.

The amount of available biomass below $70/ODT (382 239 ODT) is more than double the amount available below $60/ODT (157 140 ODT). If increases in efficiency or lowered costs can be realized, there could be an increase in available biomass at economical rates.

Most biomass that is considered to be economically available (≤ $60/ODT) is closest to the delivery points due to lower transportation costs. 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.

REFERENCES

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APPENDIX

- Forest supply - SelkirkRunV1.pdf
- Forest supply - SelkirkP1.pdf
- Forest supply - SelkirkP2.pdf
- Biomass - SelkirkRunV1.pdf
- Biomass - SelkirkP1.pdf
- Biomass - SelkirkP2.pdf

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

Cut blocks

Area	57,873.2 ha
Number of cut blocks	1041
Harvested volume	14,855,363 m³
Avg. skidding dist.	250 m
Volume/km	0 m³/km
Area/km	0 ha/km

Cut type

Clearcut	57,873.2 ha

Harvesting system

Full-tree with roadside processing	57,873.2 ha

Costs

Harvesting	21.16 $/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	0.29 $/m³
Transportation	15.62 $/m³
Loading/unloading	5.32 $/m³
Transfer yard	0.00 $/m³
Stumpage fees	0.00 $/m³
Indirect costs	0.00 $/m³
Stand establishment	N/A
Total	43.14 $/m³

Revenue

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

Net

Profit	-43.14 $/m³

Products

Name	Format	m³	m³/ha	m³/stem	%/total
Yellow Pine	Logs	27,917	0.5	0.369	0
Douglas Fir	Logs	2,832,262	48.9	0.421	19
Western Larch	Logs	2,988,680	51.6	0.399	20
Lodgepole Pine	Logs	5,134,462	88.7	0.274	35
Engelmann Spruce	Logs	1,280,651	22.1	0.351	9
Black Cottonwood	Logs	19,097	0.3	0.403	0
Hybrid Spruce	Logs	28,250	0.5	0.276	0
Western Red Cedar	Logs	410,948	7.1	0.421	3
Subalpine Fir	Logs	932,041	16.1	0.328	6
Trembling Aspen	Logs	217,647	3.8	0.421	1
Grand Fir	Logs	60,812	1.1	0.645	0
Paper Birch	Logs	120,398	2.1	0.507	1
Western White Pine	Logs	33,464	0.6	0.364	0
Western Hemlock	Logs	765,634	13.2	0.453	5
Tamarack	Logs	3,100	0.1	0.268	0
		14,855,363	256.7	0.343	100

Delivery to mills

Destination	Product	Format	m³	Transport average distance (Km)
Castlegar				
	Black Cottonwood	Logs	8,734	56
	Douglas Fir	Logs	1,217,264	54
	Engelmann Spruce	Logs	221,578	50
	Grand Fir	Logs	56,013	66
	Hybrid Spruce	Logs	3,014	85
	Lodgepole Pine	Logs	911,789	43
	Paper Birch	Logs	71,476	56
	Subalpine Fir	Logs	148,965	60
	Tamarack	Logs	3,100	27
	Trembling Aspen	Logs	134,582	53

Destination	Product	Format	m³	Transport average distance (Km)
	Western Hemlock	Logs	342,577	81
	Western Larch	Logs	1,411,988	48
	Western Red Cedar	Logs	157,918	76
	Western White Pine	Logs	19,032	70
	Yellow Pine	Logs	10,814	33
			4,718,844	53
Midway				
	Black Cottonwood	Logs	2,603	62
	Douglas Fir	Logs	351,469	63
	Engelmann Spruce	Logs	407,463	86
	Hybrid Spruce	Logs	5,092	94
	Lodgepole Pine	Logs	2,036,945	75
	Paper Birch	Logs	0	87
	Subalpine Fir	Logs	301,997	95
	Trembling Aspen	Logs	10,152	80
	Western Larch	Logs	489,522	70
	Western Red Cedar	Logs	2,088	79
	Yellow Pine	Logs	6,855	66
			3,614,187	76
Grand Forks				
	Black Cottonwood	Logs	3,114	64
	Douglas Fir	Logs	462,673	68
	Engelmann Spruce	Logs	427,054	71
	Grand Fir	Logs	45	43
	Hybrid Spruce	Logs	1,834	68
	Lodgepole Pine	Logs	1,219,975	70
	Paper Birch	Logs	7,446	101
	Subalpine Fir	Logs	281,009	67
	Trembling Aspen	Logs	38,533	86
	Western Hemlock	Logs	63,292	93

Destination	Product	Format	m³	Transport average distance (Km)
	Western Larch	Logs	640,825	69
	Western Red Cedar	Logs	40,524	76
	Western White Pine	Logs	4,277	81
	Yellow Pine	Logs	3,596	97
			3,194,197	70
Kelowna				
	Black Cottonwood	Logs	221	77
	Douglas Fir	Logs	39,709	83
	Engelmann Spruce	Logs	52,227	78
	Hybrid Spruce	Logs	1,117	100
	Lodgepole Pine	Logs	404,495	88
	Paper Birch	Logs	595	99
	Subalpine Fir	Logs	36,006	75
	Trembling Aspen	Logs	9,409	97
	Western Hemlock	Logs	2,135	87
	Western Larch	Logs	64,559	88
	Western Red Cedar	Logs	2,988	78
	Yellow Pine	Logs	3	80
			613,465	87
Revelstoke				
	Black Cottonwood	Logs	1,511	121
	Douglas Fir	Logs	356,314	128
	Engelmann Spruce	Logs	49,205	145
	Hybrid Spruce	Logs	1,999	141
	Lodgepole Pine	Logs	91,600	140
	Paper Birch	Logs	32,642	130
	Subalpine Fir	Logs	52,193	142
	Trembling Aspen	Logs	7,355	132
	Western Hemlock	Logs	249,742	122
	Western Larch	Logs	54,343	135

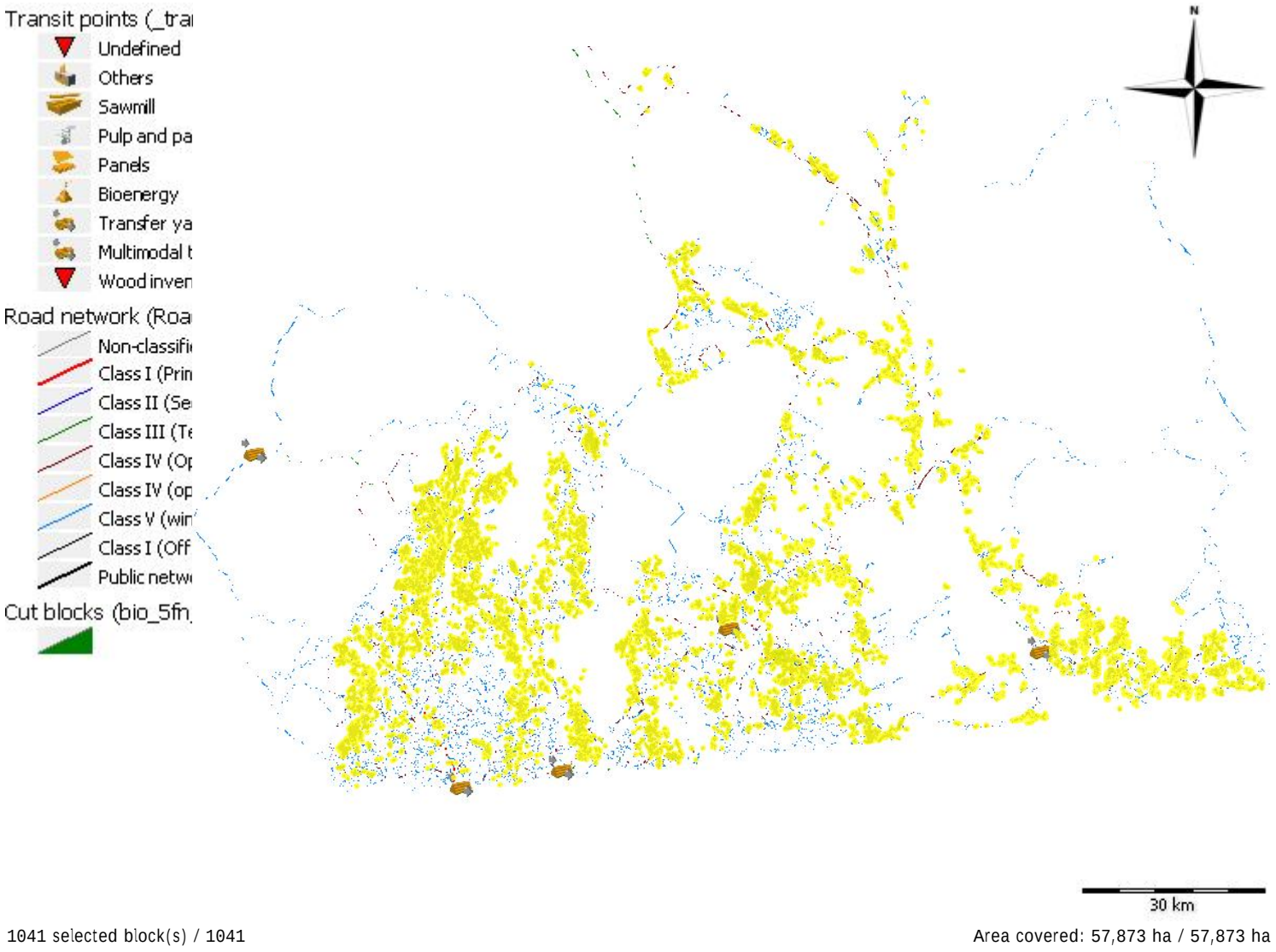
Destination	Product	Format	m³	Transport average distance (Km)
	Western Red Cedar	Logs	119,548	122
	Western White Pine	Logs	3,872	125
			1,020,325	129
Wynndel				
	Black Cottonwood	Logs	2,915	44
	Douglas Fir	Logs	404,832	68
	Engelmann Spruce	Logs	123,123	61
	Grand Fir	Logs	4,754	27
	Hybrid Spruce	Logs	15,195	64
	Lodgepole Pine	Logs	469,657	60
	Paper Birch	Logs	8,239	63
	Subalpine Fir	Logs	111,871	61
	Trembling Aspen	Logs	17,616	61
	Western Hemlock	Logs	107,887	92
	Western Larch	Logs	327,442	61
	Western Red Cedar	Logs	87,882	81
	Western White Pine	Logs	6,282	66
	Yellow Pine	Logs	6,648	38
			1,694,345	65
			14,855,363	70

Harvesting season

	m³	ha
Summer	0	0.0
Fall	0	0.0
Winter	14,855,363	57,873.2
	14,855,363	57,873.2

Terrain conditions

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



1041 selected block(s) / 1041

Area covered: 57,873 ha / 57,873 ha

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

Cut blocks

Area	29,028.4 ha
Number of cut blocks	531
Harvested volume	7,440,166 m³
Avg. skidding dist.	250 m
Volume/km	0 m³/km
Area/km	0 ha/km

Cut type

Clearcut	29,028.4 ha

Harvesting system

Full-tree with roadside processing	29,028.4 ha

Costs

Harvesting	20.47 $/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	0.29 $/m³
Transportation	15.07 $/m³
Loading/unloading	5.31 $/m³
Transfer yard	0.00 $/m³
Stumpage fees	0.00 $/m³
Indirect costs	0.00 $/m³
Stand establishment	N/A
Total	41.89 $/m³

Revenue

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

Net

Profit	-41.89 $/m³

Products

Name	Format	m³	m³/ha	m³/stem	%/total
Yellow Pine	Logs	18,248	0.6	0.445	0
Douglas Fir	Logs	1,304,924	45.0	0.421	18
Western Larch	Logs	1,610,546	55.5	0.439	22
Lodgepole Pine	Logs	2,311,012	79.6	0.309	31
Hybrid Spruce	Logs	19,290	0.7	0.256	0
Western Red Cedar	Logs	202,472	7.0	0.361	3
Engelmann Spruce	Logs	770,211	26.5	0.345	10
Subalpine Fir	Logs	581,852	20.0	0.315	8
Trembling Aspen	Logs	117,892	4.1	0.493	2
Paper Birch	Logs	72,252	2.5	0.513	1
Western Hemlock	Logs	378,253	13.0	0.433	5
Grand Fir	Logs	28,715	1.0	0.553	0
Black Cottonwood	Logs	11,278	0.4	0.428	0
Western White Pine	Logs	10,168	0.4	0.433	0
Tamarack	Logs	3,053	0.1	0.268	0
		7,440,166	256.3	0.365	100

Delivery to mills

Destination	Product	Format	m³	Transport average distance (Km)
Castlegar				
	Black Cottonwood	Logs	5,876	58
	Douglas Fir	Logs	614,761	52
	Engelmann Spruce	Logs	146,756	47
	Grand Fir	Logs	25,824	64
	Hybrid Spruce	Logs	475	103
	Lodgepole Pine	Logs	475,931	45
	Paper Birch	Logs	49,908	59
	Subalpine Fir	Logs	87,510	58
	Tamarack	Logs	3,053	27
	Trembling Aspen	Logs	85,472	53

Destination	Product	Format	m³	Transport average distance (Km)
	Western Hemlock	Logs	186,856	73
	Western Larch	Logs	921,427	47
	Western Red Cedar	Logs	90,562	69
	Western White Pine	Logs	5,547	54
	Yellow Pine	Logs	5,887	35
			2,705,847	51
Midway				
	Black Cottonwood	Logs	1,864	59
	Douglas Fir	Logs	149,110	63
	Engelmann Spruce	Logs	251,893	85
	Hybrid Spruce	Logs	4,338	95
	Lodgepole Pine	Logs	925,320	75
	Paper Birch	Logs	0	86
	Subalpine Fir	Logs	200,174	93
	Trembling Aspen	Logs	2,262	61
	Western Larch	Logs	213,250	68
	Western Red Cedar	Logs	1,506	68
	Yellow Pine	Logs	3,695	67
			1,753,412	77
Grand Forks				
	Black Cottonwood	Logs	2,283	75
	Douglas Fir	Logs	216,272	74
	Engelmann Spruce	Logs	281,233	68
	Hybrid Spruce	Logs	1,362	81
	Lodgepole Pine	Logs	602,439	74
	Paper Birch	Logs	3,837	129
	Subalpine Fir	Logs	186,840	63
	Trembling Aspen	Logs	17,524	90
	Western Hemlock	Logs	33,357	80
	Western Larch	Logs	330,145	77

Destination	Product	Format	m³	Transport average distance (Km)
	Western Red Cedar	Logs	10,237	45
	Western White Pine	Logs	2,677	72
	Yellow Pine	Logs	2,754	115
			1,690,962	73
Kelowna				
	Black Cottonwood	Logs	0	81
	Douglas Fir	Logs	26,201	82
	Engelmann Spruce	Logs	25,675	78
	Hybrid Spruce	Logs	412	100
	Lodgepole Pine	Logs	168,941	82
	Paper Birch	Logs	0	80
	Subalpine Fir	Logs	18,052	76
	Trembling Aspen	Logs	1,762	93
	Western Hemlock	Logs	2,135	87
	Western Larch	Logs	29,543	85
	Western Red Cedar	Logs	2,942	78
	Yellow Pine	Logs	3	80
			275,665	82
Revelstoke				
	Black Cottonwood	Logs	604	136
	Douglas Fir	Logs	120,279	126
	Engelmann Spruce	Logs	28,553	145
	Hybrid Spruce	Logs	1,888	141
	Lodgepole Pine	Logs	19,864	138
	Paper Birch	Logs	14,139	127
	Subalpine Fir	Logs	34,076	143
	Trembling Aspen	Logs	1,758	132
	Western Hemlock	Logs	111,034	124
	Western Larch	Logs	17,704	130
	Western Red Cedar	Logs	50,537	121

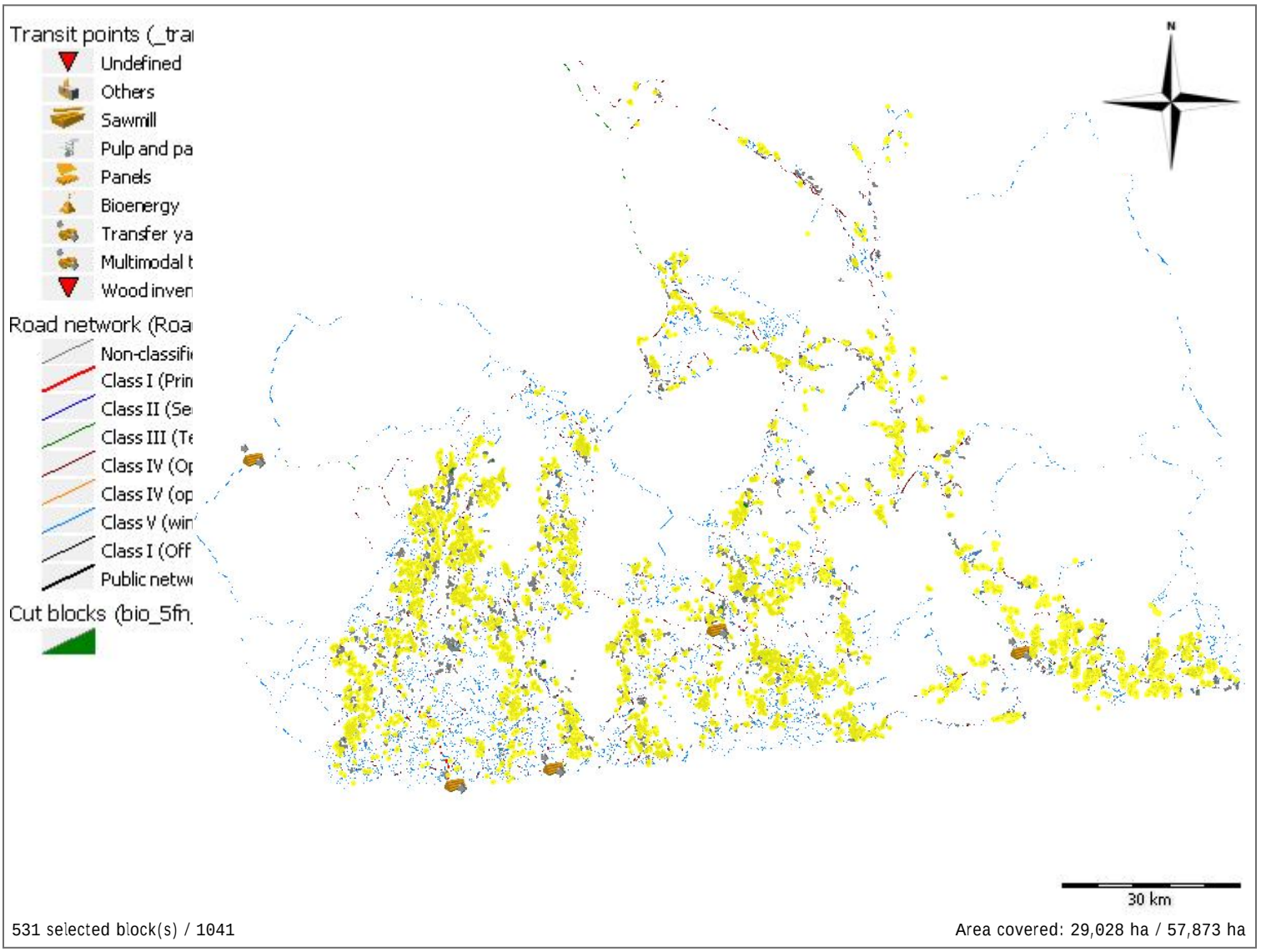
Destination	Product	Format	m³	Transport average distance (Km)
	Western White Pine	Logs	1,145	113
			401,581	128
Wynndel				
	Black Cottonwood	Logs	650	41
	Douglas Fir	Logs	178,300	64
	Engelmann Spruce	Logs	36,101	74
	Grand Fir	Logs	2,892	34
	Hybrid Spruce	Logs	10,815	57
	Lodgepole Pine	Logs	118,516	50
	Paper Birch	Logs	4,368	62
	Subalpine Fir	Logs	55,199	63
	Trembling Aspen	Logs	9,113	67
	Western Hemlock	Logs	44,870	106
	Western Larch	Logs	98,477	49
	Western Red Cedar	Logs	46,689	79
	Western White Pine	Logs	798	99
	Yellow Pine	Logs	5,909	40
			612,698	63
			7,440,166	69

Harvesting season

	m³	ha
Summer	0	0.0
Fall	0	0.0
Winter	7,440,166	29,028.4
	7,440,166	29,028.4

Terrain conditions

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



531 selected block(s) / 1041

Area covered: 29,028 ha / 57,873 ha

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

Cut blocks

Area	28,844.7 ha
Number of cut blocks	510
Harvested volume	7,415,197 m^3
Avg. skidding dist.	250 m
Volume/km	0 m^3/km
Area/km	0 ha/km

Cut type

Clearcut	28,844.7 ha

Harvesting system

Full-tree with roadside processing	28,844.7 ha

Costs

Harvesting	21.86 $/$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	0.29 $/$m^3$
Transportation	16.16 $/$m^3$
Loading/unloading	5.32 $/$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	44.38 $/$m^3$

Revenue

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

Net

Profit	-44.38 $/$m^3$

Products

Name	Format	m³	m³/ha	m³/stem	%/total
Lodgepole Pine	Logs	2,823,450	97.9	0.250	38
Engelmann Spruce	Logs	510,439	17.7	0.361	7
Western Larch	Logs	1,378,134	47.8	0.361	19
Black Cottonwood	Logs	7,820	0.3	0.372	0
Douglas Fir	Logs	1,527,338	53.0	0.421	21
Subalpine Fir	Logs	350,189	12.1	0.351	5
Western Red Cedar	Logs	208,476	7.2	0.503	3
Trembling Aspen	Logs	99,755	3.5	0.359	1
Hybrid Spruce	Logs	8,961	0.3	0.332	0
Grand Fir	Logs	32,097	1.1	0.758	0
Paper Birch	Logs	48,146	1.7	0.498	1
Western White Pine	Logs	23,296	0.8	0.340	0
Western Hemlock	Logs	387,381	13.4	0.476	5
Yellow Pine	Logs	9,669	0.3	0.278	0
Tamarack	Logs	47	0.0	0.319	0
		7,415,197	257.1	0.323	100

Delivery to mills

Destination	Product	Format	m³	Transport average distance (Km)
Castlegar				
	Black Cottonwood	Logs	2,858	50
	Douglas Fir	Logs	602,503	55
	Engelmann Spruce	Logs	74,822	55
	Grand Fir	Logs	30,189	67
	Hybrid Spruce	Logs	2,539	81
	Lodgepole Pine	Logs	435,858	41
	Paper Birch	Logs	21,568	48
	Subalpine Fir	Logs	61,455	63
	Tamarack	Logs	47	30
	Trembling Aspen	Logs	49,109	52

Destination	Product	Format	m³	Transport average distance (Km)
	Western Hemlock	Logs	155,721	92
	Western Larch	Logs	490,561	50
	Western Red Cedar	Logs	67,356	85
	Western White Pine	Logs	13,485	76
	Yellow Pine	Logs	4,928	30
			2,012,997	55
Midway				
	Black Cottonwood	Logs	739	70
	Douglas Fir	Logs	202,359	62
	Engelmann Spruce	Logs	155,570	86
	Hybrid Spruce	Logs	754	89
	Lodgepole Pine	Logs	1,111,626	75
	Paper Birch	Logs	0	92
	Subalpine Fir	Logs	101,823	100
	Trembling Aspen	Logs	7,889	85
	Western Larch	Logs	276,272	71
	Western Red Cedar	Logs	582	106
	Yellow Pine	Logs	3,160	65
			1,860,774	76
Grand Forks				
	Black Cottonwood	Logs	831	33
	Douglas Fir	Logs	246,401	64
	Engelmann Spruce	Logs	145,820	76
	Grand Fir	Logs	45	43
	Hybrid Spruce	Logs	471	32
	Lodgepole Pine	Logs	617,535	66
	Paper Birch	Logs	3,609	71
	Subalpine Fir	Logs	94,169	75
	Trembling Aspen	Logs	21,009	83
	Western Hemlock	Logs	29,935	109

Destination	Product	Format	m³	Transport average distance (Km)
	Western Larch	Logs	310,680	61
	Western Red Cedar	Logs	30,288	86
	Western White Pine	Logs	1,600	94
	Yellow Pine	Logs	842	40
			1,503,235	68
Kelowna				
	Black Cottonwood	Logs	221	77
	Douglas Fir	Logs	13,509	85
	Engelmann Spruce	Logs	26,553	78
	Hybrid Spruce	Logs	705	99
	Lodgepole Pine	Logs	235,554	93
	Paper Birch	Logs	595	99
	Subalpine Fir	Logs	17,954	74
	Trembling Aspen	Logs	7,647	98
	Western Larch	Logs	35,016	91
	Western Red Cedar	Logs	46	98
	Yellow Pine	Logs	0	87
			337,800	90
Revelstoke				
	Black Cottonwood	Logs	906	111
	Douglas Fir	Logs	236,035	129
	Engelmann Spruce	Logs	20,652	145
	Hybrid Spruce	Logs	111	144
	Lodgepole Pine	Logs	71,736	141
	Paper Birch	Logs	18,503	133
	Subalpine Fir	Logs	18,117	140
	Trembling Aspen	Logs	5,597	132
	Western Hemlock	Logs	138,708	121
	Western Larch	Logs	36,640	138
	Western Red Cedar	Logs	69,011	122

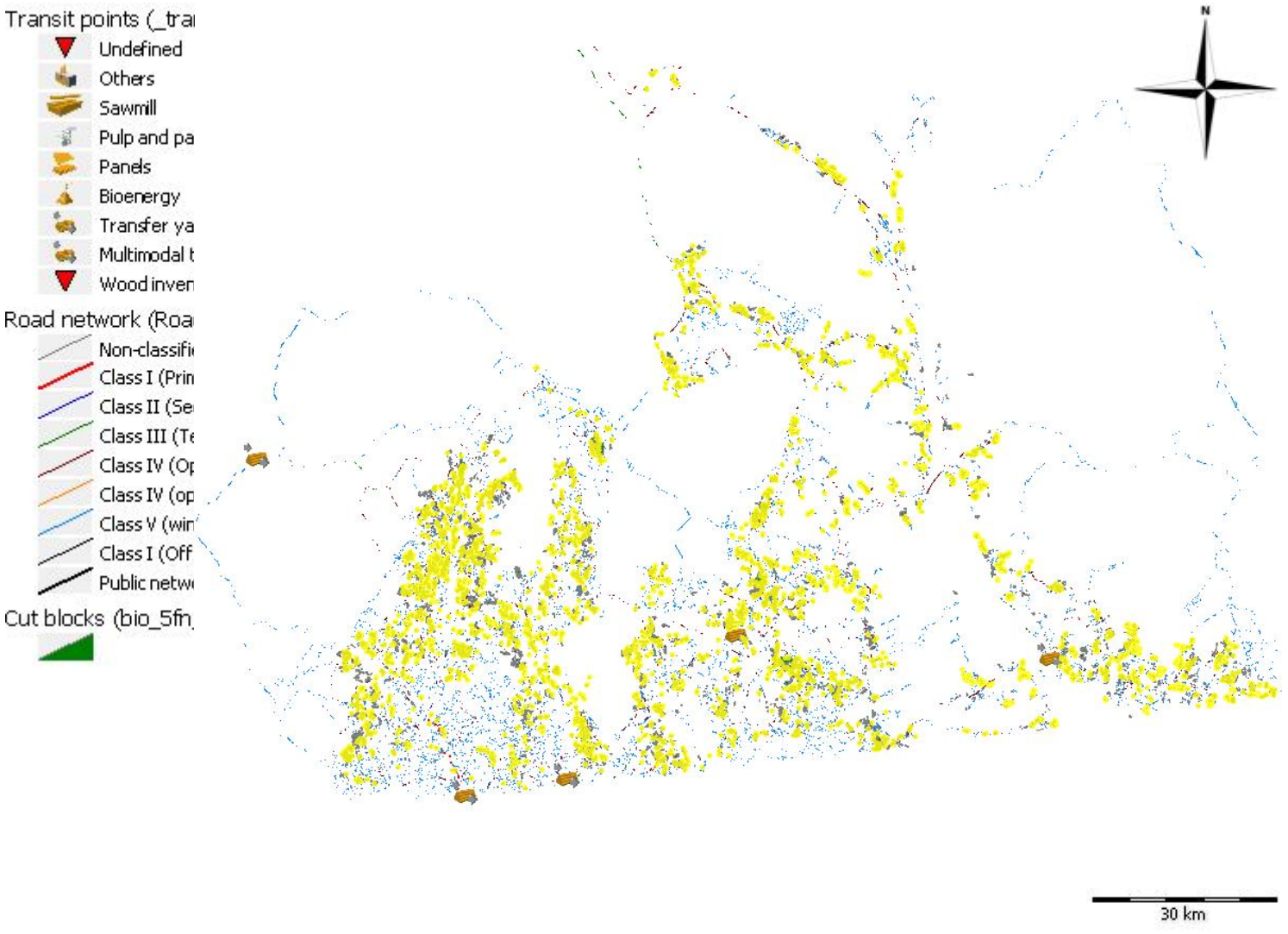
Destination	Product	Format	m³	Transport average distance (Km)
	Western White Pine	Logs	2,727	131
			618,744	129
Wynndel				
	Black Cottonwood	Logs	2,265	45
	Douglas Fir	Logs	226,532	72
	Engelmann Spruce	Logs	87,022	56
	Grand Fir	Logs	1,863	17
	Hybrid Spruce	Logs	4,379	79
	Lodgepole Pine	Logs	351,142	63
	Paper Birch	Logs	3,871	63
	Subalpine Fir	Logs	56,672	58
	Trembling Aspen	Logs	8,504	55
	Western Hemlock	Logs	63,017	82
	Western Larch	Logs	228,965	67
	Western Red Cedar	Logs	41,193	84
	Western White Pine	Logs	5,484	61
	Yellow Pine	Logs	739	26
			1,081,647	67
			7,415,197	72

Harvesting season

	m³	ha
Summer	0	0.0
Fall	0	0.0
Winter	7,415,197	28,844.7
	7,415,197	28,844.7

Terrain conditions

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



510 selected block(s) / 1041

Area covered: 28,845 ha / 57,873 ha

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

Statistics - Selected Items

Area	57,873.2 ha
Number of cut blocks	1041
Recovered biomass	1,538,075.9 odt
Biomass yield	26.6 odt/ha
Biomass odt / Merchantable m^3	0.1037 odt/m^3
Delivered products	
• Chips	100 %
• Bundles	0 %
• Trunks and Residues	0 %
Energy balance	32 : 1
Available energy	5,807,094 MWh
Fuel consumption	13.4 L/odt

Cost

Harvesting	0.00 $/odt
Biomass recovery	26.82 $/odt
Transfer yard	0.00 $/odt
Transportation	43.52 $/odt
Loading/unloading	12.80 $/odt
Stumpage fees	0.00 $/odt
Road network - Maintenance	0.70 $/odt
Indirect costs	0.00 $/odt
Total	83.84 $/odt

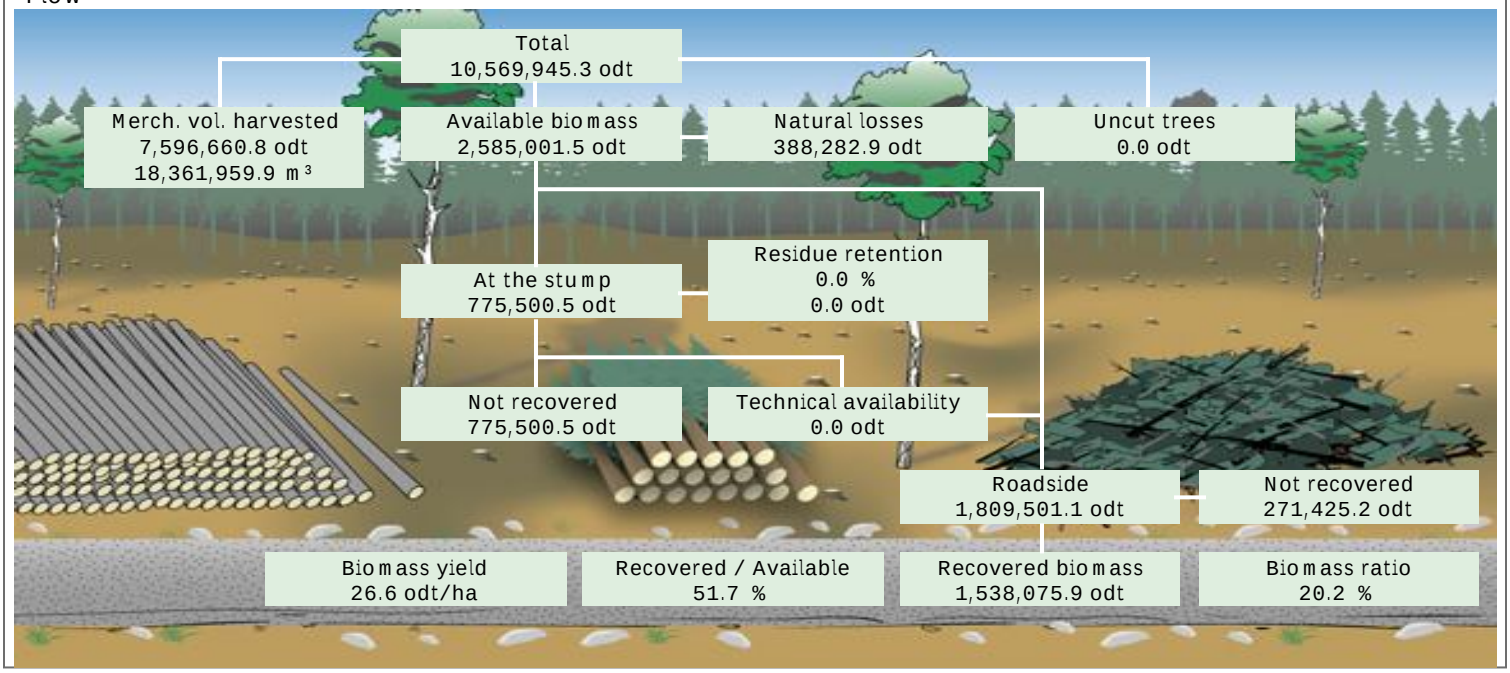
Revenue

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

Net

Profit	-83.84 $/odt

Flow



Products

Product name	odt	odt/m³	odt/ha
Western Larch (residues)	375,023.5	0.1255	6.48
Lodgepole Pine (residues)	435,309.2	0.0850	7.52
Yellow Pine (residues)	3,196.4	0.1155	0.06
Douglas Fir (residues)	372,297.6	0.1315	6.43
Black Cottonwood (residues)	2,229.8	0.1168	0.04
Engelmann Spruce (residues)	127,930.4	0.1000	2.21
Hybrid Spruce (residues)	3,053.2	0.1090	0.05
Western Red Cedar (residues)	34,627.5	0.0851	0.60
Subalpine Fir (residues)	77,097.4	0.0828	1.33
Trembling Aspen (residues)	19,165.1	0.0884	0.33
Grand Fir (residues)	3,110.5	0.0511	0.05
Paper Birch (residues)	18,802.9	0.1562	0.32
Western White Pine (residues)	3,318.3	0.0992	0.06
Western Hemlock (residues)	62,504.6	0.0820	1.08
Tamarack (residues)	409.6	0.1321	0.01
	1,538,075.9	0.1037	26.58

Recovery summary

	Volume(odt)	Area(ha)	Number of cut blocks
• Biomass recovery location			
At the stump	0.0	0.0	0
Roadside	1,538,075.9	57,873.2	1,041
• Recovery season			
Summer	0.0	0.0	0
Winter	1,538,075.9	57,873.2	1,041
• Residue freshness			
Fresh	0.0	0.0	0
Brown	1,538,075.9	57,873.2	1,041
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	778.3	778.3
60 $/odt	0.0	157,140.0	157,140.0
70 $/odt	0.0	382,238.9	382,238.9
80 $/odt	0.0	735,522.7	735,522.7
90 $/odt	0.0	1,072,155.7	1,072,155.7
100 $/odt	0.0	1,242,878.4	1,242,878.4
110 $/odt	0.0	1,354,065.4	1,354,065.4
120 $/odt	0.0	1,461,756.0	1,461,756.0
130 $/odt	0.0	1,496,693.9	1,496,693.9
140 $/odt	0.0	1,512,123.5	1,512,123.5
150 $/odt	0.0	1,522,948.6	1,522,948.6
160 $/odt	0.0	1,534,549.1	1,534,549.1
170 $/odt	0.0	1,536,024.6	1,536,024.6
180 $/odt	0.0	1,537,353.0	1,537,353.0
190 $/odt	0.0	1,537,361.5	1,537,361.5
200 $/odt	0.0	1,538,068.7	1,538,068.7
210 $/odt	0.0	1,538,075.9	1,538,075.9
Maximum cost	0.00 $/odt	202.98 $/odt	

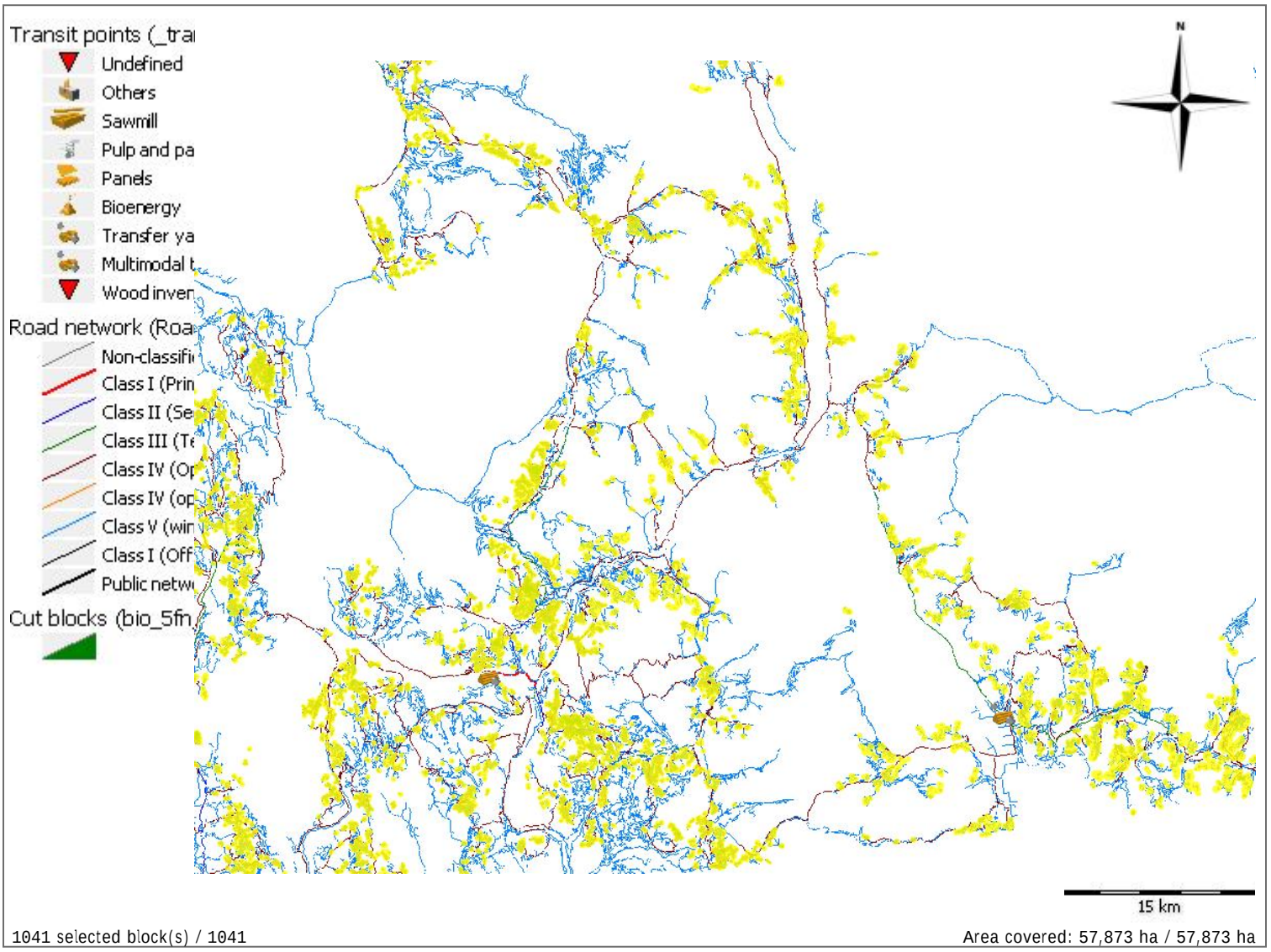
Delivery to mills

Destination	Product	Format	odt	Transport average distance (Km)
Castlegar				
	Black Cottonwood (residues)	Chips	932	54
	Douglas Fir (residues)	Chips	149,240	52
	Engelmann Spruce (residues)	Chips	19,219	49
	Grand Fir (residues)	Chips	2,736	65
	Hybrid Spruce (residues)	Chips	283	81
	Lodgepole Pine (residues)	Chips	56,849	41
	Paper Birch (residues)	Chips	11,118	54
	Subalpine Fir (residues)	Chips	11,056	58
	Tamarack (residues)	Chips	410	27
	Trembling Aspen (residues)	Chips	10,501	51
	Western Hemlock (residues)	Chips	27,374	82
	Western Larch (residues)	Chips	140,046	47
	Western Red Cedar (residues)	Chips	12,000	75
	Western White Pine (residues)	Chips	1,965	76
	Yellow Pine (residues)	Chips	1,175	31
			444,903	52
Midway				
	Black Cottonwood (residues)	Chips	349	61
	Douglas Fir (residues)	Chips	56,917	63
	Engelmann Spruce (residues)	Chips	44,839	84
	Hybrid Spruce (residues)	Chips	555	92
	Lodgepole Pine (residues)	Chips	199,274	75
	Paper Birch (residues)	Chips	0	87
	Subalpine Fir (residues)	Chips	26,019	94
	Trembling Aspen (residues)	Chips	1,235	80
	Western Larch (residues)	Chips	84,278	70
	Western Red Cedar (residues)	Chips	201	73
	Yellow Pine (residues)	Chips	919	67
			414,588	74

Destination	Product	Format	odt	Transport average distance (Km)
Grand Forks				
	Black Cottonwood (residues)	Chips	384	61
	Douglas Fir (residues)	Chips	64,518	66
	Engelmann Spruce (residues)	Chips	40,887	71
	Grand Fir (residues)	Chips	6	43
	Hybrid Spruce (residues)	Chips	207	68
	Lodgepole Pine (residues)	Chips	100,724	67
	Paper Birch (residues)	Chips	1,122	102
	Subalpine Fir (residues)	Chips	22,209	67
	Trembling Aspen (residues)	Chips	3,991	77
	Western Hemlock (residues)	Chips	5,908	94
	Western Larch (residues)	Chips	88,976	67
	Western Red Cedar (residues)	Chips	4,139	78
	Western White Pine (residues)	Chips	382	82
	Yellow Pine (residues)	Chips	402	88
			333,854	68
Kelowna				
	Black Cottonwood (residues)	Chips	30	77
	Douglas Fir (residues)	Chips	6,218	84
	Engelmann Spruce (residues)	Chips	5,634	79
	Hybrid Spruce (residues)	Chips	133	100
	Lodgepole Pine (residues)	Chips	36,907	90
	Paper Birch (residues)	Chips	128	98
	Subalpine Fir (residues)	Chips	2,964	75
	Trembling Aspen (residues)	Chips	1,128	97
	Western Hemlock (residues)	Chips	261	87
	Western Larch (residues)	Chips	10,958	89
	Western Red Cedar (residues)	Chips	332	79
	Yellow Pine (residues)	Chips	0	80
			64,694	87
Revelstoke				

Destination	Product	Format	odt	Transport average distance (Km)
Revelstoke				
	Black Cottonwood (residues)	Chips	168	122
	Douglas Fir (residues)	Chips	42,773	128
	Engelmann Spruce (residues)	Chips	4,205	146
	Hybrid Spruce (residues)	Chips	204	139
	Lodgepole Pine (residues)	Chips	4,801	139
	Paper Birch (residues)	Chips	5,137	129
	Subalpine Fir (residues)	Chips	3,842	142
	Trembling Aspen (residues)	Chips	616	132
	Western Hemlock (residues)	Chips	19,170	122
	Western Larch (residues)	Chips	5,621	135
	Western Red Cedar (residues)	Chips	9,401	121
	Western White Pine (residues)	Chips	382	122
			96,321	128
Wynndel				
	Black Cottonwood (residues)	Chips	367	45
	Douglas Fir (residues)	Chips	52,632	67
	Engelmann Spruce (residues)	Chips	13,146	63
	Grand Fir (residues)	Chips	369	25
	Hybrid Spruce (residues)	Chips	1,671	65
	Lodgepole Pine (residues)	Chips	36,754	60
	Paper Birch (residues)	Chips	1,299	62
	Subalpine Fir (residues)	Chips	11,007	64
	Trembling Aspen (residues)	Chips	1,694	59
	Western Hemlock (residues)	Chips	9,790	86
	Western Larch (residues)	Chips	45,145	60
	Western Red Cedar (residues)	Chips	8,553	75
	Western White Pine (residues)	Chips	589	62
	Yellow Pine (residues)	Chips	699	37
			183,716	64

	1,538,076	69



1041 selected block(s) / 1041

Area covered: 57,873 ha / 57,873 ha

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

Statistics - Selected Items

Area	29,028.4 ha
Number of cut blocks	531
Recovered biomass	744,493.4 odt
Biomass yield	25.6 odt/ha
Biomass odt / Merchantable m^3	0.1002 odt/m^3
Delivered products	
• Chips	100 %
• Bundles	0 %
• Trunks and Residues	0 %
Energy balance	33 : 1
Available energy	2,806,370 MWh
Fuel consumption	13.2 L/odt

Cost

Harvesting	0.00 $/odt
Biomass recovery	26.82 $/odt
Transfer yard	0.00 $/odt
Transportation	42.13 $/odt
Loading/unloading	12.88 $/odt
Stumpage fees	0.00 $/odt
Road network - Maintenance	0.69 $/odt
Indirect costs	0.00 $/odt
Total	82.52 $/odt

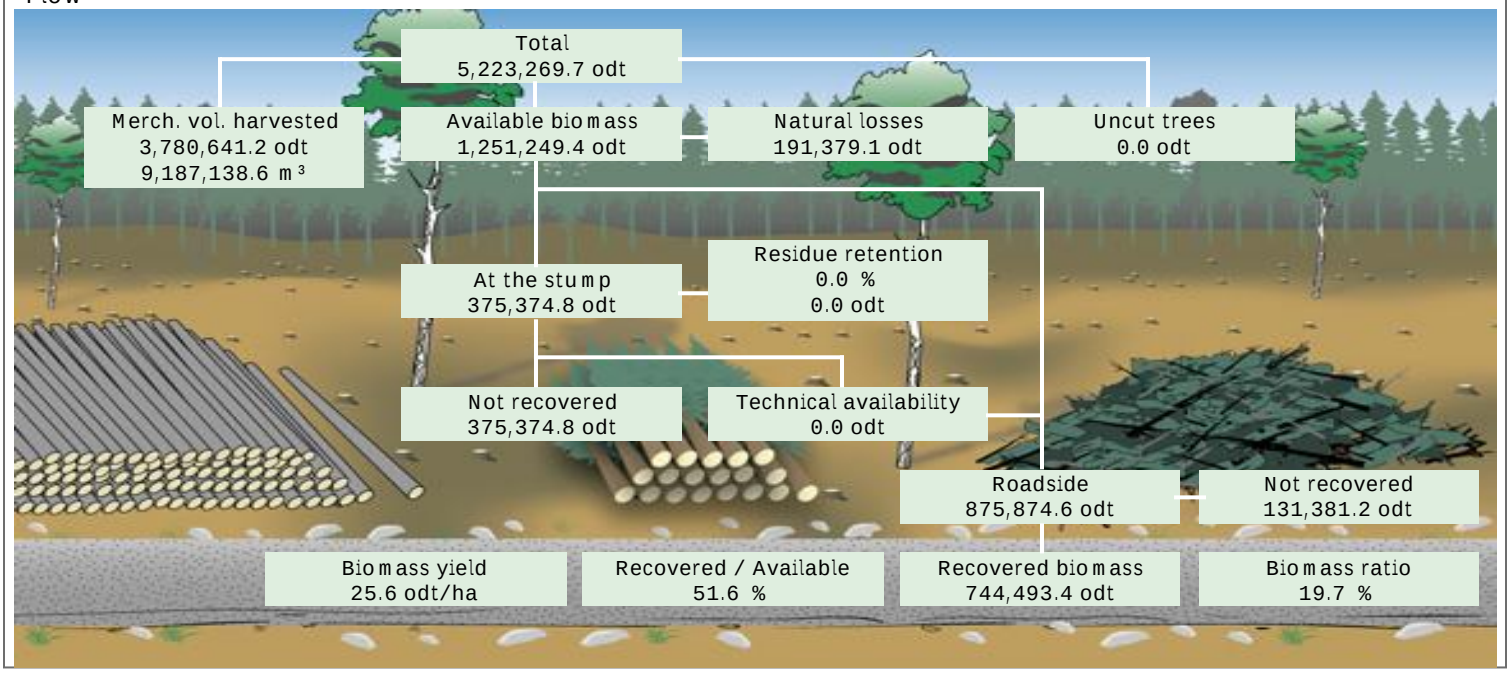
Revenue

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

Net

Profit	-82.52 $/odt

Flow



Products

Product name	odt	odt/m³	odt/ha
Western Larch (residues)	188,610.7	0.1171	6.50
Lodgepole Pine (residues)	179,719.8	0.0778	6.19
Yellow Pine (residues)	1,975.2	0.1082	0.07
Douglas Fir (residues)	171,435.8	0.1314	5.91
Engelmann Spruce (residues)	77,448.2	0.1007	2.67
Hybrid Spruce (residues)	2,104.8	0.1105	0.07
Western Red Cedar (residues)	17,855.6	0.0900	0.62
Subalpine Fir (residues)	49,010.1	0.0843	1.69
Trembling Aspen (residues)	9,897.6	0.0840	0.34
Paper Birch (residues)	11,245.0	0.1557	0.39
Grand Fir (residues)	1,622.5	0.0565	0.06
Western Hemlock (residues)	30,969.2	0.0826	1.07
Black Cottonwood (residues)	1,290.5	0.1144	0.04
Western White Pine (residues)	904.5	0.0890	0.03
Tamarack (residues)	404.0	0.1323	0.01
	744,493.4	0.1002	25.65

Recovery summary

	Volume(odt)	Area(ha)	Number of cut blocks
• Biomass recovery location			
At the stump	0.0	0.0	0
Roadside	744,493.4	29,028.4	531
• Recovery season			
Summer	0.0	0.0	0
Winter	744,493.4	29,028.4	531
• Residue freshness			
Fresh	0.0	0.0	0
Brown	744,493.4	29,028.4	531
Brittle	0.0	0.0	0

Supply summary

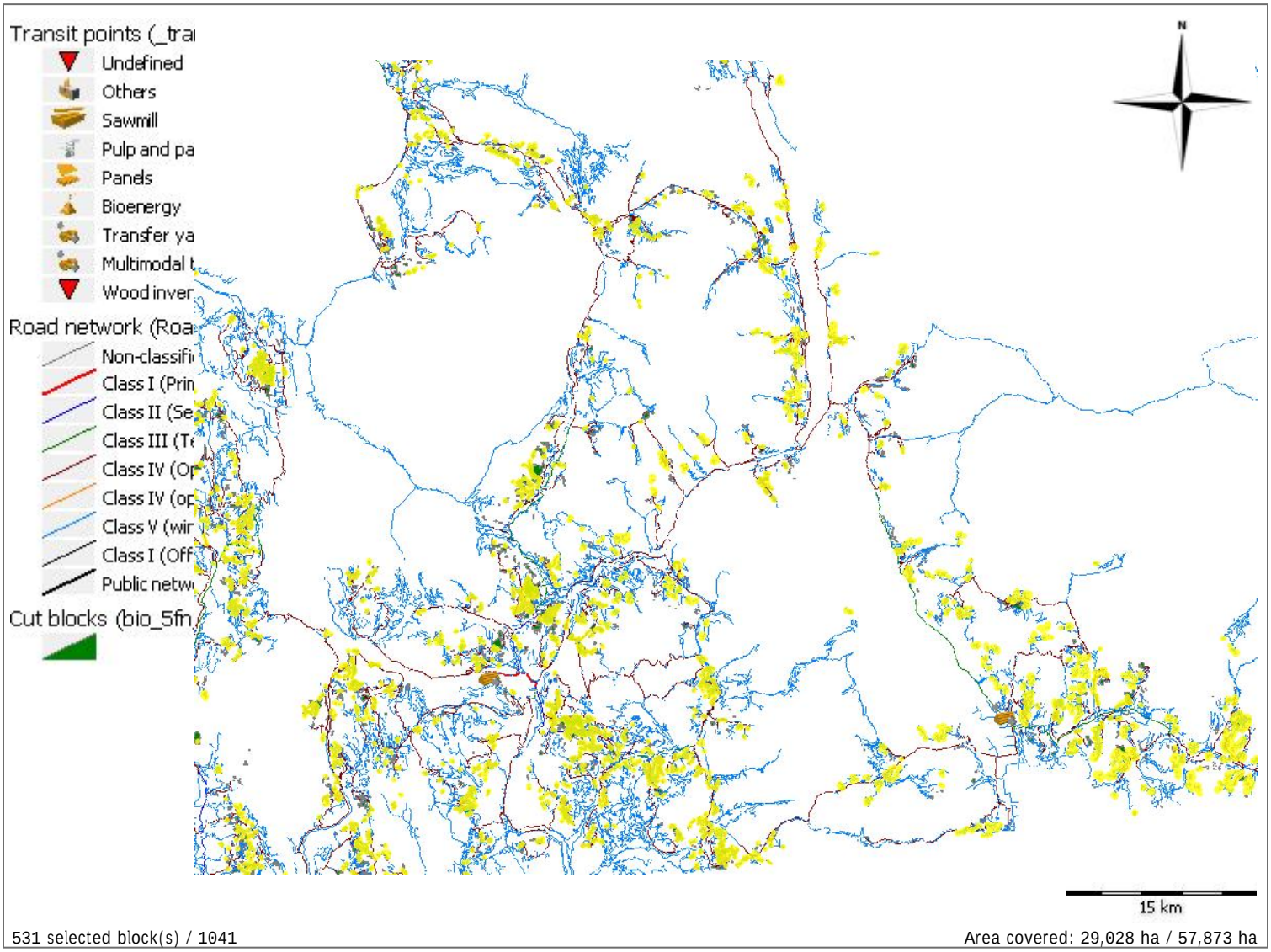
Recovered biomass to	Merchantable volume (odt)	Residues (odt)	Total biomass (odt)
10 $/odt	0.0	0.0	0.0
20 $/odt	0.0	0.0	0.0
30 $/odt	0.0	0.0	0.0
40 $/odt	0.0	0.0	0.0
50 $/odt	0.0	132.3	132.3
60 $/odt	0.0	84,623.9	84,623.9
70 $/odt	0.0	198,606.6	198,606.6
80 $/odt	0.0	358,943.5	358,943.5
90 $/odt	0.0	536,134.4	536,134.4
100 $/odt	0.0	613,988.8	613,988.8
110 $/odt	0.0	663,608.2	663,608.2
120 $/odt	0.0	720,571.1	720,571.1
130 $/odt	0.0	731,690.7	731,690.7
140 $/odt	0.0	739,480.8	739,480.8
150 $/odt	0.0	741,786.6	741,786.6
160 $/odt	0.0	743,770.4	743,770.4
170 $/odt	0.0	743,770.4	743,770.4
180 $/odt	0.0	743,770.4	743,770.4
190 $/odt	0.0	743,778.9	743,778.9
200 $/odt	0.0	744,486.2	744,486.2
210 $/odt	0.0	744,493.4	744,493.4
Maximum cost	0.00 $/odt	202.98 $/odt	

Delivery to mills

Destination	Product	Format	odt	Transport average distance (Km)
Castlegar				
	Black Cottonwood (residues)	Chips	612	58
	Douglas Fir (residues)	Chips	76,455	50
	Engelmann Spruce (residues)	Chips	12,979	45
	Grand Fir (residues)	Chips	1,385	63
	Hybrid Spruce (residues)	Chips	18	71
	Lodgepole Pine (residues)	Chips	30,475	42
	Paper Birch (residues)	Chips	7,580	57
	Subalpine Fir (residues)	Chips	6,706	55
	Tamarack (residues)	Chips	404	27
	Trembling Aspen (residues)	Chips	6,761	52
	Western Hemlock (residues)	Chips	14,182	74
	Western Larch (residues)	Chips	91,368	46
	Western Red Cedar (residues)	Chips	6,945	67
	Western White Pine (residues)	Chips	437	53
	Yellow Pine (residues)	Chips	618	33
			256,925	49
Midway				
	Black Cottonwood (residues)	Chips	240	57
	Douglas Fir (residues)	Chips	22,692	63
	Engelmann Spruce (residues)	Chips	27,344	84
	Hybrid Spruce (residues)	Chips	474	93
	Lodgepole Pine (residues)	Chips	78,209	74
	Paper Birch (residues)	Chips	0	85
	Subalpine Fir (residues)	Chips	17,110	92
	Trembling Aspen (residues)	Chips	274	61
	Western Larch (residues)	Chips	33,297	68
	Western Red Cedar (residues)	Chips	156	66
	Yellow Pine (residues)	Chips	452	67
			180,248	75

Destination	Product	Format	odt	Transport average distance (Km)
Grand Forks				
	Black Cottonwood (residues)	Chips	274	71
	Douglas Fir (residues)	Chips	29,513	71
	Engelmann Spruce (residues)	Chips	26,333	67
	Hybrid Spruce (residues)	Chips	152	82
	Lodgepole Pine (residues)	Chips	45,440	72
	Paper Birch (residues)	Chips	603	129
	Subalpine Fir (residues)	Chips	14,506	62
	Trembling Aspen (residues)	Chips	1,644	84
	Western Hemlock (residues)	Chips	2,869	80
	Western Larch (residues)	Chips	42,417	75
	Western Red Cedar (residues)	Chips	943	44
	Western White Pine (residues)	Chips	226	73
	Yellow Pine (residues)	Chips	283	110
			165,204	71
Kelowna				
	Black Cottonwood (residues)	Chips	0	82
	Douglas Fir (residues)	Chips	3,790	83
	Engelmann Spruce (residues)	Chips	2,761	78
	Hybrid Spruce (residues)	Chips	45	100
	Lodgepole Pine (residues)	Chips	13,478	82
	Paper Birch (residues)	Chips	0	80
	Subalpine Fir (residues)	Chips	1,499	77
	Trembling Aspen (residues)	Chips	192	93
	Western Hemlock (residues)	Chips	261	87
	Western Larch (residues)	Chips	4,222	86
	Western Red Cedar (residues)	Chips	326	79
	Yellow Pine (residues)	Chips	0	80
			26,576	82
Revelstoke				
	Black Cottonwood (residues)	Chips	77	138

Destination	Product	Format	odt	Transport average distance (Km)
Revelstoke				
	Douglas Fir (residues)	Chips	15,692	125
	Engelmann Spruce (residues)	Chips	2,450	147
	Hybrid Spruce (residues)	Chips	194	139
	Lodgepole Pine (residues)	Chips	1,164	138
	Paper Birch (residues)	Chips	2,405	127
	Subalpine Fir (residues)	Chips	2,510	144
	Trembling Aspen (residues)	Chips	180	131
	Western Hemlock (residues)	Chips	8,890	124
	Western Larch (residues)	Chips	2,134	131
	Western Red Cedar (residues)	Chips	4,297	120
	Western White Pine (residues)	Chips	179	110
			40,171	128
Wynndel				
	Black Cottonwood (residues)	Chips	87	41
	Douglas Fir (residues)	Chips	23,293	62
	Engelmann Spruce (residues)	Chips	5,582	72
	Grand Fir (residues)	Chips	237	30
	Hybrid Spruce (residues)	Chips	1,222	58
	Lodgepole Pine (residues)	Chips	10,955	52
	Paper Birch (residues)	Chips	657	61
	Subalpine Fir (residues)	Chips	6,679	65
	Trembling Aspen (residues)	Chips	846	65
	Western Hemlock (residues)	Chips	4,767	90
	Western Larch (residues)	Chips	15,172	48
	Western Red Cedar (residues)	Chips	5,189	69
	Western White Pine (residues)	Chips	63	97
	Yellow Pine (residues)	Chips	622	39
			75,370	61
			744,493	67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Cut blocks (bio_5fn
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15 km
531 selected block(s) / 1041
Area covered: 29,028 ha / 57,873 ha

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

Statistics - Selected Items

Area	28,844.7 ha
Number of cut blocks	510
Recovered biomass	793,582.5 odt
Biomass yield	27.5 odt/ha
Biomass odt / Merchantable m^3	0.1072 odt/m^3
Delivered products	
• Chips	100 %
• Bundles	0 %
• Trunks and Residues	0 %
Energy balance	32 : 1
Available energy	3,000,724 MWh
Fuel consumption	13.6 L/odt

Cost

Harvesting	0.00 $/odt
Biomass recovery	26.82 $/odt
Transfer yard	0.00 $/odt
Transportation	44.83 $/odt
Loading/unloading	12.72 $/odt
Stumpage fees	0.00 $/odt
Road network - Maintenance	0.71 $/odt
Indirect costs	0.00 $/odt
Total	85.08 $/odt

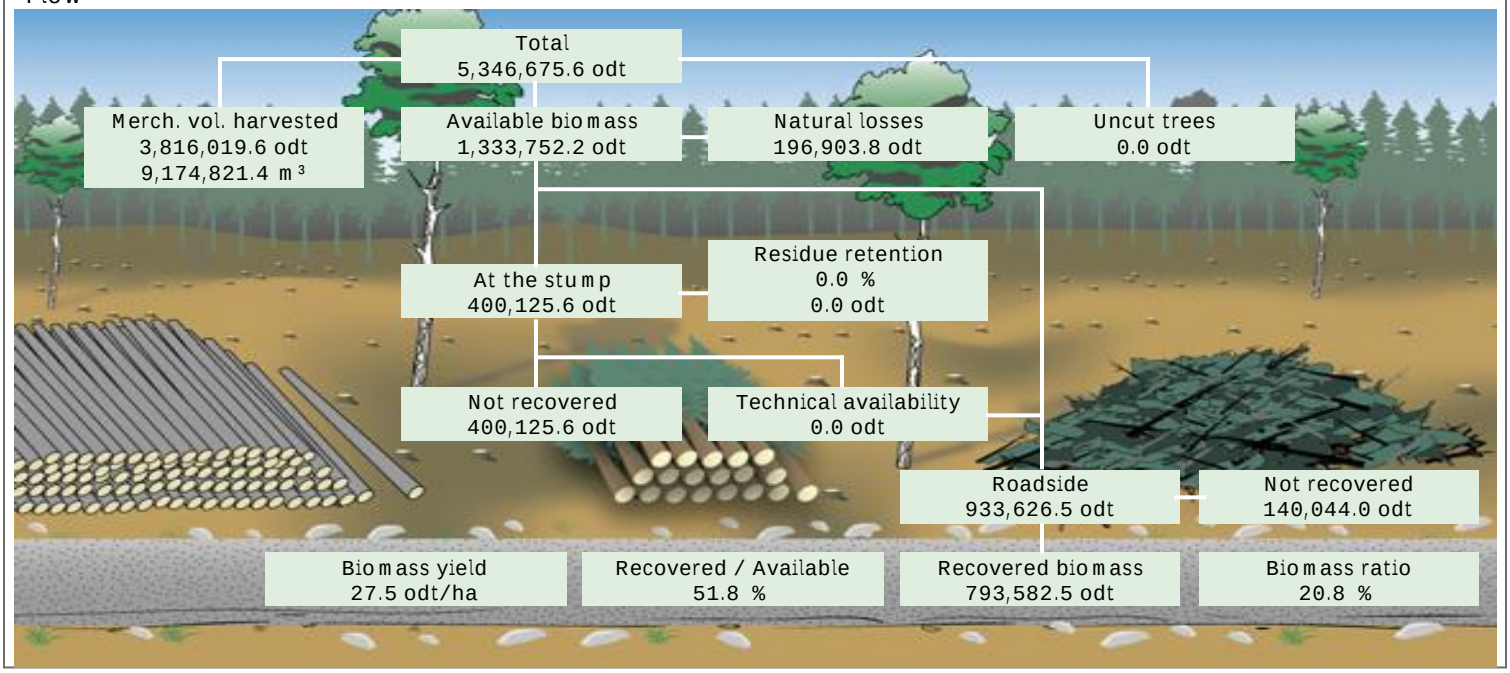
Revenue

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

Net

Profit	-85.08 $/odt

Flow



Products

Product name	odt	odt/m³	odt/ha
Black Cottonwood (residues)	939.3	0.1201	0.03
Douglas Fir (residues)	200,861.9	0.1316	6.96
Western Larch (residues)	186,412.8	0.1354	6.46
Lodgepole Pine (residues)	255,589.4	0.0909	8.86
Engelmann Spruce (residues)	50,482.1	0.0989	1.75
Subalpine Fir (residues)	28,087.3	0.0802	0.97
Trembling Aspen (residues)	9,267.5	0.0938	0.32
Hybrid Spruce (residues)	948.4	0.1058	0.03
Western Red Cedar (residues)	16,771.9	0.0805	0.58
Grand Fir (residues)	1,488.1	0.0464	0.05
Paper Birch (residues)	7,557.9	0.1570	0.26
Western White Pine (residues)	2,413.9	0.1036	0.08
Western Hemlock (residues)	31,535.4	0.0814	1.09
Yellow Pine (residues)	1,221.2	0.1296	0.04
Tamarack (residues)	5.6	0.1204	0.00
	793,582.5	0.1072	27.51

Recovery summary

	Volume(odt)	Area(ha)	Number of cut blocks
• Biomass recovery location			
At the stump	0.0	0.0	0
Roadside	793,582.5	28,844.7	510
• Recovery season			
Summer	0.0	0.0	0
Winter	793,582.5	28,844.7	510
• Residue freshness			
Fresh	0.0	0.0	0
Brown	793,582.5	28,844.7	510
Brittle	0.0	0.0	0

Supply summary

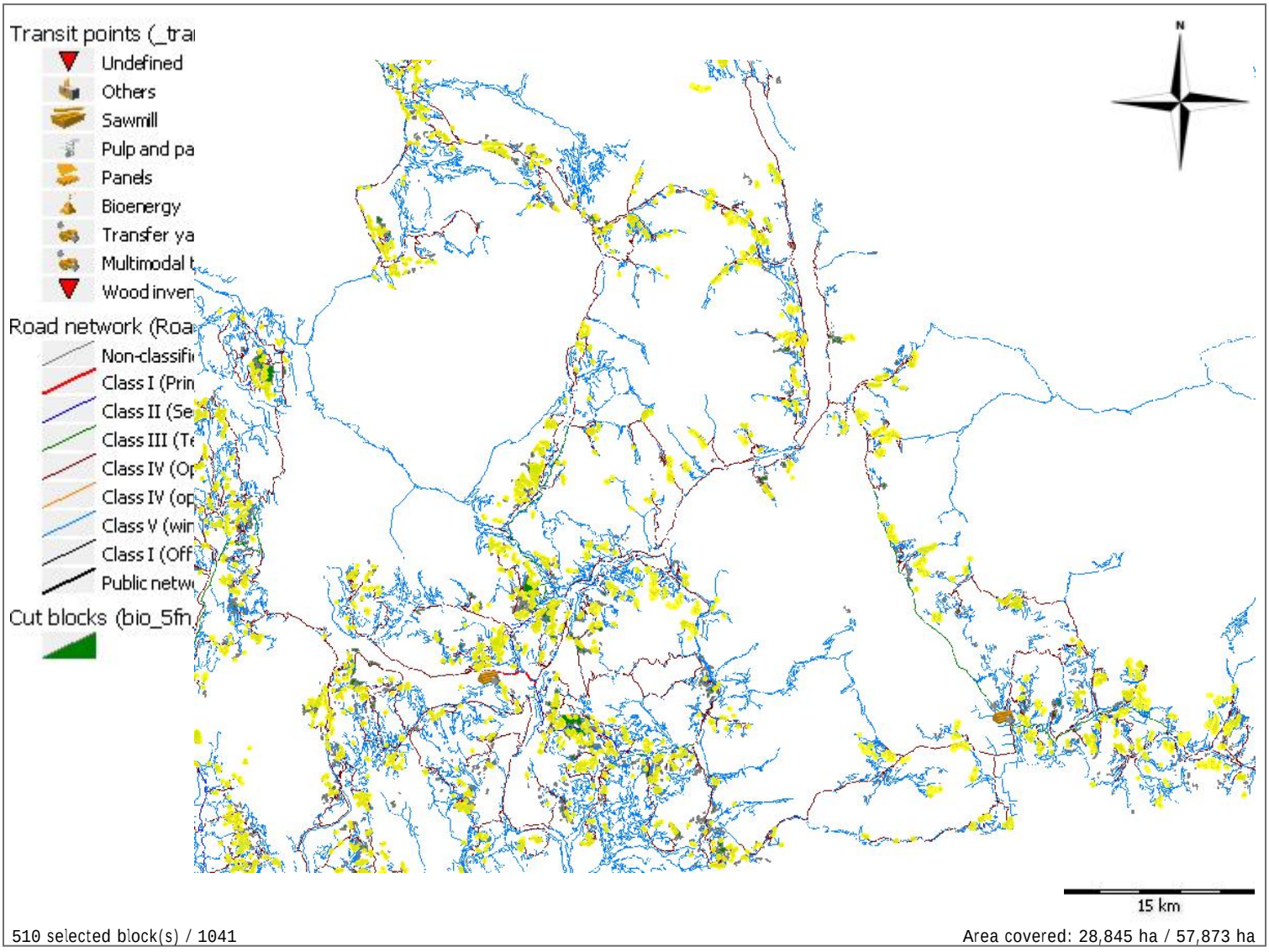
Recovered biomass to	Merchantable volume (odt)	Residues (odt)	Total biomass (odt)
10 $/odt	0.0	0.0	0.0
20 $/odt	0.0	0.0	0.0
30 $/odt	0.0	0.0	0.0
40 $/odt	0.0	0.0	0.0
50 $/odt	0.0	646.0	646.0
60 $/odt	0.0	72,516.1	72,516.1
70 $/odt	0.0	183,632.2	183,632.2
80 $/odt	0.0	376,579.3	376,579.3
90 $/odt	0.0	536,021.3	536,021.3
100 $/odt	0.0	628,889.7	628,889.7
110 $/odt	0.0	690,457.2	690,457.2
120 $/odt	0.0	741,184.9	741,184.9
130 $/odt	0.0	765,003.2	765,003.2
140 $/odt	0.0	772,642.7	772,642.7
150 $/odt	0.0	781,162.0	781,162.0
160 $/odt	0.0	790,778.7	790,778.7
170 $/odt	0.0	792,254.2	792,254.2
180 $/odt	0.0	793,582.5	793,582.5
Maximum cost	0.00 $/odt	177.75 $/odt	

Delivery to mills

Destination	Product	Format	odt	Transport average distance (Km)
Castlegar				
	Black Cottonwood (residues)	Chips	320	47
	Douglas Fir (residues)	Chips	72,785	54
	Engelmann Spruce (residues)	Chips	6,241	56
	Grand Fir (residues)	Chips	1,351	66
	Hybrid Spruce (residues)	Chips	265	82
	Lodgepole Pine (residues)	Chips	26,374	40
	Paper Birch (residues)	Chips	3,538	46
	Subalpine Fir (residues)	Chips	4,350	62
	Tamarack (residues)	Chips	6	30
	Trembling Aspen (residues)	Chips	3,740	51
	Western Hemlock (residues)	Chips	13,192	91
	Western Larch (residues)	Chips	48,678	50
	Western Red Cedar (residues)	Chips	5,056	85
	Western White Pine (residues)	Chips	1,528	82
	Yellow Pine (residues)	Chips	557	28
			187,978	55
Midway				
	Black Cottonwood (residues)	Chips	109	70
	Douglas Fir (residues)	Chips	34,225	63
	Engelmann Spruce (residues)	Chips	17,495	85
	Hybrid Spruce (residues)	Chips	82	84
	Lodgepole Pine (residues)	Chips	121,065	75
	Paper Birch (residues)	Chips	0	92
	Subalpine Fir (residues)	Chips	8,910	99
	Trembling Aspen (residues)	Chips	961	86
	Western Larch (residues)	Chips	50,981	72
	Western Red Cedar (residues)	Chips	46	98
	Yellow Pine (residues)	Chips	467	67
			234,339	74

Destination	Product	Format	odt	Transport average distance (Km)
Grand Forks				
	Black Cottonwood (residues)	Chips	110	34
	Douglas Fir (residues)	Chips	35,005	61
	Engelmann Spruce (residues)	Chips	14,554	77
	Grand Fir (residues)	Chips	6	43
	Hybrid Spruce (residues)	Chips	55	29
	Lodgepole Pine (residues)	Chips	55,284	63
	Paper Birch (residues)	Chips	518	71
	Subalpine Fir (residues)	Chips	7,702	75
	Trembling Aspen (residues)	Chips	2,346	73
	Western Hemlock (residues)	Chips	3,039	108
	Western Larch (residues)	Chips	46,559	60
	Western Red Cedar (residues)	Chips	3,196	88
	Western White Pine (residues)	Chips	156	94
	Yellow Pine (residues)	Chips	120	37
			168,650	65
Kelowna				
	Black Cottonwood (residues)	Chips	30	77
	Douglas Fir (residues)	Chips	2,428	85
	Engelmann Spruce (residues)	Chips	2,873	79
	Hybrid Spruce (residues)	Chips	88	99
	Lodgepole Pine (residues)	Chips	23,430	94
	Paper Birch (residues)	Chips	128	98
	Subalpine Fir (residues)	Chips	1,465	74
	Trembling Aspen (residues)	Chips	936	98
	Western Larch (residues)	Chips	6,735	91
	Western Red Cedar (residues)	Chips	6	98
	Yellow Pine (residues)	Chips	0	87
			38,118	91
Revelstoke				
	Black Cottonwood (residues)	Chips	91	109

Destination	Product	Format	odt	Transport average distance (Km)
Revelstoke				
	Douglas Fir (residues)	Chips	27,081	129
	Engelmann Spruce (residues)	Chips	1,755	143
	Hybrid Spruce (residues)	Chips	10	144
	Lodgepole Pine (residues)	Chips	3,637	140
	Paper Birch (residues)	Chips	2,732	132
	Subalpine Fir (residues)	Chips	1,332	138
	Trembling Aspen (residues)	Chips	437	133
	Western Hemlock (residues)	Chips	10,280	121
	Western Larch (residues)	Chips	3,487	138
	Western Red Cedar (residues)	Chips	5,104	122
	Western White Pine (residues)	Chips	203	132
			56,150	129
Wynndel				
	Black Cottonwood (residues)	Chips	280	46
	Douglas Fir (residues)	Chips	29,339	71
	Engelmann Spruce (residues)	Chips	7,564	56
	Grand Fir (residues)	Chips	132	15
	Hybrid Spruce (residues)	Chips	449	84
	Lodgepole Pine (residues)	Chips	25,799	63
	Paper Birch (residues)	Chips	642	62
	Subalpine Fir (residues)	Chips	4,327	61
	Trembling Aspen (residues)	Chips	848	54
	Western Hemlock (residues)	Chips	5,024	82
	Western Larch (residues)	Chips	29,973	66
	Western Red Cedar (residues)	Chips	3,364	84
	Western White Pine (residues)	Chips	527	58
	Yellow Pine (residues)	Chips	78	26
			108,347	67
			793,583	71



510 selected block(s) / 1041

Area covered: 28,845 ha / 57,873 ha

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