

OPERATIONAL INVENTORY

supporting business decision making

Todd Domney
Sumac Forest Information Services Ltd.

Outline

1. Introduction.
2. What is operational inventory.
3. The processes of a modern operational inventory.
 - sampling theory,
 - inventory methods,
 - compilations.
4. Applying the results.

Introduction

We expect that:

- forest inventory is the foundation on which all sustainable forest management (SFM) decisions are made.

We know that:

- traditional markets are down and, margins (profitability) are tight,
- costs need to be controlled,
- opportunities (new markets/ products) are developing or already exist.

We believe (in principal at least) that:

- it pays (\$\$\$) to invest in data collection and information gathering.
- better information leads to better decisions,
- better decisions improve financial performance.

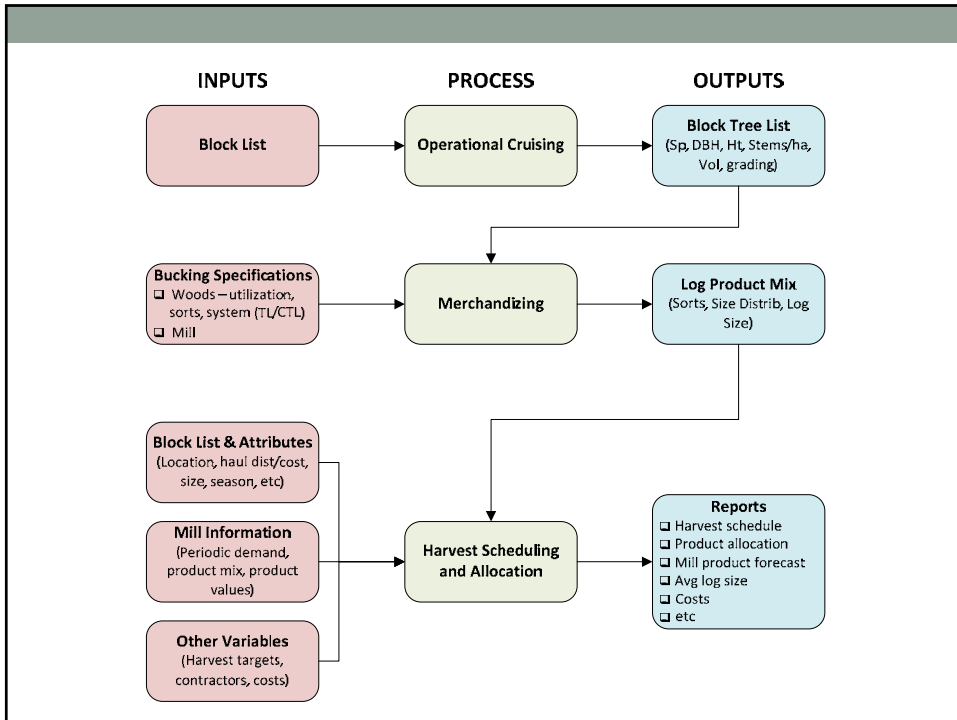
What is operational inventory?

A system which provides direct measures of timber quantity, quality and location.

- measures of actual trees to be harvested.

A series of interconnected processes and outputs that links woodland and mill operations for improved decision making capability.

- to provide the best estimate of "Tree to Dollar", driven by the economic requirements of the combined woodland and mill operation.



Sampling Theory (Design)

Objective Setting.

- establish actual business needs.

Determining Population.

- what is the area of interest?

Sampling Error.

- what is it, How much can you live with?

Use design to define costs, and budget – all up front

Sampling Theory...

Identify harvest allocation areas.

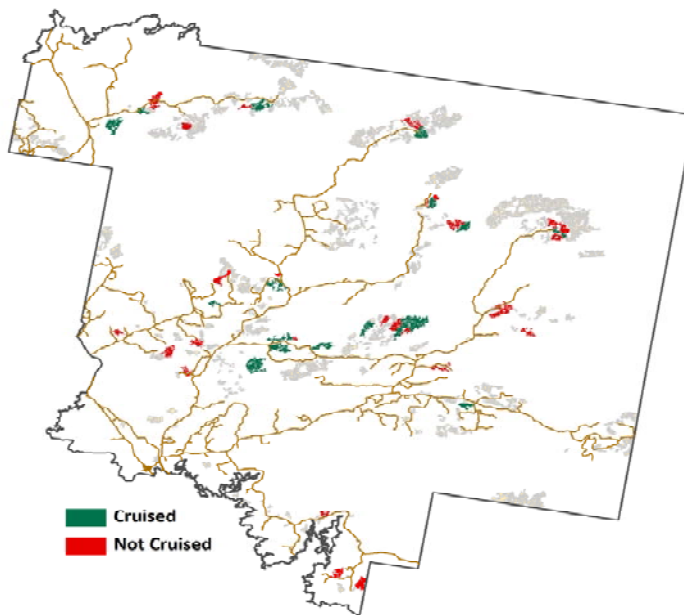
- woodlands could better predict volume and value of blocks, stands and types, removing areas that are not profitable.

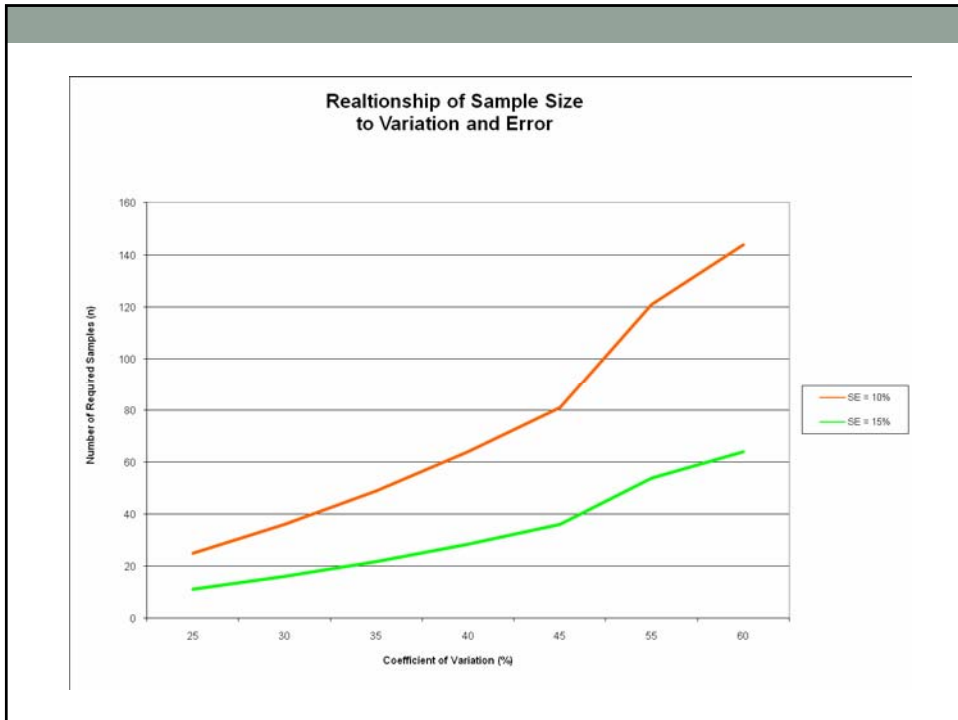
Forecasting mill outturn.

- mill staff could adjust mill configurations to best match predicted log deliveries.

Transportation logistics.

- woodlands could make better decisions relating to how and when different logs are transported to different mills.





Inventory Methods

Sampling is highly evolved and designed with efficiency in mind.

Counting trees is easy and cheap, measuring trees is costly.

Measuring trees is 50% of the answer, getting tree counts is the other 50%.



Inventory Methods...

Cruiser Call Grading.

- procedure that assigns a quality descriptor to a log length on a tree.

Number of approaches available

- BC interior/coast.
- Alberta/ Saskatchewan.
- Lake States.
- New Brunswick/ Maine.
- UK/ Ireland.
- Australia/ New Zealand.

Inventory Methods...

Method for Assessing Recoverable Volume by Log-grade (MARVL).

- Uses a data dictionary of variables to assign quality grades to log segments (high, medium, low, waste).
- Cruisers do not attempt to identify manufactured grades i.e. veneer.

Variables.

- Straightness,
- Branch/ Knot size and frequency,
- External defects i.e. scars, cracks,
- Indicators of internal defect i.e. conks.

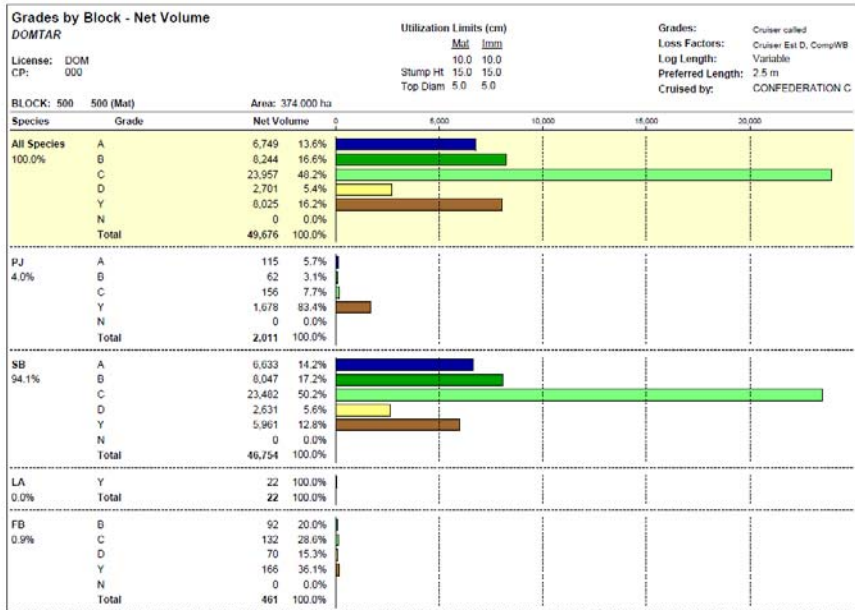
Compilation

Converting raw sample data into useful information products.



CruiseComp

Statistic	Value
Number of blocks cruised	21
Total Area (Ha)	5,209
Average block size (Ha)	248
Number of plots – Measure	1,289
Count	3,893
Total	5,182
Number of trees – Measure	7,239
Count	22,619
Total	29,858
Plots/ha	1
Cruised trees / plot	5.8
Coefficient of Variation	36.3%
Sampling error (95% CI)	2%



Compilation...

Post stratify to allow prediction of key attributes for the blocks not cruised.

- use FRI and the planning inventory.

Forest Unit used as primary stratification attribute.

- Sub stratification attributes could include:
 - site class (1 or 2),
 - age (10 year age class),
 - stocking level.

Cruise data re-compiled at the stratum (forest unit) level.

Applying Results

Log sorts.

Forestry costs.

Return to log values for each destination.

Spatial planning.

Log sort						
Name	Description	Species	Top Diam ^a	Grade	Length	
SPF_LS_AB	Spruce, pine & fir - large sawlog, AB grade	Sb, Sw, Pj, Bf	> 24.1cm	A, B	2.5m	
SPF_LS_CD	Spruce, pine & fir - large sawlog, CD grade	Sb, Sw, Pj, Bf	> 24.1cm	C, D	2.5m	
SPF_SS_AB	Spruce, pine & fir - small sawlog, AB grade	Sb, Sw, Pj, Bf	11.4 to 24.1cm	A, B	2.5m	
SPF_SS_CD	Spruce, pine & fir - small sawlog, CD grade	Sb, Sw, Pj, Bf	11.4 to 24.1cm	C, D	2.5m	
SPF_Pulp	Spruce, pine & fir - pulp (Y grade or < 11.4cm)	Sb, Sw, Pj, Bf	<11.4, Any for Y	A,B,C,D,Y	Any	
LA_LS_AB	Larch - large sawlog, AB grade	La	> 24.1cm	A, B	2.5m	
LA_LS_CD	Larch - large sawlog, CD grade	La	> 24.1cm	C, D	2.5m	
LA_SS_AB	Larch - small sawlog, AB grade	La	11.4 to 24.1cm	A, B	2.5m	
LA_SS_CD	Larch - small sawlog, CD grade	La	11.4 to 24.1cm	C, D	2.5m	
LA_Pulp	Larch - pulp (Y grade or < 11.4cm)	La	Any	A,B,C,D,Y	Any	
HW_LS_AB	Hardwood - large sawlog, AB grade	Pt, Pb, Bw	> 24.1cm	A, B	2.5m	
HW_LS_CD	Hardwood - large sawlog, CD grade	Pt, Pb, Bw	> 24.1cm	C, D	2.5m	
HW_SS_AB	Hardwood - small sawlog, AB grade	Pt, Pb, Bw	11.4 to 24.1cm	A, B	2.5m	
HW_SS_CD	Hardwood - small sawlog, CD grade	Pt, Pb, Bw	11.4 to 24.1cm	C, D	2.5m	
HW_Pulp	Hardwood - pulp (Y grade or < 11.4cm)	Pt, Pb, Bw	<11.4, Any for Y	A,B,C,D,Y	Any	
Biomass	Biomass (66% of 60.3 m3/ha) ^c	All	None	None	None	

^a 11.4 to 24.1cm = 4.5" to 9.5"

^b Weighted average RTL value

^c From "Wood Biomass Procurement and Quality Enhancement for Energy"

Return to Log Value Calculation for Stud Logs

Quality Class : Q1 A & B

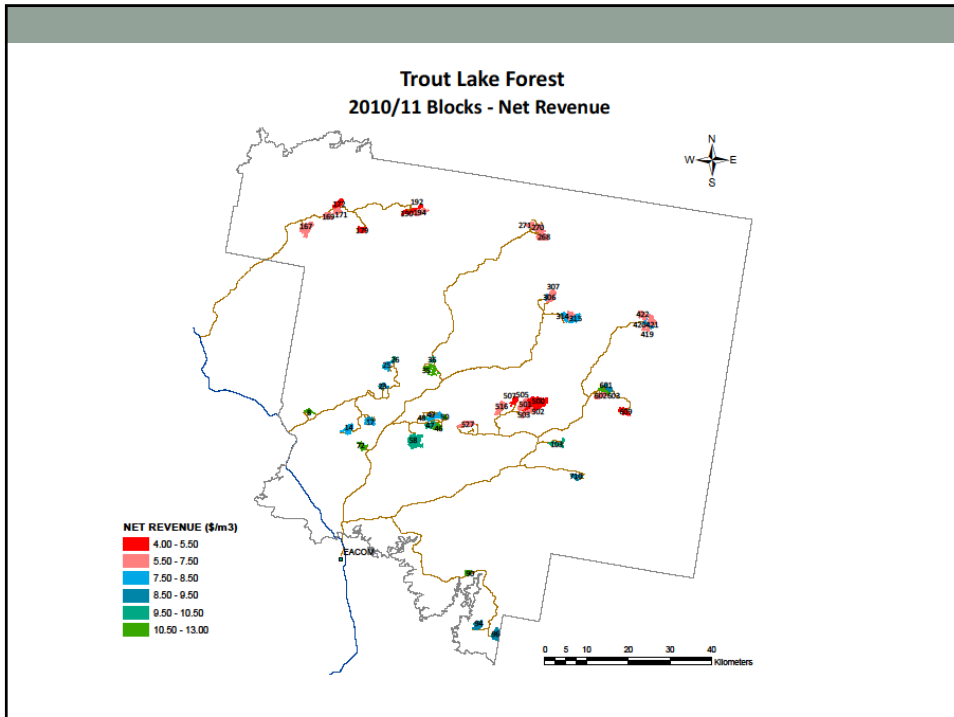
Avg Top Diam in	Diam Class in	Length m	Avg Vol m3/log	Avg Lbr Recovery bf/m3	Product Recovery (% of log volume)				Product Values		Sawmill Conversion Cost		Return to Log Value \$/m3
					Lumber	Chips	Sawdust	Shavings	Total \$/log	Total \$/m3	\$/Mbf	\$/m3	
4.5"	04"	2.5	0.031	262.4	39.8%	39.8%	9.7%	5.5%	2.87	92.01	165.31	43.38	48.64
5.5"	05"	2.5	0.045	277.2	42.6%	37.3%	8.8%	5.9%	4.29	95.28	165.31	45.82	49.46
6.5"	06"	2.5	0.061	301.1	46.1%	30.7%	10.7%	6.5%	6.15	100.48	165.31	49.77	50.71
7.5"	07"	2.5	0.080	320.9	49.5%	26.5%	11.1%	6.4%	8.54	106.78	149.60	48.01	58.76
17.5"	17"	2.5	0.407	374.5	58.8%	15.7%	11.3%	6.6%	50.94	125.24	127.60	47.78	77.46
18.5"	18"	2.5	0.453	374.7	59.0%	15.8%	11.2%	6.3%	57.40	126.63	127.60	47.82	78.81
19.5"	19"	2.5	0.502	376.7	59.5%	15.4%	11.0%	6.3%	63.91	127.22	127.60	48.06	79.16
20.5"	20"	2.5	0.554	374.6	59.4%	15.7%	11.0%	6.2%	70.41	127.11	127.60	47.80	79.31

Quality Class : Q2 C & D

Avg Top Diam in	Diam Class in	Length m	Avg Vol m3/log	Avg Lbr Recovery bf/m3	Product Recovery (% of log volume)				Product Values		Sawmill Conversion Cost		Return to Log Value \$/m3
					Lumber	Chips	Sawdust	Shavings	Total \$/log	Total \$/m3	\$/Mbf	\$/m3	
4.5"	04"	2.5	0.031	229.5	34.4%	45.0%	10.8%	5.3%	2.41	77.25	165.31	37.94	39.31
5.5"	05"	2.5	0.045	248.4	38.2%	43.3%	8.4%	5.1%	3.79	84.29	165.31	41.07	43.22
6.5"	06"	2.5	0.061	270.2	41.3%	37.0%	10.3%	5.9%	5.35	87.41	165.31	44.67	42.74
7.5"	07"	2.5	0.080	290.2	44.6%	32.7%	10.9%	6.0%	7.45	93.21	149.60	43.42	49.79
17.5"	17"	2.5	0.407	358.8	56.2%	18.6%	11.4%	6.4%	46.21	113.61	127.60	45.78	67.83
18.5"	18"	2.5	0.453	360.3	56.7%	18.5%	11.3%	6.1%	52.21	115.17	127.60	45.97	69.20
19.5"	19"	2.5	0.502	362.5	57.2%	18.1%	11.2%	6.1%	58.23	115.91	127.60	46.25	69.66
20.5"	20"	2.5	0.554	363.4	57.5%	17.8%	11.2%	6.0%	64.52	116.47	127.60	46.37	70.10

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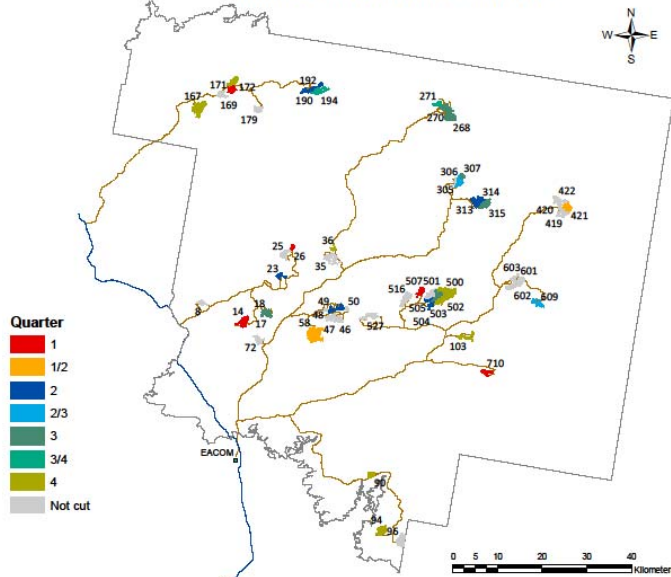
Block	Mill Volume (m³)				Financial (\$/m³)					
	EACOM	Domtar	Weyer	Total	Revenue	Stumpage	Harvest	Haul	Total Cost	Net Revenue
72	8,653	9,775	634	19,062	55.26	10.57	19.91	12.06	42.54	12.72
46	13,123	16,093	844	30,060	55.45	10.59	19.93	13.71	44.23	11.23
50	4,693	4,839	139	9,671	55.01	10.74	19.94	13.16	43.85	11.17
35	20,142	22,993	3,926	47,062	54.70	10.15	19.78	13.70	43.63	11.07
601	14,363	16,240	1,300	31,903	55.22	10.51	19.89	13.82	44.22	11.00
8	7,614	9,170	668	17,451	55.45	10.52	19.90	14.21	44.62	10.83
90	6,147	6,246	108	12,501	55.19	10.79	19.96	13.68	44.43	10.76
36	2,831	2,897	1,055	6,783	54.36	9.58	19.59	14.69	43.87	10.49
48	3,468	3,897	276	7,641	54.88	10.55	19.90	14.22	44.66	10.22
47	18,570	21,239	1,028	40,837	55.24	10.63	19.93	14.72	45.28	9.96
26	5,640	6,057	471	12,168	55.13	10.53	19.89	14.85	45.27	9.85
58	62,407	62,103	9,068	133,578	54.69	10.31	19.81	14.76	44.87	9.82
103	9,854	10,515	571	20,941	55.37	10.63	19.91	15.30	45.84	9.53
94	9,901	10,956	1,429	22,287	55.66	10.32	19.83	16.20	46.35	9.31
18	4,638	4,493	1,440	10,571	53.94	9.75	19.63	15.28	44.67	9.27
710	9,830	10,283	1,363	21,476	55.41	10.33	19.82	16.15	46.31	9.10
23	8,706	9,207	2,607	20,519	54.09	9.81	19.67	15.78	45.26	8.83
603	7,900	8,327	252	16,480	55.20	10.73	19.94	15.98	46.65	8.55
96	14,409	17,889	2,866	35,164	55.32	10.16	19.80	16.83	46.78	8.54
25	14,288	15,984	1,330	31,602	55.21	10.50	19.88	16.48	46.86	8.35
14	23,467	23,320	7,904	54,690	53.94	9.68	19.62	16.43	45.72	8.22
17	14,221	13,592	6,500	34,313	53.51	9.31	19.50	16.56	45.38	8.14
315	14,747	16,685	1,575	33,007	55.59	10.45	19.87	17.42	47.73	7.85
305	2,102	2,727	74	4,903	55.91	10.69	19.97	17.41	48.07	7.84
313	8,674	8,648	555	17,877	55.63	10.61	19.90	17.28	47.79	7.84
49	20,519	21,094	6,229	47,842	54.00	9.79	19.66	16.96	46.41	7.59
420	7,604	9,790	153	17,547	55.70	10.74	19.98	17.47	48.19	7.51
169	6,049	8,021	427	14,497	55.92	10.57	19.93	18.04	48.54	7.38
194	13,248	15,367	217	28,833	55.79	10.77	19.97	17.73	48.48	7.31
307	3,549	4,020	174	7,744	56.11	10.66	19.93	18.27	48.86	7.26



Scenario 1		Quarter				
Destination	Value	1	2	3	4	Total
Eacom	Volume	110,000	115,000	125,000	125,000	475,000
	Net Revenue	6.00	4.08	4.22	5.92	5.05
Domtar	Volume	85,000	85,000	90,000	90,000	349,999
	Net Revenue	10.86	9.28	8.87	11.34	10.09
Weyerhaeuser	Volume	13,003	12,991	7,493	22,125	55,612
	Net Revenue	0.46	-1.51	-2.47	-0.36	-0.72
Total	Volume	208,003	212,991	222,493	237,124	880,611
	Net Revenue	7.64	5.81	5.88	7.39	6.68

REMSOFT ALLOCATION OPTIMIZER

Trout Lake Forest
Blocks Cut by Quarter - Scenario 2



Closing

Operational inventories are designed support business decision making.

Technology is proven and available.

Cost effective.