Log yard inventory and usage volumes: why they get out of balance and miss expectations

Timber Measurements Society meeting
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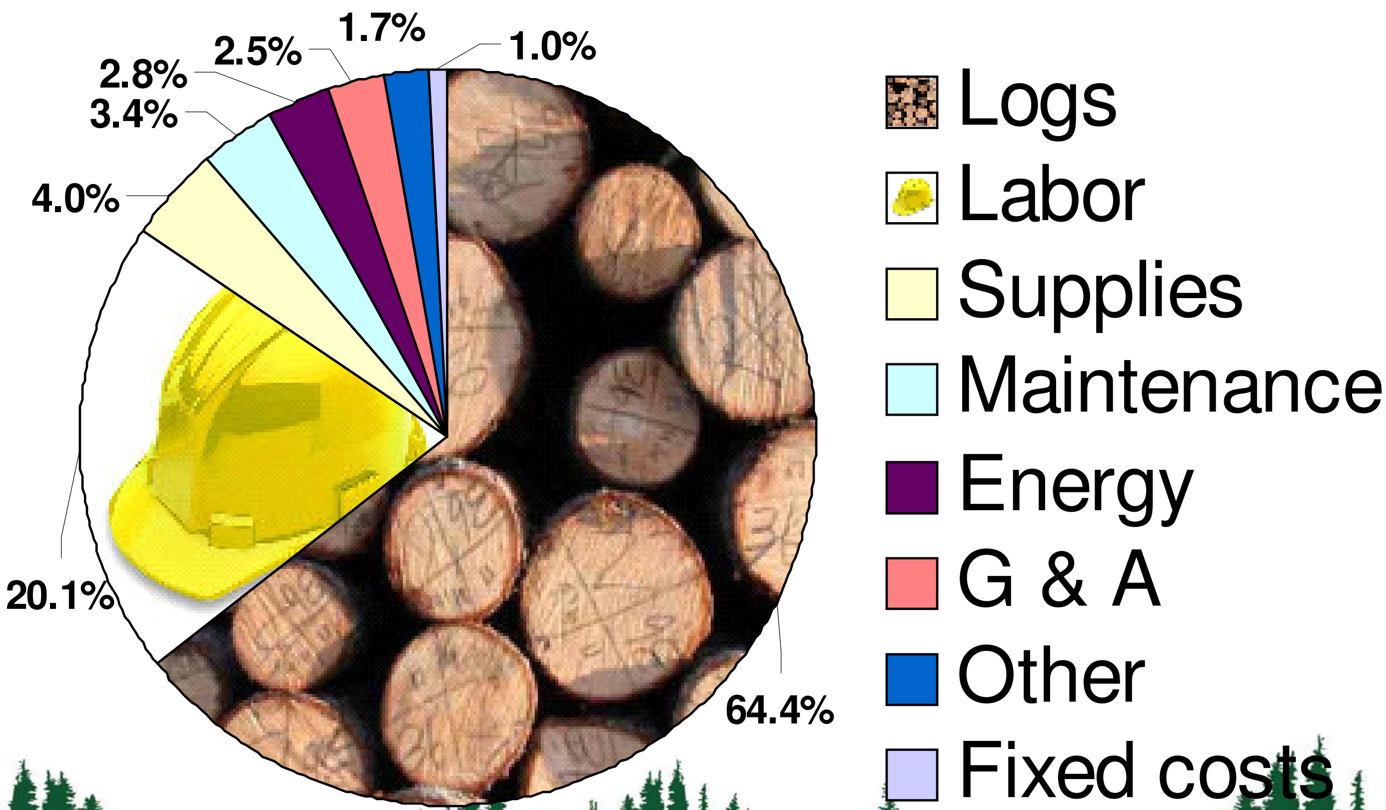
Why is it so important?

- Necessary for monthly financial statement
- Generally used to calculate monthly raw material cost
- It is an indicator of the mill efficiency
- Needed for planning purposes and supplying raw material during supply constraints

For most mills log are the largest cost of manufacturing lumber and veneer

Typical components of cost in manufacturing lumber (depreciation not included)



Calculating log usage - three common methods

1. Physical derived (beginning inventory + deliveries – ending inventory = usage
2. Book derived usage (product volume ÷ recovery factor = usage)
3. Measure usage directly (scale logs into the mill or use scanners or weight

Most mill use the first two methods, with one validating the other and often a trigger point (e.g. ± 3% where the two are reconciled

Usage is generally linked with the log yard inventory

- In most situations, you cannot discuss usage figures without understanding inventory

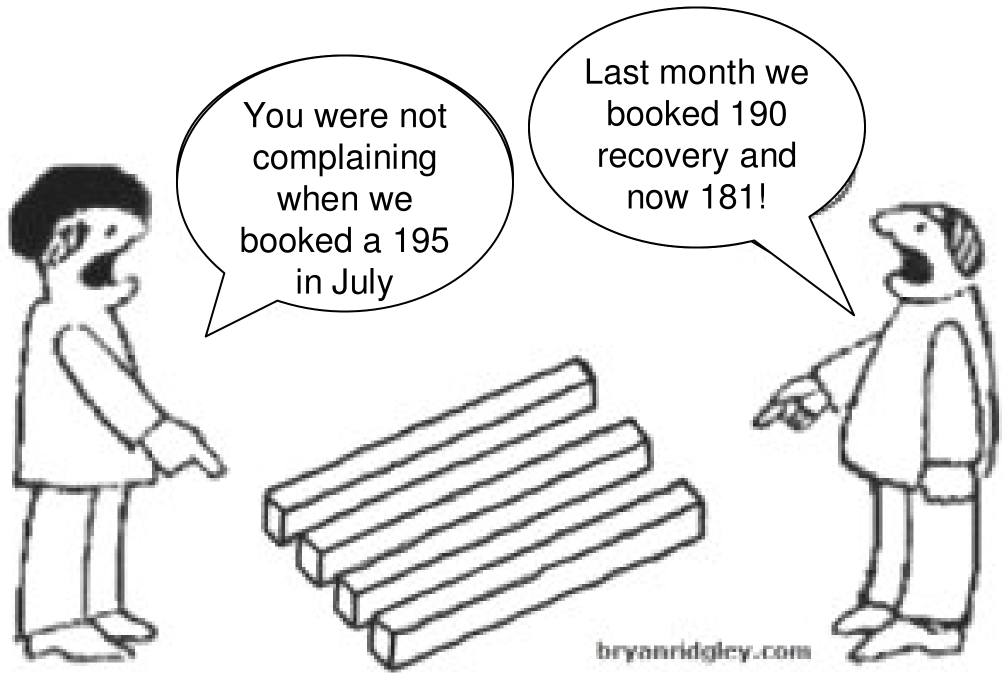
  beginning inventory (14,400 mbf) + deliveries (10,000 mbf)
  ending inventory (15,400) = usage (9,000)

- If book derived usage is used, it is generally adjusted to the physical inventory when disparity exceeds tolerance (e.g. ± 3%)

  product volume (16,200 mbf) ÷ recovery factor (1.90) = usage (8,526 mbf)

Perception vs. Reality

- Don't lose sight of the fact that the inventory does not really affect the bottom line

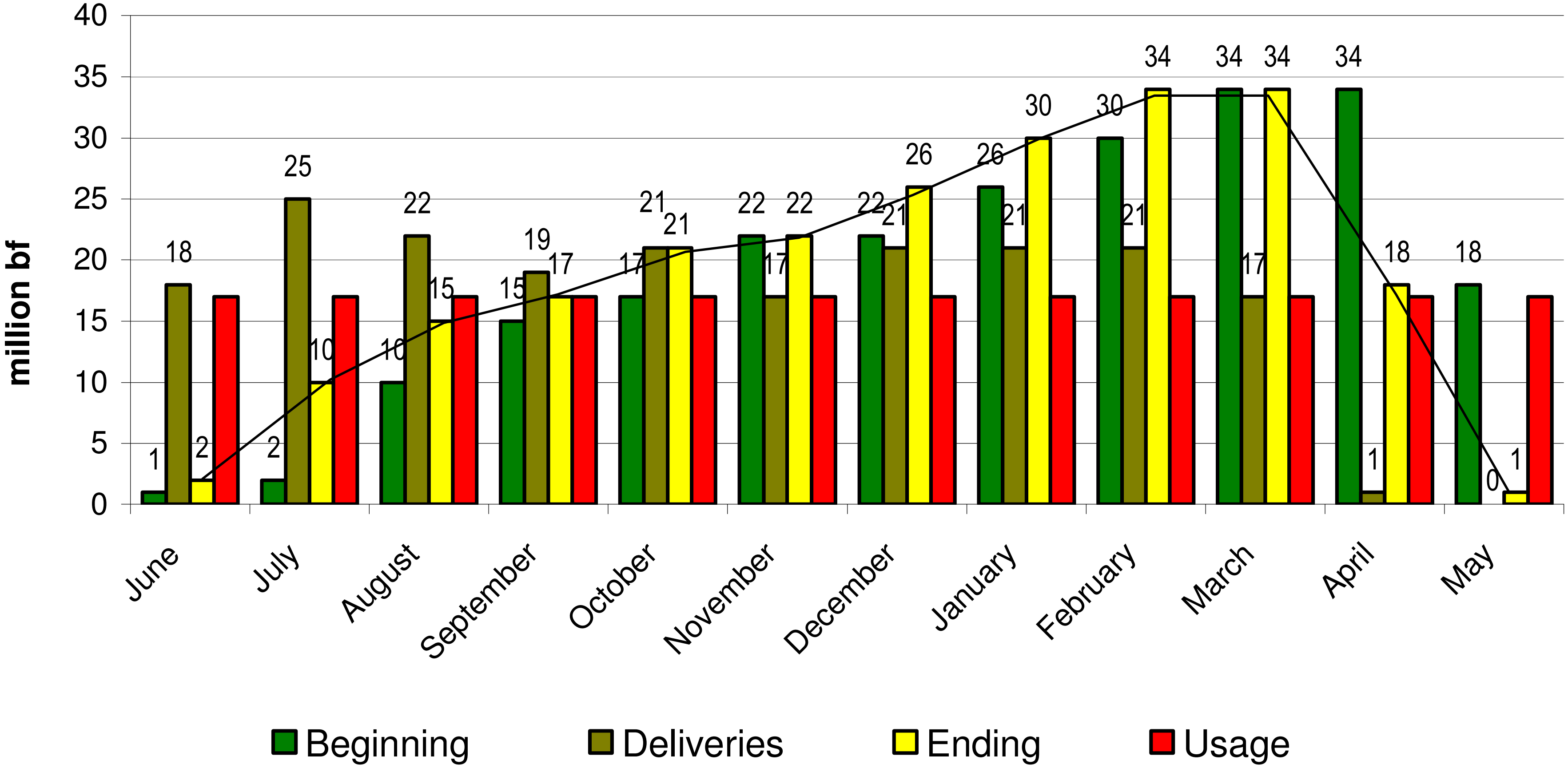


So what can goes wrong?

- Deck factors/measurement may be inaccurate
- Deck volume may not reconcile with scaled volume
- Small disparities when building inventory will become large disparities when depleting
- Log volume available for product recovery is lost in storage (degrade, breakage)
- Recovery assumptions may be overly optimistic
- Scribner based recovery is highly variable

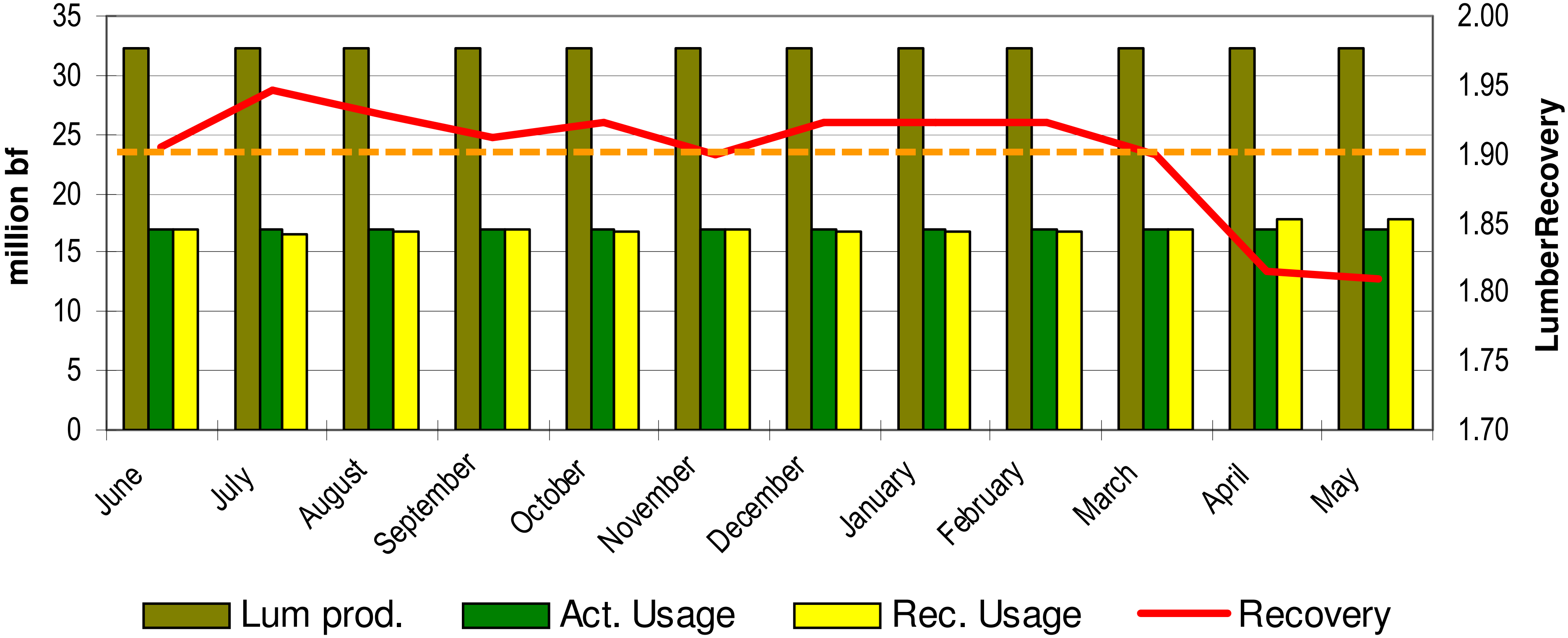
The plant accountant's dream

Example of log inventory and usage by month (cut-out to cut-out) for a mill that produces 388 mmbf of lumber from 204 mmbf of logs (**monthly usage 17 mmbf and recovery of 1.90**)



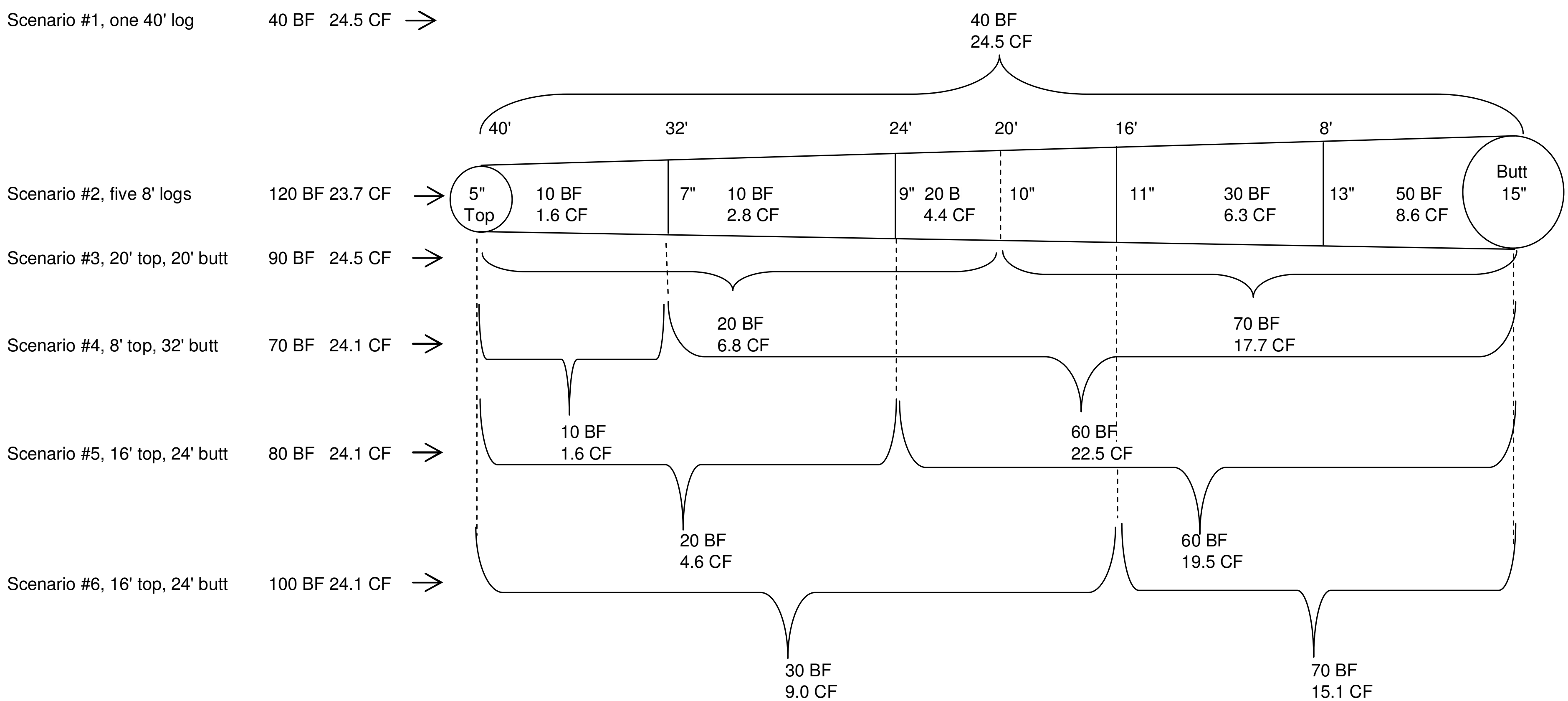
Overstated physical inventory: plant accountant's bad dream

Same scenario as the previous slide but this is what happens when the physical inventory is overstated (in this example by 5% and assumes open inventory)



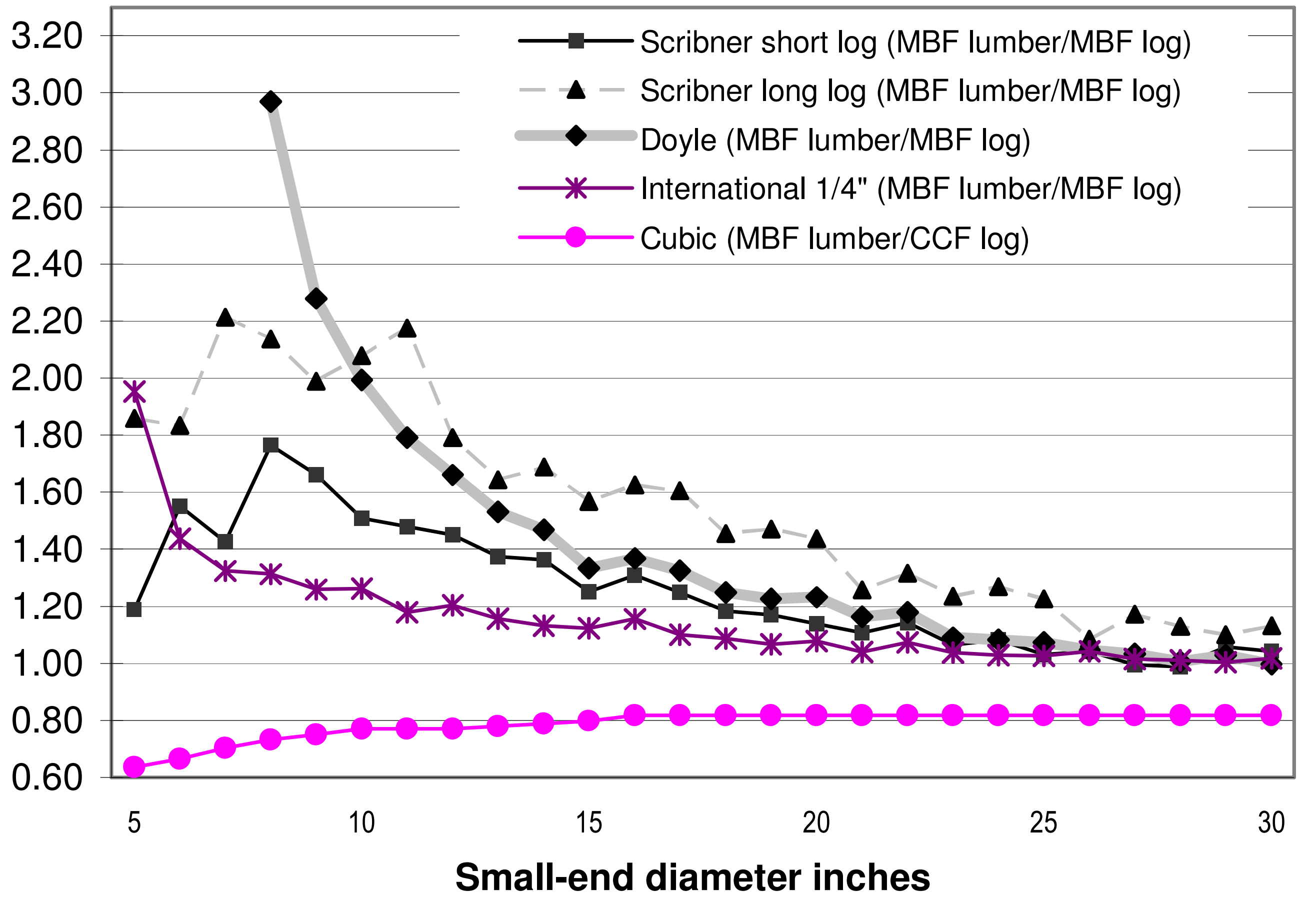
Volume lost in inventory

Scribner variability



Scribner variability

Example of averaqe lumber recovery for BF log rules and CF log scale by small end diameter (board mill)



What are the best practices?

- Cut-outs
- Closed inventory systems
- Use cubic and not Scribner in the log yard and mill
- Where feasible use weight extrapolated or scaled into inventory systems
- Don’t over invest in stacked measure systems (the cost curve is much steeper than the benefit curve).
- Use 3-D deck factors with stacked systems
- Consolidate responsibilities
- Measure usage directly

Scanner determined usage

- Most mills using scanners and optimizers to obtain optimal recovery given the shape of a log and the value of the products that can be manufactured
- Given that the above process involves measuring and mapping log shape (dimensions); log volume is easily determined and reported

Scanner determined usage

- Accurately maps and measures a logs shape and thus volume
- Measures volume differently from stick scaled
- Most do not measure defect volume*
- Generally about 8-15% more volume than stick scaled USFS cubic (but consistent by species).

Total logs processed	351				
Total PP_LPP logs	351	=	100%		
Average log length	13.0'	=	3.96 m		
Average log top diameter	10.6"	=	26.9 cm		
Average Smalian volume/log	9.53 ft^3	=	0.270 m^3		
Total Smalian log volume	3346.3 ft^3	=	94.756 m^3		
Total board volume	1938.89 ft^3	=	54.903	=	57.90%
Total Chip volume	1064.5 ft^3	=	30.143	=	31.80%
Total sawdust volume	342.94 ft^3	=	9.711 m	=	10.20%
Total mbf lumber	25.125 mbf				
Average bf lumber/log	71.581 bf/log				
Projected LRF	7.508				
Projected sawmill recovery	57.90%				
Total number of boards	3849				
Total center cant boards	3227	=	83.80%		
Total center cant edger boards	861	=	22.40%		
Total side board flitches	621	=	16.10%		
Total side boards	622	=	1 board(s)/flitch		
Total edger split side boards	1	=	0.16%		
Pieces routed to edger	1482	=	38.50%		
Total lumber value	$11,934.29	=	$34.00/log		
Total chip value	$958.05				
Total sawdust value	$102.88				
Total manufacturing costs	$3,571.84				
Net total product value	$9,423.38				
Material under 4.0" diameter	0	=	0.0 lin	=	0.000 ft^3
Material over 14.0" diameter	47	=	74.0 li	=	82.34 ft^3
Total downtime	0:33:23		(HH:MM:SS)		
Manual overrides in auto	24				
Logs processed in manual	0				
EDLF productivity based on target of 2800 log		=	12.50%		

Scanner determined usage

- **To determine ratio of scaled volume to scanned volume, logs are scaled and run through the scanner**
- **Tests are conducted monthly and accumulated to obtain a good average**

DF with 6.53 avg SED. 1/16/07

		log yard scale		Scanner		
		Gross	Net	Cubic		
1		624.8	578			
2		712.6	629.2			
3		668.1	605.7			
4		661.3	565.2			
5		697	631			
6		767.3	684.1			
7		607.1	545.5			
8		996.3	916.9			
9						
10				Scanner		
11				Data		
12						
		5734.5	5155.6	6500.51	Gross	0.882161553
					Net	0.793107002
		@ 10.5% trim		LRF		
Stacker BF	54751	49002.15		9.504644		

Usage calculation and reporting

Date	Shift	Specie	Product	Scheduled Hours	Down Time Min.	Avg. S.E.D.	Block Count	Scanner Cubic Feet	Factored Usage Log Vol. CF	Green Lumber Production	Est. Finished Lum Prod.	LRF	Percent Up-time
1-Feb	A	DF	Studs	10	66	6.62	9,256	22,027	17,900	182,405	164,621	9.20	89%
1-Feb	B	DF	Studs	10	33	6.82	9,625	24,337	19,777	205,173	185,169	9.36	95%
5-Feb	A	DF	Studs	10	23	6.65	9,626	23,065	18,744	197,771	178,488	9.52	96%
5-Feb	B	DF	Studs	10	15	6.64	10,601	25,282	20,545	215,062	194,093	9.45	98%
6-Feb	A	DF	Studs	10	22	6.73	10,239	25,179	20,462	209,399	188,983	9.24	96%
6-Feb	B	DF	Studs	10	25	6.64	10,716	25,539	20,754	215,747	194,712	9.38	96%
7-Feb	A	DF	Studs	10	26	6.64	10,391	24,754	20,116	206,143	186,044	9.25	96%
7-Feb	B	DF	Studs	10	12	6.82	10,800	27,256	22,149	232,821	210,121	9.49	98%
8-Feb	A	WF	Studs	10	45	7.94	8,513	29,669	22,381	260,258	234,883	10.49	93%
8-Feb	B	WF	Studs	10	25	7.83	9,060	30,607	23,089	277,740	250,660	10.86	96%
12-Feb	A	DF	Studs	10	42	6.94	7,908	20,353	16,540	167,251	150,944	9.13	93%
12-Feb	B	DF	Studs	10	22	6.76	9,069	22,598	18,364	191,536	172,861	9.41	96%
13-Feb	A	DF	Studs	10	31	6.74	10,132	24,948	20,274	202,909	183,125	9.03	95%
13-Feb	B	DF	Studs	10	18	6.79	10,640	26,528	21,558	223,872	202,044	9.37	97%
14-Feb	A	DF	Studs	10	29	6.64	10,126	24,265	19,719	196,512	177,352	8.99	95%
14-Feb	B	DF	Studs	10	25	6.83	10,118	25,710	20,893	214,101	193,226	9.25	96%
15-Feb	A	WF	Studs	10	28	7.89	8,741	30,153	22,746	253,644	228,914	10.06	95%
15-Feb	B	WF	Studs	10	35	7.97	8,847	30,956	23,352	273,314	246,666	10.56	94%
19-Feb	A	DF	Studs	10	33	6.89	9,517	24,391	19,821	195,417	176,364	8.90	95%
19-Feb	B	DF	Studs	10	23	7.00	9,992	26,820	21,795	225,909	203,883	9.35	96%
20-Feb	A	DF	Studs	10	19	6.93	10,155	26,309	21,380	215,177	194,197	9.08	97%
20-Feb	B	DF	Studs	10	16	6.81	10,607	26,606	21,621	221,690	200,075	9.25	97%
21-Feb	A	LP	Studs	10	20	7.22	10,150	28,481	22,161	239,493	216,142	9.75	97%
21-Feb	B	LP	Studs	10	45	7.31	9,666	27,824	21,649	240,571	217,115	10.03	93%
22-Feb	A	WF	Studs	10	29	8.03	8,264	29,579	22,313	247,309	223,196	10.00	95%
22-Feb	B	WF	Studs	10	20	8.31	8,923	34,228	25,820	301,708	272,291	10.55	97%
26-Feb	A	DF	Studs	10	46	6.85	9,515	24,330	19,772	194,362	175,412	8.87	92%
26-Feb	B	DF	Studs	10	10	6.77	10,669	26,362	21,423	212,835	192,084	8.97	98%
27-Feb	A	DF	Studs	10	28	6.90	9,909	25,456	20,687	204,760	184,796	8.93	95%
27-Feb	B	DF	Studs	10	22	6.84	10,142	26,324	21,392	211,100	190,518	8.91	96%
28-Feb	A	DF	Studs	10	46	6.85	9,350	24,387	19,818	192,575	173,799	8.77	92%
28-Feb	B	DF	Studs	10	16	6.81	10,527	26,351	21,414	215,816	194,774	9.10	97%
				320.0	**895.0**		**311,794**	**840,674**	**670,429**	**7,044,380**	**6,357,553**	**9.48**	**95%**
										Trim Gain			

	Avg. S.E.D.	CF/Block	Usage CCF	MBF Lumber*	MBF Prod./Hr.*	LRF	% Up-time
"A" Shift	7.01	2.14	3,248.32	3,037.26	18.98	9.35	94%
"B" Shift	7.03	2.16	3,455.97	3,320.29	20.75	9.61	96%
Total	**7.02**	**2.15**	**6,704.29**	**6,357.55**	**19.87**	**9.48**	**95%**

DF	6.79	2.03	4,869.17	4,467.68	18.62	9.18	96%
WF	7.99	2.67	1,397.02	1,456.61	24.28	10.43	95%
LP	7.26	2.21	438.10	433.26	21.66	9.89	95%
Total	**7.02**	**2.15**	**6,704.29**	**6,357.55**	**19.87**	**9.48**	**95%**

Conclusions

- Stacked measure is inherently inaccurate given the expectations of accounting for mill profitability, however, it is a relatively inexpensive and simple method of accounting for log yard inventory.
- Stacked measure is much more accurate when used with cubic as opposed to Scribner
- There are fairly accurate methods of accounting for log yard inventory volume, e.g., scaled, sample scaled, etc., however, these are more expensive to administer and may require an initial investment in equipment

Conclusions

- Many of the shortcomings of current log yard inventory systems can be overcome if one uses scanner data to determine usage and thus ending inventory
- Scanner derived usage data is more accurate (especially when used with cubic) than is usage as derived from log yard inventory *(beginning inventory+ deliveries – ending inventory = usage)*
- Tracking usage/recovery via scanners has other value in that it can identify problems in the mill

Conclusions

- Regardless of log yard inventory methods, scanner data is an excellent corroborative source of usage information which can be used in conjunction with the physical inventory for very little cost or effort
- Not only is it an excellent source for usage and a strong tool for calculating inventory, the process lends itself for updating deck factors, conducting mill tests and supplying the mill with ongoing performance metrics.

Thank you for your attention

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