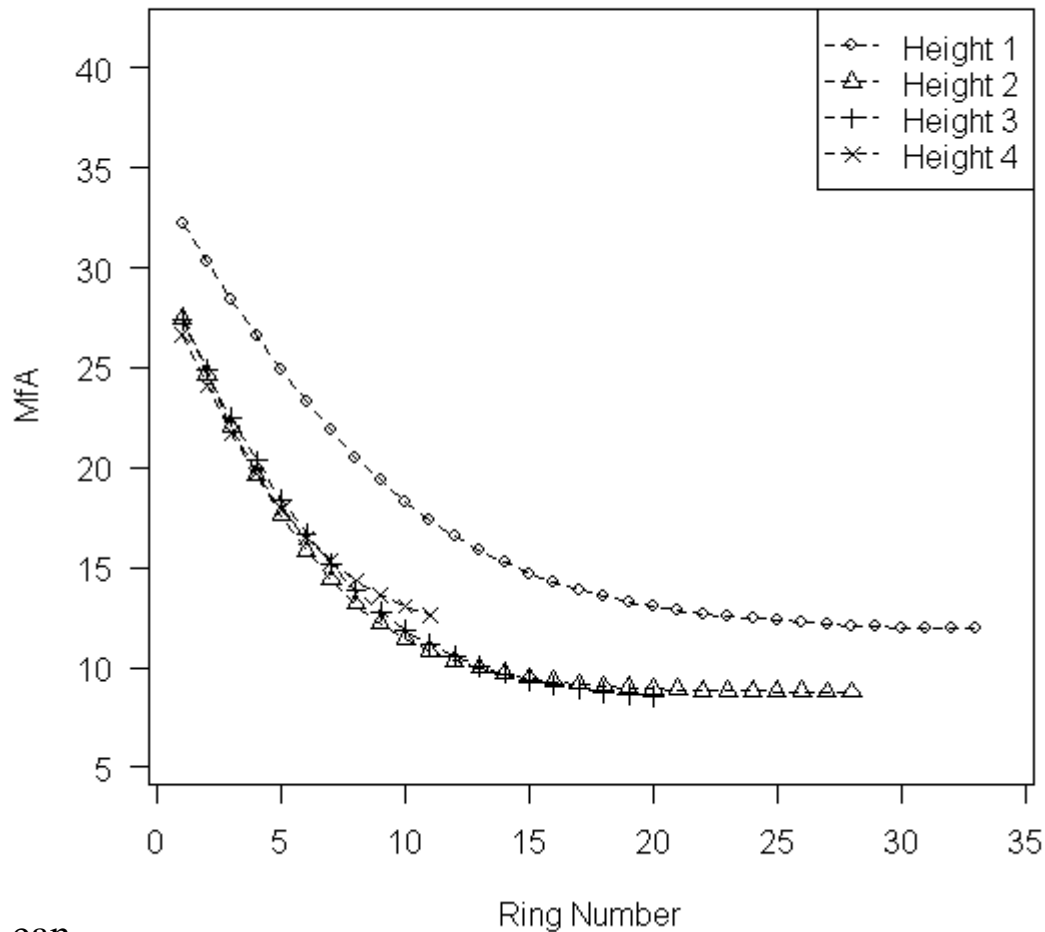


Modelling Juvenile Wood

Barry Gardiner and Elspeth Macdonald

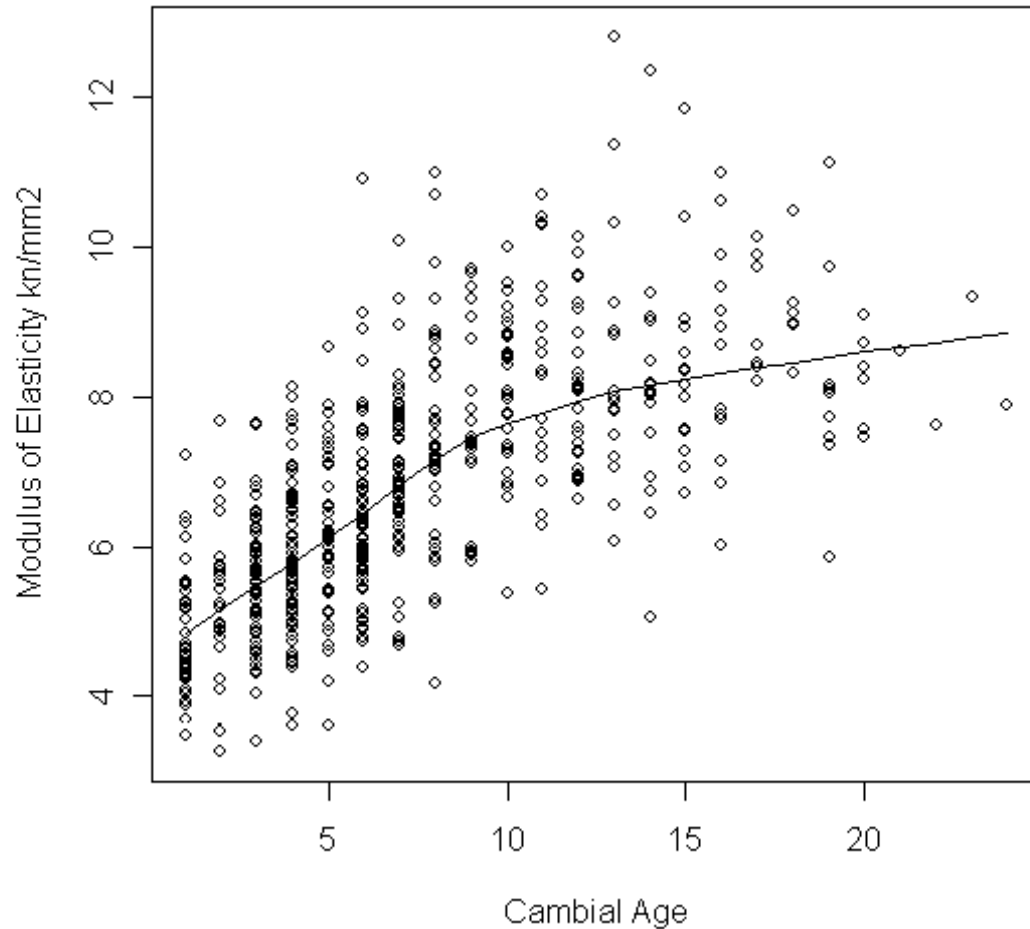
Conifer Breeding and Timber Quality Steering Group

Microfibril Angle with Ring Number



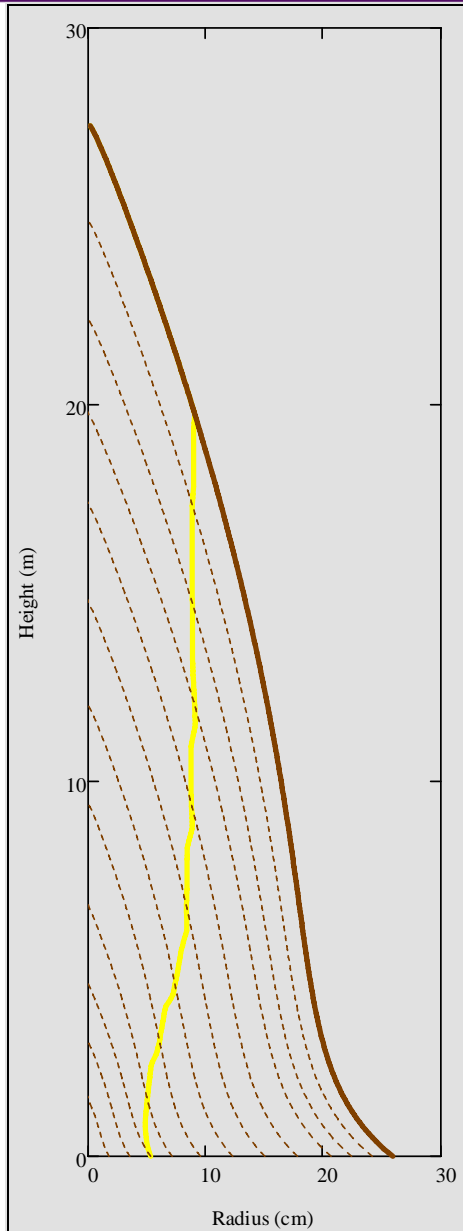
Courtesy Paul McLean

MOE versus Cambial Age in Sitka Spruce



Courtesy Paul McLean

Modelling Juvenile Wood Percentage



Vertical Slice Showing Growth Ring Every 5 Years

$$\frac{\text{JuvenileWoodVol}(0, \text{heights}(\text{TreeAge}), \text{JWDefinition}, \text{TreeAge}, \text{dbhs}, \text{heights}, \text{JMTaper})}{\text{LogVol}(0, \text{heights}(\text{TreeAge}), \text{TreeAge}, \text{dbhs}, \text{heights}, \text{JMTaper})} \cdot 100 = 26.851$$

Juvenile wood area – effects of thinning

No thin



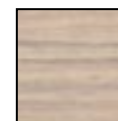
Intermediate thin



Cross-section at 4.8m



Juvenile wood area (15 growth rings)



Nominal sawn timber section

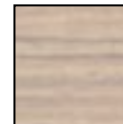
Juvenile wood area in relation to tree age



Cross-section at 4.8m



Juvenile wood area (15 growth rings)



Nominal sawn timber section

Impact of Silviculture on Wood Properties *including juvenile wood percentage*

Parameters and Properties	Standard Management (Intermediate Thinning)				Irregular Shelterwood		Crown Thinning				Frame-Tree Thinning		Group Felling			
	1a	1b	1c	1d	2a	2b	3a	3b	3c	3d	4a	4b	5a	5b	5c	5d
Growth Model	E&C	E&C	COFORD	COFORD	E&C	E&C	E&C	E&C	E&C	E&C	COFORD	COFORD	COFORD	COFORD	COFORD	COFORD
YC	14	20	14	20	14	20	14	20	14	20	14	20	14	14	20	20
Initial Spacing (m)	2.0	2.0	2.0	2.0	2.0	2.0	1.7	1.7	1.7	1.7	2.0	2.0	2.0	2.0	2.0	2.0
Thinning (type and number)	IZx5	IZx5	IZx5	IZx5	IZx12	IZx12	CZx8	CZx9	IZx7	IZx8	IZx2, CZx2	IZx2, CZx2	IZx1, CZx1	IZx1, CZx1	IZx1, CZx1	IZx1, CZx1
Age at felling	45	45	45	45	80	80	60	60	55	55	45	45	45	60	45	60
Tree mean height (m)	20.1	26.1	19.7	25.3	29.0	35.8	25.3	31.7	24.0	30.2	19.6	25.3	19.7	26.3	25.1	32.4
Tree mean DBH (cm)	32.3	42.0	35.5	46.1	46.3	60.0	33.4	42.5	33.3	42.4	27.6	30.5	39.7	50.4	52.0	64.0
Basal Area (m ² /ha)	37.3	39.0	38.0	42.5	43.9	48.0	36.6	40.3	38.6	41.2	45.5	54.1	26.6	29.0	44.7	48.0
Volume to 7cm	0.69	1.52	0.81	1.74	2.10	4.31	0.98	1.97	0.90	1.85	0.50	0.82	0.99	2.16	2.16	4.27
Volume to 16cm	0.64	1.48	0.76	1.70	2.05	4.27	0.92	1.92	0.85	1.80	0.44	0.76	0.95	2.12	2.12	4.24
Juvenile wood % at 5m	25.1	18.0	19.4	13.8	11.8	9.6	14.3	13.4	19.3	15.2	30.6	24.9	14.7	8.2	11.4	7.0
Height/DBH (taper)	62.2	62.2	55.6	54.8	62.5	59.6	75.8	74.7	72.0	71.3	71.1	82.9	49.7	52.2	48.2	50.6
Taper to 10m	82.9	83.8	72.0	71.8	92.3	82.8	113.5	108.1	104.3	101.1	98.0	123.0	62.9	70.0	61.5	65.5
Max wood density (kg/m ³)	781.8	781.8	781.8	781.8	781.8	781.8	781.8	781.8	781.8	781.8	781.8	781.8	781.8	781.8	781.8	781.8
Min wood density (kg/m ³)	425.2	365.4	293.6	290.2	425.2	365.4	431.7	397.8	426.8	392.9	344.9	315.1	290.7	290.7	290.7	290.7
Mean wood density (kg/m ³)	451.7	424.2	431.5	436.3	486.8	469.4	484.4	465.6	475.9	454.3	470.6	464.0	427.1	438.7	439.9	441.1
Mean wood density 0-10m (kg/m ³)	449.7	421.9	430.8	446.7	485.7	467.0	483.5	464.2	474.9	452.7	468.8	462.5	428.1	442.5	435.5	441.2
Lowest live branch (m)	9.8	11.3	8.8	9.8	22.8	25.7	16.6	18.8	14.6	16.6	10.7	13.6	7.8	14.6	8.2	16.0
Lowest Live Branch/Tree Height	0.49	0.43	0.45	0.39	0.79	0.72	0.65	0.59	0.61	0.55	0.55	0.54	0.39	0.56	0.33	0.49
Largest Whorl Branch (cm)	3.1	3.9	3.4	4.2	4.2	5.4	3.2	3.9	3.2	3.9	2.8	3.0	3.7	4.6	4.7	5.7
Knot area ratio 0-10m (%)	0.80	0.55	0.92	0.66	0.63	0.39	0.60	0.39	0.65	0.43	0.76	0.46	0.99	0.82	0.74	0.54
Knot area ratio for tree (%)	0.99	0.79	1.12	0.93	1.02	0.79	0.83	0.64	0.87	0.68	0.92	0.63	1.21	1.15	1.11	1.02
Mean ring width at 5m (cm)	0.48	0.57	0.50	0.60	0.32	0.39	0.33	0.40	0.37	0.45	0.41	0.41	0.56	0.49	0.67	0.58
Max ring width/mean at 5m	1.53	1.44	1.90	1.63	2.31	2.08	2.25	2.15	2.05	1.94	1.78	1.81	1.36	1.55	1.46	1.68
Outside grain angle at 1.3m (degs)	1.4	1.4	1.4	1.3	0.5	0.4	0.9	0.8	1.1	1.0	1.4	1.3	1.4	0.9	1.3	0.8

Summary

- Knowledge of the amount of juvenile wood in logs and sawn timber is valuable for understanding the performance of the timber
- Possible to model juvenile wood percentage in Sitka spruce as part of wood properties modelling
- Model can be helpful in determining the impact of different silvicultural treatments
- Main question is “What is the correct definition of juvenile wood?”