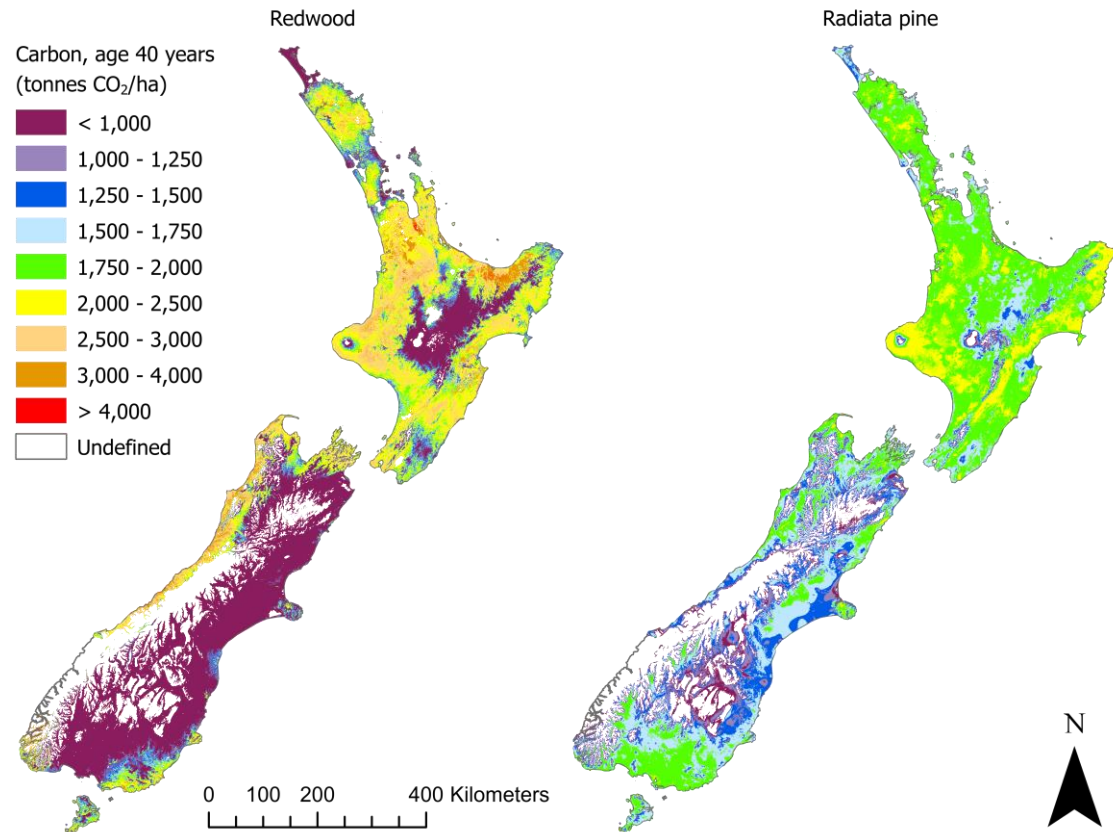


Spatial comparisons of carbon and volume for radiata pine and 10 alternative exotic species using recently developed tools

Michael Watt, Jamie Heather



Multi-species carbon calculator and dashboard

- Multi-species carbon calculator developed by Mark Kimberley and Michael Watt
- Can be used for predictions of volume, carbon for 11 common plantation species – including radiata pine, redwood, two cypresses; five eucalypts, Douglas-fir and blackwood
- Can be run off either plot data or 300 Index and site index
- Can be downloaded from:
<https://fgr.nz/tools/multi-species-carbon-calculator/>
Help file available at same site
- Recently a multi-species dashboard has been developed from the multi-species carbon calculator, which is the main subject of this presentation

Multi-species carbon calculator

Multi-Species Carbon Calculator Version 1.2 test version • Saving... • Search

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Multi-species Carbon Calculator, Version 1.2 Predicts annual growth metrics in even-aged, single-species, forest plantations grown in New Zealand
Developed for Scion by Mark Kimberley & Mike Watt, Version 1.2, June 2024

Stand information: Species: Coast redwood, 300-index: 20, Site index (m): 28, Post-establishment stocking (stems): 1000, Rotation length (years): 50. Run model

Thinning schedule: Thin 1, Thin 2, Thin 3, Thin 4. Waste/production thin, Age at thinning (years), Stocking after thinning (stems/ha), Thinning coefficient.

Pruning schedule: Lift 1, Lift 2, Lift 3, Lift 4. Age at pruning (years), Number of stems pruned (stems/ha), Pruned height (m).

Site productivity index options: Use indices specified in cells D3 and D4, Estimate indices from stand metrics, Estimate indices from Starting tree list.

DBH distribution options: Weibull distribution, Scaled tree list.

Metrics used to estimate indices: Age (years), Stocking (stems/ha), Height (m), BA (m²/ha) or DBH (cm), Annual attritional mortality (%), CV of DBH distribution, Log length at harvest (m), Minimum log SED (mm), Stem break height (%), Volume losses at harvest (%), Wood density adjustment (±%).

Other parameters: Starting tree list, Harvest summary, Felled stems, Harvested logs.

Age (years)	Stems/ha	BA (m ² /ha)	DBH (cm)	Growth model predictions					Carbon 1st rotation (tCO ₂ /ha)					Carbon 2nd rotation (tCO ₂ /ha)					
				Vol. (m ³ /ha)	vol. (m ³ /ha)	MTH (m)	height (m)	dens. (kg/m ³)	Stems height (m)	Total	Above ground	Below ground	Dead wood	Litter	Total	Above ground	Below ground	Dead wood	Litter
0	1000	0.0	0.0	0	0	0.3	0.3	318.0	0.0	0	0	0	0	0	727	0	0	384	343
1	998	0.0	0.0	0	0	0.4	0.3	318.0	0.0	0	0	0	0	0	634	0	0	367	268
2	997	0.0	0.0	0	0	0.8	0.7	318.0	0.0	0	0	0	0	0	559	0	0	350	209
3	995	0.0	0.0	1	0	1.5	1.3	318.0	0.0	1	1	0	0	0	498	1	0	334	163
4	993	0.2	1.6	2	0	2.4	2.1	318.0	0.0	2	2	0	0	0	449	2	0	319	128
5	992	1.7	4.6	4	0	3.4	3.1	318.0	0.0	6	4	1	0	0	410	4	1	305	100
6	990	4.9	7.9	11	0	4.6	4.1	318.0	0.0	17	13	3	0	1	385	13	3	291	79
7	988	9.6	11.1	24	0	5.7	5.1	318.0	0.0	34	26	6	0	2	373	26	6	278	63
8	987	15.7	14.3	42	0	6.9	6.1	318.0	0.0	59	45	11	0	4	372	45	11	265	51
9	985	23.0	17.2	68	0	8.0	7.1	318.0	0.0	91	69	16	0	6	382	69	16	253	43
10	983	31.0	20.0	99	0	9.2	8.2	318.0	0.8	130	99	23	0	8	401	99	23	242	37
11	450	22.7	25.4	79	0	10.3	9.4	318.0	0.0	172	76	18	55	23	426	76	18	286	45
12	449	26.6	27.5	99	0	11.4	10.4	318.0	0.0	190	95	22	53	21	428	95	22	273	38
13	448	30.6	29.5	121	0	12.5	11.4	318.0	0.0	210	114	27	50	19	435	114	27	261	33
14	448	34.6	31.4	146	0	13.6	12.3	318.0	0.3	234	136	32	48	18	445	136	32	249	29
15	447	38.7	33.2	172	0	14.7	13.3	318.0	1.0	260	159	37	46	18	460	159	37	238	26
16	446	42.9	35.0	201	0	15.7	14.2	318.0	1.7	288	183	43	44	18	478	183	43	228	24
17	445	47.1	36.7	231	0	16.7	15.2	318.0	2.4	319	209	49	42	18	499	209	49	217	23
18	445	51.3	38.3	264	0	17.7	16.1	318.0	3.1	351	237	55	41	18	522	237	55	208	22
19	444	55.5	39.9	298	0	18.7	16.9	318.0	3.8	386	266	62	39	19	549	266	62	199	22
20	443	59.8	41.4	334	0	19.6	17.8	318.0	4.5	422	296	69	38	20	577	296	69	190	22
21	442	64.0	42.9	371	0	20.5	18.6	318.0	5.1	460	327	76	36	21	608	327	76	182	23
22	441	68.3	44.4	410	0	21.4	19.5	318.0	5.7	500	360	84	35	22	641	360	84	174	23
23	441	72.5	45.8	450	0	22.3	20.3	318.0	6.4	541	393	92	34	23	675	393	92	166	24
24	440	76.8	47.1	492	0	23.2	21.0	318.0	7.0	584	428	100	33	24	711	428	100	159	25
25	439	81.0	48.5	534	0	24.0	21.8	318.0	7.5	628	463	108	32	25	749	463	108	153	26
26	438	85.2	49.8	578	0	24.9	22.6	318.0	8.1	673	500	116	31	26	789	500	116	146	27
27	437	89.4	51.0	624	0	25.7	23.3	318.0	8.7	719	537	125	30	27	830	537	125	140	28
28	436	93.6	52.3	670	0	26.5	24.0	318.0	9.2	767	575	134	29	28	872	575	134	135	29
29	435	97.8	53.5	717	0	27.2	24.7	318.0	9.8	815	614	143	29	29	916	614	143	129	30

Ready Accessibility: Investigate

Multi-species carbon calculator

AutoSave On Multi-Species Carbon Calculator Version 1_2 test version • Saving... Search

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Multi-species Carbon Calculator, Version 1.2 Predicts annual growth metrics in even-aged, single-species, forest plantations grown in even-aged, single-species, forest plantations. Developed for Scion by Mark Kimberley & Mike Watt, Version 1,2, June 2024

Stand information		Species	Growth model predictions							
300-index		Coast redwood	Age (years)	Stemming (stem/ha)	BA (m ² /ha)	DBH (cm)	Vol. (m ³ /ha)	vol. (m ³ /ha)	MTH (m)	mean height (m)
Site index (m)	20		0	1000	0.0	0.0	0	0	0.3	0.3
Post-establishment stocking (stems/ha)	28		1	998	0.0	0.0	0	0	0.4	0.3
Rotation length (years)	1000		2	997	0.0	0.0	0	0	0.8	0.7
	50		3	995	0.0	0.0	1	0	1.5	1.3
			4	993	0.2	1.6	2	0	2.4	2.1
			5	992	1.7	4.6	4	0	3.4	3.1
			6	990	4.9	7.9	11	0	4.6	4.1
			7	988	9.6	11.1	24	0	5.7	5.1
			8	987	15.7	14.3	42	0	6.9	6.1
			9	985	23.0	17.2	68	0	8.0	7.1
			10	983	31.0	20.0	99	0	9.2	8.2
			11	450	22.7	25.4	79	0	10.3	9.4
			12	449	26.6	27.5	99	0	11.4	10.4
			13	448	30.6	29.5	121	0	12.5	11.4
			14	448	34.6	31.4	146	0	13.6	12.3
			15	447	38.7	33.2	172	0	14.7	13.3
			16	446	42.9	35.0	201	0	15.7	14.2
			17	445	47.1	36.7	231	0	16.7	15.2

Thinning schedule

	Thin 1	Thin 2	Thin 3	Thin 4
Waste/production thin	<input checked="" type="radio"/> Waste	<input checked="" type="radio"/> Waste	<input checked="" type="radio"/> Waste	<input checked="" type="radio"/> Waste
	<input type="radio"/> Prod.	<input type="radio"/> Prod.	<input type="radio"/> Prod.	<input type="radio"/> Prod.
Age at thinning (years)	11			
Stocking after thinning (stems/ha)	450			
Thinning coefficient				

Pruning schedule

	Lift 1	Lift 2	Lift 3	Lift 4
Age at pruning (years)	6	8	10	
Number of stems pruned (stems/ha)	450	450	450	
Pruned height (m)	2.5	4.5	6.5	

Site productivity index options:

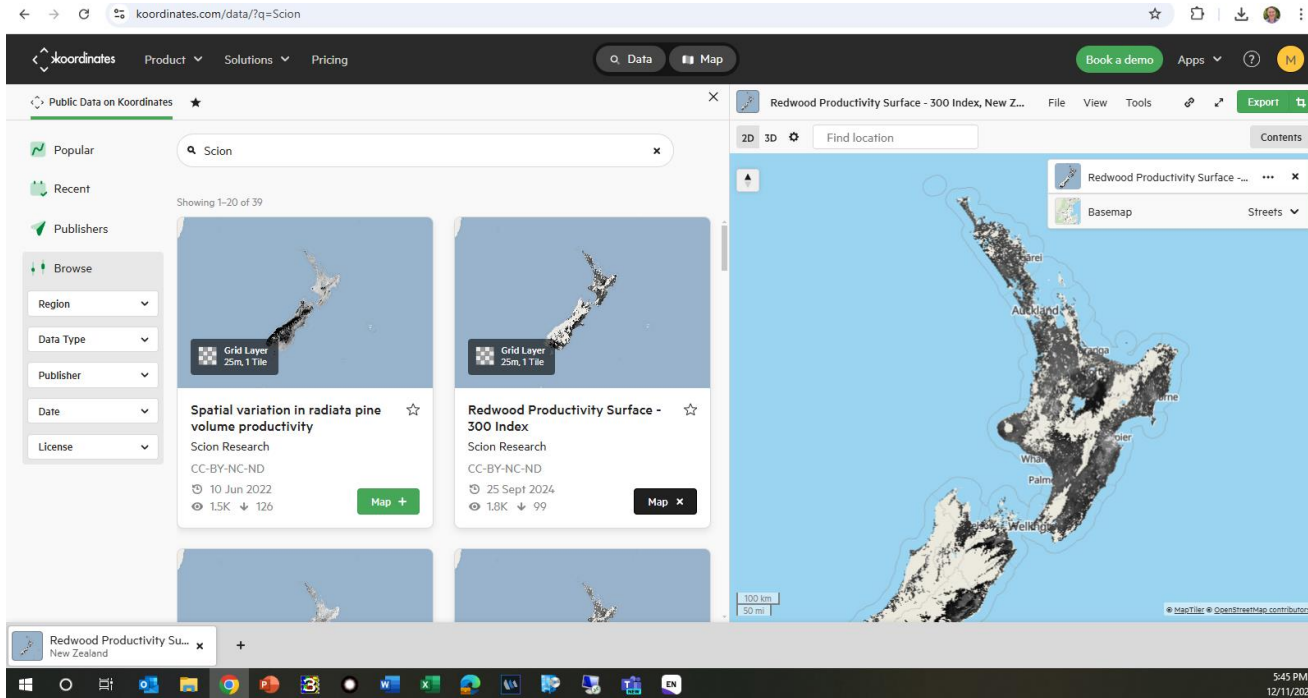
- Use indices specified in cells D3 and D4
- Estimate indices from stand metrics
- Estimate indices from Starting tree list

DBH distribution options:

- Weibull distribution
- Scaled tree list

Run model

Site estimation of 300 Index and site index - coordinates



Redwood 300 Index and Site Index

<https://scion.koordinates.com/layer/105758-redwood-productivity-surface-300-index/>

<https://scion.koordinates.com/layer/109623-spatial-variation-in-redwood-site-index/>

Radiata pine 300 Index and Site Index

<https://scion.koordinates.com/layer/107990-spatial-variation-in-radiata-pine-volume-productivity/>

<https://scion.koordinates.com/layer/108095-spatial-variation-in-radiata-pine-height-productivity/>

C. lusitanica 300 Index and site index

<https://koordinates.com/from/scion.koordinates.com/layer/113229-spatial-variation-in-cupressus-lusitanica-volume-productivity/>

<https://koordinates.com/from/scion.koordinates.com/layer/113228-spatial-variation-in-cupressus-lusitanica-height-productivity/>

C. macrocarpa 300 Index and site index

<https://koordinates.com/from/scion.koordinates.com/layer/113225-spatial-variation-in-cupressus-macrocarpa-volume-productivity/>

<https://koordinates.com/from/scion.koordinates.com/layer/113226-spatial-variation-in-cupressus-macrocarpa-height-productivity/>

Regional estimates of 300 Index and site index also available through help file

	Auckland	Waikato/ Taranaki	Bay of Plenty	Gisborne	Hawkes Bay/Southern NI	Nelson/ Marlborough	Canterbury/ Westland	Otago	Southland		North Island	South Island
300 Index (m³/ha/yr)												
Blackwood	12.7	16.7					3.4				13.5	3.4
<i>Cupressus lusitanica</i>	17.8	14.2	14.6	15.3	13.3	7.6	4.8	4.0	4.3		14.6	5.0
<i>Cupressus macrocarpa</i>	12.5	16.3	17.4	20.6	15.9	14.0	10.2	9.1	10.5		15.8	10.7
Douglas-fir (500 Index)		22.4	18.3	18.3	14.6	18.9	19.5	19.7	21.8		17.6	19.1
<i>Eucalyptus delegatensis</i>		10.5									13.5	20.4
<i>Eucalyptus fastigata</i>	15.0	22.1	21.4		21.5						20.8	
<i>Eucalyptus nitens</i>	20.3	17.4	22.2					19.0	25.5		18.8	20.5
<i>Eucalyptus regnans</i>		30.7	40.1		25.5						32.5	
<i>Eucalyptus saligna</i>	19.7		18.1								19.0	
Radiata pine	26.9	29.6	29.9	31.0	30.1	24.0	20.3	19.2	23.6		29.4	21.3
Redwood	28.3	29.2	30.0	25.2	28.0	14.7	11.7	5.6	13.5		28.3	11.3
Site Index (m, base age 30)												
Blackwood	26.3	27.5					17.7				26.9	17.7
<i>Cupressus lusitanica</i>	27.3	25.1	25.5	26.1	23.8	21.7	13.3	8.1	13.3		25.1	13.8
<i>Cupressus macrocarpa</i>	25.0	27.5	27.5	29.5	27.1	25.6	21.9	19.8	23.8		27.0	22.5
Douglas-fir (base age 40)		32.8	32.8	32.8	28.2	32.7	31.5	30.6	30.9		31.0	31.7
<i>Eucalyptus delegatensis</i>		35.6									36.1	34.4
<i>Eucalyptus fastigata</i>	34.2	44.3	44.2		39.8						41.7	
<i>Eucalyptus nitens</i>	39.9	41.2	45.7					39.9	40.7		41.5	40.1
<i>Eucalyptus regnans</i>		51.2	48.2		43.4						49.5	
<i>Eucalyptus saligna</i>	40.7		39.6								39.9	
Radiata pine (base age 20)	30.0	31.1	31.9	30.6	29.5	26.9	25.5	21.2	22.7		30.3	24.2
Redwood	34.5	30.9	33.8	30.5	30.9	23.2	18.8	15.5	21.5		31.9	19.3

However, this system has just become a lot easier with the development of the multi-species dashboard.....

Acknowledgements

- Funding from Scion SSIF and MBIE Transforming Tree Phenotyping programme
- Danielle Gatland for co-developing the dashboard
- Mark Kimberley for input around dashboard development

multispecies.nz