

Indicative forest sequestration tables

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Indicative Forest Sequestration Tables

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EXECUTIVE SUMMARY

The Ministry of Agriculture and Forestry (MAF) has requested estimates of carbon stocks by stand age for various tree species and tending regimes on various sites. These carbon stock tables are intended to be used as illustrative examples of carbon sequestration through afforestation.

This report provides the requested carbon stock tables and describes how they were constructed. In each case, the most applicable growth model was selected to construct a stem volume yield tables for various species and regimes, e.g. 300Index for Radiata pine and 500Index for Douglas-fir. The modelled regimes were supplied by MAF and the resulting volume yield tables were converted to carbon stocks using the carbon model, C_Change. A scaling factor was applied based on clearfell yield of radiata pine for adjustment to current NEFD data.

The reported tables do not purport to represent actual carbon stored in any one specific stand, nor the expected mean values for any geographical region.

INDICATIVE FOREST SEQUESTRATION TABLES

INTRODUCTION

The Government has agreed in principle that owners of post 1989 forest will be able to take ownership and responsibility for changes in forest carbon stocks. NZUs can be issued for increases in carbon stock, and a surrender of NZUs would be required for a decrease in carbon stocks.

In order to assist forest owners to assess the value to them in participating in this scheme or the Permanent Forest Sinks Initiative (PFSI), MAF wishes to provide a series of tables showing carbon sequestration rates for various species and sites. It is important to note that these tables are not the tables that will be included in the post-1989 forestry regulations of the NZ Emission Trading Scheme legislation, although the sequestration rates will be broadly consistent with the regulated tables.

This report presents tables of forest biomass carbon¹ and describes the construction methods used in their development. The tables do not purport to represent actual carbon stored in any one specific stand, nor the expected mean values for any geographical region.

METHODS

Used regimes and species

MAF requested the modelling of forest biomass and carbon tables for various tree species and different management regimes and in the case of Radiata pine at specified levels of site productivity represented by specified values of 300Index. For other species medium/average site productivity was assumed. The species and regimes modelled are shown in Table 1.

¹ Throughout the report the term “carbon” is used to mean actual carbon in tonnes per hectare. To convert numeric values of carbon to carbon dioxide equivalent, multiply by 44/12.

Table 1: Species and associated regimes for modelling afforestation carbon stock tables

Species	Site Quality 300Index	Management regime			Pruning	Thinning	comments	comments
		Rotation length (years)	Planting (sph)					
<i>Radiata Pine</i>	<i>three classes</i> <i>20/25/31</i>	50 y	1000		375 sph to 2.5m	Age 4-5		
					350 sph to 4.5m	Age 5-6	To 350 sph	Thinned to waste at age 7-8
					325 sph to 6.5m	Age 7-8		
<i>Radiata Pine</i>	<i>20/25/31</i>	50 y	1000	None			To 500 sph	Thinned to waste at age 10
<i>Radiata Pine</i> (2 nd rotation)	<i>Average site class</i>	1 st Rot: 28 y 2 nd Rot: 50 y	1000	None			To 500 sph	Thinned to waste at age 10
<i>Douglas-fir</i>	<i>Average site class</i>	80 y	1400	None			to 500 sph	Thinned to waste at age 15
<i>Redwood</i>	<i>Average site class</i>	60 y	900		400 sph to 2.5m	Age 4		
					350 sph to 4.5m	Age 6	To 300 sph	Thinned to waste at age 11
					300 sph to 6m	Age 9		
<i>E. fastigata</i>	<i>SI of 25**</i>	40 y	800	None			None	
<i>Cypresses</i>	<i>Averaged</i>	35 y	1000	None			To 500 sph	Thinned to waste at age 10
<i>Totara</i>	<i>Medium site</i>	80 y	1000	None			None	
<i>Kauri</i>	<i>Medium site</i>	80 y	1000	None			None	

* assumed mortality is 95% in the first year

** Site index as the height of the dominant trees at age 15

*** Averaged yield table based on five runs for average stands of both *C. macrocarpa* and *C. lusitanica*

Index300 and Site Index used

The modelling of the pruned and unpruned Radiata pine regimes was based on three site qualities, reflected by the 300 Indices of 20, 25 and 31.

Based on these values we calculated site index based on the relationship between 300Index and site index:

$$SI = 0.517 * I300 + 16.968 \quad R^2 = 0.5164$$

For the unpruned – two rotation Radiata pine regime we used the average national values of a 300 Index of 25 and a site index of 29.9.

With these values of site index and 300Index we modelled stem total volume inside bark and stand carbon stocks by stand age class for radiata pine.

Models used

Volume and carbon yield tables were developed using a combination of various stem volume growth models and C_Change (Beets et al 1999).

The 300 Index Growth model (Kimberley et al 2005) was used for Radiata pine, using a new national volume equation (Kimberley and Beets 2007), in combination with the biomass partitioning model C_Change.

For Douglas-fir, the 500 Index Growth model (Knowles 2005) as implemented in the Douglas-fir Calculator (MacLaren and Knowles 2005), was used in combination with C_change.

For *Eucalyptus fastigata* the *Eucalyptus fastigata* Growth model (van der Colff, Kimberley 2005) was used in combination with C_Change.

For redwood the redwood model (Kimberley and Dean 2006 unpublished) was used in combination with C_Change.

For planted totara and kauri we used recently developed yield tables, based on data from Bergin and Kimberley (2003) and Pardy et al (1992), in combination with C_Change.

For cypresses the preliminary cypress growth model (Berrill, 2004) was used in combination with C_Change.

Wood densities

We estimated wood densities for Radiata pine based on site quality. We used C/N ratios depending on site quality to estimate wood density and kept the temperature for all three site qualities constant (national average based on distribution of plantation forests is 11°C). The used C/N ratios are:

Site quality (300Index)	C/N ratio used for Wood density
20	30
25	23
31	16

The calculated outerwood density values were used to predict density for each growing year (Beets et al 2007).

Wood density for Douglas-fir was taken from the Douglas-fir calculator. Density was input by stand age class into the C_Change model.

Wood density for redwood, *E. fastigata*, cypress, totara and kauri were taken from various sources and in some instances assumed to be constant over the live of the tree. The wood density of redwood was assumed to be constant over the development of the stand (332 kg/m³). For totara we assumed a constant tree density of 373 kg/m³ and for kauri 404 kg/m³. The latter based on an unpublished study from Taranaki.

Wood density (whole tree basic density) data for *Eucalyptus fastigata* was taken from McKinley et al 2000 for available ages and then interpolated for each year.

For cypress we assumed a constant whole tree density of 420 kg/m² based on McKinley et al 2000.

Further specifications for Douglas-fir and other species

The Douglas-fir calculator was used to produce a national stem volume yield table. However ages less than 7 years old are not provided by this program. To estimate appropriate volumes at ages younger than 7 years we used the following formulae based on Kimberley & Beets (2007 in press)

$$VolAgeX = StockingAgeX \times \left(\frac{0.0000064 + (VolAgeY / StockingAgeY - 0.0000064)}{\times (AgeX^{2.7}) / (AgeY^{2.7})} \right)$$

AgeY = reference age

AgeX = current age

The national yield table for Douglas-fir were based on:

- a site index of 31.3 m
- a 500 Index of 18.4 m³/ha/year
- a latitude of 40 degrees

representing an average site.

For redwood the used average Site Index was 37 (MTH at age 40yrs). For *Eucalyptus fastigata* a site index of 25 was used, representative for an average site. The planted totara yield table is based on data from Bergin and Kimberley 2003. The planted kauri yield table is based on Pardy et al 1992. For these yield tables we used the average productivity of all planted stands with the mentioned regime (planted at 1000 stems per hectare, no thinning nor pruning) described in Pardy et al (1992) and Bergin and Kimberley (2003).

For cypress we averaged five runs of the preliminary cypress growth model (Berrill 2004) covering average stands for both species (*C. macrocarpa* and *C. lusitanica*) and

in both South Island and North Island. A North Island high quality site for *C. lusitanica* was also included. The model runs showed higher productivity from *C. macrocarpa* compared to *C. lusitanica*. The higher productivity may be an artefact of the higher number of growth plots in the model especially in the South Island.

2nd Rotation Radiata pine

Young second rotation stands show higher carbon stocks than first rotation stands (afforestation), because dead woody litter and fine woody litter residues are carried over from the previous rotation. For one average Radiata pine regime we modelled the residues from the previous rotation, assuming the same thinning and pruning regimes were applied in both rotations, and assuming that the first rotation stand was clearfelled at ages 28. Furthermore an extraction of 85% of the stem volume during the clearfelling was assumed.

Scaling factor

A fixed scaling factor was derived from the average actual clearfell yield for Radiata pine, reported in the 2006 NEFD report. The average recovered volume at 1st April 2006 was 486 m³/ha at age 28.2 years. Assuming a mean recovery of 85%, this results in $486/0.85 = 572$ m³/ha of total stem volume.

The comparison of this total stem volume at age 28 (572 m³/ha) with the modelled weighted average volume of 781 m³/ha (weighted by area for pruned and unpruned regimes in each region) gives a scaling factor of 26.8% (or 0.732). This factor was used to scale the modelled volume yield tables for radiata pine as well as Douglas-fir, redwood, cypress, *Eucalyptus fastigata*, kauri and totara - because insufficient data exists from the NEFD regarding species other than Radiata pine.

As this scaling factor is based on the average actual clearfell yield in 2006 i.e. from the clearfelling of pre-1990 stands, it may be conservative for post-1989 stands that may in general have higher yields.

RESULTS

Modelled carbon stock yield tables

The carbon stock yield tables for the radiata regimes and for the other tree species are shown in comparison in Figure 1. The modelled yield tables are found in Appendix A.

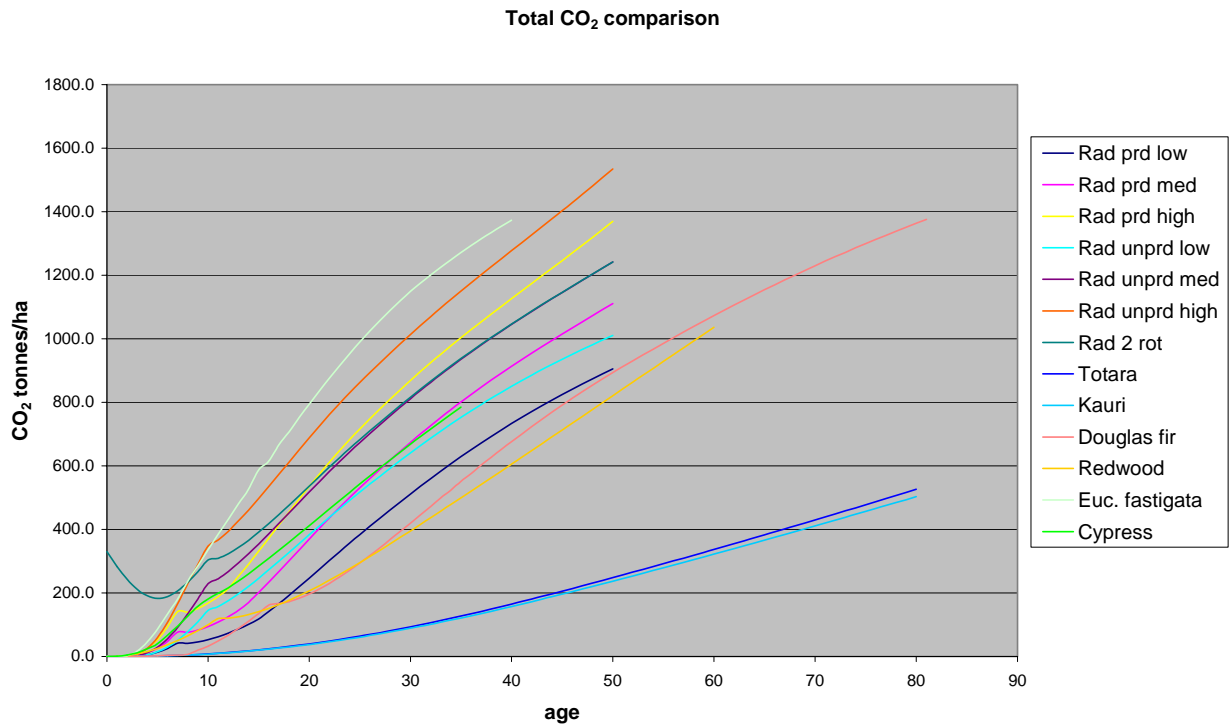


Figure 1: Total CO₂ for the radiata regimes and other tree species.

Differences between species, regimes and site quality are evident. Planted kauri shows the lowest carbon accumulation over the 80 years period. Totara sequesters carbon at a similar level. Redwood shows higher sequester rates and approximates the pruned Radiata pine regime on poor sites.

Eucalyptus fastigata shows the strongest early carbon accumulation closely followed by the unpruned radiata regime on good sites.

Modelled pools

C_Change allows the output of various carbon pools (aboveground live biomass, belowground live biomass, dead woody litter and fine litter) that contribute to the overall total of sequestered carbon. Under various regimes the total as well as the allocation in different pools varies. Figure 2 shows the different pools and their differences between an unpruned and a pruned Radiata pine regime on a medium site.

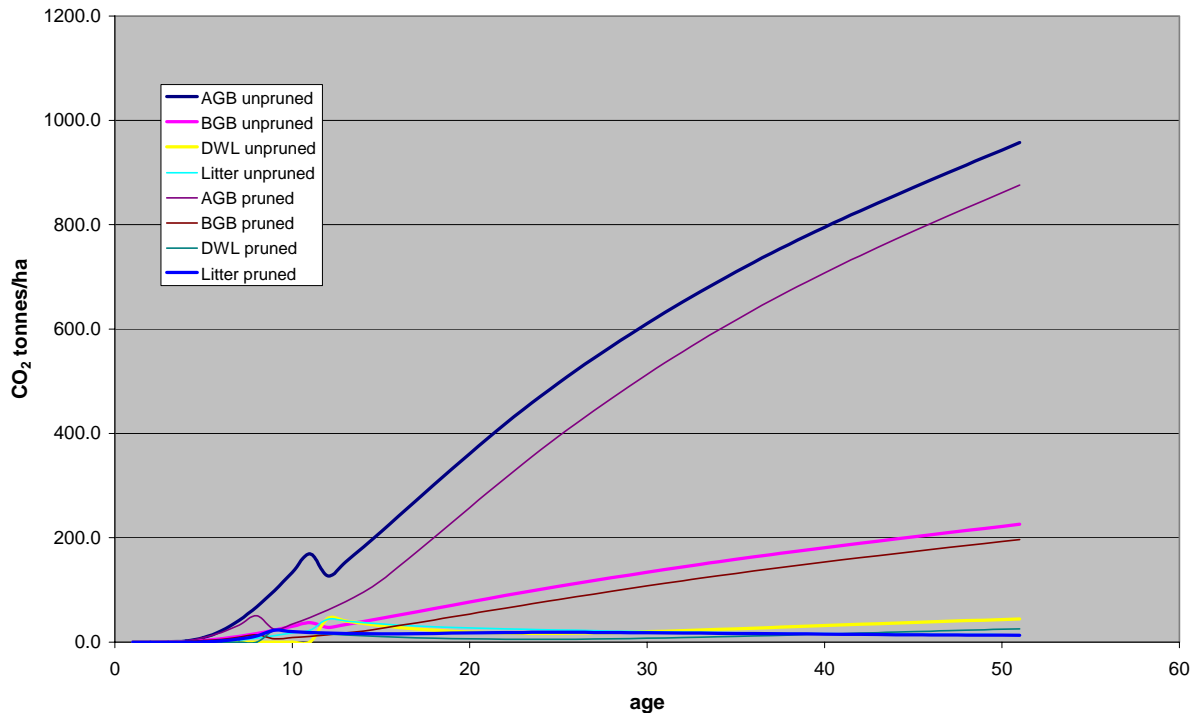


Figure 2: Differences in CO₂ equivalents for an unpruned and pruned radiata regime on a medium site for each of the four pools, aboveground live biomass (AGB), below ground live biomass (BGB), dead woody litter (DWL) and Litter, by year.

RECOMMENDATIONS AND CONCLUSIONS

Users of these carbon yield tables should be aware that they represent specified productivity and stocking values. Site productivity and silvicultural regimes, and hence carbon stocks for different sites will vary significantly from the carbon yield tables produced for this report.

Many of the input variables that have been used for the calculation of these tables will vary locally and for specific stands, especially silvicultural management, number of rotations, and site productivity information. The use of more specific site and management data will produce different results from the calculated yield tables. Once such data are available (e.g. because of a reporting requirement from the landowner) site and management specific yield tables could be produced that would better reflect the actual carbon sequestration following afforestation.

Modelled yields have been adjusted in relation to the average actual harvested volume for Radiata pine reported in the 2006 NEFD report, because modelling represents ideal conditions, in both net stocked area and implementation of silvicultural prescriptions. A single scaling factor was applied to all species as there is insufficient data on the actual clearfell yields for species other than Radiata pine. The tables do not purport to be an

accurate estimate for any specific forest, nor an estimate of average carbon stocks by species/age within a region.

REFERENCES

- Beets PN, Kimberley MO, McKinley RB 2007. Predicting wood density of *Pinus radiata* annual growth increments. *New Zealand Journal of Forestry Science* 37(2): 241 – 266.
- Beets PN, Robertson KA, Ford-Robertson JB, Gordon J, Maclaren JP 1999. Description and validation of C_Change: A Model for simulating carbon content in managed *Pinus Radiata* stands. *New Zealand Journal of Forestry Science* 29(3):409 – 427.
- Bergin DO, Kimberley MO 2003. Growth and yield of totara in planted stands. *New Zealand Journal of Forestry Science* 33(2):244-264.
- Kimberley MO, Dean MG 2006. A growth model for New Zealand-grown Redwood. Unpublished report (confidential).
- Kimberley MO, West GG, Dean MG, R. Knowles LR 2005. The 300 Index - a volume productivity index for radiata pine. *N. Z. Journal of Forestry* 50: 13-18.
- Kimberley MO, Beets PN 2007. A national volume function for estimating stem total volume of radiata pine stands established on fertile sites in New Zealand.
- MacLaren JP, Knowles RL 2005. Version 2 Calculators. Upgrading the business of farm forestry. *New Zealand Tree Grower*, May 2005:24.
- McKinley RB, Shelbourne CJA, Harris JM, Young GD 2000. Variation in whole-tree basic wood density for a range of plantation species grown in New Zealand. *New Zealand Journal of Forestry Science* 30(3): 436-446 (2000)
- Pardy GF, Bergin DO, Kimberley MO 1992. Survey of native tree plantations. *FRI Bulletin No. 175*.
- Berrill, JP 2004. Preliminary growth and yield models for even-aged *Cupressus lusitanica* and *C. macrocarpa* plantations in New Zealand. *New Zealand Journal of Forestry Science* 34(3): 272-292.
- van der Colff M, Kimberley MO 2005: Modelling *Eucalyptus fastigata* growth in New Zealand. Unpublished report (confidential). Eucalypt Cooperative. 20 p.

Appendix A: Scaled carbon stock tables

scaled Radiata pine pruned, low fertility site

Age	Carbon stocks (T/HA)					
	Total	Above ground live biomass	Below ground live biomass	Dead woody litter	Fine litter	total CO2
0	0.0	0.0	0.0	0.0	0.0	0.0
1	0.0	0.0	0.0	0.0	0.0	0.2
2	0.3	0.2	0.1	0.0	0.0	1.0
3	0.7	0.5	0.2	0.0	0.0	2.7
4	1.5	1.1	0.3	0.0	0.1	5.4
5	3.6	2.5	0.8	0.0	0.3	13.2
6	6.8	4.6	1.3	0.0	0.9	25.0
7	11.4	7.5	2.2	0.0	1.7	41.8
8	11.3	3.6	0.9	3.4	3.3	41.3
9	12.5	5.2	1.3	3.0	3.0	45.7
10	14.4	7.2	1.7	2.6	2.7	52.6
11	16.8	9.7	2.3	2.3	2.6	61.7
12	19.9	12.5	2.8	2.1	2.5	73.0
13	23.5	15.7	3.5	1.8	2.5	86.2
14	27.6	19.3	4.2	1.6	2.5	101.2
15	32.1	23.2	5.0	1.4	2.5	117.7
16	38.5	28.4	6.3	1.3	2.6	141.2
17	45.2	34.2	7.3	1.1	2.7	165.8
18	52.4	40.1	8.5	1.0	2.8	192.1
19	59.7	46.2	9.6	0.9	3.0	219.0
20	67.2	52.4	10.8	0.9	3.2	246.6
21	74.8	58.6	12.0	0.8	3.4	274.3
22	82.4	64.8	13.2	0.8	3.5	302.0
23	89.9	71.0	14.5	0.8	3.6	329.5
24	97.3	77.1	15.7	0.8	3.7	356.6
25	104.5	83.0	16.9	0.9	3.7	383.2
26	111.6	88.9	18.1	0.9	3.8	409.4
27	118.7	94.6	19.3	1.0	3.8	435.3
28	125.7	100.3	20.5	1.1	3.8	460.9
29	132.6	105.8	21.7	1.2	3.8	486.2
30	139.4	111.3	22.9	1.4	3.8	511.2
31	146.1	116.7	24.1	1.5	3.8	535.6
32	152.6	121.9	25.2	1.7	3.8	559.7
33	159.0	127.0	26.4	1.9	3.8	583.2
34	165.3	131.9	27.5	2.1	3.8	606.2
35	171.5	136.8	28.6	2.3	3.8	628.7
36	177.4	141.5	29.7	2.5	3.7	650.6
37	183.3	146.0	30.7	2.8	3.7	672.0
38	189.0	150.5	31.8	3.0	3.7	692.9
39	194.5	154.8	32.8	3.3	3.6	713.2
40	199.9	159.0	33.8	3.5	3.6	733.0
41	205.2	163.0	34.8	3.8	3.5	752.3
42	210.3	166.9	35.8	4.1	3.5	771.1
43	215.3	170.8	36.7	4.3	3.4	789.3
44	220.1	174.5	37.7	4.6	3.4	807.0
45	224.8	178.0	38.6	4.9	3.3	824.3
46	229.4	181.5	39.5	5.1	3.3	841.2
47	233.9	184.9	40.3	5.4	3.2	857.7
48	238.3	188.3	41.2	5.6	3.2	873.8
49	242.6	191.5	42.1	5.9	3.1	889.6
50	246.9	194.7	42.9	6.1	3.1	905.1

scaled Radiata pine pruned, medium fertility site

Age	Carbon stocks (T/HA)					
	Total	Above ground live biomass	Below ground live biomass	Dead woody litter	Fine litter	total CO2
0	0.0	0.0	0.0	0.0	0.0	0.0
1	0.0	0.0	0.0	0.0	0.0	0.2
2	0.3	0.2	0.1	0.0	0.0	1.0
3	0.8	0.6	0.2	0.0	0.0	2.8
4	3.2	2.3	0.8	0.0	0.1	11.9
5	7.0	5.0	1.4	0.0	0.6	25.7
6	13.0	8.8	2.6	0.0	1.6	47.8
7	20.9	13.8	3.9	0.0	3.2	76.5
8	20.6	6.6	1.7	6.2	6.2	75.6
9	22.6	9.4	2.3	5.4	5.5	83.0
10	25.6	12.8	3.0	4.8	5.0	93.9
11	29.5	16.7	3.8	4.2	4.7	108.1
12	34.1	21.2	4.8	3.7	4.5	125.1
13	39.5	26.1	5.7	3.3	4.3	144.7
14	46.4	32.1	7.1	2.9	4.3	170.1
15	54.9	39.4	8.7	2.6	4.3	201.3
16	63.7	47.0	10.0	2.3	4.3	233.4
17	72.8	54.7	11.6	2.0	4.5	267.1
18	82.1	62.5	13.1	1.9	4.7	301.1
19	91.5	70.3	14.6	1.7	4.8	335.4
20	100.8	78.1	16.2	1.6	4.9	369.4
21	110.0	85.7	17.7	1.5	5.0	403.2
22	119.0	93.2	19.3	1.5	5.0	436.3
23	127.8	100.5	20.8	1.5	5.1	468.6
24	136.4	107.5	22.3	1.5	5.1	500.0
25	144.7	114.3	23.7	1.5	5.1	530.4
26	152.8	120.9	25.1	1.6	5.0	560.1
27	160.7	127.4	26.6	1.7	5.0	589.3
28	168.5	133.8	28.0	1.8	4.9	617.9
29	176.2	139.9	29.4	2.0	4.9	645.9
30	183.7	146.0	30.7	2.2	4.8	673.4
31	191.0	151.8	32.1	2.3	4.7	700.2
32	198.1	157.5	33.4	2.5	4.7	726.3
33	205.0	163.0	34.7	2.7	4.6	751.8
34	211.8	168.4	35.9	3.0	4.5	776.6
35	218.4	173.6	37.2	3.2	4.5	800.8
36	224.8	178.7	38.4	3.4	4.4	824.4
37	231.1	183.6	39.6	3.7	4.3	847.4
38	237.2	188.4	40.7	3.9	4.2	869.8
39	243.2	193.0	41.9	4.2	4.2	891.8
40	249.1	197.5	43.0	4.4	4.1	913.2
41	254.8	202.0	44.1	4.7	4.0	934.3
42	260.4	206.3	45.2	4.9	4.0	954.9
43	265.9	210.6	46.3	5.2	3.9	975.1
44	271.4	214.8	47.3	5.4	3.8	995.0
45	276.7	218.9	48.4	5.7	3.8	1014.6
46	282.0	222.9	49.4	5.9	3.7	1034.1
47	287.3	226.9	50.5	6.2	3.7	1053.3
48	292.5	230.9	51.5	6.4	3.6	1072.5
49	297.7	234.9	52.5	6.7	3.6	1091.7
50	303.0	238.9	53.6	6.9	3.6	1110.9

scaled Radiata pine pruned, high fertility site

Age	Carbon stocks (T/HA)					
	Total	Above ground live biomass	Below ground live biomass	Dead woody litter	Fine litter	total CO2
0	0.0	0.0	0.0	0.0	0.0	0.0
1	0.1	0.1	0.0	0.0	0.0	0.4
2	0.7	0.5	0.2	0.0	0.0	2.5
3	1.9	1.4	0.4	0.0	0.1	6.8
4	7.0	5.1	1.7	0.0	0.2	25.7
5	14.4	10.3	2.9	0.0	1.2	52.7
6	25.4	17.3	4.9	0.0	3.3	93.3
7	38.6	25.5	6.9	0.0	6.2	141.6
8	38.1	12.3	3.1	11.3	11.5	139.9
9	41.3	17.0	4.1	9.9	10.2	151.3
10	45.7	22.5	5.2	8.7	9.2	167.6
11	51.4	28.6	6.5	7.7	8.5	188.4
12	58.4	35.6	8.0	6.8	8.0	214.2
13	68.8	45.0	10.2	6.0	7.6	252.2
14	79.2	54.6	11.8	5.3	7.4	290.2
15	90.3	64.3	13.9	4.7	7.4	331.0
16	101.4	74.1	15.8	4.2	7.4	371.9
17	112.7	83.8	17.8	3.8	7.4	413.4
18	123.9	93.4	19.7	3.4	7.4	454.5
19	135.1	102.9	21.7	3.1	7.3	495.2
20	145.9	112.1	23.6	2.9	7.2	535.1
21	156.5	121.1	25.5	2.8	7.2	574.0
22	166.8	129.7	27.4	2.7	7.1	611.7
23	176.7	138.0	29.2	2.6	6.9	647.9
24	186.2	145.9	30.9	2.6	6.8	682.7
25	195.2	153.4	32.6	2.6	6.6	715.8
26	204.0	160.6	34.2	2.7	6.5	747.8
27	212.5	167.7	35.8	2.7	6.3	779.1
28	220.8	174.5	37.4	2.8	6.1	809.6
29	228.9	181.1	38.9	3.0	5.9	839.4
30	236.9	187.6	40.4	3.1	5.8	868.5
31	244.6	193.8	41.9	3.3	5.6	896.8
32	252.1	199.8	43.4	3.4	5.5	924.4
33	259.5	205.7	44.8	3.6	5.3	951.3
34	266.6	211.5	46.2	3.8	5.2	977.7
35	273.7	217.0	47.5	4.0	5.1	1003.4
36	280.5	222.5	48.9	4.2	5.0	1028.7
37	287.3	227.8	50.2	4.4	4.9	1053.5
38	294.0	233.1	51.5	4.7	4.8	1078.0
39	300.6	238.3	52.8	4.9	4.7	1102.2
40	307.2	243.4	54.1	5.1	4.6	1126.3
41	313.7	248.5	55.3	5.3	4.5	1150.2
42	320.2	253.6	56.6	5.6	4.4	1174.1
43	326.7	258.6	57.9	5.8	4.4	1197.9
44	333.2	263.7	59.2	6.0	4.3	1221.8
45	339.8	268.8	60.5	6.2	4.3	1245.8
46	346.4	273.9	61.8	6.5	4.3	1270.0
47	353.0	279.0	63.1	6.7	4.2	1294.4
48	359.8	284.2	64.4	7.0	4.2	1319.2
49	366.6	289.5	65.7	7.2	4.2	1344.4
50	373.6	294.9	67.1	7.4	4.2	1370.0

scaled Radiata pine unpruned, low fertility site

Age	Carbon stocks (T/HA)					
	Total	Above ground live biomass	Below ground live biomass	Dead woody litter	Fine litter	total CO2
0	0.0	0.0	0.0	0.0	0.0	0.0
1	0.0	0.0	0.0	0.0	0.0	0.2
2	0.3	0.2	0.1	0.0	0.0	1.0
3	0.7	0.5	0.2	0.0	0.0	2.7
4	1.5	1.1	0.3	0.0	0.1	5.4
5	4.1	2.9	0.9	0.0	0.2	15.0
6	8.0	6.0	1.6	0.0	0.5	29.5
7	13.8	10.2	2.6	0.0	1.0	50.7
8	21.2	15.6	3.7	0.0	1.8	77.6
9	29.8	22.0	5.1	0.0	2.7	109.3
10	39.4	29.2	6.6	0.0	3.6	144.4
11	42.7	22.5	5.0	7.8	7.5	156.7
12	47.8	27.9	6.1	6.9	6.9	175.4
13	53.7	33.8	7.3	6.1	6.5	196.8
14	60.2	40.1	8.5	5.4	6.2	220.6
15	67.1	46.5	9.8	4.8	5.9	245.9
16	74.3	53.1	11.1	4.3	5.7	272.4
17	81.7	59.8	12.5	3.9	5.6	299.6
18	89.2	66.5	13.8	3.5	5.4	327.2
19	96.8	73.1	15.2	3.3	5.3	355.1
20	104.4	79.6	16.6	3.1	5.2	383.0
21	112.0	86.0	17.9	3.0	5.1	410.7
22	119.5	92.3	19.3	2.9	5.0	438.1
23	126.8	98.4	20.6	2.9	4.9	465.1
24	134.0	104.3	21.9	3.0	4.9	491.5
25	141.1	110.0	23.2	3.1	4.8	517.2
26	147.9	115.6	24.4	3.3	4.7	542.5
27	154.8	121.0	25.7	3.4	4.6	567.5
28	161.5	126.3	27.0	3.7	4.5	592.1
29	168.1	131.6	28.2	3.9	4.5	616.5
30	174.6	136.7	29.4	4.2	4.4	640.4
31	181.0	141.6	30.6	4.5	4.3	663.8
32	187.3	146.4	31.8	4.8	4.3	686.7
33	193.4	151.1	32.9	5.2	4.2	709.1
34	199.3	155.6	34.1	5.5	4.1	730.9
35	205.1	160.0	35.2	5.9	4.1	752.2
36	210.8	164.3	36.3	6.3	4.0	772.9
37	216.3	168.4	37.3	6.6	4.0	793.1
38	221.6	172.4	38.4	7.0	3.9	812.7
39	226.8	176.2	39.4	7.4	3.8	831.7
40	231.9	180.0	40.4	7.7	3.8	850.2
41	236.8	183.6	41.4	8.1	3.7	868.3
42	241.6	187.1	42.3	8.4	3.7	885.7
43	246.2	190.5	43.3	8.8	3.6	902.7
44	250.7	193.9	44.2	9.1	3.6	919.2
45	255.1	197.1	45.1	9.4	3.5	935.3
46	259.4	200.2	46.0	9.7	3.4	951.0
47	263.5	203.3	46.9	10.0	3.4	966.3
48	267.6	206.2	47.7	10.3	3.3	981.3
49	271.7	209.2	48.6	10.6	3.3	996.1
50	275.6	212.1	49.5	10.8	3.2	1010.6

scaled Radiata pine unpruned, medium fertility site

Age	Carbon stocks (T/HA)					
	Total	Above ground live biomass	Below ground live biomass	Dead woody litter	Fine litter	total CO2
0	0.0	0.0	0.0	0.0	0.0	0.0
1	0.0	0.0	0.0	0.0	0.0	0.2
2	0.3	0.2	0.1	0.0	0.0	1.0
3	0.8	0.6	0.2	0.0	0.0	2.8
4	3.3	2.4	0.8	0.0	0.1	12.0
5	7.9	5.9	1.7	0.0	0.4	29.0
6	15.2	11.3	3.0	0.0	1.0	55.8
7	25.0	18.4	4.5	0.0	2.0	91.6
8	36.7	27.0	6.3	0.0	3.4	134.5
9	49.5	36.4	8.2	0.0	4.8	181.3
10	62.5	46.1	10.2	0.1	6.2	229.1
11	66.7	34.6	7.7	12.4	12.0	244.4
12	73.0	41.9	9.2	11.0	11.0	267.5
13	80.2	49.6	10.8	9.7	10.1	294.2
14	88.2	57.7	12.4	8.6	9.5	323.2
15	96.5	65.9	14.1	7.7	8.9	354.0
16	105.2	74.1	15.8	6.9	8.4	385.8
17	114.1	82.4	17.5	6.2	8.1	418.4
18	123.1	90.5	19.2	5.7	7.7	451.4
19	132.1	98.5	20.9	5.3	7.4	484.5
20	141.1	106.4	22.6	5.0	7.2	517.5
21	150.0	114.0	24.3	4.8	6.9	550.0
22	158.7	121.4	26.0	4.6	6.7	582.0
23	167.2	128.6	27.6	4.6	6.5	613.2
24	175.5	135.5	29.1	4.6	6.3	643.5
25	183.5	142.1	30.6	4.7	6.1	672.8
26	191.3	148.4	32.1	4.8	6.0	701.4
27	199.0	154.6	33.6	5.0	5.8	729.6
28	206.5	160.7	35.1	5.2	5.6	757.3
29	213.9	166.5	36.5	5.4	5.5	784.5
30	221.2	172.3	37.9	5.7	5.4	811.1
31	228.3	177.8	39.3	6.0	5.2	837.1
32	235.2	183.2	40.6	6.3	5.1	862.6
33	242.0	188.5	41.9	6.6	5.0	887.4
34	248.6	193.5	43.2	6.9	4.9	911.5
35	255.0	198.5	44.5	7.3	4.8	935.1
36	261.3	203.2	45.7	7.6	4.7	958.2
37	267.4	207.9	47.0	8.0	4.6	980.6
38	273.4	212.4	48.2	8.3	4.5	1002.6
39	279.3	216.9	49.3	8.7	4.5	1024.1
40	285.0	221.2	50.5	9.0	4.4	1045.2
41	290.7	225.4	51.7	9.3	4.3	1065.9
42	296.2	229.6	52.8	9.7	4.2	1086.2
43	301.7	233.6	53.9	10.0	4.2	1106.2
44	307.1	237.7	55.0	10.3	4.1	1125.9
45	312.4	241.6	56.1	10.6	4.1	1145.4
46	317.7	245.6	57.2	10.9	4.0	1164.8
47	322.9	249.5	58.3	11.2	4.0	1184.0
48	328.1	253.3	59.4	11.5	3.9	1203.2
49	333.4	257.2	60.5	11.8	3.9	1222.4
50	338.6	261.1	61.6	12.0	3.9	1241.7

scaled Radiata pine unpruned, high fertility site

Age	Carbon stocks (T/HA)					
	Total	Above ground live biomass	Below ground live biomass	Dead woody litter	Fine litter	total CO2
0	0.0	0.0	0.0	0.0	0.0	0.0
1	0.1	0.1	0.0	0.0	0.0	0.4
2	0.7	0.5	0.2	0.0	0.0	2.5
3	1.9	1.4	0.4	0.0	0.1	6.9
4	7.1	5.1	1.7	0.0	0.2	25.9
5	16.1	12.0	3.3	0.0	0.8	58.9
6	29.3	21.7	5.5	0.0	2.1	107.3
7	45.3	33.3	7.9	0.0	4.0	166.1
8	62.5	45.7	10.3	0.0	6.4	229.1
9	79.1	57.7	12.7	0.1	8.6	290.1
10	94.7	69.1	15.0	0.2	10.3	347.1
11	100.0	51.1	11.5	19.0	18.3	366.7
12	107.4	60.7	13.4	16.8	16.5	393.7
13	116.2	70.8	15.5	14.9	15.1	426.1
14	125.6	80.9	17.6	13.2	13.9	460.6
15	135.6	91.1	19.8	11.8	12.9	497.1
16	145.8	101.3	22.0	10.6	12.0	534.7
17	156.3	111.3	24.1	9.5	11.3	573.1
18	166.8	121.2	26.3	8.7	10.7	611.7
19	177.3	130.8	28.4	8.1	10.1	650.1
20	187.6	140.1	30.4	7.5	9.6	688.0
21	197.8	149.0	32.4	7.1	9.2	725.2
22	207.7	157.6	34.4	6.8	8.8	761.4
23	217.2	165.9	36.3	6.7	8.4	796.4
24	226.4	173.7	38.1	6.6	8.1	830.0
25	235.2	181.1	39.8	6.5	7.7	862.2
26	243.7	188.2	41.5	6.6	7.4	893.5
27	252.1	195.1	43.2	6.6	7.1	924.3
28	260.3	201.8	44.9	6.8	6.8	954.5
29	268.4	208.3	46.5	6.9	6.6	984.1
30	276.3	214.7	48.1	7.1	6.4	1013.2
31	284.1	220.9	49.7	7.3	6.2	1041.7
32	291.7	226.9	51.2	7.6	6.0	1069.6
33	299.1	232.8	52.7	7.8	5.8	1096.9
34	306.5	238.5	54.2	8.1	5.7	1123.7
35	313.6	244.1	55.6	8.4	5.5	1150.0
36	320.7	249.6	57.1	8.7	5.4	1176.0
37	327.7	255.0	58.5	9.0	5.3	1201.6
38	334.6	260.3	59.9	9.3	5.2	1227.0
39	341.5	265.6	61.3	9.6	5.1	1252.2
40	348.3	270.8	62.7	9.9	5.0	1277.3
41	355.2	276.0	64.1	10.2	5.0	1302.4
42	362.0	281.2	65.5	10.5	4.9	1327.4
43	368.9	286.4	66.8	10.8	4.8	1352.5
44	375.7	291.6	68.2	11.1	4.8	1377.7
45	382.6	296.9	69.6	11.4	4.8	1403.0
46	389.6	302.1	71.1	11.7	4.8	1428.6
47	396.7	307.5	72.5	12.0	4.7	1454.5
48	403.8	312.9	73.9	12.3	4.7	1480.7
49	411.1	318.4	75.4	12.6	4.7	1507.4
50	418.5	323.9	76.9	12.9	4.8	1534.6

scaled Radiata pine, unpruned, 2nd Rotation, average site

Carbon stocks (T/HA)						
Age	Total	Above	Below	Dead	Fine litter	total CO2
		ground	ground			
		live	live	litter		
		biomass	biomass			
0	90.0	0.0	0.0	58.8	31.2	330.1
1	77.1	0.0	0.0	51.7	25.3	282.7
2	66.3	0.2	0.1	45.5	20.5	243.2
3	57.5	0.6	0.2	40.1	16.7	210.8
4	52.0	2.4	0.8	35.3	13.6	190.7
5	49.9	5.9	1.7	31.0	11.3	182.9
6	51.4	11.3	3.0	27.3	9.9	188.6
7	56.2	18.4	4.5	24.0	9.2	206.2
8	63.7	27.0	6.3	21.2	9.2	233.5
9	72.8	36.4	8.2	18.6	9.6	267.0
10	82.7	46.1	10.2	16.5	10.0	303.4
11	84.2	34.6	7.7	26.8	15.1	308.9
12	88.2	41.9	9.2	23.6	13.5	323.5
13	93.5	49.6	10.8	20.8	12.2	342.7
14	99.7	57.7	12.4	18.4	11.2	365.5
15	106.6	65.9	14.1	16.3	10.3	390.7
16	114.0	74.1	15.8	14.5	9.6	417.9
17	121.7	82.4	17.5	12.9	9.0	446.3
18	129.8	90.5	19.2	11.6	8.5	475.8
19	137.9	98.5	20.9	10.5	8.0	505.7
20	146.2	106.4	22.6	9.5	7.7	536.0
21	154.4	114.0	24.3	8.8	7.3	566.2
22	162.6	121.4	26.0	8.2	7.0	596.2
23	170.6	128.6	27.6	7.7	6.8	625.6
24	178.5	135.5	29.1	7.3	6.5	654.4
25	186.1	142.1	30.6	7.1	6.3	682.3
26	193.6	148.4	32.1	6.9	6.1	709.7
27	201.0	154.6	33.6	6.8	5.9	736.9
28	208.3	160.7	35.1	6.8	5.7	763.6
29	215.5	166.5	36.5	6.9	5.6	790.0
30	222.6	172.3	37.9	7.0	5.4	816.0
31	229.5	177.8	39.3	7.1	5.3	841.4
32	236.3	183.2	40.6	7.3	5.2	866.3
33	242.9	188.5	41.9	7.5	5.0	890.7
34	249.4	193.5	43.2	7.7	4.9	914.4
35	255.7	198.5	44.5	7.9	4.8	937.7
36	261.9	203.2	45.7	8.2	4.7	960.4
37	268.0	207.9	47.0	8.5	4.6	982.6
38	273.9	212.4	48.2	8.8	4.5	1004.3
39	279.7	216.9	49.3	9.1	4.5	1025.6
40	285.4	221.2	50.5	9.3	4.4	1046.5
41	291.0	225.4	51.7	9.6	4.3	1067.1
42	296.5	229.6	52.8	9.9	4.2	1087.2
43	301.9	233.6	53.9	10.2	4.2	1107.1
44	307.3	237.7	55.0	10.5	4.1	1126.7
45	312.6	241.6	56.1	10.8	4.1	1146.1
46	317.8	245.6	57.2	11.1	4.0	1165.4
47	323.1	249.5	58.3	11.3	4.0	1184.6
48	328.3	253.3	59.4	11.6	3.9	1203.7
49	333.5	257.2	60.5	11.9	3.9	1222.8
50	338.7	261.1	61.6	12.1	3.9	1242.0

scaled Totara, medium site

Age	Total	Carbon stocks (T/HA)			Fine litter	total CO2
		Above ground live biomass	Below ground live biomass	Dead woody litter		
0	0.0	0.0	0.0	0.0	0.0	0.0
1	0.0	0.0	0.0	0.0	0.0	0.0
2	0.1	0.0	0.0	0.0	0.0	0.2
3	0.1	0.1	0.0	0.0	0.0	0.5
4	0.3	0.2	0.1	0.0	0.0	1.0
5	0.5	0.3	0.1	0.0	0.0	1.7
6	0.7	0.5	0.1	0.0	0.1	2.5
7	1.0	0.7	0.2	0.0	0.1	3.5
8	1.3	0.9	0.2	0.0	0.1	4.7
9	1.6	1.2	0.3	0.0	0.2	6.0
10	2.1	1.5	0.3	0.0	0.2	7.5
11	2.7	2.0	0.5	0.0	0.2	9.8
12	3.3	2.5	0.5	0.0	0.3	12.1
13	4.0	3.1	0.7	0.0	0.3	14.8
14	4.8	3.7	0.8	0.0	0.3	17.6
15	5.6	4.4	0.9	0.0	0.4	20.7
16	6.5	5.1	1.1	0.0	0.4	24.0
17	7.5	5.9	1.2	0.0	0.4	27.5
18	8.5	6.7	1.4	0.0	0.4	31.3
19	9.6	7.6	1.6	0.0	0.4	35.2
20	10.8	8.5	1.7	0.0	0.5	39.4
21	12.0	9.5	1.9	0.0	0.5	43.9
22	13.2	10.6	2.1	0.0	0.5	48.5
23	14.6	11.6	2.3	0.0	0.5	53.4
24	15.9	12.8	2.6	0.0	0.6	58.4
25	17.4	14.0	2.8	0.1	0.6	63.7
26	18.9	15.2	3.0	0.1	0.6	69.2
27	20.4	16.5	3.3	0.1	0.6	74.9
28	22.0	17.8	3.5	0.1	0.6	80.8
29	23.7	19.2	3.8	0.1	0.7	86.9
30	25.4	20.6	4.0	0.1	0.7	93.1
31	27.2	22.0	4.3	0.1	0.7	99.6
32	29.0	23.5	4.6	0.1	0.7	106.2
33	30.8	25.0	4.9	0.1	0.8	113.0
34	32.7	26.6	5.2	0.1	0.8	120.0
35	34.7	28.2	5.5	0.1	0.8	127.1
36	36.6	29.8	5.8	0.1	0.8	134.4
37	38.7	31.5	6.1	0.2	0.9	141.8
38	40.7	33.2	6.5	0.2	0.9	149.3
39	42.8	34.9	6.8	0.2	0.9	157.0
40	45.0	36.7	7.1	0.2	0.9	164.8
41	47.1	38.5	7.5	0.2	0.9	172.7
42	49.3	40.3	7.8	0.2	1.0	180.8
43	51.5	42.1	8.2	0.2	1.0	188.9
44	53.8	43.9	8.6	0.2	1.0	197.1
45	56.0	45.8	8.9	0.3	1.0	205.4
46	58.3	47.7	9.3	0.3	1.0	213.8
47	60.6	49.6	9.7	0.3	1.1	222.2
48	62.9	51.5	10.1	0.3	1.1	230.7
49	65.3	53.4	10.5	0.3	1.1	239.3
50	67.6	55.3	10.9	0.3	1.1	247.9

scaled Totara, medium site cont.

Age	Total	Carbon stocks (T/HA)			Fine litter	total CO2
		Above ground live biomass	Below ground live biomass	Dead woody litter		
51	70.0	57.2	11.3	0.3	1.1	256.6
52	72.4	59.2	11.7	0.4	1.1	265.3
53	74.8	61.1	12.1	0.4	1.2	274.1
54	77.2	63.1	12.5	0.4	1.2	282.9
55	79.6	65.1	12.9	0.4	1.2	291.8
56	82.0	67.0	13.3	0.4	1.2	300.7
57	84.4	69.0	13.8	0.4	1.2	309.6
58	86.9	71.0	14.2	0.5	1.2	318.6
59	89.4	73.0	14.6	0.5	1.3	327.6
60	91.8	75.0	15.1	0.5	1.3	336.7
61	94.3	77.0	15.5	0.5	1.3	345.8
62	96.8	79.0	16.0	0.5	1.3	355.0
63	99.3	81.1	16.4	0.5	1.3	364.2
64	101.8	83.1	16.9	0.6	1.3	373.4
65	104.4	85.1	17.3	0.6	1.3	382.7
66	106.9	87.2	17.8	0.6	1.3	392.0
67	109.5	89.2	18.2	0.6	1.4	401.3
68	112.0	91.3	18.7	0.6	1.4	410.7
69	114.6	93.4	19.2	0.6	1.4	420.2
70	117.2	95.5	19.6	0.7	1.4	429.6
71	119.8	97.6	20.1	0.7	1.4	439.1
72	122.4	99.7	20.6	0.7	1.4	448.6
73	125.0	101.8	21.1	0.7	1.4	458.2
74	127.6	103.9	21.5	0.7	1.4	467.8
75	130.2	106.0	22.0	0.8	1.4	477.4
76	132.8	108.1	22.5	0.8	1.5	487.1
77	135.5	110.2	23.0	0.8	1.5	496.8
78	138.1	112.4	23.5	0.8	1.5	506.5
79	140.8	114.5	24.0	0.8	1.5	516.3
80	143.5	116.7	24.5	0.9	1.5	526.1

scaled Kauri, medium site

Age	Total	Carbon stocks (T/HA)			Fine litter	total CO2
		Above ground live biomass	Below ground live biomass	Dead woody litter		
0	0.0	0.0	0.0	0.0	0.0	0.0
1	0.0	0.0	0.0	0.0	0.0	0.0
2	0.1	0.0	0.0	0.0	0.0	0.2
3	0.1	0.1	0.0	0.0	0.0	0.5
4	0.3	0.2	0.1	0.0	0.0	1.0
5	0.4	0.3	0.1	0.0	0.0	1.6
6	0.7	0.5	0.1	0.0	0.1	2.4
7	0.9	0.7	0.2	0.0	0.1	3.4
8	1.2	0.9	0.2	0.0	0.1	4.5
9	1.6	1.1	0.3	0.0	0.2	5.7
10	2.0	1.4	0.3	0.0	0.2	7.2
11	2.5	1.9	0.4	0.0	0.2	9.3
12	3.2	2.4	0.5	0.0	0.2	11.6
13	3.8	2.9	0.6	0.0	0.3	14.1
14	4.6	3.5	0.7	0.0	0.3	16.8
15	5.4	4.2	0.9	0.0	0.3	19.7
16	6.2	4.8	1.0	0.0	0.4	22.9
17	7.1	5.6	1.2	0.0	0.4	26.2
18	8.1	6.4	1.3	0.0	0.4	29.8
19	9.2	7.2	1.5	0.0	0.4	33.6
20	10.2	8.1	1.7	0.0	0.4	37.6
21	11.4	9.1	1.8	0.0	0.5	41.8
22	12.6	10.1	2.0	0.0	0.5	46.2
23	13.9	11.1	2.2	0.0	0.5	50.9
24	15.2	12.2	2.4	0.0	0.5	55.7
25	16.6	13.3	2.7	0.1	0.5	60.7
26	18.0	14.5	2.9	0.1	0.6	66.0
27	19.5	15.7	3.1	0.1	0.6	71.4
28	21.0	17.0	3.4	0.1	0.6	77.0
29	22.6	18.3	3.6	0.1	0.6	82.8
30	24.2	19.6	3.9	0.1	0.7	88.8
31	25.9	21.0	4.1	0.1	0.7	94.9
32	27.6	22.4	4.4	0.1	0.7	101.2
33	29.4	23.9	4.7	0.1	0.7	107.7
34	31.2	25.4	5.0	0.1	0.7	114.4
35	33.0	26.9	5.2	0.1	0.8	121.2
36	34.9	28.5	5.5	0.1	0.8	128.1
37	36.9	30.1	5.9	0.2	0.8	135.2
38	38.8	31.7	6.2	0.2	0.8	142.4
39	40.8	33.3	6.5	0.2	0.9	149.7
40	42.9	35.0	6.8	0.2	0.9	157.2
41	44.9	36.7	7.1	0.2	0.9	164.8
42	47.0	38.4	7.5	0.2	0.9	172.5
43	49.2	40.2	7.8	0.2	0.9	180.2
44	51.3	42.0	8.2	0.2	1.0	188.1
45	53.5	43.7	8.5	0.2	1.0	196.1
46	55.7	45.5	8.9	0.3	1.0	204.1
47	57.9	47.4	9.2	0.3	1.0	212.2
48	60.1	49.2	9.6	0.3	1.0	220.4
49	62.3	51.0	10.0	0.3	1.0	228.6
50	64.6	52.9	10.4	0.3	1.1	236.9

scaled Kauri, medium site cont.

Age	Total	Carbon stocks (T/HA)			Fine litter	total CO2
		Above ground live biomass	Below ground live biomass	Dead woody litter		
51	66.9	54.7	10.7	0.3	1.1	245.2
52	69.2	56.6	11.1	0.3	1.1	253.6
53	71.4	58.5	11.5	0.4	1.1	262.0
54	73.8	60.3	11.9	0.4	1.1	270.4
55	76.1	62.2	12.3	0.4	1.1	278.9
56	78.4	64.1	12.7	0.4	1.2	287.5
57	80.7	66.0	13.1	0.4	1.2	296.0
58	83.1	67.9	13.5	0.4	1.2	304.7
59	85.4	69.9	13.9	0.4	1.2	313.3
60	87.8	71.8	14.4	0.5	1.2	322.0
61	90.2	73.7	14.8	0.5	1.2	330.7
62	92.6	75.6	15.2	0.5	1.2	339.5
63	95.0	77.6	15.6	0.5	1.3	348.3
64	97.4	79.5	16.1	0.5	1.3	357.1
65	99.8	81.5	16.5	0.5	1.3	366.0
66	102.2	83.4	16.9	0.6	1.3	374.9
67	104.7	85.4	17.4	0.6	1.3	383.8
68	107.1	87.4	17.8	0.6	1.3	392.8
69	109.6	89.4	18.3	0.6	1.3	401.8
70	112.0	91.4	18.7	0.6	1.3	410.8
71	114.5	93.4	19.2	0.7	1.3	419.9
72	117.0	95.4	19.6	0.7	1.3	429.0
73	119.5	97.4	20.1	0.7	1.4	438.1
74	122.0	99.4	20.5	0.7	1.4	447.3
75	124.5	101.4	21.0	0.7	1.4	456.5
76	127.0	103.4	21.5	0.7	1.4	465.7
77	129.5	105.5	21.9	0.8	1.4	474.9
78	132.1	107.5	22.4	0.8	1.4	484.2
79	134.6	109.5	22.9	0.8	1.4	493.5
80	137.1	111.6	23.3	0.8	1.4	502.9

scaled Douglas-fir, thinned, unpruned, medium site

Carbon stocks (T/HA)						
Age	Total	Above	Below	Dead woody litter	Fine litter	total CO2
		ground live biomass	ground live biomass			
0	0.0	0.0	0.0	0.0	0.0	0.0
1	0.0	0.0	0.0	0.0	0.0	0.1
2	0.1	0.1	0.0	0.0	0.0	0.3
3	0.2	0.2	0.1	0.0	0.0	0.9
4	0.5	0.4	0.1	0.0	0.0	1.8
5	0.8	0.6	0.1	0.0	0.1	3.0
6	1.2	0.9	0.2	0.0	0.1	4.5
7	1.7	1.3	0.3	0.0	0.2	6.3
8	5.4	3.8	1.3	0.0	0.2	19.7
9	8.8	6.9	1.6	0.0	0.3	32.4
10	13.4	10.2	2.4	0.0	0.7	49.0
11	18.3	14.0	3.1	0.0	1.2	67.2
12	24.0	18.2	4.0	0.1	1.7	88.0
13	30.1	23.0	5.0	0.1	2.0	110.5
14	36.8	28.2	6.1	0.1	2.4	134.9
15	44.0	33.9	7.2	0.2	2.7	161.4
16	45.3	20.5	4.5	13.5	6.9	166.3
17	46.9	24.1	5.0	11.9	5.9	172.1
18	50.0	28.2	6.0	10.5	5.3	183.4
19	53.5	32.7	6.8	9.3	4.8	196.3
20	57.9	37.5	7.8	8.2	4.4	212.3
21	62.7	42.5	8.8	7.3	4.1	229.8
22	68.2	48.0	9.9	6.5	3.9	250.2
23	74.0	53.5	10.9	5.8	3.8	271.2
24	80.2	59.2	12.1	5.2	3.7	294.0
25	86.7	65.0	13.3	4.7	3.7	317.8
26	93.3	70.9	14.4	4.3	3.6	342.0
27	100.4	77.1	15.8	3.9	3.7	368.2
28	107.3	83.0	16.9	3.7	3.7	393.4
29	114.4	89.0	18.2	3.4	3.7	419.5
30	121.5	95.0	19.5	3.3	3.8	445.6
31	128.8	101.0	20.8	3.1	3.8	472.1
32	136.0	107.1	22.1	3.1	3.9	498.8
33	142.8	112.7	23.2	3.0	3.9	523.8
34	150.3	118.7	24.7	3.0	3.9	551.0
35	157.0	124.3	25.7	3.0	4.0	575.5
36	164.4	130.2	27.2	3.1	4.0	602.8
37	171.0	135.6	28.3	3.1	4.0	626.9
38	177.8	141.0	29.6	3.2	4.0	651.8
39	184.3	146.2	30.8	3.3	4.0	675.9
40	190.9	151.5	32.0	3.4	4.0	699.9
41	197.3	156.6	33.2	3.6	4.0	723.5
42	203.6	161.6	34.3	3.7	4.0	746.6
43	209.8	166.4	35.5	3.9	3.9	769.1
44	215.8	171.2	36.6	4.1	3.9	791.2
45	221.6	175.8	37.7	4.2	3.9	812.7
46	227.4	180.3	38.8	4.4	3.8	833.6
47	232.9	184.7	39.9	4.6	3.8	854.1
48	238.4	188.9	40.9	4.8	3.7	874.0
49	243.7	193.1	41.9	5.0	3.7	893.4
50	248.8	197.1	42.9	5.2	3.6	912.3

scaled Douglas-fir, thinned, unpruned, medium site cont.

Carbon stocks (T/HA)						
Age	Total	Above	Below	Dead woody litter	Fine litter	total CO2
		ground live biomass	ground live biomass			
51	253.9	201.0	43.9	5.3	3.6	930.8
52	258.9	204.9	44.9	5.5	3.5	949.2
53	263.9	208.7	45.9	5.7	3.5	967.5
54	268.8	212.5	46.9	5.9	3.4	985.5
55	273.6	216.3	47.9	6.1	3.4	1003.4
56	278.5	220.0	48.8	6.3	3.4	1021.0
57	283.2	223.7	49.8	6.5	3.3	1038.5
58	287.9	227.3	50.7	6.6	3.3	1055.7
59	292.6	230.9	51.6	6.8	3.3	1072.7
60	297.1	234.4	52.5	7.0	3.2	1089.5
61	301.6	237.8	53.5	7.2	3.2	1106.0
62	306.1	241.2	54.4	7.3	3.2	1122.3
63	310.5	244.6	55.2	7.5	3.2	1138.3
64	314.8	247.9	56.1	7.7	3.1	1154.2
65	319.0	251.1	57.0	7.8	3.1	1169.8
66	323.2	254.3	57.8	8.0	3.1	1185.1
67	327.3	257.5	58.7	8.1	3.1	1200.2
68	331.4	260.6	59.5	8.3	3.0	1215.1
69	335.4	263.6	60.4	8.4	3.0	1229.7
70	339.3	266.6	61.2	8.6	3.0	1244.1
71	343.2	269.5	62.0	8.7	2.9	1258.3
72	347.0	272.4	62.8	8.8	2.9	1272.2
73	350.7	275.3	63.6	9.0	2.9	1285.9
74	354.4	278.1	64.4	9.1	2.9	1299.4
75	358.0	280.8	65.1	9.2	2.8	1312.7
76	361.6	283.5	65.9	9.3	2.8	1325.7
77	365.1	286.2	66.7	9.4	2.8	1338.5
78	368.5	288.8	67.4	9.6	2.8	1351.2
79	371.9	291.3	68.1	9.7	2.7	1363.6
80	375.2	293.8	68.9	9.8	2.7	1375.8

scaled Cypress, averaged

age	Total	Carbon stocks (T/HA)			Fine litter	total CO2
		Above ground live biomass	Below ground live biomass	Dead woody litter		
0	0.0	0.0	0.0	0.0	0.0	0.0
1	0.2	0.1	0.1	0.0	0.0	0.7
2	1.2	0.9	0.3	0.0	0.0	4.4
3	3.2	2.5	0.7	0.0	0.0	11.9
4	6.5	5.0	1.3	0.0	0.2	23.8
5	10.9	8.4	2.0	0.0	0.6	40.1
6	18.2	13.7	3.3	0.0	1.2	66.9
7	25.9	19.6	4.2	0.1	2.0	95.1
8	34.5	25.7	5.5	0.2	3.1	126.4
9	43.2	31.9	6.7	0.3	4.3	158.4
10	49.3	36.7	7.3	0.2	5.2	180.9
11	54.1	29.9	6.7	8.4	9.2	198.5
12	58.9	35.6	7.5	7.5	8.3	216.0
13	64.8	41.6	8.9	6.8	7.6	237.6
14	70.9	47.6	10.0	6.2	7.1	260.0
15	77.5	53.7	11.3	5.7	6.7	284.0
16	84.2	59.9	12.6	5.3	6.4	308.7
17	91.1	66.0	13.9	5.0	6.1	334.0
18	98.1	72.2	15.2	4.8	5.9	359.7
19	105.2	78.4	16.5	4.6	5.7	385.7
20	112.3	84.5	17.9	4.5	5.5	411.9
21	119.5	90.5	19.2	4.5	5.3	438.1
22	126.7	96.5	20.5	4.5	5.2	464.4
23	133.8	102.4	21.9	4.5	5.1	490.6
24	140.9	108.2	23.2	4.5	5.0	516.6
25	147.9	113.9	24.5	4.6	4.9	542.5
26	154.9	119.6	25.8	4.7	4.8	568.1
27	161.9	125.1	27.1	4.9	4.7	593.5
28	168.7	130.6	28.4	5.0	4.6	618.6
29	175.5	136.0	29.7	5.2	4.6	643.4
30	182.1	141.3	31.0	5.4	4.5	667.8
31	188.7	146.5	32.2	5.6	4.5	691.9
32	195.2	151.6	33.5	5.7	4.4	715.7
33	201.6	156.5	34.7	6.0	4.4	739.0
34	207.8	161.4	35.9	6.2	4.3	762.0
35	214.0	166.2	37.1	6.4	4.3	784.6

scaled Redwood, thinned, pruned, medium site

Carbon stocks (T/HA)						
age	Total	Above	Below	Dead	Fine litter	total CO2
		ground	ground			
		live	live	litter		
		biomass	biomass			
0	0.0	0.0	0.0	0.0	0.0	0.0
1	0.1	0.1	0.0	0.0	0.0	0.5
2	0.7	0.5	0.2	0.0	0.0	2.7
3	2.2	1.6	0.5	0.0	0.1	8.1
4	4.0	3.0	0.7	0.0	0.3	14.8
5	6.8	4.9	1.2	0.0	0.6	24.8
6	10.0	7.3	1.7	0.0	1.1	36.7
7	13.6	9.2	2.3	0.0	2.2	50.0
8	17.7	12.3	2.9	0.0	2.5	65.0
9	22.3	15.8	3.6	0.0	2.9	81.7
10	27.2	19.6	4.4	0.0	3.2	99.7
11	32.5	23.8	5.2	0.0	3.4	119.2
12	32.8	13.0	3.5	7.6	8.6	120.1
13	34.0	16.0	4.0	6.7	7.3	124.8
14	36.0	19.1	4.7	5.9	6.3	131.9
15	38.4	22.3	5.3	5.2	5.6	140.8
16	41.3	25.8	6.0	4.6	5.0	151.4
17	44.5	29.4	6.6	4.1	4.5	163.3
18	48.2	33.1	7.4	3.6	4.1	176.6
19	52.1	37.0	8.1	3.2	3.8	191.0
20	56.3	41.1	8.9	2.8	3.5	206.5
21	60.8	45.2	9.7	2.5	3.3	222.8
22	65.4	49.5	10.5	2.2	3.2	239.9
23	70.3	53.9	11.3	2.0	3.1	257.8
24	75.3	58.4	12.2	1.8	3.0	276.2
25	80.5	62.9	13.1	1.6	3.0	295.2
26	85.8	67.5	14.0	1.4	2.9	314.6
27	91.2	72.1	14.9	1.3	2.9	334.3
28	96.6	76.8	15.8	1.2	2.9	354.3
29	102.2	81.5	16.7	1.1	2.9	374.6
30	107.7	86.2	17.7	1.0	2.9	395.1
31	113.4	90.9	18.7	0.9	2.9	415.7
32	119.0	95.6	19.6	0.8	2.9	436.4
33	124.7	100.4	20.6	0.8	2.9	457.3
34	130.4	105.1	21.6	0.7	2.9	478.2
35	136.2	109.9	22.6	0.7	3.0	499.2
36	141.9	114.6	23.6	0.7	3.0	520.3
37	147.7	119.4	24.6	0.7	3.0	541.5
38	153.5	124.1	25.7	0.6	3.0	562.8
39	159.3	128.9	26.7	0.6	3.1	584.1
40	165.1	133.7	27.7	0.6	3.1	605.4
41	170.9	138.4	28.8	0.6	3.1	626.8
42	176.8	143.2	29.8	0.6	3.1	648.2
43	182.6	148.0	30.9	0.6	3.1	669.7
44	188.5	152.8	32.0	0.6	3.2	691.2
45	194.4	157.6	33.0	0.6	3.2	712.7
46	200.3	162.4	34.1	0.6	3.2	734.3
47	206.1	167.1	35.2	0.6	3.2	755.8
48	212.0	171.9	36.2	0.6	3.2	777.4
49	217.9	176.7	37.3	0.7	3.2	799.0
50	223.8	181.5	38.4	0.7	3.3	820.6

scaled Redwood, thinned, pruned, medium site cont.

age	Total	Carbon stocks (T/HA)			Fine litter	total CO2
		Above ground live biomass	Below ground live biomass	Dead woody litter		
51	229.7	186.3	39.4	0.7	3.3	842.2
52	235.6	191.1	40.5	0.7	3.3	863.8
53	241.5	195.9	41.6	0.7	3.3	885.3
54	247.3	200.6	42.7	0.7	3.3	906.9
55	253.2	205.4	43.8	0.8	3.3	928.5
56	259.1	210.2	44.8	0.8	3.3	950.0
57	265.0	214.9	45.9	0.8	3.3	971.5
58	270.8	219.7	47.0	0.8	3.3	993.0
59	276.7	224.4	48.1	0.8	3.3	1014.4
60	282.5	229.2	49.1	0.9	3.3	1035.8

scaled *Eucalyptus fastigata*, medium site

age	Carbon stocks (T/HA)					
	Total	Above ground live biomass	Below ground live biomass	Dead woody litter	Fine litter	total CO2
0	0.0	0.0	0.0	0.0	0.0	0.0
1	0.0	0.0	0.0	0.0	0.0	0.0
2	0.6	0.4	0.2	0.0	0.0	2.3
3	4.6	3.3	1.2	0.0	0.1	16.8
4	12.5	9.3	2.8	0.0	0.4	45.9
5	23.5	17.5	4.4	0.1	1.5	86.2
6	36.4	26.6	6.2	0.1	3.4	133.5
7	49.3	35.6	7.9	0.2	5.6	180.7
8	64.5	46.2	10.4	0.3	7.6	236.5
9	77.9	56.1	12.1	0.5	9.2	285.6
10	91.6	66.1	14.5	0.7	10.4	336.0
11	104.8	76.3	16.6	0.9	11.0	384.3
12	117.9	86.5	18.9	1.2	11.3	432.4
13	130.8	96.8	21.2	1.4	11.4	479.7
14	143.6	107.1	23.6	1.8	11.2	526.5
15	159.9	119.8	27.0	2.1	11.0	586.3
16	167.6	127.1	27.2	2.5	10.8	614.5
17	181.5	137.0	31.0	2.9	10.5	665.4
18	192.8	146.9	32.6	3.3	10.1	706.8
19	205.0	156.5	35.2	3.7	9.7	751.8
20	216.5	165.8	37.2	4.1	9.4	793.7
21	227.9	174.8	39.5	4.6	9.1	835.7
22	238.9	183.6	41.5	5.0	8.8	876.0
23	249.6	192.0	43.6	5.5	8.5	915.3
24	259.9	200.2	45.6	5.9	8.3	953.1
25	269.9	208.0	47.5	6.4	8.0	989.5
26	279.4	215.4	49.4	6.8	7.8	1024.4
27	288.5	222.5	51.2	7.3	7.5	1057.7
28	297.1	229.2	52.9	7.7	7.3	1089.4
29	305.3	235.5	54.5	8.2	7.1	1119.3
30	313.3	241.7	56.2	8.6	6.8	1148.9
31	320.4	247.2	57.5	9.0	6.6	1174.7
32	327.4	252.5	59.1	9.4	6.4	1200.4
33	334.0	257.6	60.5	9.8	6.1	1224.8
34	340.5	262.5	61.9	10.2	5.9	1248.5
35	346.7	267.3	63.2	10.6	5.7	1271.2
36	352.7	271.8	64.5	11.0	5.5	1293.2
37	358.4	276.1	65.7	11.3	5.3	1314.3
38	364.0	280.3	66.9	11.7	5.1	1334.6
39	369.3	284.3	68.1	12.0	5.0	1354.2
40	374.4	288.1	69.2	12.3	4.8	1372.9