

# SPACING AND SURVIVAL TABLES FOR PLANTATIONS

W. M. STIELL, *Research Scientist,*  
*Petawawa Forest Experiment Station,*  
*Department of Forestry and Rural Development,*  
*of Canada, Chalk River, Ont.*

These tables concern three expressions of plantation density-spacing distance, number of trees per acre, and percent survival (tables 1-5). The tables have been useful for both research and management since they convert simply field and office data

to that of density required. They can be applied appropriately wherever density conditions are reasonably uniform.

A short explanatory note accompanies each of the five tables.

TABLE 1.—*Trees per acre at square spacings*

Spacing	Trees	Spacing	Trees	Spacing	Trees	Spacing	Trees
<i>Feet</i>	<i>Per acre</i>	<i>Feet</i>	<i>Per acre</i>	<i>Feet</i>	<i>Per acre</i>	<i>Feet</i>	<i>Per acre</i>
1.0-----	43,560	6.0	1,210	11.0	360	16.0	170
.1-----	36,000	.1	1,171	.1	354	.1	168
.2-----	30,250	.2	1,133	.2	347	.2	166
.3-----	25,775	.3	1,098	.3	341	.3	164
.4-----	22,224	.4	1,063	.4	335	.4	162
.5-----	19,360	.5	1,031	.5	329	.5	160
.6-----	17,016	.6	1,000	.6	324	.6	158
.7-----	15,073	.7	970	.7	318	.7	156
.8-----	13,444	.8	942	.8	313	.8	154
.9-----	12,066	.9	915	.9	308	.9	153
2.0-----	10,890	7.0	889	12.0	302	17.0	151
.1-----	9,878	.1	864	.1	298	.1	149
.2-----	9,000	.2	840	.2	293	.2	147
.3-----	8,234	.3	817	.3	288	.3	146
.4-----	7,562	.4	795	.4	283	.4	144
.5-----	6,970	.5	774	.5	279	.5	142
.6-----	6,444	.6	754	.6	274	.6	141
.7-----	5,975	.7	735	.7	270	.7	139
.8-----	5,556	.8	716	.8	266	.8	137
.9-----	5,180	.9	698	.9	262	.9	136

See footnote at end of table.

TABLE 1.—Trees per acre at Square Spacings—Continued

Spacing	Trees	Spacing	Trees	Spacing	Trees	Spacing	Trees
<i>Feet</i>	<i>Per acre</i>	<i>Feet</i>	<i>Per acre</i>	<i>Feet</i>	<i>Per acre</i>	<i>Feet</i>	<i>Per acre</i>
3.0	4,840	8.0	681	13.0	258	18.0	134
.1	4,533	.1	664	.1	254	.1	133
.2	4,254	.2	648	.2	250	.2	132
.3	4,000	.3	632	.3	246	.3	130
.4	3,768	.4	617	.4	243	.4	129
.5	3,556	.5	603	.5	239	.5	127
.6	3,361	.6	589	.6	236	.6	126
.7	3,182	.7	576	.7	232	.7	124
.8	3,017	.8	562	.8	229	.8	123
.9	2,864	.9	550	.9	225	.9	122
4.0	2,722	9.0	538	14.0	222	19.0	121
.1	2,591	.1	526	.1	219	.1	119
.2	2,469	.2	515	.2	216	.2	118
.3	2,356	.3	504	.3	213	.3	117
.4	2,250	.4	493	.4	210	.4	116
.5	2,151	.5	483	.5	207	.5	115
.6	2,059	.6	473	.6	204	.6	113
.7	1,972	.7	463	.7	202	.7	112
.8	1,891	.8	454	.8	199	.8	111
.9	1,814	.9	444	.9	196	.9	110
5.0	1,742	10.0	436	15.0	194	20.0	109
.1	1,675	.1	427	.1	191	.1	108
.2	1,611	.2	419	.2	189	.2	107
.3	1,551	.3	411	.3	186	.3	106
.4	1,494	.4	403	.4	184	.4	105
.5	1,440	.5	395	.5	181	.5	104
.6	1,389	.6	388	.6	179	.6	103
.7	1,341	.7	380	.7	177	.7	102
.8	1,295	.8	373	.8	174	.8	101
.9	1,251	.9	367	.9	172	.9	100

Note: This table differs from conventional representations of average spacings and equivalent trees per acre in that it gives values interpolated to the nearest tenth of a foot. This table will probably be most useful for research purposes.

TABLE 2.—Range in trees per acre for average spacings

Spacing class in feet	Trees per acre
2	19,359—6,970
3	6,969—3,556
4	3,555—2,151
5	2,150—1,440
6	1,439—1,031
7	1,030— 774
8	773— 603
9	602— 483
10	482— 395
11	394— 329
12	328— 279
13	278— 239
14	238— 207
15	206— 181
16	180— 160
17	159— 142
18	141— 127
19	126— 115
20	114— 104

Note: This table shows the range in trees per acre for each 1-foot spacing class, as taken to the nearest hundredth of a foot. For example, the 6-foot class covers a range from 5.51 to 6.50 feet before it either rises to 5 feet or drops to 7. These limits are equivalent to 1,439 and 1,031 trees per acre, respectively. As long as there are 1,031 trees or more per acre surviving, the spacing is still in the 6-foot class, i.e. closer to 6 feet than 7 feet.

TABLE 3.—Survival standards for average spacings

Spacing class in feet	Minimum acceptable survival
	Percent
2	65
3	74
4	80
5	83
6	86
7	88
8	89
9	90
10	91
11	92
12	93
13	93
14	94
15	94
16	95
17	95
18	95
19	96
20	96

Note: The lower limit of each spacing class is expressed as a percent of the average spacing, to represent the minimum allowable survival below which the spacing would fall to the next class. For example, the average spacing of the 6-foot class represents 1,210 trees per acre, and the lower limit, 1,031 trees per acre (table 2).  $1,031/1,210=85.2$  percent. Therefore, a survival of at least 86 percent is required to maintain an average spacing in the 6-foot class.

TABLE 4.—Trees per acre according to percent survival

Planted spacing in feet	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent
	10	20	30	40	50	60	70	80	90
	Equivalent trees per acre								
2	1,089	2,178	3,267	4,356	5,445	6,534	7,623	8,712	9,801
3	484	968	1,452	1,936	2,420	2,904	3,388	3,872	4,356
4	272	544	817	1,089	1,361	1,633	1,905	2,178	2,450
5	174	348	523	697	871	1,045	1,219	1,394	1,568
6	121	242	363	484	605	726	847	968	1,089
7	89	178	267	356	444	533	622	711	800
8	68	136	204	272	340	409	477	545	613
9	54	108	161	215	269	323	377	430	484
10	44	87	131	174	218	262	305	349	392
11	36	72	108	144	180	216	252	288	324

See footnote at end of table.

TABLE 4.—Trees per acre according to percent survival—Continued

Planted spacing in feet	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent
	10	20	30	40	50	60	70	80	90
	Equivalent trees per acre								
12-----	30	60	91	121	151	181	211	242	272
13-----	26	52	77	103	129	155	181	206	232
14-----	22	44	67	89	111	133	155	178	200
15-----	19	39	58	78	97	116	136	155	175
16-----	17	34	51	68	85	102	119	136	153
17-----	15	30	45	60	76	91	106	121	136
18-----	13	27	40	54	67	80	94	107	121
19-----	12	24	36	48	60	73	85	97	109
20-----	11	22	33	44	54	65	76	87	98

Note: This presents the equivalent number of living trees per acre for a given combination of average planted spacing and percent survival.

TABLE 5.—Survival percent according to number of trees for acre

Planted spacing in feet	100	200	300	400	500	600	700	800	900	1000
		Equivalent percent survival								
2-----	0.9	1.8	2.8	3.7	4.6	5.5	6.4	7.3	8.3	9.2
3-----	2.1	4.1	6.2	8.3	10.3	12.4	14.5	16.5	18.6	20.7
4-----	3.7	7.3	11.0	14.7	18.4	22.0	25.7	29.4	33.1	36.7
5-----	5.7	11.5	17.2	23.0	28.7	34.4	40.2	45.9	51.7	57.4
6-----	8.3	16.5	24.8	33.0	41.3	49.6	57.8	66.1	74.4	82.6
7-----	11.2	22.5	33.7	45.0	56.2	67.5	78.7	90.0	—	—
8-----	14.7	29.4	44.0	58.7	73.4	88.1	—	—	—	—
9-----	18.6	37.2	55.8	74.3	92.9	—	—	—	—	—
10-----	22.9	45.9	68.8	91.7	—	—	—	—	—	—
11-----	27.8	55.6	83.3	—	—	—	—	—	—	—
12-----	33.1	66.2	99.3	—	—	—	—	—	—	—
13-----	38.8	77.5	—	—	—	—	—	—	—	—
14-----	45.0	90.1	—	—	—	—	—	—	—	—
15-----	51.5	—	—	—	—	—	—	—	—	—
16-----	58.8	—	—	—	—	—	—	—	—	—
17-----	66.2	—	—	—	—	—	—	—	—	—
18-----	74.6	—	—	—	—	—	—	—	—	—
19-----	82.6	—	—	—	—	—	—	—	—	—
20-----	91.7	—	—	—	—	—	—	—	—	—

Note: This is a restatement of information in table 4, presenting instead of the equivalent survival percent for a given average planted spacing and number of surviving trees.