Conclusion

It has been stated that the damage caused by Sirex is at the moment really quite small. This is so but given favourable conditions the insect will increase its numbers and the damage caused will be greater.

It is as well for the plantation owner to keep in view the difficulties in connection with biological control; for it is slow to establish, and requires much patient investigation. To merely say "If an infestation commences, leave it to the entomologist!" is to shuffle out of a large part of his duties and such a policy is fraught with grave danger. The prevention of a serious infestation particularly such a one as that threatened by Sirex lies in the carrying out of sound silvicultural methods and the practising of the elementary rules of forest sanitation. Many individuals and private companies have shown their long-sightedness by following the lead of the Government and planting exotics thereby increasing the national as well as their own resources. But while with the initial effort the movement has been given an excellent start, more is required. The present planting spacing of 8 feet by 8 feet is no doubt the most suitable distance, but not all will form the final crop. A series of regular thinnings throughout the life of the stand is necessary. These thinnings represent an intermediate yield and should be removed. To thin the stand and leave the thinnings lying is to defeat the main objects of the operation, those of securing an intermediate return and of keeping the stand healthy. It has been shown that Sirex will readily attack dead timber; high stumps, wind-fallen trees, and thinnings that are left to lie are favourite places for the female to oviposit. Forest sanitation demands primarily that the forest floor should be kept clear, as far as possible, of all dead and fallen matter. Trees which have become infected should be removed without delay, piled in a convenient place and burnt. The practice of removing the infected trees, sawing them for firewood and leaving them stacked for some time, possibly years, must be condemned. The larvae will live and develop just as well whether the tree is in 4 foot lengths or is entire and in due course will issue from the firewood pile as adults ready to play their part in the reproductive processes and so increase to no small extent the numerical strength of this insect pest.

With the large number of private plantations established which are in the younger stages of growth little attention in the way of thinnings will probably be necessary for some time but so soon as complete canopy is formed and definite suppression of some members takes place the commencement of a regular series of thinnings is indicated. The establishment and maintenance of the exotic plantations is one of the most striking features of present day economic development in the Dominion. These plantations in a healthy state, such as sound silvicultural methods ensure, represent an asset of enormous value; in an uncared-for state with large numbers of dead, unhealthy and suppressed trees much of this valuable asset is transformed into a definite danger. Neglected plantations of forest trees merely form in many cases breeding grounds for harmful insects. Eucalypt plantations are to be seen to-day in Canterbury which have failed through neglect or through the unsuitability of the site and these still remain a deal loss from the forester's point of view, that is financially; while more serious, they have become a mere breeding ground for our many Eucalypt pests, the control of which is becoming an increasingly complex problem. With other exotic plantations the same will apply and all those who have established or helped to establish exotic plantations should co-operate in the keeping of the stands in a healthy, properly thinned, and clean condition, thereby doing a very large share in combating the present danger and also ensuring a quicker, greater and better quality yield of forest produce from their stands at maturity.

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MEASUREMENTS IN A SAMPLE PLOT IN YOUNG RIMU

(M. R. Skipworth)

The data set out below are the result of the remeasurement in September, 1927, by the students of the School of Forestry as a field exercise in forest mensuration, of a permanent sample plot installed in January, 1921, by the State Forest Service in a stand of pole rimu near Hokitika in the tract known as Perry's Bush.

The resulting figures on increment, it is thought, will be of interest to all readers of Te Kura Ngahere, as being the first such data to be published, so far as is known, dealing with growth of the native forest on a per acre basis. The figures given are quite unofficial. The State Forest Service, to whom belongs the credit of establishing the plot, has kindly consented to our publishing here the results of our own measurements, but is of course in no way responsible for the figures themselves. The methods used in computing increment are standard, however, and the computations have been carefully checked.

The plot as originally installed consisted of an area of 0.2 acres* on which were measured and numbered fifty** trees above 3 inches D.B.H., being mainly rimu with a few silver pine, all the trees being in the pole stage, and mainly of good form, though a few forked trees, particularly of silver pine, exist. The site is coastal flat, about one mile from the sea coast, elevation approximately 30 feet, location close to the Ross Railway Line about one mile north of Takutai Station. It seems that this area was originally milled over in very early days, and the pole stand now on the ground is natural regeneration all post-dating the time of milling. This, however, has not been definitely verified.

At the time when measured by the student field party in September, 1927, the plot had been extended in size to about 0.8 acres, including 200 numbered taxad trees, the area had been fenced in and over the greater part of the enlarged plot the underscrub had been removed. A few pole size kamahi and Quintinia are to be found on the plot. These broad-leaved trees are not numerous here, and have not been numbered. The records of the initial measurement possessed by the students consisted of a sheet giving for each tree its number, species, circumference at breast height in centimetres, and a note as to its health and vigour. Measurements taken on the plot were, for each tree by numbers, its D.B.H. in inches, and as a precautionary measure, its new circumference breast high in centimetres. Representative heights were taken by Abney over the whole range of D.B.H.'s.

Computations were as follows:—The 1921 circumferences in centimetres were converted to inches diameter. A curve of height on D.B.H. for 1927 measurements was then prepared from the sample heights measured, and from this curve the present height of all trees on the plot were read off. Next, lacking any data on height in 1921, heights were obtained for that year by reading off the 1927 height curve values corresponding to the D.B.H. as possessed in 1921. This method is of course not strictly correct, but gives a very conservative result. Volumes were then computed for each tree by the paraboloidal formula, $\frac{bh}{2}$ the basal area taken being that at breast height, thus neglecting stump swell. All computations given are for total cubic volume including bark.

The results of the computation are set out below in a series of tables.

Table I.—Detailed Sheet of Measurements of all Trees.

Table II.—Summary Sheet for the Plot.

Table III.—Statistics of Growth per Acre.

In regard to the above tabulations, the following points may be mentioned. First, in Table I. the greatest increase in diameter is that of tree No. 25, a silver pine which apparently increased from 3.72 inches to 6.40 inches. This is perhaps due to an error in recording in the 1921 figures as no other silver pine shows such growth. Aside from this instance, however, the increases appear to be consistent. Several rimu trees, notably those above the average in D.B.H., have made increases of approximately one inch in diameter at that point, while the total growth of 83 cubic feet per acre per year, even though made on a stand at present far short of merchantability, indicates that the growth in the native forests is greatly in excess of current estimates, and well worth fuller investigation.

Study of Table I. would indicate that the stand is overcrowded and is badly in need of a thinning. This conclusion is pointed to by the fact that the larger trees have made the larger growth while on a great number of smaller trees the growth has been comparatively insignificant. Also in 1921 there were 16 trees of greater than average D.B.H. In 1927 this number had increased to 18, due presumably to a dragging down of the average basal area due to the very small growth taking place on the smaller trees. A heavy thinning of the smaller trees might greatly stimulate the growth of the remainder.

Editor's Note

Tree No. 28 is of particular interest. The largest tree on the plot, it was presumably passed over at the time of milling many years ago, and represents a much older age group than the other trees. With its head high above the other crowns it appears to have been making good growth, and though its diameter increase for the period under discussion is only 0.9 inches, this represents a volume increase of 11 cubic feet or, on a merchantable bole such as this, an increment of 70 super feet, or roughly 10 super feet per year, which at a royalty of 2/6 per hundred is an increase in value of 2/6 per tree per ten years, or 3d. per year. This may or may not prove to be practical forestry. Further investigation is urgently needed on this point.

** Including one dead silver pine.

* This area is not exact, thus introducing a slight error, which may cause a difference of a few cubic feet per acre. Its effect is very small.

WESTLAND RIMU BUSH—PERRY'S BUSH SAMPLE PLOT

TABLE I.—1921-1927 MEASUREMENTS ON FIRST FIFTY TREES

No. of Tree	Species	D.B.H.		Height		Basal Area		Cub. ft. Volume		Increase in Volume Cubic Feet
		1921	1927	1921	1927	1921 Sq. Ft.	1927	1921	1927	
1	Rimu	6.56	7.25	54	57	.235	.287	6.34	8.18	1.84
2	Silver Pine	5.05	5.30	46	47	.139	.153	3.20	3.59	.39
3	„ „	5.15	5.29	46	47	.144	.153	3.31	3.58	.27
4	Rimu	10.05	10.73	67	69	.550	.627	18.42	21.53	3.11
5	„	7.21	7.90	57	60	.284	.340	8.09	10.20	2.11
6	„	5.88	6.12	51	52	.185	.203	4.72	5.28	.56
7	Miro	9.00	9.30	64	65	.442	.472	14.14	15.34	1.20
8	Rimu	6.28	6.75	53	55	.215	.248	5.70	6.82	1.12
9	„	7.38	7.80	58	60	.297	.332	8.61	9.96	1.35
10	„	4.12	4.20	39	40	.092	.096	1.79	1.92	.13
11	„	7.19	7.90	57	60	.282	.340	8.04	10.20	2.16
12	„	5.74	5.95	50	51	.179	.193	4.47	4.92	.45
13	„	10.01	10.55	67	69	.546	.607	18.29	20.94	2.65
14	„	7.34	8.00	58	60	.294	.349	8.53	10.47	1.94
15	„	4.83	5.20	45	47	1.28	.147	2.88	3.45	.57
16	„	6.04	6.75	52	55	.199	.248	5.17	6.82	1.65
17	Silver Pine	dead								
18	Rimu	5.75	6.10	51	52	.180	.203	4.59	5.28	.69
19	„	4.68	5.10	44	46	.119	.142	2.62	3.27	.65
20	Silver Pine	6.53	6.75	54	55	.233	.248	6.29	6.82	.53
21	Rimu	5.54	5.75	49	50	.167	.180	4.09	4.50	.41
22	„	5.98	6.60	51	54	.195	.238	4.97	6.43	1.46
23	„	8.34	9.00	61	64	.380	.442	11.59	14.14	2.55
24	„	5.50	6.10	48	52	.165	.203	3.96	5.28	1.32
25	Silver Pine	3.72	6.40	36	54	.076	.223	1.37	6.02	4.65
26	Rimu	6.12	6.70	52	55	.204	.245	5.30	6.74	1.44
27	„	9.45	10.10	65	67	.487	.556	15.83	18.63	2.80
28	„	20.60	21.50	84	86	2.315	2.521	97.23	108.40	11.17
29	Silver Pine	5.48	5.80	49	51	.163	.183	3.99	4.67	.68
30	Rimu	8.25	9.00	61	64	.371	.442	11.32	14.14	2.82
31	„	9.23	10.10	65	67	.465	.556	15.11	18.63	3.52
32	„	4.71	5.1	44	46	.120	.142	2.64	3.27	.63
33	„	7.83	8.2	60	61	.334	.367	10.02	11.19	1.17
34	„	8.20	9.0	61	64	.367	.442	11.19	14.14	2.95
35	„	13.18	14.2	74	76	.947	1.100	35.04	41.80	6.76
36	„	6.23	6.5	53	54	.212	.230	5.62	6.21	.59
37	Silver Pine	5.76	5.78	50	51	.180	.182	4.50	4.64	.14
38	Rimu	9.32	10.2	65	68	.474	.567	15.41	19.28	3.87
39	„	6.62	7.4	55	58	.239	.299	6.57	8.67	2.10
40	„	4.71	4.8	44	45	.120	.126	2.64	2.84	.20
41	„	9.18	10.0	64	67	.460	.545	14.72	18.26	3.54
42	„	7.98	9.0	60	64	.348	.442	10.44	14.14	3.70
43	„	7.77	8.6	59	62	.329	.403	9.71	12.49	2.78
44	„	8.09	9.0	60	64	.358	.442	10.74	14.14	3.40
45	„	5.25	5.45	47	49	.150	.162	3.03	3.97	.94
46	„	13.18	14.3	74	76	.947	1.115	39.04	42.37	3.33
47	„	11.28	12.2	70	73	.694	.812	24.29	29.64	5.35
48	„	11.35	12.5	71	73	.702	.852	24.92	31.10	6.18
49	„	9.35	10.0	65	67	.477	.545	15.50	18.26	2.76
50	„	7.39	8.0	58	60	.298	.349	8.64	10.47	1.83

TABLE II.—SUMMARY FOR THE PLOT—AREA 0.2 ACRES

(a) Statistics of the average tree, all species, based on 49 living trees, from Table I.

D.B.H. (inches)			Height (feet)			Basal Area (sq. ft.)			Volume (cu. ft.)		
1921	1927	Inc.	1921	1927	Inc.	1921	1927	Inc.	1921	1927	Inc.
8.17	8.71	.54	56.5	59.0	2.5	.356	.414	.058	11.50	13.72	2.22

(b) Totals for the Plot—49 living trees.

Numbers Living Trees

	1921	1927	Mortality
Rimu	42	42	Nil
Silver Pine	6	6	Nil
Miro	1	1	Nil

Total Basal Area (square feet)—

	1921	1927	Increase
All Species	17.49	20.30	2.81

Total Volume (cubic feet)—

	1921	1927	Increase
Rimu only	526.82	627.37	100.55
All Species	563.62	672.03	108.41

TABLE III.—STATISTICS OF GROWTH PER ACRE.

(a) All Species.

No. of trees per acre 1921—245
1927—245
Volume per acre..... 1921—2,818.1 cub. ft.
1927—3,360.2 cub. ft.
Increment during 6½ years 542.1 cub. ft.
Periodic Annual Increment (per acre)—
83.4 cub. ft.
Periodic Annual Growth per cent
(by Pressler's Formula) 3.19%

(b) Rimu only—

No. of trees per acre, both periods—210
Volume per acre ..... 1921—2,634.10 cub. ft.
1927—3,136.85 cub. ft.
Increment per acre, 6½ years 502.75 cub. ft.
Periodic Annual Increment per acre—
77.35 cub. ft.
Periodic Annual Increment per cent—
3.17%

ANOMALOUS TISSUE IN THE STEM OF RIMU

(C. S. Barker)

While carrying out an investigation on the sapwood and hardwood of Rimu (Dacrydium cupressinum), (Soland.), a peculiar form of cell growth was noted in the pith and radiating out from the latter. These radiants protrude in some trees from 15-20 growth rings.

Microscopically this growth may be confused with "star-shake," which it resembles in appearance though not in texture, as "star-shakes" are clefts in the wood filled with resin, while the phenomenon under discussion consists of a system of radiating cell tissue, somewhat darker than the ground mass. This anomalous structure was noted up to 1.5 mm. in width; the length could not be ascertained as only discs of about 4 cms. in width were investigated. These discs were cut from the butt and top sections of the merchantable boles of the trees, the top discs showing the structure of the same extent as the butt discs, so there may be reason to believe that it extends throughout the length of the tree. On split longitudinal radial surfaces the structure appeared as an irregular dark mass.

Microscopically the structure takes up a cellular form. The cells are filled with a brownish content. The structure often completely surrounds isolated masses of normal secondary tissue, the latter looking as though they had been torn away from the parent mass, and if the abnormal tissue was taken away the normal isolated masses could be joined up cell to cell with the ordinary xylem ground mass. In longitudinal radial section these intrusions at times show that they may have an origin at some common point.

The cells of this abnormal tissue are irregular in shape and size. The walls are very thick in proportion to normal parenchymous or prosenchymous tissue in Rimu. As seen in transverse section the walls are up to 8 μ