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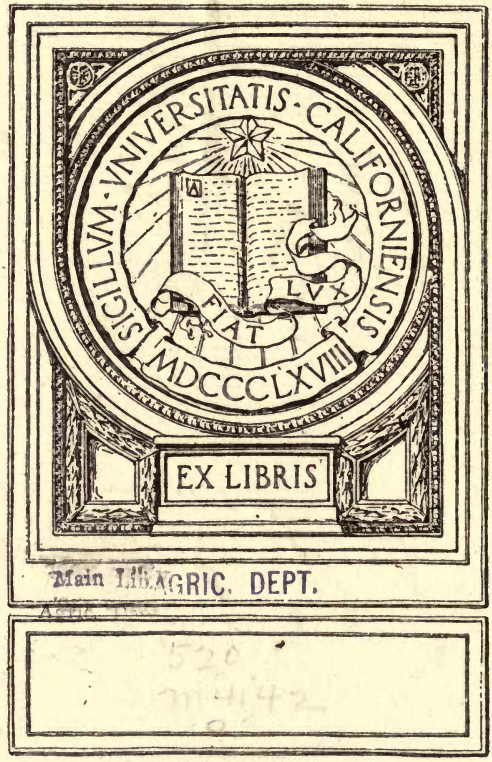

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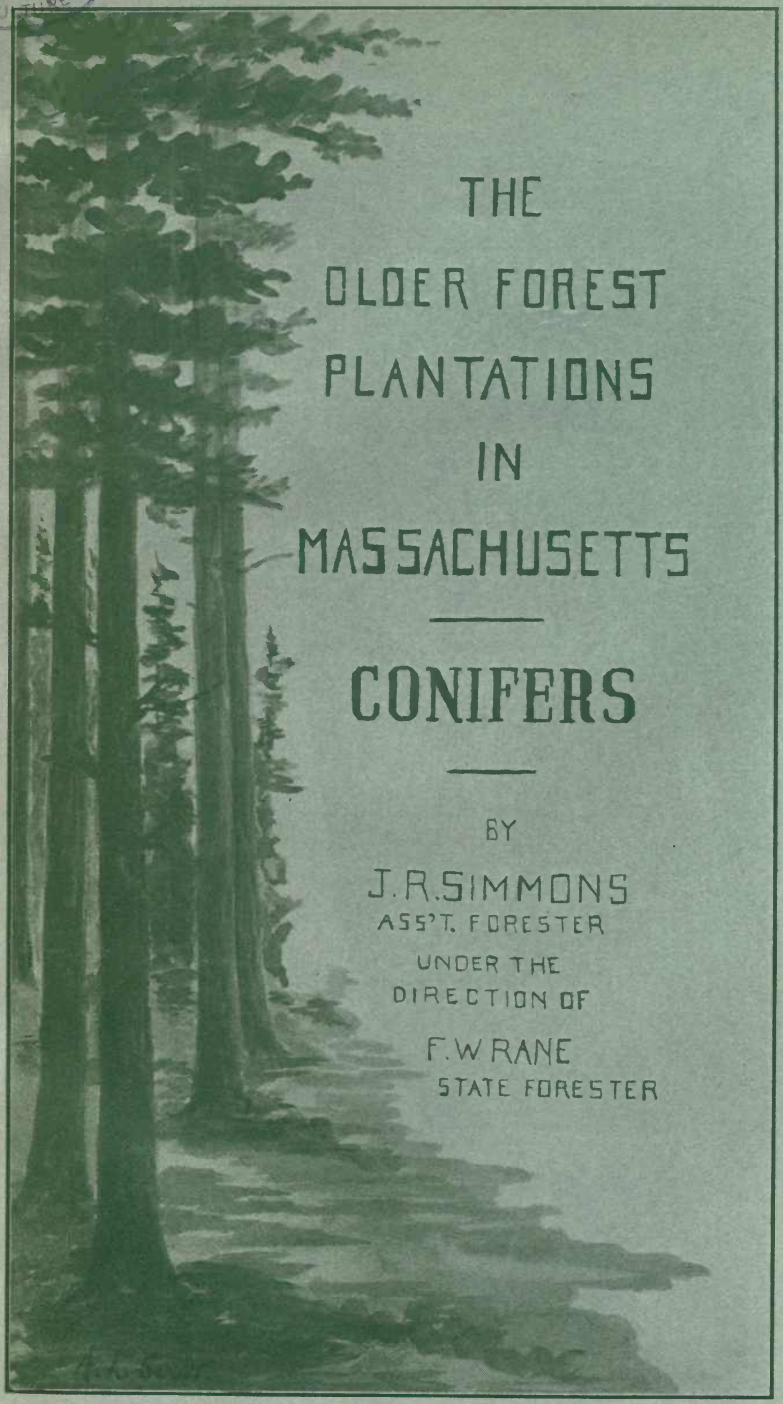

THE OLDER FOREST PLANTATIONS IN MASSACHUSETTS

CONIFERS

BY

J. R. SIMMONS
ASS'T. FORESTER

UNDER THE
DIRECTION OF

F. W. RANE
STATE FORESTER

Massachusetts. State forester.

THE OLDER FOREST PLANTATIONS IN MASSACHUSETTS.

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J. R. SIMMONS, ASSISTANT FORESTER, UNDER THE DIRECTION OF
F. W. RANE, STATE FORESTER.

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FOREWORD.

Mr. Simmons has brought together in this bulletin some very valuable information. All of the examples cited are results of actual early planting in this State.

Many of the plantations, it may be said, have not had the normal conditions that would exist to-day. Most of the stock planted was wild stock dug from the surrounding country, and in some instances the land used was extremely inferior.

With nursery-grown transplants, adaptable soils and modern methods of thinning far better results may be had in the future.

The results reported herewith are extremely conservative, and the reader, I am sure, cannot help receiving encouragement in attempting forest planting of pine in this State.

Interest in reforestation is growing rapidly each year, and we may anticipate what our well-directed efforts of to-day will bring forth twenty-five to fifty years hence by the results here shown.

Every 1,000 acres planted now will mean much to posterity, and, as well, reflect great credit and profit to our generation.

F. W. RANE,
State Forester.

FEB. 1, 1915.

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FOREST PLANTATIONS IN MASSACHUSETTS.

Introduction.

The object of this bulletin is to show the practicability and results of forest planting of coniferous trees, and deals with plantations which have reached an age when value can be measured in terms of lumber. The tracts selected for observation were originally planted by private individuals who represent the pioneers in the work of reforestation in this State. By interviewing these owners, or those to whom their property has been handed on, a considerable amount of information has been collected with regard to the objects which they had in mind in the beginning, the methods employed and the later management of their plantations. To this has been added measurements of each wood lot, either as a whole, or by the selection of sample plots, and the contents computed as described in the succeeding pages. The data and accompanying illustrations were taken in 1914. It is the desire of the State Forester to encourage those who own waste land to bring it back into forest production. This investigation represents one method of showing what may be expected from such an undertaking.

Early Methods and Interest in Forest Planting.

The period between 1820 and 1880 was one of enthusiastic planting of pine in New England. The lumberman foresaw the time when natural white pine as a marketable commodity would be gone, and the rise in prices would make planted timber of economic importance. Large plantations were made by private owners, and a few by corporations. Seedlings were usually dug up from the fields lying around old seed pines, and planted either at random or in rows, and spaced at distances

varying from 4 to 15 feet. Seed plots were attempted by some, and others even tried out broadcast sowing. At the end of this period there were in Massachusetts alone forest plantations of white pine to the extent of 10,000 acres.[1]

Typical of the forest planters of this time was Mr. Augustus Pratt, a former member of the State Board of Agriculture, who, when nineteen years old, planted pine seed on an old pasture belonging to his father. The wood lot which thus developed has been recently cut, and was between forty and fifty years old.

After 1880 interest began to decline, chiefly because of the immense supply of lumber brought from the region of the Great Lakes at a low rate of transportation and the inadequate methods of combating forest fires; these conditions tended to gradually dampen the enthusiasm of the forest planter.

Present Need of Reforestation.

We are now entering once more upon a campaign for the reclamation of waste land. This is due not alone to the decrease in our supply of lumber, but also to the following facts: —

There is a growing sentiment among our people for forests and scenic beauty. There are nearly 1,000,000 acres of waste land in Massachusetts; our hardwood forests are threatened by gypsy, brown-tail and other moth pests, and our beautiful chestnut tracts by the ever-increasing chestnut bark disease. Improved methods of forest-fire fighting and the co-operation of railroads, local fire departments and individuals have made possible the protection of forests, once they have been acquired.

Coniferous trees offer the best means of realizing our present needs. They act as the most effective check upon the devastations of the moth, being unedible to the brown-tail, while the gypsy will pass them by if he can find anything else upon which to subsist.[2] Beneath a pine forest there is always a thick bed of needles which keeps the ground moist and free from sprouts and deciduous seedlings. Therefore, while pine develops tremendous heat in case of fire, it prevents the collec-

[1] United States Forest Service Bulletin No. 35.

[2] See Massachusetts State Forester's Bulletin on "Improvement Thinnings."

tion of inflammable material which would feed on ordinary ground fire; in other words, it is a good preventive against the first causes.

Recent Plantations.

Excellent plantations of pine, ranging from trees a few inches in height to 15 or 20 feet, may be seen on the watersheds of many of our lakes and streams. A large number of individuals and corporations in all parts of the State have undertaken reforestation, either upon their own initiative or with the cooperation of the State Forester. In 1914 the amount of land planted under the reforestation act was 550 acres. In addition to this, the Massachusetts State institutions and commissions planted about 700 acres. The transplants were supplied from the State Forester's nursery at Amherst, Mass. A new State Forest Commission has, within the year, been appointed by the Governor, and empowered to acquire wild and waste lands for the purpose of converting them into State forests. These lands will be turned over to the State Forester for planting and management. In most parts of the State the work of private forestry companies is also becoming evident. To many people a flourishing forest is sufficient remuneration. For the economic advantages of reforestation the reader is referred to the measurements given herewith, and also to "Forest Mensuration of the White Pine," which can be obtained by writing to the State Forester.

The Forest Taxation Law.

The advantages of the new forest taxation law should be known and understood by those interested in the subject of reforestation. In order to benefit by the provisions of the law the forest plantation must first be registered. The law then substitutes for the general tax on land and timber two taxes, *i.e.*, one on the land at its own value, the same as if all the trees had been removed, and one equal to 6 per cent. of the stumpage value, payable when the timber is cut. The owner of a registered plantation would therefore pay an annual tax on the value of his land ($1 to $10 per acre, which at a $20 rate would amount to 2 to 20 cents) so long as the plantation stood, and a yield tax of 6 per cent. when the timber was cut

($10 to $20 per acre). These two taxes would be considerably less than the amount paid under the present system, and their amount would be a known quantity, because the owner could determine in advance the amount which he would have to expend. Under the old system he would be subject to the judgment of his assessors, who can raise the amount of his valuation from year to year. The reader is referred to the Massachusetts State Forester's Bulletin, "The Forest Taxation Law."

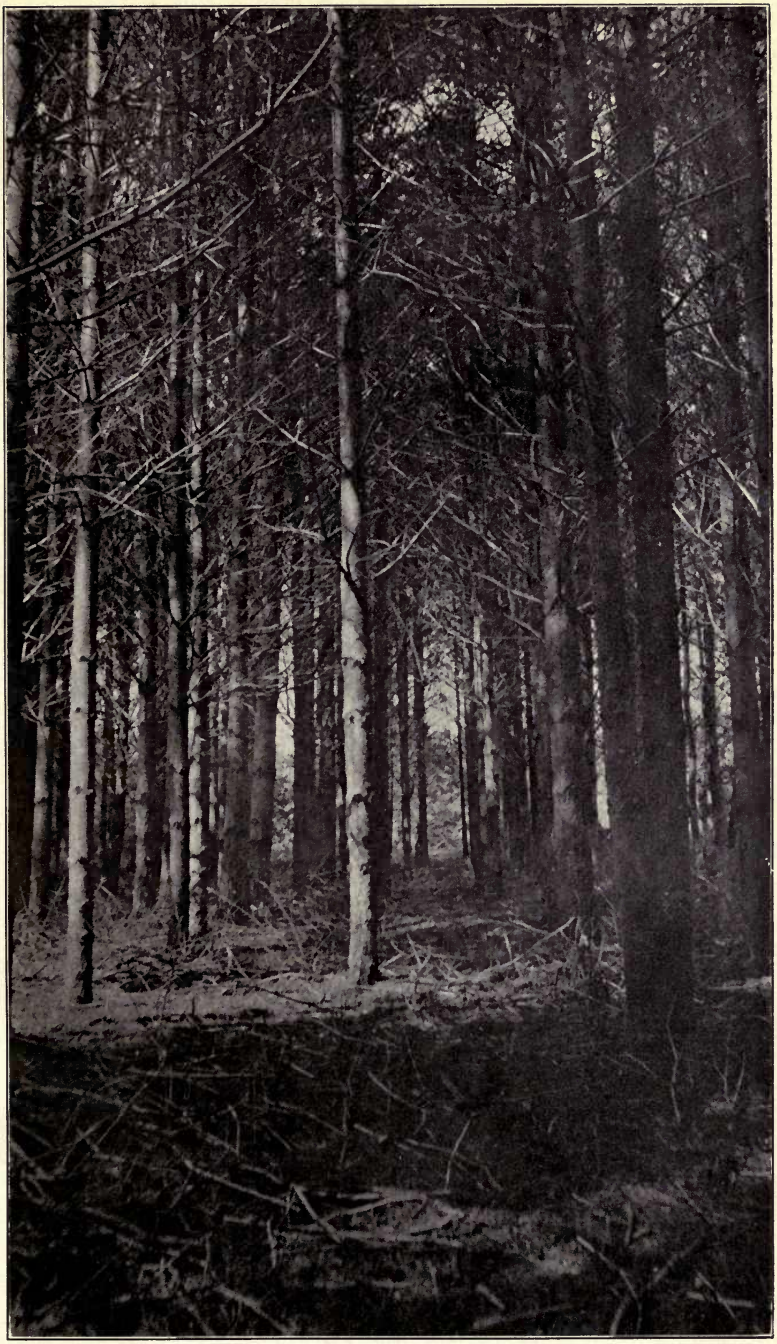
Plantations.

South Orleans, Mass. — Owner, John Kenrick.

History. — This plantation was made in March, 1876, by John Kenrick, Sr., and consists of about 7 acres of white pine, Scotch pine and American larch. Previous to planting, the land had borne rye for one year and corn for two years, and the trees were set out on the corn stubble 4 feet apart. On a portion of the tract, instead of using seedlings, small seed spots were sown, always with the same spacing. The larch consisted entirely of seedlings. In spite of the close spacing, the trees have made a remarkable growth for this section of the State, and there are very few blank spaces, even where the seed was used. Occasionally a small group of trees more slender than the others marks where several seedlings sprang up as if from a single root out of the seed spot, but usually the most vigorous tree has crowded out the others.

Objects. — Personal interest in forest planting, and to demonstrate the practicability of forest planting on Cape Cod; to improve and utilize land otherwise of little agricultural value.

Treatment. — The original owner lived to make his first forest thinning, though well on in years when the planting was done. This was confined almost entirely to removing the dead and overcrowded trees. The 4-foot spacing remains in evidence throughout most of the tract. A large number of trees could now be removed to advantage, but even as they stand they present a marked contrast to the native pitch pine, being taller and of greater diameter.



Thirty-eight year old plantation of white pine. John Kenrick, South Orleans, Mass.

Thirty-eight year old plantation of Scotch pine. John Kenrick, South Orleans, Mass.

Plot No. 1. White Pine predominating.

Sample plot, 280 by 110 feet; age, thirty-eight years.

Diameter Breast High (Inches).	Number of Trees.			Board Feet.
	White Pine.	Scotch Pine.	Height (Feet).	
5,	70	25	35	1,188
6,	59	21	35	1,400
7,	55	23	35	1,950
8,	38	21	40	2,065
9,	21	14	40	1,575
10,	16	8	40	1,320
11,	8	6	45	1,085
12,	7	2	45	810
13,	–	4	45	410
14,	1	–	45	120
Total,	275	125	40[1]	11,923

Total number of trees to acre, 571.
Total board feet to acre, 17,033.

[1] Average height.

Plot No. 2. Scotch Pine predominating.

Area, ¼ acre; age, thirty-eight years.

Diameter Breast High (Inches).	Number of Trees.		Board Feet.
	Scotch Pine.	White Pine.	
5,	21	14	525
6,	15	19	680
7,	22	7	870
8,	26	12	1,330
9,	7	5	540
10,	5	–	275
11,	–	–	–
12,	1	–	75
Total,	97	57	4,295

Total number of trees to acre, 616.
Total board feet to acre, 17,180.
Average height, 40 feet.

Plot No. 3. Tamarack.

Area, ¼ acre; age, thirty-eight years.

Diameter Breast High (Inches).	Number of Trees.	Board Feet.
5,	19	238
6,	29	508
7,	27	675
8,	15	450
9,	10	375
10,	4	190
11,	1	60
12,	1	70
13,	1	80
Total,	107	2,646

Total number of trees to acre, 428.
Total board feet to acre, 10,584.
Average height, 35 feet.

Plot No. 4. Tamarack.

Area, ¼ acre; age; thirty-eight years.

Diameter Breast High (Inches).	Number of Trees.	Board Feet.
5,	92	920
6,	51	765
7,	32	640
8,	5	125
9,	1	30
10,	2	80
Total,	183	2,550

Total number of trees to acre, 732.
Total board feet to acre, 10,200.
Average height, 30 feet.

West Monponsett Lake, Mass. — Owner, Frank H. Albee.

History. — Before this land was bought by the present owner it was covered with a beautiful plantation of white pine. This was for the most part lumbered in 1913 and cut, according to the buyer of the timber, 30,000 board feet to the acre. Measurements have been made of a sample acre of stumps and one inch

deducted to determine the diameter of the original trees breast high. The plantation was made about forty-six years ago by Samuel Alden, East Bridgewater, Mass., and a Mr. Kingman of Brockton, Mass., and the land selected was on an abandoned farm. Planting was begun in the fall and finished in the spring, and the spacing was done by means of cross-plowed furrows about 10 feet apart.

Objects. — Interest in reforestation, and to utilize waste land.

Treatment. — The removal of dead trees was the only care given this tract, so far as could be determined. The wide spacing prevented excessive overcrowding, but the diameter growth was much better than the height, as estimated from the few trees left standing.

Sample Plot.

Area, 1 acre; age, forty-six years.

Diameter Breast High (Inches).	Number of Trees.	Height (Feet).	Board Feet.
8,	13	30	325
9,	9	30	270
10,	26	30	1,040
11,	17	30	850
12,	44	40	3,300
13,	44	40	3,740
14,	54	40	5,400
15,	40	40	4,600
16,	36	40	4,860
17,	19	50	3,800
18,	9	50	2,115
19,	2	60	670
20,	1	60	380
21,	1	60	430
Total,	315	42[1]	31,780

[1] Average height estimated.

Rehoboth, Mass. — Owners, Miss Fannie Douse and Mrs. Clara I. Hubbard.

History. — This fifty-five year old plantation was made by Mr. Christopher Carpenter. Pasture trees were used and the spacing was about 8 to 10 feet. At the end of the first ten

years the trees had reached the height of a man's head. The property is now in the possession of Miss Fannie Douse and Mrs. Clara I. Hubbard.

Treatment. — About four years ago the dead trees were removed and measures taken to protect the plantation from forest fires.

An examination of the tract showed so regular a growth, and so much care in lining up the rows, that a slightly different method was used in measuring it, as follows: —

Two rows of trees through the plantation were measured for heights and diameters, and the contents in each case multiplied by the total number of rows. As a check on this work, a sample quarter acre was measured, with about the same average result.

Row No. 1.

Area, 7 acres; age, fifty-five years.

Diameter Breast High (Inches).	Number of Trees.	Board Feet.
6,	4	120
7,	1	40
8,	5	250
9,	7	420
10,	4	300
11,	7	630
12,	13	1,265
13,	4	480
14,	4	560
15,	2	320
16,	–	–
17,	1	260
Total,	52	4,645

Total number of rows, 66.
Total board feet, 306,570.
Total number of acres, 7.

Total board feet to acre, 43,796.
Average height, 50 feet.

Fifty-five year old plantation of white pine owned by Mrs. Clara I. Hubbard and Miss Fannie Douse, Rehoboth, Mass.

A view of the same tract, taken inside the woods.

Row No. 2.

Diameter Breast High (Inches).	Total Number of Trees.	Board Feet.
6,	1	30
7,	2	80
8,	2	100
9,	5	300
10,	11	825
11,	6	540
12,	12	1,260
13,	7	840
14,	2	280
15,	–	–
16,	2	360
Total,	50	4,615

Total number of rows, 66.
Total board feet, 304,590.
Total number of acres, 7.
Total board feet to acre, 43,512.
Average height, 50 feet.

Total Results Averaging Rows Nos. 1 and 2.

Area, 7 acres.
Number of trees to acre, 480.
Board feet to acre, 43,654.

Sharon, Mass. — Owner, Mr. Edwin Fobes.

History. — The original planter was Mr. Lyman Plimpton, who in 1858 planted white pine on the site of an old peach orchard which had been killed by blight. When first made, the plantation comprised about 6 acres, but a forest fire swept through it a number of years ago, destroying or badly damaging over half of it. A few of the remaining trees show scars upon their trunks, but otherwise appear very thrifty.

Purposes. — To utilize poor land. Interest in forestry, from the standpoint of lumber value and beauty of landscape.

White Pine.

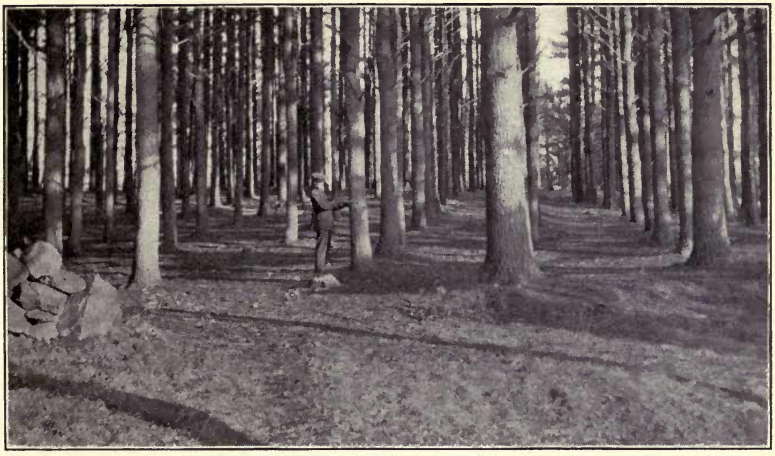
Area, 2 acres; age, fifty-six years.

Diameter Breast High (Inches).	Number of Trees.	Height (Feet).	Board Feet.
6,	16	60	480
7,	23	60	1,150
8,	50	60	3,250
9,	75	60	7,875
10,	74	70	9,250
11,	98	70	14,210
12,	60	70	9,900
13,	35	70	6,650
14,	25	70	5,375
15,	17	75	4,624
16,	12	75	3,660
17,	6	75	2,040
18,	5	75	1,900
19,	5	75	2,110
20,	3	80	1,515
21,	2	80	1,110
22,	2	80	1,190
23,	1	80	640
Total,	509	70[1]	76,929

Total number of trees to acre, 254.
Total board feet to acre, 38,464.

[1] Average height.

Along the road which passes this plantation is a row of pine trees which were planted at the same date. Their growth, on account of the added amount of light they have received, has been so much greater than that of average forest trees that it was deemed advisable to measure them separately. While their height is about 10 feet less than that of the adjoining plantation, they show a far greater diameter growth, which will give some idea of what might be expected from white pine if given every possible advantage.



Fifty-six year old plantation of white pine. Edwin Fobes, Sharon, Mass.

A row of forty-two white pine trees, fifty-six years old. Edwin Fobes plantation, Sharon, Mass.

White pine on the edges of the Edwin Fobes plantation. Note the heavy reproduction in the background.

White Pine.

Measurements for a row of trees along road spaced about 10 feet; age, fifty-six years. (See illustration.)

Diameter Breast High (Inches).	Number of Trees.	Board Feet.
15,	1	200
16,	2	460
17,	–	–
18,	3	885
19,	4	1,340
20,	8	3,040
21,	6	2,880
22,	2	1,040
23,	5	2,825
24,	1	600
25,	4	2,580
26,	4	3,440
27,	2	1,880
Total,	42	21,170

Average height, 60 feet.

Because these trees are planted in a straight row, 10 feet apart, the spread of the branches, laterally, is nearly 50 feet. It would therefore require only about 80 trees of this size to cover an acre of ground. In terms of the above measurements they would yield a little over 40,000 board feet.

Bridgewater, Mass. — Owner, C. M. Cook.

History. — So far as could be ascertained from residents in the vicinity of this small plantation it was made about fifty years ago, trees dug up from the surrounding pastures being used. Stumps within and on the border of the lot show between 45 and 50 rings. Other information than these observations and the measurements given is lacking.

White Pine.

Area, 200 by 320 feet (approximately 1⅗ acres); age, fifty years.

Diameter Breast High (Inches).	Number of Trees.	Average Height (Feet).	Board Feet.
5,	33	40	495
6,	32	40	640
7,	51	40	1,530
8,	59	40	2,065
9,	94	40	4,230
10,	85	50	6,375
11,	78	50	7,020
12,	75	50	7,875
13,	54	50	6,480
14,	29	50	4,060
15,	11	50	1,760
16,	1	50	180
17,	5	60	1,300
18,	4	60	1,180
19,	1	60	335
20,	–	–	–
21,	1	70	480
22,	–	–	–
23,	1	70	565
Total,	614	–	46,570

Total number of trees to acre, 460.
Total board feet to acre, 34,927.

East Bridgewater, Mass. — Owner, Mr. Harris Latham.

History. — Mr. Latham's plantation is one of the largest investigated, and covers about 12 acres. It can be seen from any one of three roads, and has the appearance of a well-kept park. The original planter was Mr. Galen Latham, father of the present owner, and the trees were set out in 1875, in furrows, plowed 8 to 10 feet apart. Pasture trees 10 to 12 inches in height were used.

Objects. — Interest in forestry. To improve the landscape and to utilize land difficult of successful cultivation. To utilize a large number of seedlings which had sprung up in the pasture.

Fifty year old plantation owned by C. M. Cook, Bridgewater, Mass.

Two views of the Harris Latham plantation, East Bridgewater, Mass.; age, thirty-nine years.

Treatment. — No thinnings have been made. A very few dead trees have been removed, and no limbs and refuse allowed to remain on the ground.

This experiment is the most extensive recorded in this bulletin from the standpoint of the number of trees measured. The land was resurveyed as a check on the area.

White Pine.

Area, 12 acres; age, thirty-nine years.

Diameter Breast High (Inches).	Number of Trees.	Board Feet.
5,	470	4,700
6,	749	22,470
7,	896	35,840
8,	981	49,050
9,	927	55,620
10,	705	52,875
11,	371	33,390
12,	170	17,850
13,	85	10,200
14,	53	7,420
15,	15	2,400
16,	8	1,440
Total,	5,430	293,255

Total number of trees to acre, 452.
Total board feet to acre, 24,428.
Average height, 50 feet.

South Lancaster, Mass. — Owner, Mr. Harold Parker.

History. — This plantation was made by the father of the present owner forty-three years ago. Natural seedlings were used, taken from the surrounding woods, and spaced about 10 by 10 feet. The whole area reforested covered between 15 and 20 acres, and, besides pine, several types of hardwoods were planted. The area from which measurements were taken, and devoted almost entirely to pine, is about 4 acres.

Objects. — To utilize waste land for commercial advantage, and to determine what might be expected from planted white pine as an investment. To improve the appearance of the land

from the standpoint of beauty of landscape. Interest in horticulture and the care of woodlands.

Treatment. — In 1905 the government laid out four sample plots, numbered and measured the diameters of all the trees in each plot, and most of the suppressed trees were removed. The total numbers of trees removed (compare following lists of data) were as follows: —

Plot No. 1,	1
Plot No. 2,	73
Plot No. 3,	46
Plot No. 4,	32

A record of the data taken in 1905 was loaned by the United States Forest Service in Washington and compared with measurements made in 1914. For convenience in obtaining board measure, trees whose diameters fell over or under the half-inch division of the rule were recorded to the nearest inch. No height measurements were made in 1905. The heights for that date have therefore been estimated at 5 feet below the measurements for 1914. It is believed that this is a conservative estimate.

Sample Plot No. 1 (Government Plot No. 4).

Area, ¼ acre; age, forty-three years.

Tree Number.	Species.	Diameter Breast High (Inches).		Class.	Board Feet.		Gain in Board Feet.
		1905.	1914.		1905.	1914.	
1,	White pine,	12	12	2	105	120	15
2,	White pine,	12	13	1	105	138	33
3,	White pine,	12	12	1	105	120	15
4,	White pine,	10	12	1	75	120	45
5,	White pine,	10	11	1	75	103	28
6,	White pine,	13	14	1	120	158	38
7,	White pine,	10	10	2	75	85	10
8,	White pine,	10	10	2	75	85	10
9,	White pine,	13	14	1	120	158	38
10,	White pine,	13	14	1	120	158	38
11,	White pine,	13	15	1	120	180	60
12,	White pine,	15	15	1	160	180	20

Forty-three year old plantation of white pine which is making a current annual growth of about 1,000 B. F. to the acre. Harold Parker, South Lancaster, Mass.

Sample Plot No. 1 (Government Plot No. 4) — Continued.

Tree Number.	Species.	Diameter Breast High (Inches).		Class.	Board Feet.		Gain in Board Feet.
		1905.	1914.		1905.	1914.	
13,	White pine,	13	14	1	120	158	38
14,	White pine,	9	9	2	60	70	10
15,	White pine,	12	13	1	105	138	33
16,	White pine,	10	10	1	75	85	10
17,	White pine,	12	13	1	105	138	33
18,	White pine,	11	12	1	90	120	30
19,	White pine,	10	11	2	75	103	28
20,	White pine,	10	10	2	75	85	10
21,	White pine,	10	11	1	75	103	28
22,	White pine,	9	10	2	60	85	25
23,	White pine,	11	11	1	90	103	13
24,	White pine,	8	8	2	50	58	8
25,	White pine,	9	10	2	60	85	25
26,	White pine,	7	7	2	40	45	5
27,	White pine,	11	12	1	90	120	30
28,	White pine,	10	11	1	75	103	28
29,	White pine,	12	14	1	105	158	53
30,	White pine,	14	15	1	140	180	40
31,	White pine,	8	8	2	50	58	8
32,	White pine,	11	12	1	90	120	30
33,	White pine,	11	12	1	90	120	30
34,	White pine,	12	13	1	105	138	33
35,	White pine,	8	8	2	50	58	8
36,	White pine,	8	8	2	50	58	8
37,	White pine,	12	13	1	105	138	33
38,	Hemlock,	2	3	5	3	3	–
39,	Hemlock,	3	4	5	5	5	–
40,	White pine,	13	14	1	120	158	38
41,	White pine,	8	8	2	50	58	8
42,	White pine,	10	10	1	75	85	10
43,	White pine,	8	8	2	50	58	8
44,	White pine,	14	15	1	140	180	40
46,	White pine,	8	8	2	50	58	8
47,	White pine,	11	12	2	90	120	30
48,	White pine,	12	12	1	105	120	15

Sample Plot No. 1 (Government Plot No. 4) — Continued.

Tree Number.	Species.	Diameter Breast High (Inches).		Class.	Board Feet.		Gain in Board Feet.
		1905.	1914.		1905.	1914.	
49, ...	White pine, . .	12	12	2	105	120	15
50, ...	White pine, . .	8	9	1	50	70	20
51, ...	White pine, . .	8	8	3	50	58	8
52, ...	White pine, . .	10	11	1	75	103	28
53, ...	White pine, . .	11	12	1	90	120	30
54, ...	White pine, . .	12	13	1	105	138	33
55, ...	White pine, . .	12	12	1	105	120	15
56, ...	White pine, . .	10	10	1	75	85	10
57, ...	White pine, . .	7	7	3	40	45	5
58, ...	White pine, . .	10	11	1	75	103	28
59, ...	White pine, . .	9	10	1	60	85	25
60, ...	White pine, . .	12	13	1	105	138	33
61, ...	White pine, . .	10	10	1	75	85	10
62, ...	White pine, . .	12	13	1	105	138	33
63, ...	White pine, . .	10	10	1	75	85	10
64, ...	White pine, . .	14	15	1	140	180	40
65, ...	White pine, . .	11	12	1	90	120	30
66, ...	White pine, . .	12	13	1	105	138	33
67, ...	White pine, . .	12	14	2	105	158	53
68, ...	White pine, . .	13	14	1	120	158	38
69, ...	White pine, . .	12	13	1	105	138	33
70, ...	White pine, . .	13	14	1	120	158	38
71, ...	White pine, . .	10	11	1	75	103	28
72, ...	White pine, . .	11	11	2	90	103	13
73, ...	White pine, . .	9	9	3	60	70	10
74, ...	White pine, . .	14	15	1	140	180	40
75, ...	White pine, . .	9	10	2	60	85	25
76, ...	White pine, . .	12	13	2	105	138	33
77, ...	White pine, . .	13	14	1	120	158	38
78, ...	White pine, . .	12	13	1	105	138	33
79, ...	White pine, . .	14	16	1	140	205	65
80, ...	White pine, . .	12	14	1	105	158	53
81, ...	Hemlock, . .	3	3	6	5	5	–
82, ...	Hemlock, . .	4	4	4	10	10	–
83, ...	White pine, . .	5	5	3	15	25	10

Sample Plot No. 1 (Government Plot No. 4) — Concluded.

Tree Number.	Species.	Diameter Breast High (Inches).		Class.	Board Feet.		Gain in Board Feet.
		1905.	1914.		1905.	1914.	
84,	White pine,	9	9	3	60	70	10
85,	White pine,	8	10	3	50	85	35
86,	White pine,	8	9	2	50	70	20
87,	White pine,	11	11	1	90	103	13
88,	White pine,	10	11	1	75	103	28
Total,		–	–	–	7,303	9,429	2,126

Average height, 1905, 50 feet.
Average height, 1914, 55 feet.

Summary of Data.

Total board feet to acre, 1905,	29,212
Total board feet to acre, 1914,	37,716
Total gain in board feet per acre,	8,504
Current annual gain in board feet per acre,	945

Sample Plot No. 2 (Government Plot No. 5).

Area, ½ acre; age, forty-three years.

Tree Number.	Species.	Diameter Breast High (Inches).		Class.	Board Feet.		Gain in Board Feet.
		1905.	1914.		1905.	1914.	
1,	White pine,	13	14	1	120	158	38
2,	White pine,	12	14	1	105	158	53
3,	White pine,	12	14	1	105	158	53
4,	White pine,	11	13	1	90	138	48
5,	White pine,	8	9	1	50	70	20
6,	White pine,	9	11	2	60	103	43
7,	White pine,	11	13	1	90	138	48
8,	White pine,	7	9	2	40	70	30
10,	White pine,	7	9	2	40	70	30
11,	White pine,	6	9	2	30	38	8
12,	White pine,	10	11	1	75	103	28
13,	White pine,	10	11	1	75	103	28
14,	White pine,	8	9	2	50	70	20
15,	White pine,	8	8	2	50	58	8

Sample Plot No. 2 (Government Plot No. 5) — Continued.

Tree Number.	Species.	Diameter Breast High (Inches).		Class.	Board Feet.		Gain in Board Feet.
		1905.	1914.		1905.	1914.	
16, . . .	White pine, . .	9	9	2	60	70	10
17, . . .	White pine, . .	10	11	1	75	103	28
18, . . .	White pine, . .	11	11	1	90	103	13
19, . . .	White pine, . .	10	11	2	75	103	28
20, . . .	White pine, . .	10	11	2	75	103	28
22, . . .	White pine, . .	11	12	1	90	120	30
23, . . .	White pine, . .	12	14	1	105	158	53
24, . . .	White pine, . .	9	9	2	60	70	10
25, . . .	White pine, . .	10	11	1	75	103	28
27, . . .	White pine, . .	11	13	1	90	138	48
29, . . .	White pine, . .	8	9	2	50	70	20
31, . . .	White pine, . .	7	8	2	40	58	18
33, . . .	White pine, . .	8	8	2	50	58	8
34, . . .	White pine, . .	6	7	2	30	45	15
36, . . .	White pine, . .	8	9	2	50	70	20
43, . . .	White pine, . .	7	7	1	40	45	5
45, . . .	Larch, . . .	7	7	1	40	45	5
46, . . .	White pine, . .	3	3	3	5	8	3
47, . . .	White pine, . .	4	4	3	10	15	5
48, . . .	White pine, . .	8	9	2	50	70	20
49, . . .	White pine, . .	6	6	2	30	38	8
50, . . .	White pine, . .	6	7	2	30	45	15
54, . . .	White pine, . .	7	8	2	40	58	18
55, . . .	White pine, . .	6	7	2	30	45	15
56, . . .	White pine, . .	6	7	2	30	45	15
57, . . .	White pine, . .	9	10	1	60	85	25
58, . . .	White pine, . .	8	8	2	50	58	8
59, . . .	White pine, . .	7	8	2	40	58	18
60, . . .	White pine, . .	6	7	2	30	45	15
61, . . .	White pine, . .	9	10	1	60	85	25
68, . . .	Larch, . . .	9	10	1	60	85	25
69, . . .	Larch, . . .	5	6	2	15	38	23
70, . . .	Larch, . . .	5	5	2	15	25	10
71, . . .	White pine, . .	12	15	1	120	180	60
72, . . .	White pine, . .	6	8	3	30	58	28

Sample Plot No. 2 (Government Plot No. 5) — Continued.

Tree Number.	Species.	Diameter Breast High (Inches).		Class.	Board Feet.		Gain in Board Feet.
		1905.	1914.		1905.	1914.	
73,	White pine,	13	15	1	120	180	60
74,	White pine,	13	15	1	120	180	60
76,	White pine,	15	16	1	160	205	45
77,	White pine,	12	13	1	105	138	33
78,	White pine,	16	18	1	180	295	115
79,	White pine,	14	15	1	140	180	40
80,	White pine,	17	18	1	200	295	95
81,	White pine,	12	13	1	105	260	20
83,	White pine,	14	17	1	140	260	20
84,	White pine,	15	16	1	160	205	45
86,	White pine,	11	11	1	90	103	13
87,	White pine,	8	10	3	50	85	35
88,	White pine,	11	12	1	90	120	30
90,	White pine,	10	10	2	75	85	10
92,	White pine,	9	9	2	60	70	10
93,	White pine,	11	13	1	90	138	48
94,	White pine,	8	9	2	50	70	20
96,	White pine,	12	13	1	105	138	33
99,	White pine,	11	11	2	90	103	13
100,	White pine,	11	11	–	90	103	13
102,	White pine,	11	12	1	90	120	30
103,	White pine,	9	9	1	60	70	10
105,	White pine,	11	12	1	90	120	30
106,	White pine,	9	9	2	60	70	10
107,	White pine,	9	10	1	60	85	25
108,	White pine,	10	10	1	75	85	10
112,	White pine,	14	16	1	140	205	65
113,	White pine,	9	9	2	60	70	10
114,	White pine,	9	9	–	60	70	10
120,	White pine,	8	8	3	50	58	8
121,	Larch,	6	7	2	30	45	15
122,	White pine,	9	10	1	60	85	25
123,	White pine,	10	11	1	75	103	28
124,	White pine,	12	13	1	105	138	33
127,	White pine,	7	7	2	40	45	5

Sample Plot No. 2 (Government Plot No. 5) — Continued.

Tree Number.	Species.	Diameter Breast High (Inches).		Class.	Board Feet.		Gain in Board Feet.
		1905.	1914.		1905.	1914.	
128,	White pine,	10	10	2	75	85	10
129,	White pine,	8	9	1	50	70	20
131,	White pine,	12	14	1	105	158	53
132,	White pine,	11	12	1	90	120	30
133,	White pine,	13	14	1	120	158	38
136,	White pine,	12	14	1	105	158	53
137,	White pine,	10	12	1	75	120	45
138,	White pine,	12	13	1	105	138	33
144,	White pine,	9	10	2	60	85	25
145,	White pine,	8	9	1	50	70	20
146,	White pine,	11	11	1	90	103	13
147,	Hemlock,	3	4	4	5	15	10
148,	Hemlock,	3	4	5	5	15	10
149,	White pine,	9	9	2	60	70	10
150,	White pine,	7	7	3	40	45	5
151,	White pine,	9	10	1	60	85	25
152,	White pine,	8	9	1	50	70	20
154,	White pine,	9	11	1	60	103	43
157,	White pine,	11	12	1	90	120	30
158,	White pine,	10	10	1	75	85	10
159,	White pine,	7	7	2	40	45	5
161,	White pine,	8	9	1	50	70	20
162,	White pine,	6	7	2	30	45	15
164,	White pine,	10	11	1	75	103	28
166,	White pine,	9	10	1	60	85	25
167,	White pine,	7	8	2	40	58	18
168,	White pine,	9	9	2	60	70	10
169,	White pine,	10	12	1	75	120	45
170,	White pine,	8	8	2	50	58	8
172,	White pine,	8	8	2	50	58	8
173,	White pine,	10	10	2	75	85	10
174,	White pine,	10	12	1	75	120	45
175,	White pine,	7	8	2	40	50	10
177,	White pine,	8	8	2	50	58	8
178,	White pine,	8	9	2	50	70	20

Sample Plot No. 2 (Government Plot No. 5) — Concluded.

Tree Number.	Species.	Diameter Breast High (Inches).		Class.	Board Feet.		Gain in Board Feet.
		1905.	1914.		1905.	1914.	
179,	White pine,	11	11	1	90	103	13
180,	White pine,	8	9	2	50	70	20
181,	White pine,	9	9	2	60	70	10
182,	White pine,	9	10	1	60	85	25
185,	White pine,	6	8	3	30	58	28
186,	White pine,	11	11	1	90	103	13
187,	White pine,	8	8	2	50	58	8
188,	White pine,	10	11	1	75	103	28
189,	Larch,	6	6	2	30	38	8
191,	White pine,	11	12	1	90	120	30
193,	White pine,	9	10	1	60	85	25
195,	White pine,	10	11	1	75	103	28
196,	White pine,	10	10	1	75	85	10
197,	White pine,	12	13	1	105	138	33
199,	White pine,	12	13	1	105	138	33
200,	White pine,	12	13	1	105	138	33
201,	White pine,	8	9	1	50	70	20
202,	White pine,	10	11	1	75	103	28
203,	White pine,	11	12	1	90	120	30
204,	Larch,	9	9	1	60	70	10
207,	Larch,	5	6	2	15	38	23
212,	Larch,	5	5	2	15	25	10
213,	Larch,	6	6	2	30	38	8
215,	White pine,	11	13	1	90	138	48
Total,		–	–	–	9,820	13,371	3,551

Average height, 1905, 50 feet.
Average height, 1914, 55 feet.

Summary of Data.

Total board feet to acre, 1905,	19,640
Total board feet to acre, 1914,	26,742
Total gain in board feet per acre,	7,102
Current annual gain in board feet per acre,	789

Sample Plot No. 3 (Government Plot No. 6).

Area, ⅛ acre; age, forty-three years.

Tree Number.	Species.	Diameter Breast High (Inches).		Class.	Board Feet.		Gain in Board Feet.
		1905.	1914.		1905.	1914.	
3, . . .	White pine, . .	7	7	1	50	58	8
5, . . .	White pine, . .	11	12	1	115	150	35
7, . . .	White pine, . .	6	6	2	35	48	13
8, . . .	White pine, . .	6	6	2	35	48	13
10, . . .	White pine, . .	6	7	1	35	48	13
11, . . .	White pine, . .	6	6	2	35	48	13
12, . . .	White pine, . .	6	7	1	35	58	23
13, . . .	White pine, . .	6	7	2	35	58	23
14, . . .	White pine, . .	5	6	2	20	48	28
15, . . .	White pine, . .	5	5	2	20	35	15
16, . . .	White pine, . .	10	11	1	95	130	35
21, . . .	White pine, . .	7	7	2	50	58	8
22, . . .	White pine, . .	5	6	2	20	48	28
23, . . .	White pine, . .	8	9	1	65	93	28
24, . . .	White pine, . .	7	9	1	50	93	43
25, . . .	White pine, . .	9	11	1	80	130	50
27, . . .	White pine, . .	6	7	1	35	58	23
29, . . .	White pine, . .	7	8	1	50	75	25
30, . . .	White pine, . .	6	6	2	35	48	13
31, . . .	White pine, . .	6	7	2	35	58	23
33, . . .	White pine, . .	8	9	1	65	93	28
35, . . .	White pine, . .	8	9	1	65	93	28
44, . . .	White pine, . .	6	7	2	35	58	23
45, . . .	White pine, . .	8	9	1	65	93	28
46, . . .	White pine, . .	8	9	1	65	93	28
49, . . .	White pine, . .	7	8	2	50	75	25
53, . . .	White pine, . .	8	9	1	65	93	28
54, . . .	White pine, . .	8	9	2	65	93	28
55, . . .	White pine, . .	8	9	2	65	93	28
56, . . .	White pine, . .	7	8	2	50	75	25
57, . . .	White pine, . .	6	6	2	35	48	13
59, . . .	White pine, . .	6	7	2	35	58	23
61, . . .	White pine, . .	8	9	1	65	93	28
63, . . .	White pine, . .	6	6	2	35	48	13

Sample Plot No. 3 (Government Plot No. 6) — Concluded.

Tree Number.	Species.	Diameter Breast High (Inches).		Class.	Board Feet.		Gain in Board Feet.
		1905.	1914.		1905.	1914.	
64, . . .	White pine, . .	5	7	2	20	58	38
66, . . .	White pine, . .	7	7	2	50	58	8
67, . . .	White pine, . .	8	9	3	65	93	28
69, . . .	White pine, . .	7	8	1	50	75	25
71, . . .	White pine, . .	9	10	1	80	110	30
73, . . .	White pine, . .	9	10	1	80	110	30
74, . . .	White pine, . .	8	9	2	65	93	28
75, . . .	White pine, . .	7	8	2	50	75	25
76, . . .	White pine, . .	6	6	3	35	48	13
77, . . .	White pine, . .	9	10	1	80	110	30
78, . . .	White pine, . .	7	7	2	50	58	8
81, . . .	White pine, . .	9	9	1	80	83	13
83, . . .	White pine, . .	7	7	2	50	58	8
85, . . .	White pine, . .	6	7	2	35	58	23
86, . . .	White pine, . .	8	10	1	65	110	45
87, . . .	White pine, . .	5	5	2	20	35	15
89, . . .	Wnite pine, . .	7	7	2	50	58	8
91, . . .	White pine, . .	8	9	1	65	93	28
92, . . .	White pine, . .	7	7	2	50	58	8
94, . . .	White pine, . .	7	7	2	50	58	8
101, . . .	White pine, . .	9	11	1	80	130	50
Total, . .	. . . . .	–	–	–	2,860	4,135	1,275

Average height, 1905, 60 feet.
Average height, 1914, 65 feet.

Summary of Data.

Total board feet per acre, 1905, ...	22,880
Total board feet per acre, 1914, ...	33,080
Total gain in board feet per acre, ...	10,200
Current annual gain in board feet per acre, . . .	1,133

Sample Plot No. 4 (Government Plot No. 7).

Area, ⅛ acre; age, forty-three years.

Tree Number.	Species.	Diameter Breast High (Inches).		Class.	Board Feet.		Gain in Board Feet.
		1905.	1914.		1905.	1914.	
1, . . .	White pine, . .	6	7	2	35	58	23
2, . . .	White pine, . .	6	6	2	35	48	13
3, . . .	White pine, . .	6	6	2	35	48	13
5, . . .	White pine, . .	6	6	2	35	48	13
7, . . .	White pine, . .	7	8	1	50	75	25
8, . . .	White pine, . .	5	5	2	20	35	15
9, . . .	White pine, . .	7	8	1	50	75	25
10, . . .	White pine, . .	5	5	2	20	35	15
12, . . .	White pine, . .	7	7	1	50	58	8
13, . . .	White pine, . .	6	6	1	35	58	23
16, . . .	White pine, . .	6	6	1	35	48	13
17, . . .	White pine, . .	6	6	2	35	48	13
18, . . .	White pine, . .	7	7	1	50	58	8
19, . . .	White pine, . .	5	5	2	20	35	15
20, . . .	White pine, . .	6	6	2	35	48	13
21, . . .	White pine, . .	4	5	3	10	35	25
22, . . .	White pine, . .	7	7	1	50	58	8
23, . . .	White pine, . .	8	10	1	65	110	45
24, . . .	White pine, . .	5	6	2	20	48	28
25, . . .	White pine, . .	7	7	2	50	58	8
26, . . .	White pine, . .	7	8	1	50	75	25
27, . . .	White pine, . .	6	6	2	35	48	13
29, . . .	White pine, . .	7	7	2	50	58	8
30, . . .	White pine, . .	8	9	1	65	93	28
35, . . .	White pine, . .	5	5	2	20	35	15
36, . . .	White pine, . .	4	4	3	10	15	5
37, . . .	White pine, . .	7	8	1	50	75	25
38, . . .	White pine, . .	6	7	1	35	58	23
39, . . .	White pine, . .	4	5	2	10	35	25
41, . . .	White pine, . .	7	7	1	50	58	8
42, . . .	White pine, . .	5	5	2	20	35	15
43, . . .	White pine, . .	6	6	2	35	48	13
46, . . .	White pine, . .	7	8	1	35	75	40
48, . . .	White pine, . .	5	5	2	20	35	15

Sample Plot No. 4 (Government Plot No. 7) — Continued.

Tree Number.	Species.	Diameter. Breast High (Inches).		Class.	Board Feet.		Gain in Board Feet.
		1905.	1914.		1905.	1914.	
49,	White pine,	8	9	1	65	93	28
51,	White pine,	8	9	1	65	93	28
52,	White pine,	7	7	2	50	58	8
53,	White pine,	7	8	1	50	75	25
55,	White pine,	7	7	2	50	58	8
56,	White pine,	8	9	1	65	93	28
57,	White pine,	4	4	3	10	15	5
58,	White pine,	4	4	3	10	15	5
59,	White pine,	9	9	1	80	93	13
60,	White pine,	6	6	2	35	48	13
61,	White pine,	7	7	2	50	58	8
62,	White pine,	5	6	3	20	48	28
63,	White pine,	4	5	2	10	35	25
64,	White pine,	5	6	2	20	48	28
65,	White pine,	7	9	1	50	93	43
66,	White pine,	6	6	2	35	48	13
68,	White pine,	6	7	2	35	58	23
70,	White pine,	7	8	2	50	75	25
71,	White pine,	7	7	1	50	58	58
72,	White pine,	10	11	1	95	130	3
73,	White pine,	5	5	2	20	35	15
74,	White pine,	5	5	2	20	35	15
75,	White pine,	6	6	2	35	48	13
76,	White pine,	6	6	3	35	38	13
77,	White pine,	9	11	1	80	130	50
79,	White pine,	8	9	1	65	93	28
81,	White pine,	5	5	2	20	35	15
82,	White pine,	8	8	2	65	75	10
83,	White pine,	5	6	2	20	48	28
85,	White pine,	7	8	2	50	75	25
86,	White pine,	8	8	1	65	75	10
87,	White pine,	7	7	2	50	58	8
88,	White pine,	6	7	2	35	58	23
89,	White pine,	4	4	3	10	15	5
98,	White pine,	11	12	1	115	150	35

Sample Plot No. 4 (Government Plot No. 7) — Concluded.

Tree Number.	Species.	Diameter Breast High (Inches).		Class.	Board Feet.		Gain in Board Feet.
		1905.	1914.		1905.	1914.	
99,	White pine,	5	5	2	20	35	15
101,	White pine,	6	7	2	35	58	23
102,	White pine,	8	9	1	65	93	28
105,	White pine,	5	5	3	20	35	15
106,	White pine,	6	6	3	35	48	13
107,	White pine,	6	6	3	35	48	13
108,	White pine,	6	6	3	35	48	13
109,	White pine,	6	6	3	35	48	13
110,	White pine,	5	5	3	20	35	15
111,	White pine,	8	8	2	65	75	10
112,	White pine,	11	12	1	115	150	35
113,	White pine,	8	8	1	65	75	10
Total,		–	–	–	3,345	4,835	1,490

Average height, 1905, 60 feet.
Average height, 1914, 65 feet.

Summary of Data.

Total board feet to acre, 1905,	26,760
Total board feet to acre, 1914,	38,680
Total gain in board feet per acre,	11,920
Current annual gain in board feet per acre,	1,324

South Lancaster, Mass. — Owner, Mrs. Abbie F. Kilburn.

History. — This plantation joins that of Mr. Harold Parker, only a stone wall separating the two lots. It was made by Mr. Jonas Goss, and was planted in two sections, aged sixty years and forty-one years, respectively. The spacing was 6 by 8 feet. Since that time trees of various ages have been added around the edges. A survey was therefore necessary to show the areas of the original lots of even aged trees, which are: for the sixty-year old lot, 2.11 acres, and for the forty-one year old lot, 2.02 acres. If all trees are included, the area is 7 acres, and the figures given under "Treatment" were worked out on that basis by Mr. W. G. Kilburn.

Treatment. — In 1908 a thinning was made under the direc-

Abbie F. Kilburn plantation, after thinning was made; age forty-one years.

tion of this office, and about one-third of the trees removed. The following is a record of the lumber taken out: —

Box boards,	14,000 feet.
Wood,	40 cords.
Cost of brush burning,	$35
Stumpage price received for lumber,	$8 per M.
Stumpage price received for wood,	$1 per cord.
Profit per acre,	$20
Net profit,	$150

While this work was going on the small dead branches so persistent on white pine were removed from the trunks of the trees in order to improve the general appearance of the grove. The thinning was not made so much with the idea of an immediate profit, as to increase the value of the plantation. While six years is not sufficient time to judge accurately as to the increase in growth due to thinning, the trees have every appearance of being stimulated by the added light received. This is shown by the healthy bark, green tops and absence of any dead or dying trees.

Section 1.

Area, 2.11 acres; age, sixty years.

Diameter Breast High (Inches).	Number of Trees.	Board Feet.
6,	7	210
7,	19	950
8,	60	3,900
9,	130	10,400
10,	152	14,440
11,	155	17,825
12,	148	19,980
13,	69	10,695
14,	32	5,600
15,	16	3,200
16,	12	2,760
17,	8	2,080
Total,	808	92,040

Total number of trees to acre, 383.
Total board feet to acre, 43,620.
Average height, 60 feet.

Section 2.

Area, 2.02 acres; age, forty-one years.

Diameter Breast High (Inches).	Number of Trees.	Board Feet.
5,	5	50
6,	21	630
7,	57	2,565
8,	122	7,015
9,	151	10,570
10,	116	9,860
11,	102	10,455
12,	46	5,520
13,	26	3,575
14,	5	788
15,	3	540
16,	4	820
Total,	658	52,388

Total number of trees to acre, 325.
Total board feet to acre, 25,934.
Average height, 55 feet.

East Taunton, Mass. — Owner, Miss Margaret Dean.

History. — About 1854 David Dean, a brother of the present owner, set out this plantation of white pine near his home, and about 1880 another lot adjoining was planted. Field trees were used and spaced 10 by 10 feet.

Object. — At that time the "American Agriculturist," published in New York, was advertising the planting of pine, and the original owner was one of those who became interested in forest planting.

Treatment. — This tract, while an excellent illustration of the growth of New England white pine, would have increased from 2 to 3 inches in diameter growth if it had been thinned at the proper time. A few trees have died out, and some were blown down during a heavy gale. Observations were made of the stumps of these trees. The last 20 annual rings were scarcely thicker than a sheet of paper, showing a tendency towards stagnation. For the first twenty years the rings show a growth, in some cases, better than normal.

White pine plantation, fifty years old, owned by Miss Margaret Dean, East Taunton, Mass.

The measurements were made early in the year (1914), and the total results placed upon the records in the State Forester's office. The inch classes are therefore omitted.

Section 1, Sixty-one Year Old Plantation.

Area, 1½ acres.

Total number of trees, 400.
Average height, 60 feet.
Board feet to acre, 41,000.

Section 2. Thirty-eight Year Old Plantation.

Area, 1½ acres.

Total number of trees, 375.
Average height, 50 feet.
Board feet to acre, 29,000.

Georgetown, Mass. — Owner, H. E. Guptill.

History. — Although this timber was measured in 1912, the totals are here given to show the results of the growth of white pine planted with Norway spruce. The plantation was forty-eight years old when measured, and was made with natural seedlings transplanted from the woods.

White Pine and Norway Spruce.

Area, 2.57 acres; age, forty-eight years.

Total board feet of spruce, 27,000.
Total board feet of pine, 55,000.
Total stand per acre, 33,000 board feet.

Conclusion.

The total results of the investigation, in terms of board measure for pine, are as follows. The two sample plots of tamarack and the forty-two roadside trees at Sharon, Mass., are not included.

	Board Feet per Acre.
Plantations 30 to 40 years old,	21,910
Plantations 40 to 50 years old,	32,726
Plantations 50 to 60 years old,	41,186

These results compare favorably with measurements made by this office of healthy stands of native Massachusetts white pine. No attempt has been made to show that planted pine, untreated, would produce more. On only two of the plantations was anything like a systematic thinning made (pages 18 and 31), and in no case were trees removed at an age when an added amount of light would have given the remaining trees the maximum amount of growth. The present method of planting calls for a 6 by 6 foot spacing, but with the idea that thinning is to be done as the trees develop to prevent overcrowding, to realize something in the way of an income on the plantation, and to develop the best diameters and heights possible for the final stand.

In conclusion the reader is referred to the yield tables on pages 37 and 38, representing the financial rotations of white pine plantations, the one under the present general system of taxing forest land, and the other under the new forest taxation law enacted in 1914. These tables are compiled by H. O. Cook, supplementary to the financial rotations in his bulletin on "Forest Mensuration of the White Pine." The volume tables used in this investigation were taken from the same bulletin.

When we speak of the yield of a pine plantation we think principally of the amount of lumber which can be cut from the land. Now, while this is important, the real determining factor as to whether a plantation is a success or not is the financial profit that such a plantation will bring. As with any investment, it is not the amount of business done, but the profits made which in the last analysis determine failure or success.

Timber crops are peculiar in that they cannot be harvested except after a period of years, so that it is not alone necessary to deduct actual expenses from gross returns in order to determine net yield, but these expenses must be carried from the date of their incurrence at some determined rate. As most savings banks pay 4 per cent., we must use a rate better than that, and have chosen 5 per cent. The net yield is in this case, therefore, a speculative profit over and above 5 per cent.

The gross returns are in this case the stumpage value ob-

tained from a yield table made by measuring sample plots in well-stocked natural stands in all parts of this State. Natural stands were taken because of the limited number of plantations that can be taken for this purpose. It will be seen on comparison, however, that the amounts given in the table are in substantial agreement with the average shown by the plantations described in this bulletin. The stumpage rates chosen run from $6 to $10, and are the rates of the present day, no allowance being made for the increase that future years will bring.

In compiling these tables certain assumptions were made, based on actual experience. The cost of the land is assumed to be the first expense, and is placed at $5 per acre. The second premise is the cost of planting which is placed at $12 per acre. These two expenses must be carried at compound interest from the beginning to the end of the rotation.

We have presented two tables, one of which shows the returns of a plantation taxed under the present general system, and the other for the same plantation registered under the new taxation law. We have assumed the tax rate to be $20 per thousand. The land, of course, pays taxes from the beginning, but the timber not until the twenty-fifth year. In the case of classified land it pays no tax until it is cut, when it pays a product tax of 6 per cent. All of these expenses are carried at 5 per cent. compound interest to the end of the rotation, and we see that in the case of unclassified land the maximum yield comes at fifty years, when there is an excess profit of $60. In the case of registered land the maximum yield comes at fifty years, and there is an excess profit of $140, or two and a half times that of the unregistered. It should be said here, however, that in the case of the unclassified land we have assumed that the assessors taxed it at its full value, which is unusual in practice.

We would urge that every owner of a young artificial plantation should register his land, for it will be seen that while the owner of Plantation 1 invested in actual cash $83 on his timber in fifty years, the owner of the registered Plantation 2 only risked $40 in cash. On account of the time element and risk of a forest plantation the owner should take every opportunity

of keeping down his money investment. At present prices on lumber, a pine plantation is a 6 or 7 per cent. investment in Massachusetts, but an increase in stumpage values of whatever per cent. will make a corresponding increase in the returns. In other words, the planter of the present day can assume that he is investing for a 10 or 12 per cent. return rather than a 6 or 7 per cent. return.

One Acre Pine Plantation unclassified. Investment, Interest, Profit.

[Money valued at 5 per cent. Land at $5 per acre. Cost of planting, $12 per acre.]

Age of Stand (Years).	RETURNS.		EXPENSES AND INTEREST.									PROFIT.	
			Production Cost.		Taxes —								
					on timber.			on land.					
	Volume, Board Feet.	Stumpage Value.	Interest on Value of Land.	Cost of Planting plus Interest.	Annual for Five-year Periods.	Amount paid in Money.	Amount paid with Interest.	Amount paid in Money.	Amount plus Accrued Interest.	Total Investment (Money).	Total Investment plus Interest.	Gross (Money).	Net in Excess of 5 Per Cent.
25, . . .	4,000	$24 00	$11 92	$40 62	$0 48	–	–	$2 50	$4 15	$14 50	$56 69	$9 50	—$32 69
30, . . .	7,500	45 00	16 62	51 84	90	$2 40	$2 78	3 00	5 80	17 40	77 04	27 60	—32 04
35, . . .	17,000	136 00	22 56	66 18	2 72	6 90	8 78	3 50	7 85	22 40	105 37	113 60	31 63
40, . . .	25,200	200 00	30 20	84 48	4 00	20 50	29 78	4 00	10 90	36 50	155 36	163 50	44 64
45, . . .	32,100	257 00	39 90	107 22	5 14	40 50	56 85	4 50	13 95	57 00	217 92	200 00	39 08
50, . . .	37,600	376 00	57 30	137 58	7 50	66 20	102 16	5 00	18 30	83 20	315 34	292 80	60 66
55, . . .	42,100	420 00	73 17	175 62	8 40	103 70	172 96	5 50	23 85	121 20	445 60	308 80	—25 60
60, . . .	44,500	445 00	93 40	224 10	8 90	145 70	271 00	6 00	30 90	163 70	619 40	281 30	—174 40
65, . . .	46,200	462 00	116 70	386 02	9 24	191 20	409 22	6 50	40 00	209 70	951 94	254 30	—489 94

One Acre Pine Plantation classified. Returns, Taxes, Interest, Profits.

[Money valued at 5 per cent. Land at $5 per acre. Cost of planting, $12 per acre.]

Age of Stand (Years).	RETURNS.		EXPENSES AND ACCRUED INTEREST.							PROFIT.	
			Production Cost.		Taxes—						
					on land.						
	Stumpage Value.	Volume, Board Feet.	Interest on Value of Land.	Cost of Planting plus Interest.	Amount paid in Money.	Amount plus Interest.	Yield. Paid if Cut.	Total Invest-ment (Money).	Total Invest-ment plus Interest.	Gross (Money).	Net in Excess of 5 Per Cent.
25, ...	$24 00	4,000	$11 92	$40 62	$2 50	$4 15	$1 44	$15 94	$58 13	$9 00	—$33 13
30, ...	45 00	7,500	16 62	51 84	3 00	5 80	2 70	20 80	76 96	24 20	—30 96
35, ...	136 00	17,000	22 56	66 18	3 50	7 85	8 16	23 35	96 59	112 65	39 41
40, ...	200 00	25,000	30 20	84 48	4 00	10 90	12 00	28 00	137 58	172 00	62 42
45, ...	257 00	32,100	39 90	107 22	4 50	13 95	15 42	31 92	176 49	225 08	80 59
50, ...	376 00	37,600	57 30	137 58	5 00	18 30	22 56	39 56	235 74	336 44	140 25
55, ...	420 00	42,100	73 17	175 62	5 50	23 85	25 20	42 70	297 84	377 30	132 16
60, ...	445 00	44,500	93 40	224 10	6 00	30 90	26 70	44 70	375 10	400 30	69 90
65, ...	462 00	46,200	116 70	386 02	6 50	40 00	27 72	46 22	570 44	415 76	108 44

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