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NORTHERN INTERIOR
FOREST EXPERIMENT STATION

REPORT
— OF —
PRELIMINARY INVESTIGATIONS
1924

P. M. BARR

DEPARTMENT OF LANDS

MUNICATIONS IN REFERENCE TO FORESTRY TO
ADDRESSED TO THE CHIEF FORESTER.

VICTORIA, B.C. September 10, 1924.

FOREST BRANCH

The Chief Forester,

Victoria, B.C.

Sir:-

I beg to submit herewith a brief report of the preliminary investigations undertaken during the past summer in connection with the establishment of the Northern Interior Forest Experiment Station.

It has not been possible to make a careful study of any of the problems which are outlined in this report and any suggestions made in connection with them are tentative in nature and subject to change in the light of further study and experience.

P. M. Barr.

Junior Forester
Northern Interior
Forest Experiment Station.

NORTHERN INTERIOR

FOREST EXPERIMENT STATION

Report of Preliminary Investigations

1924

— P. M. Barr —

1134

Spruce - Balsam Type. Giscome
Mature Spruce. Balsam Reproduction

No. 1.

OUTLINE OF REPORT

OUTLINE OF REPORT. (Continued).

NORTHERN INTERIOR
FOREST EXPERIMENT STATION

REPORT - 1924

(1) WORK DONE DURING THE SEASON.

My instructions upon appointment were to spend the summer in the Northern Interior, to become familiar with the forest conditions and problems there, and to meet the Forest Branch staff and the operators in forest industries. All this was to be done with a view to making plans for the establishment of a forest experiment station in the district.

Through the assistance of the District Forester in Prince George, I secured an office in the Provincial Government Buildings there, which served as a convenient headquarters for the season.

It was not possible to examine the whole region in even an extensive manner. The problems appeared to be most pressing in the valley of the Upper Fraser and most of the season was spent there; short trips were made in the watersheds of the Nechako and Upper Skeena to observe the general nature of the forests. During the field trips throughout the region, notes were taken of the timber types encountered, and of the species, reproduction, underbrush, soil, ground cover, etc., in each type.

I met most of the field men of the Branch in the Fort George Forest District, and several of those in the parts of the Prince Rupert and Cariboo Districts which will eventually lie within the jurisdiction of the Northern Interior Station. I spent several days in the woods with most of the Rangers I met, in connection with their routine duties, and discussed investigative work with them in a general way, securing their observations on the forest problems of their own districts, and noting their conclusions and advice. I also met most of the mill-men in the Upper Fraser country, and discussed the establishment of the Experiment Station with them. The attitude of almost everyone in the district is very favorable towards the starting of investigative work in the Northern Interior. The opinions of loggers, mill-men, settlers, and forest officers are naturally conflicting in regard to details of forest policy, but all agree that research work should be started, and an attempt made to deal with the problems of re forestation and slash disposal.

Some preliminary reproductive studies were made. It is necessary to have some statistical data before definite conclusions can be drawn in regard to conditions in the forest, and a two-man party was organ-ized to make counts of the number of trees of each

species and of all ages on representative plots in the spruce stands of the Upper Fraser. The work of the party was carried on in the woods near Giscome, Hansard, Longworth, and Aleza Lake. A copy of their instructions, which summarizes the details of the work, with a summary of the results obtained, is included in the appendix to this report. Age counts were also made of stumps of mature spruce, and of balsam and spruce reproduction, to secure data on age classes, and in regard to the establishment, rate of growth, and suppression of the understory of reproduction in the mature stand.

In the work of the Station, the study and correlation of research literature will play an important part. A start was made this Summer by getting into touch with a number of the more important sources of publications which may be of value. Contact was also established with other research organizations and experiment stations. A list of the literature obtained and copies of letters received from organizations offering to co-operate with the work of the Northern Interior Station are included in the appendix. See pages 56 to 69

(2) FOREST CONDITIONS IN THE NORTHERN INTERIOR.

(a) Area included in investigations.

The investigations of the Northern Interior Forest Experiment Station should cover the areas drained by:-

(1) The Fraser River above its confluence with, and including, the Quesnel River.

(2) The northern portions of the Canoe and North Thompson Rivers.

(3) The Skeena above Hazelton.

Further examination may show the advisability of work on the Fraser below Quesnel, on the Skeena west of Hazelton, and in the watershed of the Peace River. In the meantime there is an unlimited field of research in the region outlined above, and the whole forms a fairly definite unit from the point of view of forest types. Logging is carried on west of Hazelton, but the conditions begin to be more typical of those of the Coast. It is unlikely that there will be much utilization of forest resources of the Peace in the near future. It will be unwise to attempt to define rigid boundaries for the area in which investigation will be carried on. As problems arise throughout the Northern Interior, they should be examined by the Director of the Station, with regard to their relative importance and urgency, and passed on to the central Research Committee with recommendations for their inclusion, or otherwise, in

1135

Second Growth Fir Type. Griscome

No. 2.

1133

Second Growth Spruce from Seed Tree after old fire. Stuart Lake

No. 3

the work of the Station as the program of research is built up and the various projects are undertaken and correlated.

The success of the Station will depend, not upon the extent of the area covered, but upon the selection of problems which are of fundamental importance.

(b) FOREST TYPES IN THE NORTHERN INTERIOR.

The first classification of the forests of the North is, naturally, into "types." The accurate completion of such a classification will be one of the first problems of the Northern Interior Forest Experiment Station. The forests contain a reasonably small number of definite forms of tree associations, which may be listed in order of occurrence, as:-

Spruce Balsam.....	mainly in	Upper Fraser.
Lodgepole Pine.....	"	" Nechako.
Old Cedar-Hemlock-Fir..	"	" Quesnel and Upper Fraser.
Mixed mature Spruce-Hemlock-Fir-Balsam-Cedar-Pine.....	found mainly in	Quesnel and Skeena.

The following associations are found to a less extent:-

Muskeg Lodgepole Pine Type, in Upper Fraser.
L.P. Pine-Spruce, in Nechako and Skeena.
Spruce Type in the Nechako.
Pure Balsam.
Douglas Fir (second growth).
Aspen and Cottonwood.

All these types may be found in each of four conditions:-

(1) Undisturbed green timber.
(2) Burned virgin stands.
(3) Logged and unburned.
(4) Burned after logging.

In attempting to classify the types or tree associations found in the North, the problem must be regarded from two points of view. We may use the nature of the existing crop of timber as a criterion of type, and from its composition, by age classes, and varying proportions of different species, assign it to its proper place in our system of classification, or we may analyze the environmental factors of the site, temperature, moisture, wind, soil, and light, and from a study of these factors and their effect upon the native tree species, arrive at the nature of the forest which should be on the ground. We can call this the permanent type; it may be removed from the site by accidental causes, such as fire, insect infestations, or logging, or it may be replaced by another type in the natural trend of the life of the forest. In either case the original type may or may not find its way back again, naturally, or as the result of disturbing factors of fire or other damage.

In our type classification then, we can, for any area, determine the permanent type or the actual association on the ground. For purposes of forest regulation the latter is the more important. The investigator is not concerned so

much with what will naturally grow on the site if it is left entirely to the effect of natural influences. His problem is to do the best he can with what he has, under existing conditions. For instance, in the Upper Fraser, markets require that Spruce should be removed and Balsam left on the ground. Most of the reproduction is Balsam. Research has to discover what is the best thing to do with such conditions, and how the next crop may contain as much Spruce as possible, and as little Balsam. It is possible that the permanent type of the area may have been neither Spruce nor Balsam.

(c) Description of Types.

1. Spruce-Balsam.

This type is widely distributed throughout the watersheds of the Upper Fraser, the Nechako, and the Quesnel Rivers. It reaches its best development in the valley of the Fraser between Prince George and McBride where it forms the most important economic forest unit in the Northern Interior. The type reaches its best development on the flats and low benches along the river. More extensive stands of less volume per unit area occupy the low hills in the wider parts of the valley, and the lower slopes of tributary streams. On the upper slopes and narrow side valleys the quality of the type is greatly inferior to that found on the lower levels. Some good stands, not very large in area, are found in the

basins of the Quesnel and the lower Nechako.

The two principal species in the type are Spruce and Balsam (Abies lasiocarpa). The Spruce includes three species, P. canadensis (P. glauca), P. engelmanni, and to a less extent P. mariana. The first two comprise possibly nine-tenths or more of the species. The proportion of the other two in the total has not been determined, and a study of the characteristics, habit, and occurrence of the different species of Spruce in the Northern Interior should be made by the Station. There does not seem to be any important difference in the quality of the wood of the three, or in the rate of growth or development of the tree, but there may be important differences in the silvical characteristics of the species, which may be of use in working out the silvicultural system which will be practised in the area in the future. The tables on Page 53 contain a summary of the results obtained from a study of age classes in Spruce.

The species in the type occur in the following proportions:-

	Mature 8" DBH and over	Poles 4" - 8" DBH	Reproduction Under 4" DBH
Spruce	58.0%	32.8%	14.2%
Balsam	40.0	64.6	81.4
Fir	1.6	0.6	0.1
Hemlock	0.0	1.0	0.2
Cedar	0.4	1.0	4.1

(Proportions by number of trees)
Based on counts on 87 plots.

Scattered overmature Douglas Fir trees are found throughout the type. These veterans are apparently the survivors of an older stand in which there may have been a larger proportion of fir than is present in the Spruce Balsam association now on the ground. The lumber produced by these trees is very defective, and some of the operators have discontinued taking out the scattered fir along with the more valuable Spruce when they are logging the type. The trees are mostly from 450 to 500 years old, and range from 30 inches upward in diameter.

The Hemlock (T. heterophylla) and Cedar occur as scattered stunted trees.

Soil

The soil in this area is fairly uniform in nature, free from rock and gravel; the main constituent may be sand, silt or clay, but the former is so fine as to

grade into silt, and the clay is light, and usually contains some silt. These three constituents are found in varying proportions, but always forming a fairly compact, fine, smooth mixture of even color and consistency. The layer of surface humus is thin, rarely more than four inches in depth and there is a remarkable sharpness in the gradation from the layer of vegetable matter to the pure mineral soil, with a very small amount of the latter stained by decaying humus. There is almost a total absence of an intermediate stage between the vegetable and mineral soils. The humus, although shallow, is compact in nature, having the successive layers of leaves, twigs and moss packed tightly together by the weight of the snow during the Winter, and forming a carpet-like cover on the subsoil, interlaced by the roots of the underbrush and reproduction.

The soil factor is one of the most important in the life of this type. Before the natural life history of the type can be understood, the character of the soil must be accurately determined and the effects of its composition, temperature, moisture, and structure upon the species in the type must be isolated.

Ground Cover

The underbrush and vegetation in the Spruce Balsam type is difficult to understand. Under what are apparently identical conditions the nature of the ground

cover will include a wide range of variations. A dense growth of devilsclub and thimbleberry will change in a distance of a few yards to an area having a total absence of underbrush, with a light ground cover of moss. There seems to be a delicate balance in the forest community, and the nature of the underbrush, as well as the reproduction and mature timber, can be affected and perhaps totally altered by a change in the relative value of the ecological factors which is imperceptible to the observer. There appear to be definite relations between the nature of the ground cover and the reproduction. For instance, balsam reproduction is very plentiful if devilsclub is absent, though it is not clear which of these is the causal factor.

Reproduction

The reproduction exists in the following proportions:-

Spruce	14.2%	by numbers of trees.
Balsam	81.4%	
Fir	0.1%	
Hemlock	0.2%	
Cedar	4.1%	

It will be seen that although the spruce predominates over the Balsam in the mature sizes, (see P.48..) (58% - 40%), there is very little of this species in the reproduction. The numbers of trees per acre is as follows:-

	Mature	Poles	Reproduction
Spruce	64.3	31.6	126.2
Balsam	44.3	62.2	725.9

It will also be noted that even though the balsam predominates in the young understory, there is still insufficient reproduction to insure complete restocking.

Both the Spruce and Balsam are badly suppressed. On Page 48 will be found a summary of the results of the age counts of reproduction of both species. Few seedlings are found, the youngest specimens being from twenty to thirty years old. The occurrence of the reproduction is not uniform. Spruce is found in scattered clumps where soil conditions have apparently been satisfactory for the establishment of the young seedlings, while Balsam occurs more generally but is extremely irregular in density.

The establishment of the Spruce seedlings seems to be prevented by several factors. Of these, the dense layer of humus on the surface of the mineral soil is probably the most important. The inability of Spruce of all species to reproduce satisfactorily in humus has been discussed by a number of authorities. (See "The Red Spruce, Its Growth and Management," L.S. Murphy, U.S.D.A. Bul. 544; "The Spruce and Balsam Fir Trees of the Rocky Mountain Region," Sudworth, U.S.D.A. Bul. 327; "Forest Research in Southern Appalachians," Frotheringham, Southern Lumberman, Dec. 1922; "Balsam Fir," Zon, U.S.D.A. Bul. 55). Moisture is essential for Spruce seedlings. In

the Spring or Fall there will be enough water in the humus to cause germination of the seeds, but during the Summer the layer of vegetation will dry out under the influences of wind, temperature and humidity, causing the young plants to die of drought. Root development is not as vigorous in Spruce as in Balsam, and the tough layer of moss, leaves, and needles on the surface of the mineral soil prevents the roots of the young seedling from penetrating down to the mineral soil in search of the necessary moisture when the upper material has dried out. In the Fraser Spruce-Balsam type the tough humus layer is very wet in the Spring and affords every opportunity for seed germination then, and to a less extent in the Fall. Evaporation of surface moisture is rapid in the early Summer and the litter is quite dry after a few weeks. The seed wings of the annual crop of seed can be found in large numbers in the humus under the mature Spruce stands, but when examined during the latter half of the Summer in 1924, the seeds themselves were missing in every instance. Further study should determine the number and mortality of the Spruce germinates in the early Spring and during the Fall, and what proportion of them are lost through withering of the germinates due to evaporation of the surface moisture, and through destruction of the seeds by birds and rodents. For methods of determining the damage to seeds by animal lifee, see "The Biotic Factor in Forestry," E.N. Munns, Scientific

Monthly, Vol XV111. March 1924.

The conditions of soil moisture also determine the success of the establishment of Spruce seedlings in mineral soil. If the surface evaporation is too rapid the reproduction will be prevented as in the case of the tough layer of humus. Where the mineral soil has been exposed, the Spruce seedlings come in satisfactorily if a light ground cover of debris, vegetation, or litter has been built up to prevent too rapid drying out of the surface under the action of the sun and wind. This can be readily seen along the cutbanks on the railways and wagon roads. Where a large expanse of soil has been exposed, the drying action of the atmosphere is very complete during the Summer, and in the neighborhood of mature Spruce, with ideal seeding conditions, there will be a complete absence of seedlings. Where, however, a smaller area of soil has been uncovered, and it is shaded by nearby trees or vegetation, and a light covering of slash and litter has been protecting it from sun and wind, a dense crop of young seedlings comes in, with fresh additions each year. Such a group of seedlings is illustrated in Photograph No..5.6.16 Under such conditions the Balsam also comes in. Examination of reproduction on excavations along the Canadian National Railway showed that where the nearby timber was the undisturbed natural Spruce-Balsam mixture there were more Spruce than Balsam

Spruce-Balsam Type Logged and Burned. Penny Ranger Station
No. 4

Spruce Reproduction in Mineral Soil on Railway Cut.
No. 5

among the seedlings. Where logging had taken place and most or all of the Spruce removed from the stand, almost all of the young stuff on the cutbank was Balsam. In both cases the root development of the Balsam was much more vigorous than that of the Spruce. A number of Spruce and Balsam seedlings were taken up during the past season to secure data on root development, but the roots became so brittle after drying that accurate measurements of their length could not be made. With this experience as a guide, it is hoped that the required data can be secured next year. It will be necessary to measure the length of the seedling roots as the plants are taken from the ground, rather than to keep the collected specimens for examination in the laboratory. It would appear, however, that given exposed mineral soil which has been deeply stirred up, and Spruce seed trees within a maximum distance which must be determined, that Spruce is likely to seed in satisfactorily in any case, and will probably produce a good crop, with Spruce predominating, even when there is seeding competition by surrounding Balsam seed trees.

It remains to be determined if Spruce will seed in from seed trees on exposed mineral soil on the surface, rather than that which has been stirred up, or uncovered at some distance below the surface, as is the case in the

excavation of railway cuts. Where the Spruce-Balsam type has been completely burned, and the mineral soil exposed by the fire no seedlings come in as the result of seeding by healthy trees in nearby unburned stands. There may be two reasons for this. The evaporation may have been so great from the surface in the early Summer that the germinates have been killed by drought, and the dense crop of vegetation which has followed has prevented the establishment of seedlings during the following years, when the shade of the ground cover has produced favorable moisture conditions for germination and survival. Or again, the original pure crop of Spruce, mixed with a younger crop of Balsam, may have rendered the soil unsuitable for a later crop of Spruce. For a brief discussion of the effect of successive crops of Spruce on forest soil, see "Forest Utilization in Europe," Schenck, 1924. Referring to conditions in Saxony, Dr. Schenck says:-

"The soil is sick. Two forest generations of spruce have destroyed its fecundity. It has lost its porosity, hydroscopocity, and microsmic content. The rotations of pure spruce have reduced the size of the pores in the soil. Small pores conduct water but not air, which is most important for microsmic and bacterial life. Experiments have shown that clear cutting has reduced by two thirds the air capacity of the forest soil and has seriously disturbed its water permeability. Soil lives, breathes, and undergoes continuous

changes. Soil quality is not permanent, unaltered, always normal. Each tree depends symbiotically on its associates and the subsurface life of the soil.

American foresters should avoid:-

1. Clear cutting.
2. Destruction of debris and surface litter.
3. Exposure to full overhead light.
4. Artificial cultivation of any species beyond its natural habitat.
5. Pure plantations and short rotations."

Whether or not such factors as are outlined above are responsible for the absence of Spruce reproduction in burned over forest land, as well as in green timber, is problematical. Balsam does not come in after a fire in the Spruce-Balsam mixture, even if seed trees are at hand, so it would appear that the conditions following a burn cannot be regarded as an indication of the effect of a pure Spruce stand on the forest soil. It is clear, however, that Balsam is favored in green timber and it is not likely that the exact relative influences of the casual factors can be found out except by careful, and comprehensive experiments in the area, with a background of the experience which has been gained by experimenters with Spruce in other regions.

An interesting case of Spruce reproduction was noted near Shelley. A small clearing had been made during construction days (1911-1913) in a typical Spruce-Balsam

stand and the slash had been subsequently burned. A plentiful supply of seed trees existed in the surrounding timber, but the burned over soil came up in a dense growth of fireweed and other vegetation, with a complete absence of coniferous reproduction. A small cabin was constructed in the clearing, and about a foot of fresh mineral soil thrown upon the shake roof to provide a waterproof covering. At the time of examination in 1924 there was a dense growth of Spruce and Balsam seedlings, with the former predominating numerically, in the soil on the roof of the cabin. Unfortunately, this interesting example of natural reproduction was destroyed by a slash fire in June of this year, (1924).

Another case was noted on the Cottonwood River. Debris had blocked up a small channel in the river, changing the course of the water and exposing a bar of soil composed of sand and fine silt. There were some mature Spruce nearby, and a dense growth of young Spruce seedlings had come in on the bar.

A third instance is shown in Photographs Nos. 6... and. 7.. p. 21 Just south of Prince George, on the South Fort George Road, part of the original Spruce-Balsam was burned, possibly fifteen or twenty years ago. A good supply of Spruce seed trees exists in a strip of green timber beside the burned area. Following the fire no reproduction came in, but after some years a scattered

Spruce Coming in after Old Burn, from Seed Trees, under Alternate Crop of Aspen. Prince George No. 6.

No. 7

growth of Aspen spread over the old burn, supplanting the heavy growth of vegetation which sprang up after the fire. In the shade of this Aspen, the Spruce seedlings are getting a foothold and the area should eventually find its way back to pure Spruce, if not damaged by fire, and if the marginal mature Spruce is retained to supply seed.

Diseases and Infestations.

It was not possible during the past season to complete an accurate study of the condition of the timber in this type. In general the Spruce is sound and the Balsam is rotten or suffering from incipient decay. Comprehensive studies will be necessary to determine the extent of defect in both species. Both are almost free of insect infestations. The principal defect in the Balsam is the Indian Paint Fungus (Echinodontium tinctorium). Fomes pinicola and a root rot which has not been identified appear to be the chief enemies of the Spruce. A collection of fruiting bodies found in the area was collected with the assistance of Compassman R.G. McKee of the McKinley cruising party and forwarded to the Department of Botany of the University of British Columbia for further and more accurate identification. Some slight damage has been done to Balsam and Spruce reproduction, chiefly the former, by an insect which appears to devour the leaves on the terminal twigs shortly after they open out in the Spring.

1130

Spruce-Balsam Type Replaced by Meadows. Cottonwood River
No. 8

1132

Coniferous Type Replaced by Grass Land. Stuart Lake
No. 9

Rate of Growth.

During the past season notes were taken of the ages and diameters of some 488 mature spruce trees in representative stands of the Spruce-Balsam type. Studies were also made of the rate of growth of balsam and spruce reproduction under the mature stand. The results of this work are summarized in the tables on page 52 .

Utilization.

The lumbering industry in the Spruce-Balsam stands of the Upper Fraser is developing rapidly, and is likely to continue to do so. Conditions of utilization are very extensive; the lumber produced is sold in the East in competition with that from regions situated nearer to the markets of the Atlantic seaboard, and the small margin of profit with even a favorable price forces the operator to take the best timber and leave the rest in the woods. As a result the stands are being wrecked without regard to measures whichwill insure a second crop, and care is not taken to even remove the present one with any degree of thoroughness. If the fir is not likely to make the upper grades of lumber it is left standing, along with the greater part of the balsam. It is true that the latter is subject to a high percentage of defect but a very large amount of sound wood is not taken out during the operation. Conditions in the woods after logging are illustrated in Photographs Nos. 13 ..to. 20 .

It is not difficult to understand the effect which such conditions of cutting will have on the forests in this type. The large amount of slash makes a dangerous fire hazard which is

1139

Unburned and Burned Cutting of 1918 at Hutton
No. 10

1138

Spruce-Balsam Type Six Years after Logging.
No Fresh Reproduction
No. 11

does not disturb the surface of the soil to any extent, and conditions are not improved for the establishment of seedlings either by fresh seed or by seed which has remained in the humus from previous years;it remains to be determined if any seed remains in the humus during the winter without germinating. Where the soil is disturbed a dense growth of vegetation, usually ferns, springs up during the first spring after logging and while this may eventually be replaced by coniferous reproduction there is not sufficient evidence to justify any conclusion that this reproduction will contain a satisfactory proportion of spruce. The nature of the vegetation on old logging roads and in openings in the timber caused by cutting is shown in Photographs Nos. 16 and 19 .

Management.

The object of the management of this type should be to secure a sustained yield of the most valuable species or series of species which can be made to grown on the ground. At present spruce is the most valuable tree on the area and if environmental conditions are favorable to its reproduction, the immediate objective should be to secure adequate reproduction of this species. Given the means of securing this reproduction the management should not be difficult, and it should be possible to cut the type in an economic manner, at the same time removing a proportion of the balsam which will increase as conditions of utilization become more intensive. With better economic conditions in the future the application of forest sanitation should improve the quality of the balsam in later crops of timber.

1136

Spruce - Balsam Type Cut 1919 Over and 1920 Burned
Sample Plot No. 4. (Hope's) Penny
No. 12

1146

Cut-over Spruce - Balsam Type. Giscome
Note Openings Made in Stand
No. 13

But there is an extremely small amount of advance spruce reproduction in cuttings, and little or no fresh seeding seems to take place in the cuttings either before or after slash fires. Until the reason for this has been accurately and completely determined, methods of management cannot be worked out. It will be necessary to find out if seedlings can be established under present logging methods, from seed trees, either in groups or strips in:-

1. Undisturbed soil with humus covering.
2. Soil which has been burned over.
3. Soil disturbed by logging.
4. Soil artifically prepared by raking, scraping, &c.

Once it has been determined how seeding can take place, a method of slash disposal can be developed.

Lodgepole Pine Type.

A careful analysis of the problems of this type cannot be undertaken in this report. The area whichthe type covers is so extensive, and there are so many variations in its composition and environmental conditions that its nature, life history, and natural tendencies to change and replacement will not be understood until very comprehensive investigations have been made, dealing with this type exclusively. Climatic conditions vary considerably over the areas in Central British Columbia which are now occupied by lodgepole pine. Unlike most of the Spruce-Balsam type, the pine is found in evenaged stands of all ages. The original forest must have included a number of types, each different to the present variety of types in all of which the pine

predominates. Also, the reproduction is not as uniform in nature as in the spruce stands of the Fraser. Some areas of pine have spruce reproduction, others pine, others none at all.

The mixture of pine and spruce in this type should be studied carefully in the near future. There are large areas in the Nechako and Skeena basins where a mature stand of pine has acted as a nurse crop for a dense growth of young spruce. The management of such a mixture is already presenting some difficulties. The pine is in demand now for ties, while mature spruce in the mixture cannot be utilized profitably. If the pine is cut and the spruce left, the slash presents a hazard from fire and insects, and the question of adequate reproduction is made more difficult. The present lodgepole stands, both with and without the spruce admixture, will be one of the biggest factors in the management of the forests of the whole Northern country, possibly the greatest.

Unlike the Spruce-Balsam type, the pine type will require the development of a separate system for each subtype it contains, and it may eventually be most profitable to manage some areas to produce successive crops of pine while others will be devoted to alternate crops of spruce and pine. If Douglas Fir originally occupied some of the region it may be best to encourage it to come in again as market conditions and forest practice becomes more intensive. With regard to the spruce and pine, at present there is an unbalanced demand for the two species in the type.

In the future, when a pulp industry has been established in the Northern Interior, it may be possible to dispose of the spruce in the mixture at the time the pine is taken out, either as pulpwood or as ties or sawlogs, whichever is the most profitable.

Cedar-Fir-Hemlock Type.

Conditions in this type are different to those of both the spruce and pine types. The timber has become overmature, and is of little or no merchantable value. The problem is to dispose of the decadent stand on the ground at present, and to put the area to better use, growing something of value.

Very little attention has been given to this type. The stands of spruce and pine in the North will provide a sufficiently large field for the investigator for a good many years to come. They contain timber of value and can be made to grow second crops which will also be valuable. Neither of these conditions exist in the Cedar-Hemlock stands and therefore they should not receive the attention of the Experiment Station to much extent for some time until the more useful types have been dealt with, except insofar as the results of the investigations in them may be of value in working with the spruce and pine.

1140

Spruce-Balsam Slash Piled and Burned to Form Fire Guard
No. 14

1146

Slash and Unmerchantable Balsam Left by Logging
No. 15

1141

Typical Stand of Balsam Left after Logging No. 16

1146

Balsam and Defective Spruce Left after Cutting No. 17

1146

Note Debris on Ground No. 18

1146

Cutover
Spruce-Balsam
Type.
Giscome

Note Growth of Ferns on Exposed Soil No. 19

1146

Opening Made by Logging Road No. 20

WORK OF THE STATION

It is suggested that the work of the Northern Interior Forest Experiment Station should be organized as follows:-

(a). An experiment station should be established in the district, where the office, laboratory, nursery, and small scale experiments could be carried on.

(b). The Aleza Lake Forest Reserve should be developed for the purpose of experimental silvicultural cuttings, and other large scale experiments.

(c). Further areas should be set aside for cutting and other experimental purposes in the various types in the region as the need arises.

These three phases of the work of the Station will be dealt with in more detail in the following pages.

(a). Experiment Station.

The same factors affecting the selection of a site for a forest experiment station which were discussed by Mr. Alexander in connection with the Southern Coast Experiment Station apply to the selection of a site in the Northern Interior. The station should be centrally located, with reference to forest types and areas, in the first place, and also, to a lesser extent, ~~and also~~ with reference to the development of the industry and the location of the offices of the Forest Branch in the District. It should be accessible. The soil should be suitable, and well drained. There should be adequate protection against fire, and the possible effects of the local climatic conditions should be carefully studied to minimize the danger from frost.

In regard to buildings, it is suggested that the Station should include a dwelling house which would contain an office and laboratory, with a greenhouse attached, A tool shed, garage, and quarters for workmen could be added as required. It is likely that at least one permanent assistant will be needed from the beginning to take charge of small field parties during the summer, and to assist in the work of the station during the winter, or to conduct cost studies and other field work then. It will be understood that the above suggestions are merely preliminary in nature. During the immediate future the present office in Prince George will serve as the best headquarters for the Station, and a more permanent institution can be established later when the needs of the work are better understood and information has been secured of the best practice which is being followed in older, more experienced organizations.

The investigations which will come under the work of the experiment station can be divided into (a)., those which will be carried on in the central station, and (b)., those which must be carried out in the field. These will be described briefly in order.

(a) Work to be undertaken at the Station.

1. Meteorology.

It will be in this connection that the best information can be secured about environmental conditions of climate. Data of air temperatures, annual and seasonal means, frosts, precipitation, humidity, and wind can be secured; co-operation should be worked up

with existing stations in other parts of the region,

2. Nursery work.

This should be undertaken to secure information in regard to artificial planting, race experiments, exotic species and other work in which it will be necessary to observe carefully the effect of soil, light, temperature, and moisture on growing seedlings. Transplants and ~~also~~ nursery stock can also be grown for various purposes as required.

3. Seed testing and germination.

Seeds from various species, sites, and different age classes of each species must be tested for viability and qualities of durability under different conditions of moisture and temperature. Germination tests should be made of all classes of seed to determine the rate of germination at different seasons and under different environmental conditions.

4. Sowing and planting.

If artificial reforestation is eventually necessary in any part of the region it will first be necessary to find out how the sowing or planting can be done in the most efficient and economical manner. This can only be determined by comprehensive experiments both in the field and under the more accurate conditions of the experiment station.

5. Establishment of Seedlings.

5. Establishment of Seedlings.

This work will be of special importance in the study of the spruce type. Beds should be prepared where seeds of various species may be sowed in a variety of soils under all conditions of shade, moisture, and temperature, and the growth, mortality, water requirements, root development and other characteristics of the seedlings may be studied.

6. Soil examination and tests.

The importance of a study of the soil in each of the timber types has already been referred to. Part of this work can best be done under laboratory and nursery conditions. The work of the Forest Branch agronomist will be correlated with that of the Experiment Station, and overlapping avoided, but certain work of the examination of the forest soils of the region, can be undertaken by the Station to good advantage. Samples of soil from each type which have been burned should be tested for their suitability for seedling growth and compared with natural unburned soil. Other experiments should be undertaken to determine the comparative growth of seedlings in the various combinations of sand, silt, and clay.

7. Office and Laboratory.

The study of research literature, and the correlation of the results secured by other research organizations will be an important part of the work. Reports will have to be prepared, andas the work progresses bulletins may be issued for various purposes. Laboratory work will include the study of collected specimens, experiments in wood technology, and physiological investigations

Work in the Field.

1. Distribution of species and types.

This study will be the most important project to be undertaken in the near future which will include the whole area covered by the Stations. The nature of the forests must be understood before their problems can be solved. The distribution and occurrence of each type ~~solved~~ should first be determined, and then for each type a life history should be built up, so that its past might be known and a prediction of its future made possible. Also,--and included in this study;—the nature of the permanent type of each area should be determined, if a single definite type can permanently exist on it. Combined with this study of type distribution, data should be secured dealing with the distribution of each species.

2. Growth, volume, and yield.

These studies will furnish basic material for mensuration, management, and regulation. They must be preceded by the determination of types and sites.

3. Cutting methods.

The cutting methods will be the application of the theories developed by investigation and experiment. When the best method for the type under consideration has been developed on paper it should be tried out in the woods, and its application and effect carefully observed. This should be done in an area assigned for permanent experimental purposes. Such a practical, large scale experiment will show the effect of each cutting method on:-

1. Reproduction and reforestation:
2. Slash disposal.
3. Fire hazard.

In these experimental cuttings each system should be carried on under a variety of seasonal conditions and logging methods. A permanent series of observations would serve to note the effects of the cuttings.

The Aleza Lake Forest Reserve will serve as an admirable area for experiments in cutting methods in the Spruce-Balsam stands of the Fraser. Experiments should also be carried out in other types, and as policy dictates, in cooperation with lumber,

(Continued on next page.)

tie, and pulp companies.

4. Thinnings.

The economics of thinnings, and their effect on the remaining stand, should be studied. In a few years it may be profitab to take thinnings from some of the Lodgepole Pine stands on the Nechako. Thinnings in other stands would improve the quality of the final product, but will not be economically possible for some years. The time for the making of such thinnings should be determined.

5. Ecology.

The study of the effects of environment will be necessary in almost every phase of the work; ecological factors affect the distribution of types, and the changes in their composition during the natural trend of their life history: such a change as the natural replacement of a Douglas Fir stand by one of Cedar and Hemlock is due entirely to environmental factors. Every forest, under natural conditions is suffering a constant breaking down, and building up of its constituents. The rate of change and the trend of the evolution of new characteristics can be understood only in the light of ecology.

6. Primeval Stands.

Where a forest has been destroyed by accidental means, and has been replaced by an entirely different type as a result of the accident,- which may have been a fire or an insect epidemic--the nature of this socalled permanent type must be learned by the investigator before he can find out what will grow on the area to the best ultimate advantage. For instance a fire stand may occupy an area which once ~~one~~ bore spruce, later destroyed by fire. The intolerant fire cannot readily

reproduce satisfactorily and it might be best to bring in the spruce again, and secure a better yield from it, with simpler management. Under such conditions the determination of the nature of the primeval forest opens up the solution of the problem.

7. Site studies.

A system of site classification should be worked out, in connection with the delineation of types. Then for each site characteristics of composition, reproduction, and wood qualities should be determined.

8. Seed dissemination and germination.

Part of these studies should be carried on in the field, in conjunction with other phases, of investigation of the same subject which can be better handled in the laboratory and nursery. The studies should include:-

(a) Production, dissemination and naturaly storage of seed.

(b) Rates of mortality and germination.

(c) The effects of the source of the seed, (Overhead stands, seed trees and marginal timber), upon production, and dissemination.

(d) Seed in the forest floor.

(e) The occurrence of seed years, and the seeding characteristics, for each species.

(f) Seed germination.

Factors:-(1) Light-(Tolerance) Moisture requirements.
Soil:-

Composition
Humus cover
Soil history.

(g) Seedling establishment.

Factors: Light and moisture.

Soil and Humus.

Root development.

Suppressive influences.

Biotic factor.

9. Fire Research.

This can be correlated with the work in meterology and slash disposal. Fire conditions in the North require study, and such study can be undertaken by the Station to good advantage. With the growth of the organization one of the first additions to the personnel should be a fire and slash disposal specialist.

10. Slash disposal.

This is already a big problem and its study will always constitute one of the major projects of the Stations. Conditions differ in every type: the problem should be first tackled where utilization is most extensive. The best method of disposal will have to be cheap, securing good new reproduction, and not injuring the advance growth. with protection from fire and insects. Before such a method can be developed for any type, each of these factors must be studied. In this, as in all the work of the Station, the investigator will have to trace down each of the many forces which hold the forest organization in equilibrium, and then build up a method which will preserve the status quo when a disturbing element has been introduced by logging or fires.

11. Cooperation with companies.

As forest industries develop in the North the operators will take an increasing interest in technical forestry and it is likely that within the next few years some of the larger companies will be anxious to initiate some experiments in reforestation,

utilisation , or slash disposal, on their holdings. The development of forestry in the region will be served if such work is encouraged: the work will be done to the best advantage if it is cooperated with that of the Station or other independent investigators.

12. Methods of increasing Forest Producivity.

Stands should be handled not only with a view to being kept as valuable as they are at present, but also to make them more valuable. The natural forest is productive: management should make it more productive. This object can be achieved by:-

(a) Increased area.

Greater production on mature forests.

Production from waste lands.

(b) Increased growth.

Retention of fast growing species only.

Increased production of mixed stands.

(c) Increased quality.

Increased yield of useful material.

Retention of best trees only.

Concentration of growth on best trees:

(See "Methods of Increasing Forest Producivity" U.S.F.S. Cir. 172.)

13. Dendrology.
14. Entomology.
15. Pathology.

The work of the Station should be to detect the high spots of problems in these fields of investigation: he should know when his forests need the attention of a specialist. Problems of botany, tree diseases and forest infestations are exceedingly

complex and need careful handling. As utilization progresses the disturbance in the forest balance will bring diseases and infestations in its wake. It is possible, for instance, that the removal of spruce from the Spruce-Balsam type, with the retention of an almost complete canopy of balsam may cause an insect epidemic. (See Schierbeck on "The Budworm").

(b) Aleza Lake Forest Reserve.

The main purpose of this reserve will be to serve as an area where experimental cuttings may be carried out, and their progress and effects observed on a permanent basis. Cutting should not be done until basic studies have indicated the system which should be tried out but in the meantime some initial preparations may be made. The boundaries should be set out, and a map of the area made in conjunction with a cruise of the timber.

1. Survey. It is recommended that the outside boundaries be surveyed by a B.C. Land Surveyor, and that posts be placed along the boundaries at intervals of 10 chains. The elevations of each of these points should be established by rod and level.

2. A topographic map, should be made, with, as a tentative suggestion, a 25 foot contour interval. The notes for this map should be secured during the cruise.

3. The timber should be estimated on the basis of a 20% tally on one chain strips, five chains apart. All trees should he tallied having a diameter at breast height of 4" or more.

- -

Upon completion of the survey of the Reserve an adequate protection system should be worked out, with any improvements which may be necessary.

(c) Other areas.

As the research program is developed experimental areas should be selected in the Lodgepole Pine and other types, and investigations initiated on them on a permanent basis. For experimental cutting, small reserves, similar to that at Aleza Lake could be set aside: smaller areas could be utilized for field nurseries and planting experiments, Sample plots, temporary and permanent, will be necessary in almost every phase of investigation.

(d) General.

All the work of the Experiment Station will be carried on with the definite aim of building up working plans and developing a policy of forest management, and regulation in each major type. The projects assigned to the investigators by the Research Committee should be selected with that end in view, and the correlation of various phases of the work must be prefectly balanced, without undue overdevelopment in one branch of investigation, and a lack of information in another.

When the best plan of regulation has been worked out it cannot be applied, to the best advantage, unless there is a favorable public sentiment. While plans are being made to apply better forest practice, the ground should be prepared by fostering a forest sentiment in the region. The work of the Station should be given publicity. Conservation and protection should be brought home to

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the people who should be interested in the forests. Lectures could be given during the winter months. No opportunity should be lost to increase, the publicity of the Branch in the press, the schools, and the community life of the district.

SUMMARY OF TREE COUNTS ON REPRODUCTIVE PLOTS

Spruce Balsam Type in Upper Fraser Valley.

(1) Green Timber. Number of plots.....87.

	Trees per Acre		
	Mature	Poles	Reproduction
Spruce	64.3	31.6	126.2
Balsam	44.3	62.2	725.9
Fir	1.8	0.5	0.5
Hemlock	0	1.0	2.0
Cedar	0.5	1.0	37.7

(2) Logged over areas. Number of plots.....78.

	Trees per acre.		
	Mature	Poles	Reproduction
Spruce	7.5	20.9	37.9
Balsam	30.4	35.3	294.5
Fir	0.9	0.1	0.8
Hemlock	0.0	0.2	0.2
Cedar	0.2	0.0	1.8

Decrease in trees per acre after logging.

	Mature	Poles	Reproduction
Spruce	88.4	33.8	70.0
Balsam	31.4	43.2	59.3
Fir, Hemlock, Cedar	Numbers insufficient to give accurate values.		

NORTHERN INTERIOR FOREST EXPERIMENT STATION

Reproductive Studies.

Instructions in Tallying Preliminary Plots

The purpose of making these reproductive studies is to secure data in regard to the composition of the stands of timber in the Northern Spruce Region both before and after logging, and also in regard to the nature of the growth which we may expect in stands after they have been cut over.

For this purpose small plots should be selected in undisturbed natural spruce stands and in logged over areas, and all the trees on these plots should be tallied by species and diameter classes. Trees less than four inches in diameter should be measured by height, in four foot height classrs. As far as is possible the plots should be eight chains in length, and one-quarter of a chain wide, thus containing one-fifth of an acre. When a plot has been selected the two-chain steel tape should be stretched out in a straight line, and all the trees measured and tallied which lie within eight and one-quarter feet on each side. This distance should be measured by a light pole cut to that length, and marked at intervals of two feet for use in measuring the height of trees under four inches in diameter.

The diameters of trees should be measured by a diameter tape. A Biltmore stick may be used occasionally, but the tape must be regarded as the more reliable means of measurement, and it must be used frequently on every plot.

In green timber the beginning and end of the plot must be plainly marked on a tree of at least eight inches in diamater, below stump height, and the location and inscription of these blazes must be marked on the back of the tally sheet, and also the distance of the plot from the last one measured. The plots should be located at fairly regular intervals of from four to ten chains over the area being examined. In logged over areas it is not necessary that special care be taken to identify the position of the sample plots.

A number of photographs of the plots should be secured. If a lookout is kept for likely scenes, especially in logged over country, good pictures can be taken now and then. Take the picture, from a point between your object and the sun, from which you have an uninterrupted view of the area. A little work in clearing away the underbrush in front of the camera will greatly improve the photograph.

Remember these points:-

Be sure you have the right species.
Don't measure anything outside the 8 foot mark.
Use the Biltmore stick with care.
Stand properly when using the compass.
Tally every tree, but none of them twice.

A number of these details are covered in "Instructions for Intensive Reconnaissance." This book was written for cruising work, but it should be read and studied.

Rule up your sheets the night before. Keep good notes. Remember that your notes represent a large amount of money, and they must on no account be lost or mislaid.

You are expected to be on the job from eight till five with an hour off for lunch, and it is up to you to see that this part of your job is carried out.

If you get into difficulties write or wire at once and you will be given every assistance.

(Sgd.) P.M.Barr

Junior Forester.

F↑B
Plot No. 112
North End.

Method of Marking Plots

NORTHERN INTERIOR
FOREST EXPERIMENT STATION

REPRODUCTIVE STUDIES -1924.

A check-up of the sheets which have been handed in to date shows that improvement in methods can be made in a number of ways. In the future attention should be paid to the following details:-

1. The sheets should be ruled properly. If this is done the tallying and compilation of dots is likely to be more accurate.

2. The timber type must always be indicated, in both green and logged over timber. The types we have encountered to date are the Spruce-Balsam, the Fir Ridge, and the Cedar.

3. All compilations must be checked by a second man and must be initialed by him.

4. Measure the humus depth carefully, and describe what the humus is composed of.

5. If spruce reproduction is plentiful, try to find out the reason why.

6. Do not count dots which have been cancelled by having a circle drawn around them.

7. The location of logged over plots must be indicated, as, for instance, "in logging of 1923-24 on south side of C.N.R. opposite Johnson Mill, Hansard."

8. When adding up the dots on the tally sheet, if there is a large number in any one class, total the dots on one line at a time, then total these figures to obtain the total for the class. This will eliminate errors in counting large numbers of dots.

(Sgd.) P.M.Barr

Aug. 18,1924.

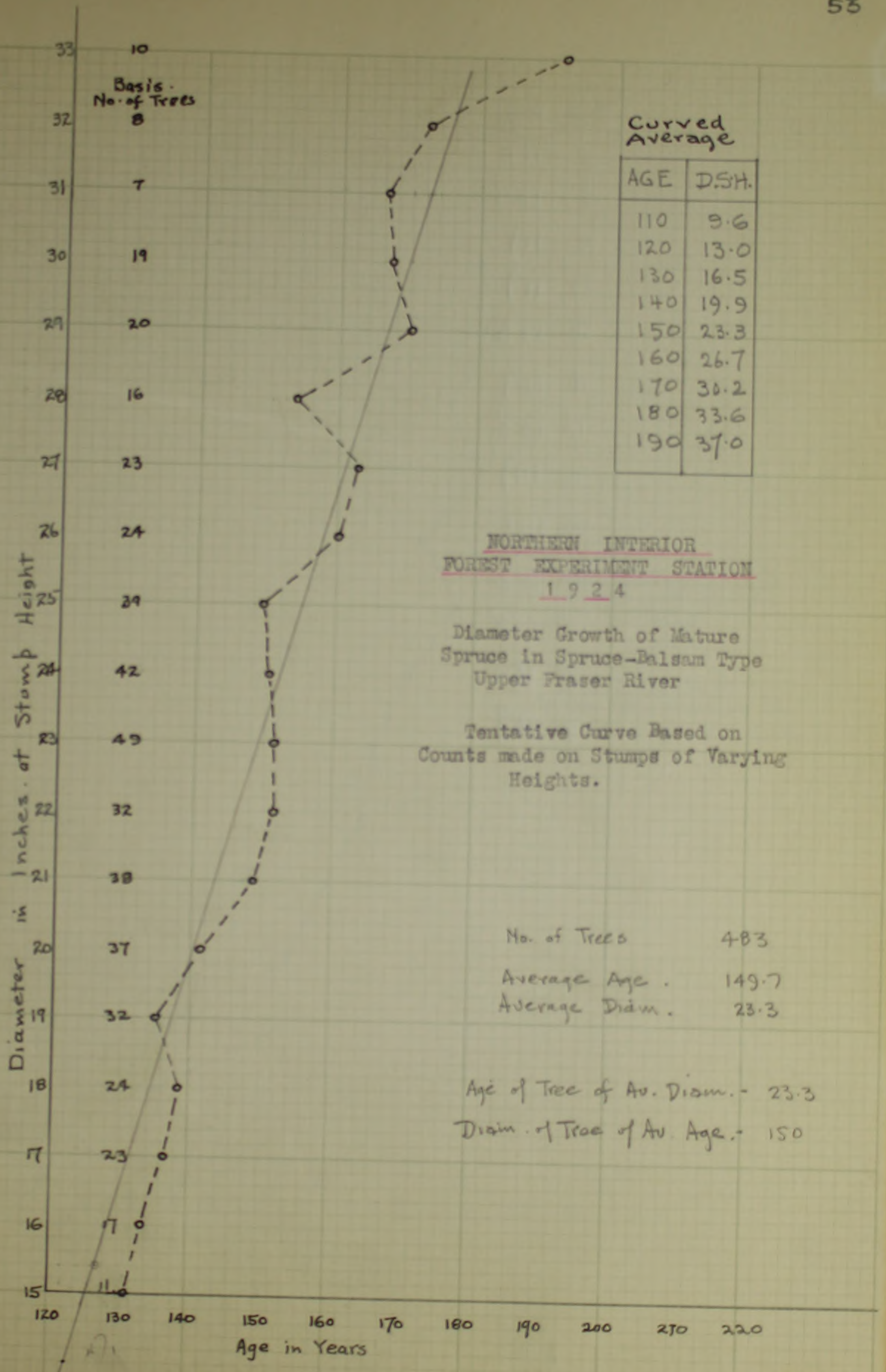
NOTE ON AGE CURVES

Diameter Growth of Spruce.

In securing the data for this curve the rings were counted on stumps of mature spruce in logging operations. Counts were made in several areas and in general the stands were found to be roughly evenaged in each case and trees of the same age covered a wide range of diameters. The rate of growth seems to depend more on environmental conditions which affect suppression rather than on age. The height of the stumps varied from two to four feet and to secure an accurate curve the age of each tree should be corrected for the time required to grow to stump height. This data should be secured from counts of spruce reproduction in a young stand free from suppression, as there does not appear to have been any suppression of the present mature spruce stand in its early youth.

Height growth of Spruce and Balsam Reproduction.

These curves illustrate the suppressed condition of the reproduction under the cover of the mature trees in the Spruce-Balsam Type in the Valley of the Upper Fraser. There is very little difference in the height growth of the two species. Further studies should be undertaken to show the rate of growth of the two species after release from suppression. In making the counts the young trees were cut at a height of twelve inches. A correction should be made for the time required for suppressed seedlings to grow to this height.



Curved Average

AGE	D.S.H.
110	9.6
120	13.0
130	16.5
140	19.9
150	23.3
160	26.7
170	30.2
180	33.6
190	37.0

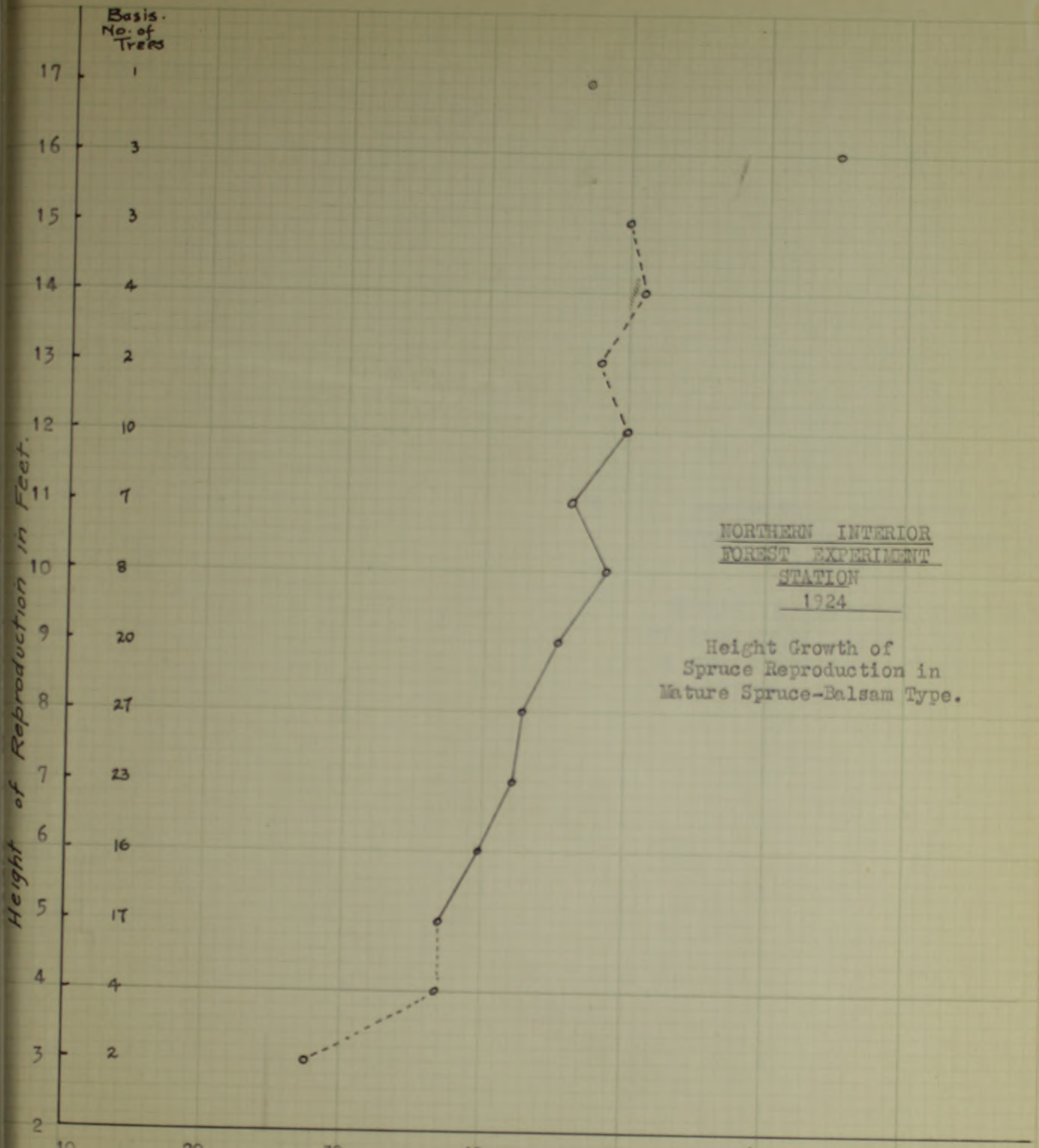
NORTHERN INTERIOR
FOREST EXPERIMENT STATION
1 9 2 4

Diameter Growth of Mature Spruce in Spruce-Balsam Type Upper Fraser River

Tentative Curve Based on Counts made on Stumps of Varying Heights.

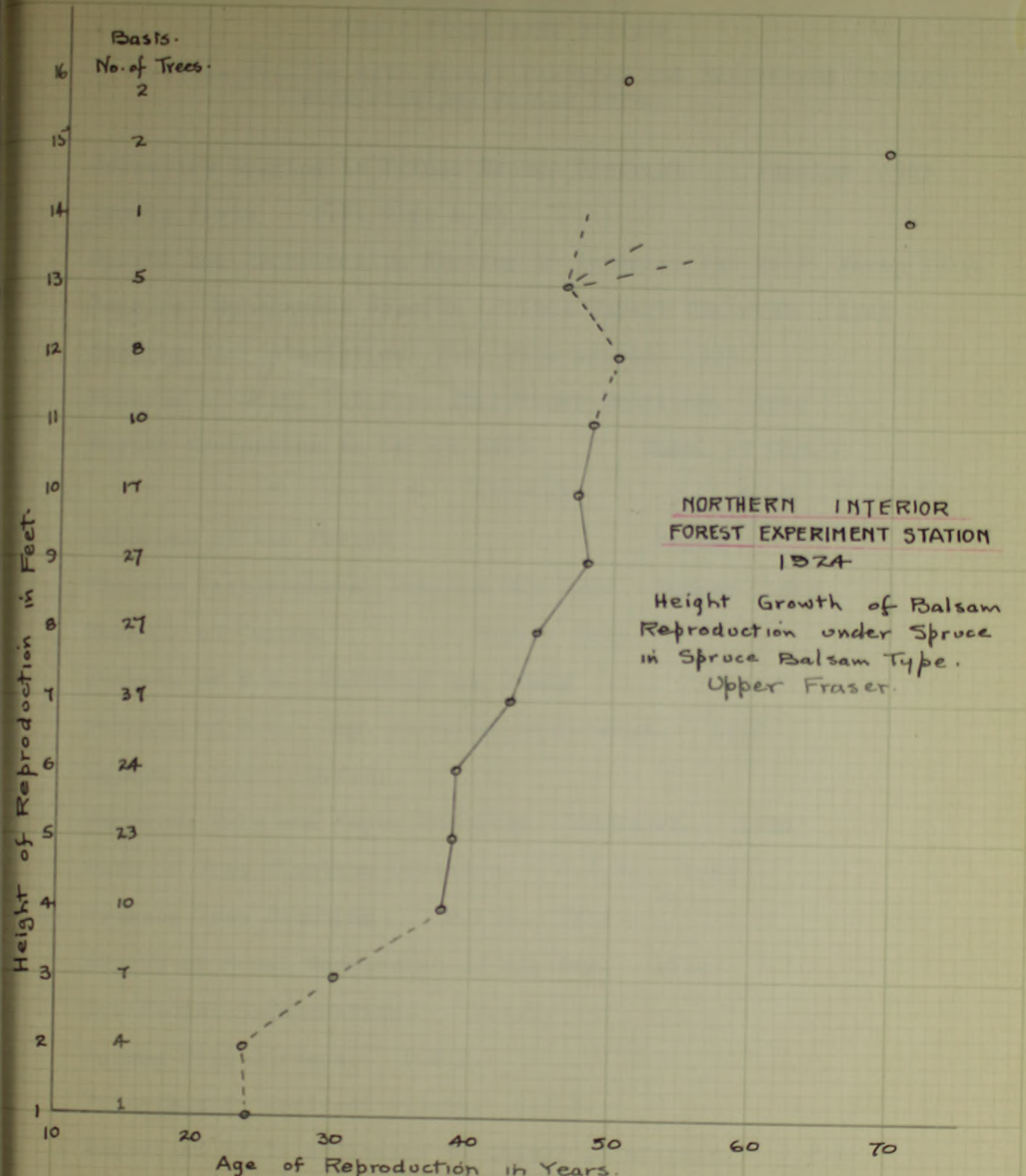
No. of Trees 483
Average Age . 149.7
Average Diam . 23.3

Age of Tree of Av. Diam. - 23.3
Diam. of Tree of Av. Age. - 150



NORTHERN INTERIOR
FOREST EXPERIMENT
STATION
1924

Height Growth of
Spruce Reproduction in
Mature Spruce-Balsam Type.


Basis.
No. of Trees.
16 2
15 2
14 1
13 5
12 8
11 10
10 17
9 27
8 27
7 37
6 24
5 23
4 10
3 7
2 4
1 1
Height of Reproduction in Feet.
10
20
30
40
50
60
70
Age of Reproduction in Years.
NORTHERN INTERIOR
FOREST EXPERIMENT STATION
1924
Height Growth of Balsam Reproduction under Spruce in Spruce Balsam Type.
Upper Fraser.

NORTHERN INTERIOR
FIREST EXPERIMENT STATION

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" " " " 1912-13 " " "

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C O P Y

61

United States Department of Agriculture

Forest Service

Washington

July 1, 1924.

Forest Experiment Stations.

Mr. P.M. Barr, Jr. Forester,
Department of Lands,
Prince George, B. C.

Dear Mr. Barr:-

I am very glad indeed to have your letter of June 23 as to the establishment of an Experiment Station in British Columbia, and I am certain that our own organization here would be very glad to be of any assistance to you, at any time.

I am sending you a copy of the program of work of our own Forest Experiment Stations for 1923, and also will place your name upon the list of receive our monthly report, which is more of a news letter than a report. I am sending you the last two issues of this, and will see that you get the new ones as they are issued.

You are probably aware that this year we are establishing a Forest Experiment Station in the Pacific Northwest which has for its territory; Oregon, Washington, and Alaska. Mr. T.T. Munger of the Forest Service at Portland is to be the Director of this Station, the headquarters of which have not been decided upon as yet. He is, just now, getting under way in developing his program and building up his personnel, also gathering together such equipment as he will need. It is planned, this year, to have a force of about five technical men in permanent assignment. The principle problems, of course, will be those of growth and yield, particularly, of the Coast Forests; better methods of fire protection; and the proper management of the major forest types, some of which are, of course, as common to your region as to ours.

We have another Station at Missoula, Montana, known as the Priest River Station, whose work deals with Idaho and Montana. Their problems lie chiefly in the Northern Rocky Mountain Forests, of which the western white pine is the most important tree. We have a Station in New England at Amherst, Mass. Here, work deals very largely at present with the spruce forests of the northeast.

J.M.B.

In case you desire to get in touch with any of the Stations, I would suggest that you write to the Directors personally. There is enclosed a copy of a list of the Forest Experiment Stations, with their addresses.

I sincerely trust that it will be possible for you to come east, as you have planned, and when you do I would like very much indeed to meet you, and also to have you meet a number of other men here in Washington.

Very sincerely yours,

(Sgd.) E. N. Munns
Acting Chief,

Forest Experiment Stations.

Enclosures.

Program of work, etc., sent
under separate cover.

ADDRESSES OF THE FEDERAL FOREST EXPERIMENT STATIONS

- - - - -

Director,
Appalachian Forest Experiment Station,
Asheville, N.C.

Director,
Southern Forest Experiment Station,
New Orleans, La.

Director,
Northeastern Forest Experiment Station,
Amherst, Mass.

Director,
Lake States Forest Experiment Station,
University Farm, St. Paul, Minn.

Director,
Priest River Forest Experiment Station,
Montana Building, Missoula, Mont.

Silviculturist,
Fremont Forest Experiment Station,
Colorado Springs, Colo.

Director,
Southwestern Forest Experiment Station,
Flagstaff, Ariz.

Director,
Pacific N.W. Forest Experiment Station,
Portland, Ore.

Washington.	E.H.Clapp	Chief of Research
	Ward Sheppard	Assistant Chief
	G.B.Sudworth	Dendrology
	E. N. Munns	Experiment Stations
	R.M. Brown	Forest Measurements

C O P Y.

United States Department of Agriculture,
Forest Service
Appalachian Forest Experiment Station

June 24, 1924.

Mr. P.M. Barr,
Forest Branch,
Department of Lands,
Prince George, B.C.

Dear Mr. Barr:-

I was very much interested to know from your letter of June 17 that you had been placed in charge of the organization of the Northern Experiment Station in British Columbia. I am sending you a copy of our investigative report for 1922 which discusses the various activities of this Station as proposed and later carried out in general conformity with the plans out-lined. Our report for 1923 is exhausted and that for 1924 has not reached us in mimeographed form for distribution. As soon as it comes in a copy will be sent you.

You will note that these reports cover only the large features of the investigative work. The detail is reserved for special working plans which are not mimeographed and which, I regret, are not available for distribution. Copies could be loaned you for specific projects should you desire them. although as yet no classification on the basis of height, and possibly for one or two other projects.

For manifest reasons the report as prepared for distribution does not go into the finances of the Station.

The Station has offices in Asheville but as yet no field facilities other than seed beds worked in co-operation with a nearby pulp and paper plant and a hitherto unused area on the Pisgah National Forest, the development of which is expected to begin this year. On account of the large territory in which we are working it is necessary to develop working centers or sub-stations at different representative points. Several of these are contemplated but work has been started on only one center- that at Berea, Kentucky, in co-operation with Berea College. Most of our work has been of an extensive preliminary nature.

I take pleasure in enclosing one or two reprints covering phases of the work so far done at this Station.

Very sincerely yours,

(Sgd.) E.H.Frothingham

Director.

C O P Y

United States Department of Agriculture
Forest Service

Northeastern Forest Experiment Station

Amherst, Mass.
August 1, 1 9 2 4.

Mr. P. M.Barr,
c/o The District Forester,
Prince George, B. C.

Dear Mr.Barr:

Your letter of July 21 must have crossed mine of July 16. Since this station has been in operation less than a year, I am sorry to say that we have not yet issued any publications that can be sent you. There is, however, now being mimeographed a statement as to forest investigations now under way in the Northeast, including those being handled by the Experiment Station, a copy of which I shall be glad to send you as soon as it is ready. If you are interested in see the working plans for our spruce growth and yield, spruce methods of cutting, and taper and volume studies, I shall be glad to have copies sent you when they can be prepared. As you will see, the bulk of our work so far is with spruce. Jack pine is so scarce in this region as to be of little more than botanical interest.

I am asking the Washington office to send you when ready a copy of the bibliography entitled "Forest Problems of the Northeastern States", which is now being mimeographed. In case you do not have access to any of the articles listed there in which you are interested, you can doubtless arrange to see them through the Washington office of the Forest Service.

I hope we shall be able to keep in touch with each other's activities, and shall be very glad to send you from time to time any material from here that may appear to be of special interest. Copies of office memoranda or publications of interest to us which may be prepared at your station will be appreciated in return.

Very sincerely yours,

(Sgd.) S.T. ~~Davis~~ Dana
Director.

C O P Y
United States Department of Agriculture
Forest Service

Pacific Northwest Forest Exp. Station

Portland, Oregon,
July 17, 1924.

Mr. P. M. Parr, Jr. Forester,
Department of Lands,
Prince George, B.C.

Dear Sir:-

Through Mr. Munns' letter of July 1 to you, copy of which was sent to me, I have been very much interested in learning of the establishment of a forest experiment station in British Columbia.

There are so many points of resemblance between the territory covered by our newly created experiment station here and your British Columbia that I foresee great benefits to be derived by an interchange of data and ideas across the line. As you are aware, we have been doing some research for years here, partly through the local Wind River Experiment Station and partly through the District Office in Portland. A recent appropriation promises a very material enlargement of our work which has already commenced. It is too soon, however, to state exactly the lines of endeavor we will concentrate on at the start but we expect to formulate a program that will look some way into the future during the coming months. At present we are continuing in the vicinity of Wind River the work which has been under way there for some time, notably the study of the meteorological conditions that lead up to acute fire danger and the means of predicting them. We hope to do much work on our fire problems, particularly the determination of inflammability conditions, the behavior of fires on all kinds of sites and types, and the prognostication of dangerous conditions.

I have also recently put in the field a small crew to study yield of Douglas fir stands and they will work in normal fully-stocked "second growth" from about 40 to about 140 years of age. This will supplement the considerable amount of work done in 1909 and 1911. We expect to make this a major project and to gather a sufficient amount of data to prepare rather comprehensive yield tables for all varieties of conditions found in the Douglas fir belt of western Oregon and Washington. We will amplify this study later by putting in many more permanent sample plots. It seems to me that it will be mutually helpful to correlate the work that we do on this side of the line with what you do on the other, especially in order that comparison might be made between the yields in one country and in the other. The fundamental principles

worked out in the one region should certainly find application by its neighbor.

I shall hope, therefore, to learn more of your work as your projects are formulated and wish to assure you that I shall be most glad to make available to you outlines of any projects we are undertaking, or any reports which may result from our work that may be of interest to you.

Very truly yours,

(Sgd.) Thornton T. Munger

Director.

C O P Y

United States Department of Agriculture
Forest Service

Northeastern Forest Experiment Station

Amherst, Mass.

July 16, 1924.

Mr. P.M. Barr,
Junior Forester,
Department of Lands,
Prince George, B.C.

Dear Mr.Barr:

Mr.Munns has sent me a copy of his letter of July 1 to you. From this I judge that you are planning on an eastern trip in the rather near future, and hope that it will be possible for you to include Amherst in your itinerary. We should be more than glad of an opportunity to get acquainted and to tell you something of our work, as well as to learn more of Experiment Station activities and plans in British Columbia.

Very sincerely yours,

(Sgd.) S.T. ~~Davis~~ Dana

Director

Lot 2688 - 160 acres
Logged in 1926 - Examined 1950

Stand and Stock Table

D.B.H Class	Spruce		Balsam	
	No.	Volume f.b.m.	No.	Volume f.b.m.
8	15.0	300	16.4	328
10	11.4	456	23.6	944
12	8.6	774	8.6	774
14	5.0	775	6.5	1,008
16	4.3	989	3.6	828
18	0.7	214	-	-
20	-	-	0.7	277
22	0.7	336	-	0
Totals	45.7	3,844	59.4	4,159

C O P Y

Department of the Interior
Canada

FORESTRY BRANCH

OTTAWA, 25th June, 1924.

Sir:-

I beg to acknowledge the receipt of your letter of June 18th, and note with interest that you have been placed in charge of experimental work in connection with the Northern Experimental Station of the British Columbia Forest Branch.

In regard to your request for memoranda or circulars dealing with investigative work carried on by our Branch, we have prepared a "Forest Research Manual" which is in the course of publication. When this is available in printed form we will be pleased to let you have a copy. In the meantime I am sending you the following memoranda and circular:- Enc.

The Use of Statistical Methods in Forest Investigative Work.
Forest Investigative work of the Dominion Forest Service.
Natural Reproduction on Cut-over Areas.
Artificial Regeneration: Planting.
General Instructions for Working Plan Surveys.
Memorandum on Thinnings.
Number of Permanent Plots necessary to obtain an Average.

Most of this material is contained in our Manual in slightly altered form. We hope this material will be of use to you.

It is very probable that we will take advantage of your offer of co-operation later on and we will be pleased to receive, at any time, either descriptions of any forest investigative work which you have initiated, or any results which you have obtained from your work.

Your obedient servant,

(Sgd.) B.Roy Cameron
B.

Acting Director.

P.M.Barr, Esq.
B.C. Forest Branch,
Prince George. B