

COMPARISON BETWEEN THE GROWING SEASONS OF WESTERN YELLOW  
PINE AND DOUGLAS FIR.

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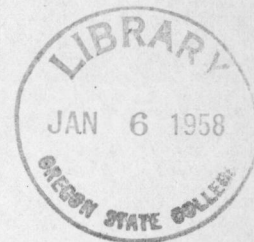
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SENIOR THESIS



Since the creation of a national forestry system in 1891, many important problems of the forestry profession have been solved and many are to be solved. In some ways we have much to learn yet about the growth of trees. There is an increasing interest in experimental work in the Pacific Northwest, as pointed out by Mr. Munger, in charge of the recently established Pacific Northwest Forest Experiment Station at Portland, Oregon. In connection with the interest in research work in this region, the Forest School at Corvallis, Oregon, is entering upon a series of experiments.

In the spring of 1925 one of the experiments was assigned to me by Professor T. J. Starker, Professor of Forestry at the Oregon State Agricultural College. The experiment consisted of the actual measurements of the height growth made by forty seedlings which were five years old. Twenty were Douglas Fir, (*Pseudotsuga Taxifolia*), and twenty were Western Yellow Pine, (*Pinus Ponderosa*).

The experiment was started on April 16, 1925. The trees were numbered so that future records of each tree could be definitely kept.

Record sheets, in table form, were made out so that each week the measurements could be taken and tabulated in columns which showed date of measurements, tree number, height of seedling at time of starting experiment, length of leader, time seedling started growth, and time that seedling stopped growing. Measurements were taken to nearest tenth of an inch, and made each week regularly throughout the entire growing season. In order that no mistake would be made in taking measurements from the same place each time, a tack was pressed firmly into the base of the spring shoot and used as a reference point from which all future measurements were taken.



Notwithstanding the fact that this was a small experiment, it may be significant for future research work in growth studies of Douglas Fir and Western Yellow Pine for reforestation purposes in this region. The experiment disclosed some interesting features. One is that some of the Douglas Fir seedlings started their height growth earlier than others but <sup>this</sup> which did not mean that they finished their growth earlier in the season. Regardless of whether this or that seedling started two weeks earlier than some other seedling, they all quit growing apparently at the same time, which seemed to be on account of moisture in the ground or temperature and humidity of the air, rather than the time of starting spring growth. Thus it would seem possible to cultivate seed which would start spring growth early for low, warm elevations, and so get more annual growth due to early starting and longer growing season.

The seedlings were five years old and all were grown at Wind River Nursery, Carson, Washington, and then transplanted to the nursery of the Forest School at Oregon State Agricultural College, Corvallis, Oregon. This was their third growing season in their present site under uniform conditions.

On April 16, when the first measurements were taken, the Yellow Pine had already developed an average leader length of 8.4 inches. This length partly included the opening of the long terminal bud. The terminal bud of Western Yellow Pine is very long compared with the terminal bud of Douglas Fir, Yellow Pine being 2 to 3 inches and Douglas Fir 1/2 to 3/4 inches. At that time the terminal buds of some of the Douglas fir seedlings were just swelling and starting the leaders out for the season height growth. The early growth of the Western Yellow Pine was probably due to the fact that the seed, which came from Eastern Oregon (Whitman National Forest), had the inherent ability to grow at a lower temperature and thus the required temperature came earlier in this locality for those seed, which gave them an advantage.

It can easily be noted from the data that not only did Western Yellow Pine start earlier but that these seedlings continued their growth later into the season than did the Douglas Fir. The height growth of the Douglas Fir stopped sharply about July 2, while the Western Yellow Pine continued its upward growth until about August 6. It appears that the earlier starting of growth does not indicate that the growing period will terminate earlier in the fall. This again shows the superior ability of Western Yellow Pine to grow during extremely dry seasons.

In this connection Professor Starker points out an interesting comparison with results obtained by the data derived from fourteen years observation of *Pinus Scopulorum*, by G. A. Pearson, at the Southwestern Forest Experiment Station at Flagstaff, Arizona, and published in the Journal of Agricultural Research. Mr. Pearson says, "Western Yellow Pine shoots begin to grow about the middle of May, elongate most rapidly in June and practically finish their growth by July 1. The major height growth occurs during the driest month of the year, although the lower soil strata are always moist from the heavy winter precipitation."

Of the twenty Douglas Fir seedlings, there were eleven that started about April 16, and made an average of 13.7 inches for the season. Of the nine which started from eight to fifteen days later, growth ceased at the same time with an average of 12.2 inches for the season. The maximum growth for Douglas Fir was 18.8 inches for any one seedling during the entire growing season as compared with a maximum growth of Yellow pine which reached a height growth of 26.4 inches, and an average height growth greater than the maximum of Douglas Fir (18.8 inches). Yellow Pine averaged 19 inches.

The above observations would seem to indicate that Western Yellow Pine has at least a certain advantage over Douglas Fir under certain site



conditions. Professor Starker says, "The Forest School is continuing not only this experiment but others in order to determine the relative merits of the two species for reforestation purposes in this region."

With these two species paralleling each other in their range from British Columbia to Southern California, and merging into each other from pure stands of one to pure stands of the other, there are a great many borderline site conditions and areas upon which one of these species must be the basis for future forestry work. Either of these species will play an important role in the future supply of our economic timber.

The question which we are concerned about for reforestation purposes is which species can we produce in the shortest time and at least cost. Since there is a great similarity in the uses to which either of the two woods can be put, we must look further into the costs of producing each. The cost depends upon many factors, such as ability to replenish the stock by natural seeding, stand per acre, volume per acre, resistance to natural enemies, effect upon soil, etcetera. This experiment gives inadequate data upon which to base even the factors of growing season and height growth, yet it may be an index to problems which will play an important part in reforestation of this great timber region.

While all of these problems must be co-related before any definite conclusion can be drawn, the limits of this thesis do not permit any attempt to answer these questions and I must hold to the two main points brought out by the experiment, namely: height, growth and growing season. So far as this experiment is concerned, it showed both a greater height growth and longer growing season for Yellow Pine than for Douglas Fir, under the same conditions. This seemingly is due to the ability of Western Yellow Pine to withstand drouth.

It is a well established fact that the forest has an important effect upon climate as to temperature and rainfall. It is also a well known fact that as the forest is removed, and it is expected to be removed faster and faster from this region, there is less rainfall and consequently drier soil. If this is true then it may be possible for Western Yellow Pine to extend its range not only in the twelve states where it is found now, but more widely in the Pacific Coast States and thus overlap the Douglas Fir region to a greater extent in the future than it does at present.

The silviculturist may for reforestation purposes ask the following questions as regards this great border line area between Western Yellow Pine and Douglas Fir:

1. What is the difference in economic importance between Douglas Fir and Western Yellow Pine?
2. What size (height and diameter) will each attain on same site conditions in a given number of years?
3. Which has the greater resistance to decay when mature, on a given site?
4. What commercial distribution has each? Best developments? Markets?
5. What moisture, light and soil will each require?
6. How will each grow with other species of a given locality?
7. Which has the more natural enemies on a given site?
8. Which has the most ability for natural reproduction?
9. Finally, will the increased growth due to faster and longer growing seasons, produce more volume per acre than a slower growing species (Douglas Fir). Which has more trees per acre? Which is the best on a given site?



In conclusion, it would seem from the experiment, that Western Yellow Pine has one advantage at least which will give it precedence over Douglas Fir. It has the ability to grow longer into the drier season and thus on drier sites where Douglas Fir could not grow. Notwithstanding the fact that Douglas Fir is the more tolerant and can grow more trees per acre, there are, in my opinion, many sections in this great border area between the two regions that Western Yellow Pine will not only grow to merchantable size quicker, but also have a greater volume per acre on certain of these sites in a given number of years.

Western Yellow Pine is found in small groups in the valleys of the Douglas Fir region from sea level to the region of its best development east of the Cascades in eastern Oregon, and northern California. This proves its ability to grow in the more moist regions as well as in the driest regions, while Douglas Fir is limited in its range by the drier climate of the Western Yellow Pine region. The location of the nursery where this experiment was made at Corvallis, Oregon, is in the center of the Douglas Fir region. With this last fact in mind, attention is called to the pictures submitted herein.





These photographs illustrate the most vigorous growing seedlings of each species under discussion. They were taken at the same time and same distance from each seedling.

I do not believe it is necessary to submit all the tabulations of measurements made during the season, and will submit only the following outstanding features indicative of each species:

Time	Douglas Fir	Western Yellow Pine
Time of Starting	April 16th, 1925	April 15th, 1925.
Maximum Height Growth	18.8 inches	26.4 inches
Average Height Growth	12.9 inches	19.0 inches
Minimum Height Growth	5.6 inches	11.6 inches
Time of Stopping (Approx)	July 2nd, 1925	August 6th, 1926

*Perhaps April 15th would be better.*

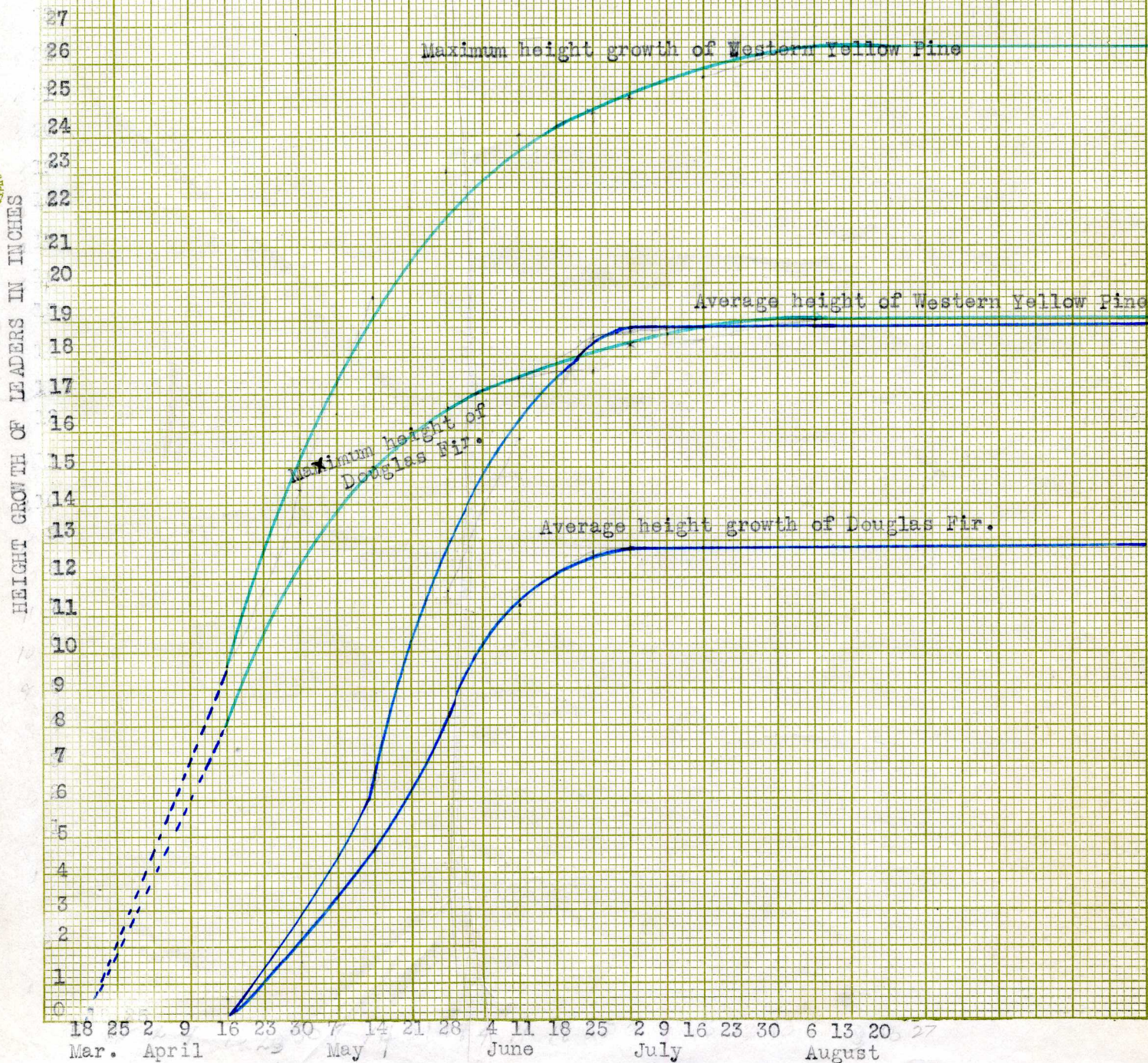
Statistics are the foundation of improvement in any business. They give the basis for sound conclusions, and besides disclosing errors, show the direction of advancement.

In the usual report on experiments long columns of figures must be studied in order to connect them mentally into quantities which may be comparable as to size and value. This is a tedious task which many neglect. A somewhat mental process is required to grasp fully the real facts. A simple graph may convey more real information than an elaborate written report. The accompanying graph may help to illustrate the results of the experiment upon which this thesis is based.

*English*



COMPARISON OF HEIGHT GROWTH OF DOUGLAS FIR AND WESTERN  
YELLOW PINE DURING THE GROWING SEASON OF 1925 AT CORVALLIS,  
OREGON, BASED ON TWENTY SEEDLINGS OF EACH SPECIES. THEY  
WERE FIVE YEARS OLD AND GROWN UNDER UNIFORM CONDITIONS.





# Douglas Fir

## Height of Leader

Date	Tree No	Inches		
		June 28	July 12	Aug 3-26
	1	15 $\frac{7}{8}$	15 $\frac{7}{8}$	16
	2	14 $\frac{3}{8}$	14 $\frac{3}{8}$	14 $\frac{1}{2}$
	3	19 $\frac{3}{4}$	19 $\frac{3}{4}$	19 $\frac{3}{4}$
	4	17 $\frac{1}{4}$	17 $\frac{1}{4}$	17 $\frac{1}{4}$
	5	18 $\frac{1}{4}$	18 $\frac{1}{4}$	18 $\frac{1}{2}$
	6	20 $\frac{1}{2}$	20 $\frac{5}{8}$	21
	7	8 <del><math>\frac{5}{8}</math></del>	9	9
	8	11	11	11
	9	16 $\frac{7}{8}$	16 $\frac{7}{8}$	16 $\frac{7}{8}$
	10	19 $\frac{1}{4}$	19 <del><math>\frac{15}{16}</math></del>	19 $\frac{1}{4}$
	11	13 $\frac{3}{4}$	13 $\frac{3}{4}$	13 $\frac{7}{8}$
	12	12 $\frac{1}{8}$	12 $\frac{1}{4}$	12 $\frac{1}{4}$
	13	16 $\frac{1}{2}$	16 $\frac{9}{16}$	16 $\frac{9}{16}$
	14	20 $\frac{5}{8}$	20 $\frac{5}{8}$	21
	15	10 $\frac{1}{4}$	10 $\frac{3}{8}$	10 $\frac{1}{2}$
	16	16 $\frac{1}{2}$	16 $\frac{11}{16}$	16 $\frac{11}{16}$
	17	16 $\frac{3}{8}$	16 $\frac{7}{16}$	16 $\frac{7}{16}$
	18	15 $\frac{3}{4}$	15 $\frac{3}{4}$	16
	19	16 $\frac{3}{8}$	16 $\frac{3}{8}$	16 $\frac{1}{2}$
	20	19 $\frac{9}{8}$	19 $\frac{7}{8}$	20

# Western Yellow Pine

## Height of Leader Inches

Tree No.

Date

June 28

July 12

Aug 3

1 25  $\frac{3}{4}$  26  $\frac{1}{2}$  27  $\frac{3}{8}$  3rd

2 26 27 27

3 28  $\frac{7}{8}$  29  $\frac{1}{4}$  30

Leader  
killed

4 17  $\frac{3}{4}$  17  $\frac{3}{4}$  17  $\frac{3}{4}$

5 19  $\frac{7}{8}$  20 20

6 25  $\frac{1}{2}$  25  ~~$\frac{5}{8}$~~  25  $\frac{1}{4}$

7 28 28  $\frac{5}{8}$  31

8 25  $\frac{1}{8}$  25  $\frac{1}{4}$  25  $\frac{1}{4}$

9 20  $\frac{1}{4}$  21  $\frac{3}{4}$  23

10 21  $\frac{1}{8}$  24  $\frac{1}{4}$  24  $\frac{1}{4}$

11 19  $\frac{1}{4}$  19  ~~$\frac{3}{8}$~~  19  $\frac{1}{2}$

12 24  $\frac{3}{4}$  25 25

13 21  $\frac{1}{4}$  21  $\frac{5}{8}$  21  $\frac{1}{4}$

14 23  $\frac{1}{8}$  23  $\frac{1}{4}$  23  $\frac{1}{2}$

15 19  $\frac{7}{8}$  20  $\frac{1}{2}$  21

16 26 26  ~~$\frac{7}{8}$~~  26  $\frac{1}{4}$

17 17  $\frac{1}{4}$  17  ~~$\frac{1}{2}$~~  17  $\frac{1}{2}$

18 23 23  $\frac{1}{4}$  23  $\frac{1}{2}$

19 21  $\frac{1}{2}$  22  $\frac{1}{4}$  23

20