

SILVICAL PROBLEMS OF THE NORTHWEST

Paper by Thornton T. Munger, Forest Assistant
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The subject which has been given to me to talk about with you is "Silvical Problems of the Northwest." My talk will be divided into two fairly distinct parts – first, I propose to say something about the science of silvics in general and its usefulness in this District, and in the second part of my talk I want to say a little about the actual work of the Section of Silvics in its relation to the Supervisor.

A few years ago the term silvics was almost unheard of in the United States just as was the whole subject of forestry, but the word silvics along with a lot of other technical forestry terms has been imported to describe this recently introduced science.

Very few people outside of foresters have yet more than a vague idea what the word silvics means, not because this is not an important branch of knowledge, but because as a science it is so new in this country. In Bull. 61 of the Forest Service the definition of silvics is: "The science which treats the life of the trees in the forest." You see this is a very broad definition. The fact that a Douglas fir demands more light for its growth than hemlock, or that it reproduces well after fire, or that yellow pine is a much longer lived tree than lodgepole pine are all facts of the science of silvics but we would never have thought of putting these every day observations down as parts of a science. All facts in regard to the life and habits of trees in the forest have an immensely important bearing on the practice of forestry just as a doctor in order to practice medicine has got to know chemistry, physiology, habits of his patients, etc., so the forester has got to know the physiology and life history and habits of his trees in order really to practice forestry. I take it the prime object of our work in the Forest Service is to practice forestry on Government land; most of us I presume feel pretty far away from this prime object. This underlying object is rather drowned out by the press of routine details, which are necessary to keep the National Forest business going. It is natural that it should be so for stumpage is not yet high enough and the demand for our timber great enough to make the need of intensive methods of forestry acutely felt as it is in Europe and even in the East today, but I think that we never want to forget that it is up to the Forest Service to practice forestry on the National Forests. Fifty or a hundred years hence the conditions of these National Forests will testify as to whether we are practicing forestry – I use this term in a broad sense – at the present time or not. Their condition will depend not so much on whether we are keeping up all the routine details, or whether the price paid for stumpage is a few cents more or less than the regular price, but the condition of the forest than will show whether or not we are now using the right silvicultural method of management, whether we are cutting timber where we should cut it, or leaving it where it should be left. If fifty years from now one of the areas we are logging on now, and on which we expect to get natural reproduction, has not restocked making it necessary to reforest it by artificial means at considerable cost, our

successors will have a right to say that we didn't do a good silvicultural job on that sale. Or suppose that 50 years from now the amount of timber on the National Forests is found to be less than it normally ought to be, future generations will say that in our greed to make timber sales and turn money into the Treasury that we have over-cut the annual growth and cut off some of the stands prematurely. Or suppose the reverse case, which in this District I think is the greater danger, particularly west of the Cascades, that the Supervisors of twenty-five years hence find their Forests enormous stands of fire damaged or very over-ripe timber which is so defective that it hardly pays to log it, and that they complain because we had not cut this timber years before, got the value of it and started the land in to produce a new crop.

When I say that the real test of our efficiency today is the condition of our Forests 25-50 or 100 years hence, I do not of course mean to undervalue the importance of keeping up to the highest degree of perfection the machinery of every day routine and administration, but I do want to give full weight to the far-reaching importance of good silviculture and forest management. You may say that it is an idle dream to be giving any thought to what our Forests are going to look like 50 years from now, that sufficient unto the day is the evil thereof, without worrying about the future. Anybody who is in the business of forestry ought to be far-sighted, he should be able to look ahead 50 years as if it were only six months. He does not need to be an idealist or a dreamer; but he must be an optimist and be able to conduct his present day operations of timber cutting under as definite a plan of management, and with as much confidence in the ultimate results as though his next crop would be harvested within 100 days instead of perhaps 100 years. The farmer has to have some foresight when he puts in the ground in the spring many dollars' worth of seed with a definite plan in mind and places part of his farm under one system of management or crop rotation, and another part under another system, and has confidence all the time that he is going to get in four months, certain profitable results. The forester ought to have this same kind of foresight amplified many times.

You may rightly begin to wonder just what is the relation between the wise technical management of the National Forests and the subject of Silvics, the science which treats of the life of trees in the forest. I will try to show you by a number of concrete examples just how a knowledge of the silvics of our trees, that is a study of the characteristics and growth of a forest type or of commercial trees – bears in the practical problems. The examples which I use are those which occur to me as being particularly apt in this district.

Suppose that a section of Douglas fir timber is to be sold and the question comes up in making out the contract what method of cutting shall be used to insure natural reproduction. Suppose that no thorough study of the habits of Douglas fir had ever been made. The Forest officer who decided upon the silvical method to be used had no knowledge to go upon but he knew perhaps that leaving two seed trees per acre had been very successful in the white pine region of the Lake States or he had seen cut over Douglas fir areas which had seeded up from solitary seed trees. So this method of solitary seed trees was decided upon. But the soil in this particular section happened to

be clayey and rather wet and the location was exposed. Within three months after the logging was finished all these seed trees had been blown over, a big capital represented in the seed trees was rotting in the ground, there was no way now of naturally seeding up the area. In short the sale was silviculturally a failure. It was bad forestal management. If the Forest officer had a knowledge of the silvical characteristics of Douglas fir such as he would have had if a thorough study of the tree had been made and known that on wet clayey soil Douglas fir is not at all wind-firm, he could have avoided this mistake. Or let us suppose that leaving seed trees in groups so that they would not be windthrown was recommended by the Forest officer in charge of the sale. The groups were each an acre in size. This represented a big capital to put into seed trees so the groups were made few and far between, one to a 40, or 1,200 feet apart. Now Douglas fir seed trees can not be depended upon to scatter their seeds to a distance greater than 350 feet on all sides. Hence on the cut-over sale area there would result a ring of reproduction about each group of seed trees, and then a belt where there was no reproduction. This strip of non-regenerating cut-over land would be a living reminder of the fact that foresters must know how far seed is disseminated from seed trees before they decide how far apart seed trees are to be located.

I do not mean to suggest by the above rather pessimistic illustrations of cut-over areas that blunders of this sort have been made in this District by the Forest Service, for they have not, but it would not be surprising if they had. In other parts of the country greater mistakes have been made when recommendations for the management of a tree or type were made without a thorough knowledge of all the habits of that tree or all the conditions in that type.

All over the district there are questions which a forester may be up against at any time. If he is conscientious and wants to have the areas that are being cut-over to day show results of proper management 10-20 or 50 years from now he will want to know the correct answer for these questions and not have to guess.

If an opportunity came tomorrow to sell a big body of timber in the upper slope type west of the Cascades where the stand was a miscellaneous mixture of hemlock, Noble fir, Douglas fir, white pine, amabilis fir, yellow cypress and so on, what methods of cutting should be used. Should we clear cut and broadcast burn as in the pure Douglas fir belt or should we make a selection cutting favoring certain species and if so which species should we favor. I don't believe anybody could really answer this question at the present meager state of our knowledge. If a selection cutting of a certain severity was made we might get all hemlock reproduction and another density might bring in a heavy proportion of pine or Noble fir, or if the proper disposal of brush was not made we might not get any reproduction. I do believe, however, that questions of this kind can be answered by field study so that we can find out what are the rapid growing and desirable species to favor and what conditions we have got to supply in logging to promote their reproduction and growth.

West of the Coast Range some of the lumbermen are complaining against the dictum "Burn your slashings" which is the slogan of the Washington fire warden. The claim that

in the fog belt the fire season is very short, decay of logging debris is very rapid, and that it is unnecessary to burn over logged-over land and that a great deal of spruce, hemlock and cedar "advance" reproduction and many little trees are saved if the logged-over land is not burned. Along the foothills of the Cascades burning of slashings is certainly the wisest procedure, but it may not be in the fog belt, where for many reasons the selection system seems preferable to a clear cutting system. A study of local forest conditions can alone settle a question of this kind which requires a knowledge of an exact nature of the silvical habits of the trees and a power to see at the present time what the future forest will look like following certain forms of management.

This question really falls outside the province of National Forest administration for there is so little of the fog belt inside the boundaries, but it serves well to illustrate the danger of generalities and the necessity for local study of each forest region in order to decide upon the best form of management for that region.

Over east of the Cascades the matter of brush disposal is a matter of considerable interest and one that requires much local study. Brush piling and burning has been universally recommended and introduced as the Forest Service practice in a selection system of cutting such as that used in the yellow pine region, for it has been very successful in other regions. Some soils in Eastern Oregon, however, are very dry and reproduction of yellow pine difficult. On such soils there is strong indication that satisfactory reproduction will not be secured on these cut-over areas where the ground is cleaned up slick and clean after logging, for a little cover of brush and a partial mulch of needles, bark, etc., is of assistance to the yellow pine reproduction. If we follow the usual practice of brush burning after logging on these exceptionally dry soils it is more than likely that we will not get satisfactory reproduction. But who can say at the present time whether the brush should be piled and burned or whether it should be left unburned and scattered over the ground. In this region there have never been extensive logging operations so that we can not study the results of logging or have actual experience to go by. A careful study of yellow pine reproduction in various localities, observations of under what conditions it comes up best, on what soils, whether it seeks the partial protection of brush, etc., should enable us to reach some conclusions on which to base a policy of brush disposal. Of course, experimentation is the best way, but it takes a long time to get results. Two experimental areas are now under observation to test side by side on a timber sale area these two methods of brush disposal, but unfortunately neither of them are in ideal locations – the natural reproduction is too good in these places to make the conclusions very conspicuous. There is one serious drawback to scattering brush and leaving it unburned, which may sometimes outweigh its advantages as a conserver of soil moisture. It furnishes a breeding place for bark beetles and other bug enemies for forests and thereby may assist in their multiplication and start a plague of them. However, in the smaller branches these bugs breed little; it is chiefly the largest branches, the stumps, tops and cull logs that attract the beetles.

The question of the effect of sheep grazing on reproduction we have already discussed pretty thoroughly. I think we all reached the conclusion that reproduction of yellow pine

is assisted by grazing animals harrowing the seed into the ground certainly on certain kinds of soils, but the matter as to whether the animals may not do enough damage to the very small seedlings to make it worth while to keep sheep off of cut-over areas for two or three years after the seed has caught is another question. If the sheep are harmful to yellow pine reproduction they should certainly be excluded until the reproduction has got started and is big enough to shift for itself. Before we go ahead on any policy of protecting cut-over areas it is essential that definite conclusions based on reliable observation be made. I should like immensely to see a thorough study of this question made.

In most of our forest types of mixed species there are forest weeds as well as species of particular value. All our operations on the woods should work toward getting rid of the forest weeds and encouraging the better species. To make a valuable tree grow where an inferior one did is good business, and therefore good forestry. Along the coast in Oregon is some Lawson cypress, or Port Orford cedar as it is more often called. It is worth \$5 a thousand now and will soon be worth \$10 on the stump. If it can compete with fir in growth we should try to increase the proportion of the valuable species in the forest. But if today we were to conduct a logging operation in a mixed forest of Lawson cypress, Douglas fir and white fir, and wanted to increase the proportion of the former and decrease the latter, I am sure I don't know how we would go about it, whether we should clear cut, or make a selection cutting, how we should dispose of the brush, how many and what kind of seed trees to leave, etc. This is not an imminent problem, but it illustrates the lines of study that we must work upon in order to put the Forests under intelligent silvicultural management. East of the mountains lodgepole pine in some locations shows a disposition to run out yellow pine. This is not at all to be desired considering the comparative values of the two species and is not at all necessary. Wise forest management can prevent further replacement of yellow pine by lodgepole, but under forest operations that did not thoroughly take account of the habits of these two trees, lodgepole pine might very readily take possession of yellow pine cut-over land.

In many parts of the District white fir and grand fir (*Abies concolor* and *Abies grandis*) are serious forest weeds. They are next to worthless, but exceedingly virile and hardy so that the chances are good that they will crowd in on cut-over land. It is going to require good timber sale management to prevent this, but I think that a great deal can be done to prevent the spread of forest weeds like these – white fir and grand fir, by making the cuttings of proper density. A thorough understanding of the habit of these trees and their associates is essential to accomplishing this result, however.

This year for the first time the Forester has called for an estimate of what the annual yield is for each National Forest, in order to place the Forests on a firm sustained annual yield basis and to limit the annual cut. This is a wise step in the practice of forestry. In this District as yet, the cut on no Forest is nearly up to the annual growth, but already in District 3 I am told they have been overcutting the annual growth on some Forests. This year in sending to the Forester our figures for the limitation of the annual cut all we are able to do is to make a big guess as to what it is. But we must soon get down to closer estimates than this, and the way to get this is: 1. to make

reconnaissance studies and find out what we have. 2. to make growth studies and find out what the annual growth per acre is.

The rate of growth is one of the important silvicultural characteristics of a tree and just as rapidly as possible studies of the rate of growth of the important trees of the Forests will be made so that we can find out approximately what is the growth per acre in various types of forests on various soils. The measurement of growth is an exceedingly complicated problem, for no two acres and no two trees are just alike, and it will be many years before we have full growth figures, but it is not too soon now to make a beginning in getting figures for the most important trees and regions.

These growth and yield studies have a double useful application, first in guiding us to an estimate of the annual growth of the Forest and assisting us to place the forest on a sustained annual yield basis and second in showing us the cooperative rate of growth of associated trees, and of single trees on various soils and localities.

It will be a long while in this District before we are cutting on the National Forests each year their full growth, but it is not now a bit too soon to start to find out what the annual growth is so that we can put each Forest on a business like sustained annual yield basis and develop a systematic plan of cutting.

I would not be surprised if some of you were saying to your selves: What is the use of solving all these silvical problems when the practical obstacles to practicing the approved ideal forms of management are seemingly insurmountable? This is a decidedly apt question and one that should be uppermost in the mind of any practical man, but it is a question to which there is to my mind a decidedly positive answer. In forest management as in all other lines of work we have got to know just what we are working for before we can start out in the right direction. We don't expect that the National Forests will all be beautifully fully stocked normal stands with the ideal distribution of species for centuries yet, but the sooner we find out what sort of forest management will result in this ideal forest the sooner will the ideal be reached. For example, we may not be able to rid yellow pine land of the encroachment of lodgepole pine, but the sooner we find out whether we want to do so and how to go about it the better.

The practice of forestry is, of course, just commencing in this District and we have hardly begun to discover what our problems are, much less to solve them. But we must have the right answers for these silvical questions when they do become acute as they are going to soon with increasing timber sales and more systematic and intensive management. Otherwise, the Forest Service will not be fulfilling its basic mission of practicing forestry in the National Forests.

I think that there is actually a great deal of real forestry which we can practice – more than we think for – on the National Forest at the present time.

It is one of the discouraging things about the practice of forestry that there are so many woods-operations that a forester would like to do to better the conditions of his Forest, which he can't do because the practical obstacles are so great. Perhaps one piece of his Forest is badly in need of an improvement cutting to get rid of defective timber and make room for young quick-growing trees, but there is no demand for the timber and he must let it stand and rot. Or the forester wants to get rid of a forest tree weed to prevent its spread after timber sales, but again he has no way to dispose of it. Practical obstacles such as these encumber the way of the ideal forest management but they do not by any means block the way for advance in forestry practice. In spite of these encumbrances the most progress in the practice of forestry will be made by the forester who has a far-sighted vision to see over these present day obstacles, to perceive toward what ultimate goal he should work, keeping the technical ideal always in mind regardless of the fact that his hands are tied so that he can't put in practice all the principles that he knows ought to be.

Now I have come to the second part of my talk in which I want to say something about the actual work of the Section of Silvics particularly in its relation to the Supervisor.

When the present organization of the Forest Service was introduced it was suggested that the section which conducted the purely scientific work of the Service be called the Section of Forest Investigations. This would have been a rather good title as it is more descriptive of the line of work of this section than the present title.

The province of the Section of Silvics is to conduct investigations and experiments which will assist the Office of Silviculture and the Supervisors to better forest management.

Some of the so-called silvical problems appear on the surface to be simple, but they are not always so simple as they first appear to be – they ought not to be settled by hasty judgment. The important problems must be worked out by systematic observation, measurements, and experimentation – they require more than casual observation for their settlement – and this is the work of Silvics.

The major silvical problem in the District, particularly those which concern a number of Forests should be studied directly by the District office. This has been the policy in the past and I hope it will continue to be in the future. The District office is naturally in a better position to handle extensive studies which require several months than is the Supervisor with his present equipment of technical men, and naturally inter-Forest problems can not be economically studied by the force from several different Forests. The two general studies which have already been made in this District by the central office – the encroachment of lodgepole pine on yellow pine east of the Cascades and the yield and growth of Douglas fir west of the Cascades are obviously subjects better treated by the central office than in the local offices. When the general regional problems, some of which I have already spoken of, and the extended studies of growth and yield are taken up they will be conducted under the direction of the District office, freeing the Supervisor of responsibility for them, even though perhaps partly conducted

on his Forest, only asking his advice and occasional cooperation of some of his force. From time to time in various parts of the District intensive experiments, chiefly on timber sale areas, will be initiated. Also it is planned soon to locate some permanent sample plots – in the Douglas fir region – to demonstrate by exact measurement through a series of years just what the rate of growth of the tree is under certain conditions. Both of these lines of work will be carried out by the District office principally.

There are a great many subjects of local importance, however, which concern only a single Forest, which it will be up to the Supervisor to have studied by his own force, independent of the District office, and the chief opportunity of doing this will be through the annual silvical report of the Forest Assistant.

Annual Silvical Report:

I presume all of you have looked upon the Annual Silvical Report as a good deal of a bugaboo, in the preparation of which the Forest Assistant spent a lot of time hot airing without getting anywhere. This was partly because of the character of the old style silvical reports and partly because of the Forest Assistants didn't ordinarily see in the Silvical Report the opportunity to get together some really practical valuable information. As you know, up to this year the silvical reports were all to be prepared according to a minute and comprehensive outline 3 or 4 pages long, which called for a detailed discussion of every tree and type on the Forest. One such report of this general nature is a very good thing as a sort of silvical reconnaissance of a Forest of which little is definitely known of its tree species and forest types. But subsequent reports of this general nature are apt to be simply a re-hash of the first report. Beginning this year, therefore, the whole system of the silvical report was very much changed. Hereafter, a report of the general nature will be prepared for only those Forests for which one has never been prepared, that is, those on which there has never been stationed a Forest Assistant. On all other Forests the silvical report will be the discussion of some single type of practical importance on that Forest, that is, a single local silvical problem. If a Forest Assistant in the spring selects some subject that he is going to make a special study of during the season, keeps his eyes open all the field season and jots down in his notebook whatever observations he makes from time to time, he should find in the fall that he has a notebook full of interesting observations and ideas on this topic. The result should be a brief, clearcut report dealing with this single subject which would be a real contribution to knowledge. Naturally in intervals between other work the Forest Assistant can spend a half day now and then, or a week in the study of this one subject, taking measurements, or making some systematic observations to back up his miscellaneous observations and conclusions.

I once heard Mr. Pinchot say that a forester should make a walk in the woods the hardest kind of mental work; he should have his eyes and mind always alert, that he should make mental note of the characteristics of the trees and types about him, and continually thinking of the why and wherefore of forest conditions and types. I wish that we all had the capacity to do this. I know it would result in the accumulation of a great deal of silvical information which we have opportunity to observe in the field but we do

not. A good hunter sees everything in the game line in the woods; a good forester ought to see as much as he can in the timber line.

Several reports of this character, dealing with a single topic, were prepared this year and although this season the boundary and reconnaissance work almost wholly absorbed the time of the Forest Assistants, some of these silvical reports are of distinct value and to my mind prove that this monographic form of silvical report is one that is calculated to bring out really valuable scientific forestry knowledge. The Forest Assistant should feel that this is the only single important report of the year in which he has the opportunity to make use of his technical forestry training and to make any original contributions to the fund of forestry knowledge.

As the routine work becomes more firmly organized and to the Forest Assistant falls less of the routine which he has to do now because there is nobody else to do it, more and more work of this technical nature will be expected of him. More accent will be placed on the Silvical Report in the future than has been in the past and more real original investigation work expected of the Forest Assistant.

I would like to suggest a few of the subjects that appeal to me as being the kind of subjects well worth investigation by the Forest Assistant and which come within the broad scope of a silvical report.

1. Possible local methods of brush disposal with recommendation of the best method for various types.
2. The study of any particular form of forest damage, such as a particular insect pest, or form of rot or other source of defect with suggestions for its prevention or control.
3. Study of the chaparral problem.
4. Collection of figures for a local volume table.
5. The relation of cattle or sheep grazing and reproduction.
6. The inter-relation of any two species of trees such as the replacement of very old stands of Douglas fir by hemlock, or the encroachment of white fir on cut-over areas. In carrying out this system of silvical reports the best system seems to be for the Supervisor to talk over with the Forest Assistant possible subjects; and then along in the spring write to the District office suggesting two or three other possible subjects and the one preferred. The subject will then before June 1 be definitely assigned by the District office and it will naturally be the one preferred by the local Supervisor unless the topic is not properly a silvical subject or its study is going to be a duplication of other work.

Cut-over Areas:

As you know a definite plan has been inaugurated to keep a record of cut-over areas, that is, a record of the silvicultural results of our form of management. We are the first ones to try conservation methods of logging in the northwest and we don't know how our methods are going to work out. On the principle that experience is the best teacher we want to watch the cut-over areas on the National Forests to see whether the trees

we have left for seed blow over or not, whether reproduction starts or not, to what extent sod and brush come in and similar points the observation of which will help to teach us better methods of cutting on similar land in the future. It is only worth while to have under observation the important cut-over areas, that is, those of several acres in extent cut all at the same time. For a full record of cut-over areas there should be made immediately after the sale is completed, a report on the sale area describing its condition after logging as to seed trees, ground cover, underbrush, etc. This will supplement the sale area description, and serve as a basis of comparison with the condition of the area years later. Every 3-5 thereafter for 10-20 years the sale area should again be examined and a concise report written on its condition. This series of reports ought to form a history of the tract in which are written many valuable object lessons.

In some special instances parts of cut-over areas will be considered intensive experimental areas, on which plots will be laid off for close description and scrutiny in order to demonstrate special points, such as distance from seed trees that seed is carried, comparative methods of brush disposal and like. These experiments will be initiated either by the District office or by the Forest force, according to circumstances. I hope Forest Assistants will start some of these intensive experiments on their own initiative.

Insect Infestation:

To the Section of Silvics falls somewhat the study of insect damage. Insects do an enormous amount of damage in the aggregate, Dr. Hopkins says more than fire, on the Forests, most of it is inconspicuous and therefore not fully appreciated. To a certain degree some of it is preventable in regions where any cutting can be done, and therefore it behooves us to get together as much information as possible about insect damage so that we will know how to combat these pests when we get the chance. On the Deschutes Forest this year a little patch of small insect-infested timber is to be cut with a view to stopping the spread of the insects and the result of the effort will be watched with much interest. Soon the Bureau of Entomology is going to put one of its agents in this District, who will act in cooperation with the Forest Service in the identification of specimens, and in recommending an insect control policy. I hope that you will note cases of serious infestation, so that if necessary, further study of the ground can be made and something done to check the invasion if possible. Those of you who heard Mr. Langille, the other evening, speak on the subject of insect infestation know how awake some of the lumbermen are to this source of damage to the timber. It behooves the Forest Service not to be behind them in doing whatever is possible and best in insect control, but rather to set the example to the lumbermen.

There are a number of things which in the division of labor of the District work fall to the Section of Silvics, such as the cooperative arrangement with the Weather Bureau for the appointment of local weather observers, the distribution of publications, the herbarium, the care of the library, but I will not take your time to speak of these things unless you have some questions to ask about them.

But just a word about the library and then I am through. We have now in the District office quite a good little library of books and pamphlets and periodicals in regard to forestry, engineering, grazing, geology and other applied subjects. These books ought to be put to the fullest possible utility, and lately it has been decided to extend the field of the District library to include the whole District. That is, if there is any book in the District library which anyone of you wants, it will be sent to you by mail on loan on condition only that you return it to this office should a call arise for it here. There are many books that ought to be in every Supervisor's office, but funds are too short to purchase them, hence this is a substitute way of giving the men of the Forests the chance to use the books that they need. I hope that you will take advantage of this opportunity as often as you wish to.

Although the subject of my talk has been "Silvical Problems of Immediate Importance in the Northwest," I have not said much in detail about any one of the problems, or even begun to name them all, but I hope that in the next few minutes many of you will call the attention of the rest of us to the problems which strike you as important and which we should start to solve.