GROWING RED ALDER ON THE
NESTUCCA DRAINAGE

by

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Part I

Introduction
PURPOSE

Red Alder (Alnus rubra) is the leading hardwood of the Pacific Northwest, and its demand is increasing every year. A few years ago, private owners on the Nestucca drainage did not realize that alder was valuable; consequently, they practically gave stumpage to loggers in order to get rid of it and to create new grazing and farm lands. Now a few regard it as having considerable value, as they find that they can really sell stumpage for at least $2.00 per thousand board feet. Several citizens of Tillamook county are beginning to realize that at the present rate of cut, alder will be liquidated in a few years, and they will lose one of their main industries. Some think that it is a matter of course and nothing can be done about it.

By presenting the present conditions of the alder industry and discussing the future possibilities of growing alder, it is hoped that interest for future studies will be created, so that sustained yield may replace the present complete liquidation.

Studies have been limited to the drainages of the Big and Little Nestucca rivers in Tillamook and Yamhill counties, because this is the heart of the alder industry of Oregon. Results of studies made on this area can readily be applied to other alder areas under similar conditions.
Importance

Red Alder occupies approximately 70 thousand acres on the Nestucca drainages, and is being rapidly liquidated. Under the present systems of cutting, this land will be covered with unmerchantable alder, which will gradually give away to Douglas fir and brush. It is readily seen that such conditions are not desired, because the land will be non-productive.

Alder is very valuable as a nurse crop for coniferous species, as a soil builder, as a fire protection, and as a commercial crop. These will be discussed under the value of Red Alder.

Since there are so few accessible facts on Red Alder and people know so little about it, this report will serve as a reference for studying the present conditions and the future possibilities.

Previous Studies Made

A very intensive study was made by the Forest Service and published in 1926. (4) Since that time only one study has been made, and that was also by the Forest Service. This was in 1939, when a management plan was made for Red Alder in the Nestucca Working Circle. This plan was made as an attempt to fulfil the immediate need for knowledge concerning the sustained yield capacity of the alder stands.
in that working circle. (1)

Experiments are being carried on by the Pacific Northwest Experiment Station and by the Oregon State College School of Forestry, but up to date no definite conclusions can be reached.

**Procedure**

The present conditions of the alder supply, the alder industry, the growth characteristics of alder, and the value of alder are discussed in the first part of this report. The industry includes methods of lumbering, economic and financial conditions, silvicultural practices, and utilization of alder.

Following this is a discussion of the possibilities for sustained yield of alder, including perpetuation of the present supply and regeneration, and possibilities for better utilization.

In the summary, returns of alder is compared with that of Douglas fir and conclusions are drawn. Lastly, recommendations for future studies are listed.

**Source of Data**

Data concerning the present conditions of the alder industry was secured directly from managers of the various alder mills on and adjacent to the Nestucca drainage. This
was supplemented by observations made during the past four summers and by facts from prominent Forest Service men.

Other data was taken from the references listed in the literature cited at the end of this report.
Part II

The Present Conditions of the Alder Supply, the Industry and Characteristics of Growth and Yield of Alder.
Supply

There are 8,615 acres of productive alder land and 61,345 acres of non-productive alder land on the Nestucca drainages. The Forest Service classified "productive alder land" as land of site quality which will produce commercial alder timber, so located as to be loggable during the current rotation period and now supporting stands of commercially operable alder (either mature or immature) or recently cutover or burned areas which are reproducing, or are expected to reproduce, satisfactory stands of commercially valuable alder. (1) The productive alder land is pretty well confined to the stream courses.

"Non-productive alder land," as classified by the Forest Service, is the land supporting commercially inoperable alder stands of a protection type, for which there is now no market and which apparently will not be marketable during the current rotation period. (1)

This 69,960 acres of productive and non-productive alder land contains 42,927,000 board feet of alder saw timber on the productive alder land. The volume for non-productive alder land was not computable.

Ownership:

Private stumpage includes 2,936 acres of productive alder land, or 10,328,000 board feet of alder saw timber. This volume is based on trees 13 inch d.b.h. and over and
includes allowances for breakage and defect. Approximately one hundred separate parties represent the private owners, the largest private ownership being around one hundred acres of productive alder land.

The government owns 5,679 acres of productive alder land, which contains 32,599,000 board feet of saw timber. This volume was computed on the same basis as that of the privately owned. About 65 per cent of the operable alder volume is government owned.

Rate of Depletion:

The present rate of cut on both private and government lands averages approximately 2,500,000 board feet annually. This annual cut includes 700,000 board feet of government timber and 1,800,000 board feet of private timber. If this rate of cut is continued, the private timber will be gone in about 5 years and the government timber will be gone in about 46 years. The annual cut on government owned land will have to increase after the private timber is gone, so that the demand for alder logs can be met. The alder supply will not last over 17 years if the government alder is used to keep up the present annual consumption.
The Industry

Between 1929 and 1936, the logging and manufacturing of red alder on the Nestucca drainage was almost entirely confined to one small operator, who moved a portable mill from place to place. He cut approximately 500,000 board feet each season. Since 1937, more mills have been set up to help take care of the increased demand for alder lumber. The average annual cut jumped from 500,000 to 2,500,000 board feet. There are four alder sawmills using logs from the Nestucca drainage at the present time. Two of these are seasonal and two are year around operations.

Methods of Lumbering:

As logging and milling of alder is generally done by different operators, they will be discussed separately.

1. Logging:

Most of the logging is contracted to ranchers, who log as a side line on their own land or on the government owned land. The operators of the seasonal mills usually do their own logging, as the mills are located in the woods adjacent to alder stands.

Bucking is done in the woods for horse logging and at the landing for cat and donkey logging. Trees are backed into 8 and 10 foot logs up to a 6 inch top limit.

The greatest per cent of the skidding is done with one or two horse teams; although one seasonal operator uses a cat and a small donkey. Horse skidding seems to be the
Small donkey used in logging alder

Log coming in on the high lead
Putting logs on the rollway

Cut-over alder land
most practical method, but the operator using the cat and donkey has made a tremendous progress in the last three years. He started out with a horse and a worn out truck, and sold his logs to one of the permanent mills. Now he has his own mill, a late model truck, a cat, and a small donkey. He markets his lumber in Portland, Oregon.

Logs are trucked to the permanent mill, which will average from three to twenty-five miles from the logging operations. One truck ordinarily hauls from 15 to 20 logs, which vary from 900 to 1200 board feet per load. The average year around log will run 14 inches in diameter.

All of the contract loggers market their logs at Burns' Alder Company of Beaver or at Three Rivers Alder Company of Tillamook. During the last few months, these mills were unable to buy all of the logs that they needed, because the present loggers were unable to meet the sudden increase of demand for alder lumber.

2. Milling:

As previously stated, there are four alder mills operating, two of which are seasonal and the others are permanent. One of the permanent mills markets finished lumber and dimension stock, while the others market only green lumber. The average mill cuts about 10,000 board feet per day.

Labor for the permanent mills consist of local men, usually city people who depend upon the mill for their livelihood. The seasonal mills use ranchers for extra help,
Cat and arch logging

Bucking alder trees and the landing
A portable alder sawmill

Green alder lumber ready for loading on the truck
if it is needed.

The Three Rivers Alder Company kiln dries all of its lumber, and makes dimension stock out of the low grades. Grades are grouped into two classes, No. 2 or better and No. 3. As there is no market for No. 3 green lumber, the other three mills air dry all of their No. 3.

Burns' Alder Company of Beaver, Oregon, markets its lumber at Portland and Los Angeles. It ships by truck to the nearest railroad, by rail to Portland, and by water from Portland to Los Angeles. Three Rivers Alder Company markets finished lumber and dimension stock at Los Angeles and ships by rail. Other mills market at Portland.
Economic and Financial Considerations

No reliable figures could be obtained from portable mills on their operation and production costs. The costs per thousand for the Three Rivers Alder Company are as follows:

Selling values (No. 2 finished)
@ $34 to $55 or average . . . . . . . . $45.00
Cost of logs at Pond . . . . . . . . . . . . . $12.00

Milling costs:
Sawing @ $4.35 to $5.60
or average . . . . . . . $5.00
Kiln-drying . . . . . . . 2.40
Planning . . . . . . . 1.00
Total Milling Costs . . . . 8.40
Freight by rail to Los Angeles . . 11.50

Total Costs . . . . . . . . . . . . . . . . . . . 31.90
Net Returns . . . . . . . . . . . . . . . . . . . $13.10

The following costs per thousand are not accurate, but will give an idea of operation and production costs of smaller mills. Logging costs were not determined, because most of it is done by mill operator and by contract loggers, who do their own felling, backing, and skidding.

Selling values @ $23 to $25
or average of . . . . . . . . . . . . . . . . . . . . . $24.00
Cost of logs . . . . . . . . . . . . . . . . . . . . . $12.00
Milling costs . . . . . . . . . . . . . . . . . . . . . 4.75
Freight to Portland . . . . . . . . . . . . . . . . . 5.15

Total costs . . . . . . . . . . . . . . . . . . . . . 21.90
Net Profit . . . . . . . . . . . . . . . . . . . . . $ 2.10
From these figures, it can be seen that there is a great variation in profits between finished and unfinished lumber. In addition to the No. 2 lumber that the Three Rivers Alder Company sells to the Los Angeles market, it also sells dimension stock for from $60.00 to $80.00 per thousand.

Silvicultural Practices:

The customary cutting practice is to take all trees 13 inches d.b.h. and over, and some of the easily accessible 12 inch trees. This results in practically a clear cut along the stream courses and working toward a heavy residual stand on the hill sides.

As alder slash decays very rapidly and does not create a serious fire hazard, it is left on the ground by both private and Forest Service practices.

The Forest Service have realized that it is a poor policy to leave a residual stand and have altered their cutting practices. This very recent change was to take out all trees that the operator can handle.

Utilization:

Industries using red alder are considered as belonging to the primary wood-using industries or to the secondary wood-using industries. The former are those which depend entirely upon the log or bolt and the latter are those which use mainly lumber or dimension stock for future manufacture into various products. (4)
Fuel is practically the only product used by primary wood-using industries to any extent, and there is not a very good market for it. Ranchers cut their own wood, while the city people buy from ranchers to a very limited extent or use Douglas fir. Alder has a fuel value of about 80 per cent of that of Douglas fir, 70 per cent of white ash, and 60 per cent of white oak. (4)

The secondary industries use red alder for furniture, chairs, paper plugs, fixtures, handles, dairymen's supplies, laundry appliances, toys, and other miscellaneous articles.

The greatest amount of alder is used for furniture and chairs. The production of chairs is more specialized than furniture; therefore, it is dealt with separately. In the manufacture of furniture, alder is used for panels, cross-bands, cores, and other parts where only moderate strength is required. The chair industry uses alder chiefly in the production of what might be considered as standard grades, but of a cheap to medium variety. As alder is easily worked and takes stains well, it is finished to imitate maple, black walnut, or mahogany. In high grade alder chairs, alder is used for core stock, seat bottoms, side rails, and top slats.

In 1923, furniture and chair manufacturers of Oregon and Washington used 12,063,000 board feet of red alder. Judging by the sudden increase in demand, it would be safe to say that these manufacturers use much more alder today.
Characteristics of Growth and Yield of Red Alder

Red Alder usually grows in pure stands along water courses and on well watered slopes. The merchantable alder is found along the water courses in a shoe string fashion up the canyons. Hill side alder very seldom reaches merchantable size.

Growth Conditions:

Alder is considered to be a short lived tree, reaching maturity at 60 to 65 years. For the best development it demands a deep, fertile, loamy soil; although it will grow in gravel, sand, or clay. It requires an abundant soil moisture, and it will grow on very wet ground, but not in bottoms subject to overflow. Best growth results in a temperate climate with over forty inches of precipitation.

Alder never grows in deep shade, nor casts an extremely dense shadow, and usually requires some side light as well as light from above. Considerable light is needed; therefore, the largest yields are found in even-aged stands, where all the trees are about the same height.

Site quality varies from good in the creek bottoms to poor a short distance up the average hill side.

Residual stands left after logging are too old to put on growth of any economic value. In a 60 year stand, diameter growth increases about one inch in ten years, while height growth is negligible. Residual trees cease to grow
at 70 years, and as the stand grows older decay and mortality will exceed growth. Side branches develop on trees left in the open and causes serious damage to the stand. A logger cannot afford to come back to a stand for less than 5,000 board feet per acre, and then it would not be practical, because of high road construction costs. He would also be faced with the risk of heavy losses from mortality and decay in the overmature trees.

Susceptibility to Injury:

Red Alder is relatively free from serious fungus diseases until it reaches maturity. Over-mature stands are frequently attacked by the false tinder fungus (Fomes igniarius) causing red heart and hollowness. This rot first appears in stands 60 to 70 years old and probably increases with the age of the stand.

After mild winters, the tent caterpillars (malacosoma pluvialis) destroy the foliage, but the only effect of this defoliation is to lessen the seasons growth. The effect of heavy defoliation on overmature stands may easily cause mortality of serious proportions.

Mortality and decay attack stands 70 years of age, and indications are that serious losses will occur in older stands. The rate of mortality and decay in overmature stands is unknown.

Fire in alder stands is very unusual; in fact, the stands are used for fire breaks. Fire will run in alder stands during seasons of exceptional dryness, but the bark,
although thin, is sufficiently fire-resistant to protect the tree from light surface fires.

Value of Alder as a Type

Red alder has considerable value as a nurse crop, as a soil builder, as a fire protection, as a commercial crop, and as a sociological value. As the values are very important, they will be discussed separately.

Value as a Nurse Crop:

Red Alder is creating a condition enabling Douglas fir to regain a foothold, so that those large areas now barren will revert to the immense forest which once dominated them. There are large areas on hillsides that are covered with unmerchantable alder, which is being gradually crowded out by Douglas fir.

Value as a Soil Builder:

Alder affects both the physical conditions and the chemical properties of the sites upon which it grows. There is less loss through evaporation, which accounts for the greater moisture content of the soil under alder stands. The mulch created under the stands through the accumulation and decaying of debris acts as a moisture conserver. This also greatly enriches the soil through the formation of humus.

Madison Laboratory examined the nodules found on alder
roots, and showed that they contained nitrogen-fixing bacteria and perform the same functions as leguminous crops in adding nitrogen to the soil. (3) This is very desirable where repeated fires have depleted the soils of these elements.

Value as a fire protection:

The efficacy of the alder as a fire protection was proven during the season of 1910, when disastrous fires swept the Mt. Hebo region. At this time there were hundreds of acres of valuable Douglas fir reproduction saved from destruction by the surrounding alder growth. This was a great saving and especially notable, because that season was an exceptionally dry one.

Value as a commercial crop:

One acre of alder will yield 10,500 board feet of saw timber in 60 years, which is worth about two dollars per thousand on the stump. Carrying costs for the 60 years will approximate $13.00 per thousand. This leaves a net profit of about $8.00 per acre or thirteen cents per acre per year. Details of these costs are worked out in the appendix.

Sociological value:

The alder mills of Tillamook county employs around fifty men, who are totally dependent on this employment for their livelihood or for an increased standard of living. The logging operations also employ several men, who might
be on relief if they were unable to work.

Some furniture manufacturers of Portland and Los Angeles are depending on Tillamook county for part of their hardwood supply.

Tillamook county collects taxes, based on the valuation of the sawmills, from the operators. The county also benefits greatly by having this industry in addition to other industries, and the leading citizens and county officials feel that it is of considerable importance to the county and is well worth perpetuating.
Part III

Possibilities for Sustained Yield
Perpetuation of the Present Supply

In order to perpetuate the present supply of alder on the Nestucca drainage, there will have to be some changes made in the cutting systems. As approximately 65 per cent of the volume of operable alder is government owned, this should not be too hard to accomplish. If the Forest Service will start a plan for perpetuation of the present alder supply, maybe private owners will follow:

Forest Service versus Private Owners:

The Forest Service is beginning to realize the value of perpetuating the alder supply and are making studies accordingly. They are changing from partial cutting to clear cutting, with intentions of removing residual trees. They are also trying to devise a plan to get rid of all unmerchantable trees on cut-over areas, by girdling if it is practical. The experiment station is carrying on experiments to help solve the problems of sustained yield.

The private owners look at growing alder in a different manner. Most of them are dairy ranchers, who want to clear their land for agriculture and grazing. Some private owners want to get what they can out of the merchantable timber, and forget about the residual stands. They believe that if the cut-over lands are not used for grazing or agriculture, they are worthless.

The greatest problem in dealing with private owners is to sell them on the idea of growing alder as a side
line. Of course, the land should be used to the greatest advantage; therefore, it should be classified according to timber, agricultural, and grazing lands. The dairy industry in the Nestucca drainage vicinity would probably have been impossible, if the adjacent areas were bare instead of covered with alder when the dairies were started. (3)

Management Problems:

There are two alternatives for cutting alder during the present rotation; cut so that the sustained yield capacity would not be exceeded, or cut the overmature stands before excessive loss from mortality and decay occur. After studies determine the rate of mortality and decay in overmature stands, a plan can be developed to get the greatest returns from the older stands. If losses are not serious, it would be better to cut to the sustained yield capacity; otherwise, it would be wise to liquidate the overmature alder as fast as the markets can use the lumber.

As slash contributes to the soil and does not create a fire hazard, it is proper to leave it as it falls. Slash will deteriorate in a few years, thus contributing to better ground conditions.

One of the big problems is the utilization of alder under 12 inches d.b.h. It is hard to get loggers to cut trees that they cannot sell; therefore, the answer to this problem is to make use of the smaller trees. Better
utilization would create a market for the slow grown hillside alder that is not of commercial value under the present conditions. There are many possibilities of doing this, but studies will have to be made in order to determine the best use or uses and to determine the practicability of using alder in this way. Some of the possible uses are as follows:

1. Manufacture of novelties, woodenware, paper plugs, and many other small articles.

2. There may be a market for charcoal that will help solve this problem. The sole powder-manufacturing concern in the Pacific Northwest used alder in the production of charcoal in 1926. (4) There is no later data available concerning this. This concern used both slabs and bolts, preferring it to softwoods. One cord of alder will yield from 650 to 700 pounds of charcoal.

3. Alder sawdust is supposed to be good for packing nursery stock, and there are a great many nurseries. This might be a way out, if the small alder could be ground up and marketed for a profit.

The future demand for alder should be as good or better than it is now, and there is a good demand for it now. During the last few months the demand for alder took a rapid increase, because the selling price of southern hardwoods, alder's competitor, took a sudden jump. This sudden increase in price was due to the fact that the southern hardwood industries had to comply with the Wage
and Hour law, which they have been evading. As long as this law is in effect, alder should at least maintain its demand.

Regeneration of Alder

Natural Regeneration:

In seed production alder is very prolific, and from all observations will restock in clear cut areas naturally to a satisfactory degree in a few years. Alder will not restock under a residual stand, because of too much shade. Instead, brush usually forms a dense understory, and the land becomes worthless.

Artificial Regeneration:

There have been no steps taken toward planting cutover areas; therefore, the results of planting are unknown. It seems reasonable that planting would be possible for spots that do not reproduce naturally.

The School of Forestry at Oregon State College is carrying on an experiment this year with vegetative propagation. So far the results are good, but no conclusions can be drawn. This may be the best way to re-establish bare or cutover areas and to help other areas reach normal stocking.
Part IV

Summary
Conclusions

The greatest and most frequent question that arises is, "Why not grow Douglas fir instead of alder?" There is no cut and dried answer, but after comparing the two it is easy to understand that alder is better on the Nestucca drainage. In comparing alder with Douglas fir, several aspects should be considered. As previously stated, alder is beneficial as a soil builder, a fire protection, a nurse crop, a commercial crop, and for sociological reasons. It would be almost impossible for Douglas fir to regain a foothold on the Nestucca drainage, if alder was not present. Alder acts as a nurse crop for Douglas fir in building up the soil, retaining moisture in the soil, and protecting it from fire.

Looking at this problem for only the greatest financial return, the following conclusions were drawn. It is evident that Douglas fir would have to be planted on alder lands or an indefinite period of time will pass before it crowds alder out. Then brush would occupy part of the area, and this is not desired. If Douglas fir is planted with seedlings, at the end of a 60 year rotation this would amount to $80.11. With the present stumpage price and yield per acre, Douglas would return a gross profit of $57.48. This gives a net loss of $22.63 per acre. For details of these costs see the appendix.

Alder does not have fire protection costs, assuming
that the carrying costs, including taxes and administration costs, are the same as that for Douglas fir. At the end of a 60 year rotation, alder will yield a gross return of $21.00 per acre, with costs amounting to $13.04. This leaves a net profit of $7.96 per acre. See appendix for full details.

From the above calculations, it can readily be seen that alder can be grown on alder land more economically than Douglas fir. It is impractical to try to change from alder to Douglas fir, when Douglas fir has to be planted.

If cutting practices are changed so that there will be no trees left on the area, sustained yield will soon be under control. Better utilization is a big hinderance to a complete clear cut; therefore, studies will have to be made before satisfactory plans can be made.

**Recommendations**

As there has been practically no data published on red alder in the last fifteen years, more studies and research should be carried on. Research is needed on the following points: (1)


2. Rate of mortality and decay in overmature stands.

3. Effect of the heavy undergrowth normally found under alder stands on regeneration of alder.

4. The tendency toward side branching in open stands.
Experiments should be carried on to determine per cent of stocking of reproduction on cutover alder lands, and the possibilities of planting denuded areas. Could bare areas or brush covered areas be planted to alder as a nurse crop for the reestablishment of Douglas fir? What should be done with the hill side alder, which has no commercial value? Would it be better to leave it as a soil builder and water preserver, or to establish Douglas fir?

There are a great many problems to be solved, and the only way to solve them is for foresters to keep after them. The field is wide open; so this study should be continued.
Costs of growing Douglas fir on a 60 year rotation, starting on bare areas.

Gross returns per acre:
- Normal yield at 60 years ... 42,800 bd. ft.
- 85% stocking ........... 36,380 bd. ft.
- Stumpage @ $1.58 per M ........... $57.48

Growing costs:
- Planting @ $10/acre plus 3% interest compounded annually .... $58.92
- Carrying Costs @ 13¢/M (including taxes, protection, and administration) ........ 21.19

Total Costs ................. $80.11

Net Loss per acre ........... $22.63

Cost of growing Red alder on a 60 year rotation with natural regeneration.

Gross returns per acre:
- Yield .................. 10,500 bd. ft.
- Stumpage @ $2/M .......... $21.00

Costs:
- Carrying costs @ 8¢/M plus interest compounded annually ........ 13.04

Net Profit per acre ........... $ 7.96
Volume Table for Red Alder on the Nestucca Drainage

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<th>Scribner Decimal C</th>
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Table constructed by means of curves based on data from trees cut from private sale areas and Three Rivers and Ranacher alder sales, Hebo Ranger District, Siuslaw National Forest. (1)

Table based on 6" top diameter limit, with allowances made for breakage, defect and limby top logs.
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