Site Tables:

Depending on the species of site tree selected, use the appropriate table to determine site index.

1. King's Douglas-fir table. Use for Douglas-fir and grand fir.

2. Barnes western hemlock table. Use for western hemlock and Sitka spruce.

3. Meyer's ponderosa pine table. Use for ponderosa pine and Jeffrey pine. Use this table when in stands that are predominantly pine, or when pine site trees are all that are available (except in the Willamette Valley).

How to use site tables:

The following site index tables are "upper limit tables." This means that when a tree height indicates a site index that falls between two site indices listed you should use the higher one. Example: Site tree is Douglas-fir, 75 years old at breast height, 115 feet tall. King's Douglas-fir site index table indicates that a height of 115 feet at age 75 falls between site index 80 and 90. Site index is therefore 90.

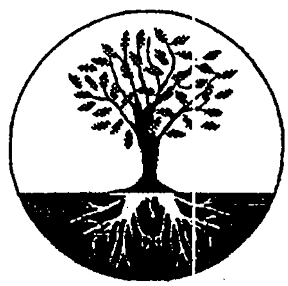

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Exhibit 1-7

Jim Just

From: "Bennett, Max" <max.bennett@oregonstate.edu>
To: "Fletcher, Rick" <rick.fletcher@oregonstate.edu>; "Jim Just" <goal1@pacifier.com>
Sent: Tuesday, January 27, 2004 5:09 PM
Subject: RE: ponderosa pine soils ratings

Jim & Rick:

I don't have any SW OR volume tables for ponderosa pine I can lay my hands on easily. Not sure they even exist per se. Maybe the closest we can come is from the following two pubs:

Oliver, W.W. and R.F. Powers. 1978. Growth models for ponderosa pine: I. Yield of unthinned plantations in northern California. Research Paper PSW-133. Berkeley CA: Pacific Southwest Forest and Range Experiment Station, Forest Service, USDA. 21 p.
Powers, R.F. and W.W. Oliver. 1978. Site classification of ponderosa pine stands under stocking control in California. Research Paper PSW-128. Berkeley CA: Pacific Southwest Forest and Range Experiment Station, Forest Service, USDA. 9 p.

I don't have copies, they are probably at the OSU library.
On the modelling front, there is SYSTUM-1, which models young stands up to age 20, at which point ORGANON takes over. Actual or hypothetical stand data is required. These models are calibrated with SW OR and N. CA stand data.

As a rough approximation, the Silvics handbook has the following yield table. To calculate the cubic ft/ac/year, determine the mean annual increment (MAI, = total stand volume divided by age) for a given site index. For example, for SI=120, the MAI at age 40 is 5,650 cubic ft / 40 years = 141 cubic ft per acre per year. FOr a 50 year base site index, would have to first convert to 100-base value.

Max

Table 1- Total volume inside bark of ponderosa pine 1.5 cm (0.6 in) and larger in d.b.h. (*39*)

Age	Site index at base age 100 years[1]			
	18 m or 60 ft	**27 m or 90 ft**	**37 m or 120 ft**	**46 m or 150 ft**
yr	**m³/ha**			
20	28	94	168	262
40	122	238	396	588
60	192	340	570	861
80	238	413	696	1060
100	273	472	794	1204
120	308	518	868	-
140	336	556	928	-
yr	**ft³/acre**			
20	400	1,350	2,400	3,750

Exhibit 2 | 1/28/2004

40	1,750	3,400	5,650	8,400
60	2,750	4,850	8,150	12,300
80	3,400	5,900	9,950	15,150
100	3,900	6,750	11,350	17,200
120	4,400	7,400	12,400	-
140	4,800	7,950	13,250	-

[1]Height of dominant and codominant trees of average d.b.h.

: Fletcher, Rick
Sent: Tuesday, January 27, 2004 9:40 AM
To: Jim Just
Cc: Bennett, Max
Subject: RE: ponderosa pine soils ratings

Jim:

There are no published yield tables for Valley ponderosa like there are for Douglas-fir and other species. One logical approach would be to use the volume tables for ponderosa in SW Oregon. Max Bennett, our agent in Medford has some experience with Valley ponderosa and ponderosa in SW Oregon, so he may be able to help with this. I have included him in this email. Let's see what he might suggest.

Rick

From: Jim Just [mailto:goal1@pacifier.com]
Sent: Mon 1/26/2004 3:51 PM
To: Fletcher, Rick
Subject: ponderosa pine soils ratings

Rick,
How would you convert a site index for ponderosa pine into a cf/ac/yr rating? i.e. for Philomath soils, what cf/ac/yr rating could be expected from a site index of 104?

Thanks for your help.

Jim Just, Executive Director
Goal One Coalition
39625 Almen Drive
Lebanon, OR 97355
phone/fax: 541.258.6074

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THE WOODLAND WORKBOOK

FOREST MEASUREMENT

EC 1190 • Reprinted May 2004 $5.00

Stand Volume and Growth: Getting the Numbers

S. Bowers, N. Coleman, R.A. Fletcher

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Steve Bowers, Extension forester, Lane County, Oregon State University; Nate Coleman, OSU Extension Master Woodland Manager volunteer, Lane County; Richard A. Fletcher, Extension forester, Linn and Benton counties, Oregon State University.

The procedures outlined in this publication show you how to estimate standing volume and annual growth of timber *stands*—areas that are uniform in age, stand characteristics, and species. Estimates of volume and growth are helpful in planning when to harvest or how much to remove in a thinning operation. These estimates also can assist you with financial analysis and the tax implications of a timber harvest.

Don't confuse the simplified procedure that we describe for collecting and analyzing tree volumes with the more complex and precise techniques that professional foresters use to estimate timber values for sales, land appraisals, or legal purposes. Our system allows you to get reasonably accurate gross volumes of timber but does not address net volumes, log grades, or monetary values.

Volume and growth numbers generated by any tree measuring system are estimates. You usually can't afford the time and money to measure all your trees, so you'll measure a few sample trees. You'll use the sample to obtain an index called a *tarif number*, which will be used to compute individual tree and stand volumes.

Of European origin, the tarif system was adapted for Pacific Northwest use by the State of Washington. The tarif system shows the gross volume of trees based on species, tree diameter, and total height. It's one of several types of tree-volume tables. The tree-volume tables supported by this publication are for Douglas-fir, grand fir, western hemlock, ponderosa pine, western redcedar, and red alder.

If you have a question about the appropriateness of the tarif system for management decisions regarding your timber stand—or if you need help with a complex situation—contact the Extension forestry agent who serves your county, or your state service forester from the Oregon Department of Forestry, or a consulting forester.

Oregon State UNIVERSITY | Extension Service

Ex 3-1

Key numbers that you'll generate

By following the procedures we outline, you'll be able to generate the following kinds of numbers that describe your stand and help you evaluate its performance.

Number of trees per acre

This is a good start, but other numbers generated through the use of this publication are more valuable in making management decisions.

Number of trees per acre by diameter class

Also called a *stand table,* these numbers can be used to plan logging jobs and to evaluate the tree size that's available to merchandise. We'll also use these numbers as the starting point for projecting future stand growth.

Average stand diameter

This is valuable when making decisions on merchantability, in selecting appropriate logging equipment, and for projecting stand growth. Average stand diameter, along with number of trees per acre, can be useful in making thinning decisions.

Basal area

This is the area of a cross-section of the tree at a point 4.5 feet above the ground on the uphill side of the tree, a point commonly called *breast height*. The sum of the basal area for all trees in the stand is the total stand basal area, a common measure of stand density.

Tarif number

A tarif number identifies the taper or shape of your trees and is the key to determining volumes. A tarif number is the cubic foot volume of a tree with a basal area of 1 square foot and a given height. For example, a tree that's 13.56 inches in diameter has a basal area of 1 square foot. If this tree had a volume of 35 cubic feet, its tarif number would be 35. Trees with lots of taper have low tarif numbers; trees with high tarif numbers have a minimum of taper.

Stand volumes

Using the tarif numbers of your sample trees, you can look up volumes of trees of various diameters in board-foot or cubic-foot volume tables. To convert these into per-acre volumes by diameter class, multiply the individual tree volumes by the number of trees per acre. Tree volumes are probably the most useful numbers you'll generate. It's important to remember, however, that they are gross volumes—they don't consider losses for defects and breakage.

Board-foot volume often is of greatest interest, since most timber in the Pacific Northwest is sold at a price per 1,000 board feet (MBF). There are several methods of scaling or measuring board feet; we've used the most common for the Pacific Northwest, the Scribner Volume Table.

There's help available

To complete the procedures described in this publication, you need a basic understanding of how to measure trees and distance and how to do simple math calculations.

To better understand the preparatory steps essential to using this publication, read *Mapping and Managing Poorly Stocked Douglas-fir Stands,* EC 1133, which defines terms, shows how to divide your trees into separate stands, and tells how to make sampling plans.

Tools for Measuring Your Forest, EC 1129, discusses tools you need to measure your trees.

A computer program is available for those who want to avoid math calculations. *VARPLOT: Stand Measurement Software* uses measurements of tarif trees and of plot trees (from either fixed- or variable-radius plots) to estimate trees per acre, basal area per acre, and cubic-foot and board-foot volumes per acre. Stand parameters are reported by diameter classes in 1-inch increments for the total stand. *VARPLOT* also estimates average diameter at breast height (DBH), a growth projection factor, and board-foot volume growth expressed as mean annual increment (MAI) and periodic annual increment (PAI). In addition, *VARPLOT* estimates a stand density index (SDI) and relative density (RD), which are measures of stand density and competition that are important in managing your timber stand.

Ex 3.2

Table 1.—Steps to measuring a stand's volume and growth.

Procedure	How	Tools needed
1. Identify distinct stands.	Mark on map or photo, using field data.	Aerial photo, map, EC 1133
2. Choose a sampling plan.	Follow procedures in EC 1133.	EC 1133, aerial photo, map
3. Estimate the plot size you'll need.	Begin with a plot of 1/20 (0.05) acre; adjust if needed after 3 or 4 plots.	Compass, tape
4. Collect plot information.	Establish a plot.	Tape, compass, Tree Tally Card (Appendix C)
	Measure tree diameters.	Diameter tape
	Measure tarif trees.	Tree Tally Card (Appendix C), clinometer
	Take increment cores.	Increment borer

Cubic-foot volume of the tree stem is a basic measure of wood volume that's independent of how the tree is cut into logs. It's also useful in determining some basic growth relationships for the stand and for comparison with other stands or species.

Using the numbers described above, along with measuring the tree ring widths from increment cores, you'll be able to measure past growth and estimate future growth. This will allow you to determine:

Growth projection factor (GPF) This can be used in conjunction with board-foot or cubic-foot volumes to determine future stand volumes given current growth rates.

Mean annual increment (MAI) This is the average volume growth per year over the life of the stand.

Periodic annual increment (PAI) This is the annual volume growth measured over a specified period, usually 5 or 10 years. We recommend you use the growth over the past 5 years to calculate PAI.

Our example: "Coleman's Conifers"

Beginning on page 5, you'll find boxes like this, on a shaded background. Text in the boxes describes our example to help you work through the procedures. Each time you see one of these boxes, we're applying the steps explained in nearby text and are moving our calculations one step farther.

Measuring stand volume and growth

Table 1 summarizes the necessary steps for measuring your stand*, how to accomplish those steps, and the tools you'll need to perform the task. Steps 1 through 4 explain the information in Table 1.

Step 1. Identify distinct stands

Carefully select the area or stand you wish to sample. It should be relatively uniform in *stocking* (trees per acre or space between trees) and in size of trees. Publication EC 1133 explains how to divide your land into logical stand types. You can do this on an aerial photo, but you must verify your decisions on the ground by walking through the stand.

Here are some ways to deal with different stand characteristics.

- If one area of your stand contains trees consistently and substantially smaller (by 6 inches or more) in diameter at breast height (DBH) than trees in the rest of the stand, *treat the two areas as separate stands*.

*This publication is not designed to obtain precise total volumes for your timber stands. If you need this kind of information, you should take a larger sample and precisely calculate acreage for each stand. Or, hire a consulting forester.

Ex 3-3

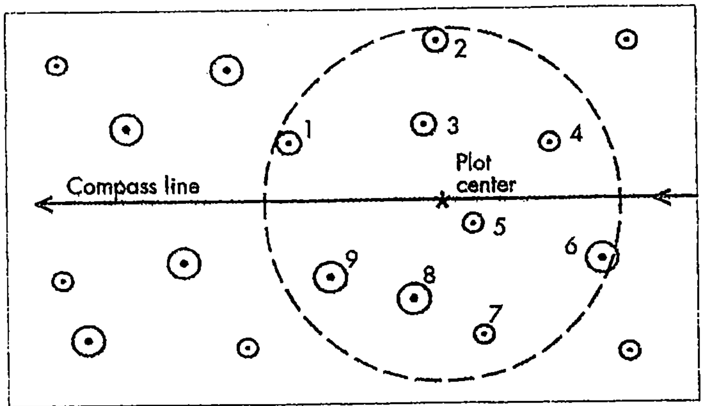

Figure 1.—Establishing plot 1 for Coleman's Conifers (consisting of nine "in" trees).

- If you have a few trees of larger diameter mixed uniformly into a younger stand, sample it as one stand, *but estimate the volumes separately based on different tarif numbers measured from the large and small trees*. Combine the results to obtain total stand growth and yield.
- If you have a distinct smaller area (1 to 3 acres) with poor stocking in a larger well-stocked area, *exclude the smaller area from your sample and volume estimate; measure it separately.*
- If you have several openings of 0.25 to 0.5 acre scattered through a larger stand that is otherwise uniform, *sample the entire area*. The confidence you place in your estimate may be lower, but the numbers you generate will be more accurate than if you had ignored the openings.
- If you have a mixed-species stand of conifers and hardwoods, *sample each species separately* and combine the volumes for total stand growth and yield.

Step 2. Choose a sampling plan

Once you determine which areas are similar enough to be sampled together as stands, it's time to make your sampling plan. To avoid any bias, you must locate samples using systematic measurements. If you wander through your stand and pick likely looking spots, your estimates will be inaccurate. As publication EC 1133 shows you, mark intended plot locations on your photo or map. One plot per 1 to 2 acres generally will give you a good estimate for uniform stands, but more diverse stands require at least one plot per acre.

Step 3. Estimate the plot size you'll need

Your objective is to select a plot size that will give you five to eight sample trees per plot. The proper plot size to use for sampling depends on the number of trees per acre, which is directly related to distance between trees.

Before you leave for the field, use Table 2 as a checklist to ensure that you have the proper equipment.

To begin, refer to the sampling plan you determined for the stand under step 2. Locate on the ground the point where you'll start the sample.

Measure a straight line, in your planned compass direction, to the first plot center. The dots in Figure 1 represent trees in a hypothetical stand. An asterisk (*) marks the center point for your plot. Note that the plot center does not need to be a tree. It is simply the center point according to your measurements.

From your plot center, proceed to measure all trees within a radius of 26 feet and 4 inches. This plot size—which is one-twentieth of an acre (0.05 acre)—often gives you a sufficient number of trees per plot. If you don't achieve the desired five to eight trees after recording plot 1, don't change your plot size yet.

Proceeding along your planned compass direction, in plot 2 measure the number of trees within the plot radius of 26 feet and 4 inches. If you continue to have too many or too few sample trees after measuring three or four plots, then return to plot 1 and adjust plot size accordingly.

Remember, it is much better to have a few more trees than you'd planned than to not have enough, so be sure you have an adequate plot size. Eight to ten trees per plot may seem a lot of trees to measure and record, but it is much better than getting only two to four trees per plot and risking an inaccurate volume estimate.

Once you have obtained the proper plot size, continue with your sampling plan for the entire stand.

Ex 3-4

Table 2.—Tools needed for field measurements.

Needs	Purposes
A. To obtain volume information:	
1. Logger's or similar tape	Measure distance to plot boundaries and tarif trees.
2. Diameter tape or Woodland Stick	Measure tree diameters.
3. Clinometer or Woodland Stick	Measure tree heights.
4. Tarif access tables and tarif volume tables in the appendices.	Provide information needed to transform measurements to volumes.
5. A second person (optional but recommended)	Hold one end of the tape when measuring boundaries; tally information while you take measurements; hold one end of the tape when measuring distance from tarif trees; shake tarif trees so you can see the tops when measuring heights.
B. To obtain growth information:	
1. Increment borer	Extract a core sample from tarif trees. (Also an option for determining tree age.)
2. Small ruler	Measure the width of annual rings in the core sample.
3. A carrier for core samples (optional but recommended)	Take the core sample home for measurement.

*See publication EC 1129 for details about selecting measurement tools.

Step 4. Collect plot information

Establish a plot

Using point * as your plot center (see Figure 1) and the plot radius you determined in step 3, identify the trees within your plot. It's not necessary to mark the entire outer limits of the plot or to measure the distance to trees that are clearly "in" the plot. From the plot center, measure the distance only to trees near the perimeter.

As you traverse your compass line and reach the location for your next plot, immediately locate the plot center. Do not deviate from your compass line! Moving the plot center one way or the other to get more trees in the plot may overstate actual stand volume. A temporary marker (a flag or stick) at the plot center is fine for most purposes. Establish a more permanent plot center if you have a long-range plan to sample the same stand repeatedly.

Measure tree diameters

Recording plot trees Moving clockwise from your compass line, begin recording the trees in the plot. Remember the first tree you measured so you don't accidentally count it a second time. A tree is "in" the plot if its center falls inside the plot boundary. Measure DBH and record these numbers on the Plot Trees section of the Tree Tally Card. Figure 3 (page 7) is a sample completed Tree Tally Card for Coleman's Conifers. A blank card is available in Appendix C.

Be sure to read the key that explains the Tree Tally Card's dot-tally system. Record diameters to the nearest full inch. If a tree measures exactly at the 0.5-inch mark, round the diameter *down* to the nearest full

Estimating plot size

To estimate plot size and location, first find the center of plot 1 by pacing off from the stand boundary. You can measure virtually any timber stand with a plot of one-fiftieth (0.02), one-twentieth (0.05), or one-tenth (0.1) acre. A 0.05-acre plot is the default. After measuring three or four plots, you may find there are too few or too many trees per plot. If so, return to plot 1 and adjust plot size accordingly. Discuss stands that fall outside this suggested plot range with a professional forester before proceeding with sampling.

Ex 3-5

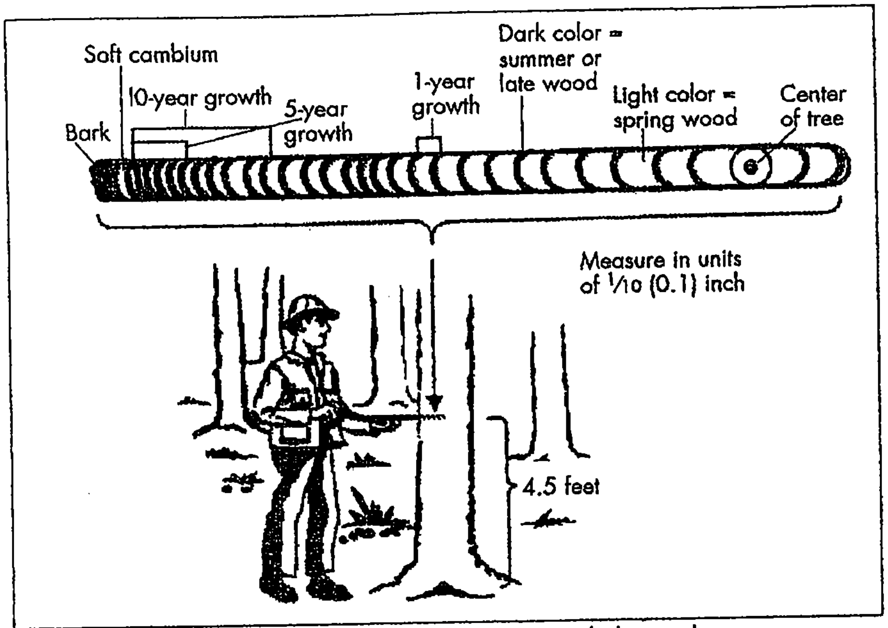

Figure 2.—Increment core sampling to determine radial growth.

inch. Make a mental note of this decision; when you encounter the next tree measuring at the 0.5-inch mark, round the diameter *up* to the nearest full inch. Repeat this process as necessary.

Recording tarif trees To find your tarif tree in the plot, look in a clockwise direction from your compass line; ordinarily, your tarif tree will be the first tree you encounter. (In Figure 1, for example, the tarif tree is shown with the number one.) Your tarif tree should be representative of the other trees in the stand. If the first tree is suppressed, dead, or has a broken top, go to the second tree in the plot and use it as your tarif tree. (In subsequent plots, go back to using the first tree as your tarif tree unless the first tree is not representative of trees in your stand.) You already recorded the tarif tree's diameter on the Plot Trees section of your Tree Tally Card. Now you record its diameter and total height on the Tarif Trees section of the Tree Tally Card.

Pick a vantage point from which you can see the top of the tarif tree. Your estimates will be more accurate if you take your observations from about the same level as the base of the tree. Record its height, to the nearest 5 feet, on the Tarif Tree section of the Tree Tally Card. See publication EC 1129 for more information on measuring the heights of your trees.

Taking increment cores for stand age and growth rates If you have not determined the age of your stand from old records or by counting growth rings on stumps, now is the time. If counting rings on a stump, remember to add the number of years since the tree was cut.

To determine stand age using an increment borer, bore on an exactly horizontal line into the center of the tree at breast height. Bore slightly farther than the tree's radius (for example, bore 8 inches if tree radius is 7 inches). You can recognize the center of the tree by viewing the direction of the slight arc in the growth rings from the extracted core (Figure 2). To properly determine stand age, you will have to add 6 to 10 years to the number you obtained from your increment core. Add 6 years for a high-growth-rate site, 10 years for a low-rate site, to account for the years it took the tree to grow to breast height.

Next, use your increment borer to take a growth rate measurement from your tarif

Taking plot data

You're ready to record plot information (refer to Figures 1 and 3). You identify nine "in" trees on plot 1 (see Figure 1). The first tree measures 12.2 inches DBH, so tally a dot under Plot Trees on plot 1 next to 12 inches DBH. The second tree is 13.3 inches; tally at 13. Continue to measure and record DBH for the remaining seven trees in the plot.

Now you need the tarif tree for plot 1. Remember, the first "in" tree on the plot is your tarif tree. The first tree measures 12.2 inches DBH, so you record 12 in the DBH column under Tarif Trees. You measure its height as 94 feet and record 95 in the Height column. This tree had nonuniform growth over the past 10 years, so you measure the distance from the outermost five rings and find 0.6-inch radial growth, which you record in the radial-growth column of the Tarif Trees section.

Figure 3 shows a completed sample of 10 plots for our stand. The next step is to find a comfortable place to calculate the Tree Tally Card data and turn it into some valuable stand volume and growth information.

Ex 3-6

Figure 3.— Sample Tree Tally Card, completed.

User name ______________________
Stand name Coleman's Conifers
Date ______________________

Plot size 1/20
Species Doug-fir
Stand age 50

Multiplication factor* 2
Average tarif number 39

Plot Trees

DBH (in.)	Plot number 1	2	3	4	5	6	7	8	9	10	Total trees	Total trees per acre
7												
8			•							•	2	4
9									•		1	2
10	•		•	•	•					•	5	10
11		•	••	•	•	•		•	•	••	10	20
12	•	•	••	•••	••		••	••		•	14	28
13	••	••	•	•	•	•••	••••	••	•	••	19	38
14	•••	••			••		••	•••	••	•	15	30
15	••			•		•	•	•	•		7	14
16		•	•		•	•				•	5	10
17					•				•		2	4
18												
19												
20												
21												
22												
23												
24												
25												
26												
27												
28												
29												
30												
31												
32												
33												
34												
35												
36												
										Total	80	160

Tariff Trees

1 Plot no.	2 DBH (in.)	3 Height to nearest 5 ft.	4 Radial growth for 5 yrs. (in.)	5 Tarif no. from access tables
1	12	95	0.6	38
2	13	100	0.6	39
3	10	80	0.5	35
4	15	115	0.6	43
5	14	110	0.7	42
6	13	105	0.6	41
7	15	110	0.8	41
8	13	90	0.5	35
9	17	105	0.5	37
10	16	110	0.6	40
		Total	6.0	391
		Average	0.6	39.1

* Multiplication factor = Plot size correction factor / Number of plots

Dot count key
• = 1
•• = 2
3 dots = 3
4 dots = 4
5 = 5
6 = 6
7 = 7
8 = 8
9 = 9
10 = 10

Remember: The first tree on each plot is recorded as a Plot Tree and as a Tarif Tree.

Recommended plot sizes	Distance between trees: less than 8 ft.	8–16 ft.	16–24 ft.	more than 24 ft.
Plot size (acres)	1/100th	1/50th	1/20th	1/10th
Plot radius (ft. & in.)	11'10"	16'8"	26'4"	37'2"
Plot radius (ft.)	11.8	16.7	26.3	37.2
Plot size correction factor	100	50	20	10

Ex 3.7

tree. You can use the same core sample used to determine stand age. If you didn't use a core for the stand age, you need to bore only far enough (2 to 4 inches) to see growth for the most recent 5 to 10 years.

Count five growth rings from the outermost ring, and measure the distance in tenths of an inch (Figure 2). Record this measurement in the fourth column of the Tarif Trees section of the Tree Tally Card.

You can store cores in a plastic straw and examine them later, but it's important to label them properly and to examine them before they dry out and shrink.

Use your compass and proceed to the second plot. Repeat all the steps used to measure your Plot Trees and Tarif Trees on each of the other plots and record the information on your Tree Tally Card.

Calculating stand volume and growth

Now that you've collected the plot information, you can take it home and translate it into numbers that will more accurately describe your stand. The numbers to generate include:

- Trees per acre
- Tarif number for the stand
- Average radial growth
- Stand volume
- Basal area and average stand diameter
- Volume projections

Calculating trees per acre

Looking at Figure 3, Coleman's Conifers has a total of 80 trees on 10 plots. The multiplication factor is 2 (a plot size correction factor of 20 divided by the number of plots, which is 10). For example, we have 14 trees with a 12-inch diameter; thus we have 28 (14 plot trees times the multiplication factor of 2) 12-inch trees per acre in the stand.

Getting the tarif numbers

In our example, we measured 10 tarif trees in the Douglas-fir stand. Adding the tarif numbers for all sample trees (see Appendix A1) and dividing by 10, we find an average of 39.1. Rounding to the nearest whole number, 39 is the tarif number for the stand.

Computing average radial growth (ARG)

In the Tarif Trees section of the Tree Tally Card, the total of column 4 is 6.0. This means the average tree had 0.6 inch in radial growth (6.0 ÷ 10 trees measured) in the 5-year period. Diameter growth was 1.2 inches (0.6 radial growth times 2).

Trees per acre

We will use the completed Tree Tally Card for Coleman's Conifers (Figure 3) for the data in our computations, and we'll consult the completed Volume Computation Form (Figure 4, page 11) for our completed stand volume and growth calculations. A blank Tree Tally Card (Appendix C) and Volume Computation Form (Appendix D) have been provided for you to copy and use in your own timber stand calculations.

To determine the total trees per acre, refer to the Plot Trees section of your Tree Tally Card (Figure 3). Total the trees tallied for each diameter class and enter the number in the Total Trees column.

The next step is to calculate total trees per acre. First, find your plot size in the bottom table in the Tree Tally Card; the corresponding plot size correction factor is at the bottom of that column. Divide this factor by the number of plots in your sample to get the multiplication factor.

The multiplication factor expresses how many trees per acre are represented by each tree in a sample plot. To find how many trees per acre are in each diameter class, look at the Plot Trees section and multiply the value in the Total Trees column for each diameter class by the multiplication factor. Next, add the values in the Total Trees per Acre column to calculate total trees per acre. Transfer this information to column 1 of your Volume Computation Form (Figure 4, page 11).

Tarif number for the stand

The average tarif number for the stand is the average of the tarif numbers for all the tarif trees you sampled.

Ex 3-8

Determine the tarif number for each sample tree on the Tarif Trees section of your Tree Tally Card by looking up the value in the tarif access table for that tree species (Appendices A1 through A6). These tables list a tarif number based on tree species, DBH, and total tree height.

In our example, we record height to the nearest 5 feet and diameter to the nearest whole inch. We then look in the appropriate appendix and record the corresponding tarif number on the Tarif Trees section of the Tree Tally Card.

Next, we total these values and divide by the number of tarif trees to determine the average tarif number of the stand. Place this number at the top of your Volume Computation Form (Figure 4). Average tarif number identifies the taper of your trees, and it's the key to determining tree volumes.

Using *VARPLOT: Stand Measurement Software*, you can measure tarif trees to the nearest tenth of an inch in diameter and the nearest foot in height. In some—but not all—instances, these more accurate measurements will give slightly different figures than the rounded numbers used in our example.

Average radial growth (ARG)

Estimate radial growth for the stand by adding the core samples recorded in column 4 of the Tarif Trees section of the Tree Tally Card (Figure 3). Compute average radial growth by dividing the total of the column by the number of tarif trees measured. Remember, this is a radial—not a diameter—measurement. (Figure 2 illustrates radial growth.) Transfer this information to the average radial growth line in the upper right of your Volume Computation Form.

Estimating stand volume

The next step is to estimate stand volume from field measurements and the average tarif number.

In column 1 of the Volume Computation Form, write in the number of trees per acre by diameter class, drawing that information from the Total Trees per Acre column on the Tree Tally Card.

Next, record average radial growth and your average tarif number at the top of the Volume Computation Form. Don't worry about average basal area/tree or average stand diameter at this time; you'll fill in these lines during the next step.

Tree volume tables are in Appendices B1 through B3. The volumes you use are in the column under the appropriate tarif numbers. For our example, we determined 39 as our average tarif number for the stand.

To estimate board-foot volumes in 32-foot logs, use Appendix B1. (Appendix B2 is for volumes in 16-foot logs, and cubic-foot volumes are in Appendix B3.) Record board feet in column 2 and cubic feet in column 4 of the Volume Computation Form.

To get the total board-foot and cubic-foot volumes per acre for each diameter class, multiply trees per acre (column 1) by volume per tree (columns 2 and 4, respectively) on the Volume Computation Form. Enter total volumes per acre for each diameter class in columns 3 and 5. The sum of column 3 is your total board-foot volume per acre, and the sum of column 5 is your total cubic-foot volume per acre.

Estimating stand volume

Assume you want to estimate board-foot volume in 32-foot logs with 8-inches DBH. The Tree Tally Card shows four trees per acre with a DBH of 8 inches. Using Appendix B1, our average tarif number of 39 shows a volume of 40 board feet for each tree with an 8-inch DBH.

On the Volume Computation Form, multiply four trees (column 1) by 40 board feet (column 2) to get 160 board-foot volume per acre for trees in our 8-inch diameter class (column 3). Repeat this process for each diameter class. Adding the values in columns 1 and 3 shows a total of 160 trees per acre with a volume of 23,900 board feet per acre.

Ex 3-9

Basal area and average stand diameter

In column 6 of the Volume Computation Form, basal area per tree has been calculated for each diameter class on the form. To determine basal area per acre of trees by diameter class (column 7), multiply values in column 1 by those in column 6. Add column 7 to get total basal area per acre and record at the bottom of the column.

To compute average basal area per tree, we need the total basal area per acre (column 7) and trees per acre (column 1). The formula is:

Average basal area/tree = Total basal area/acre (i.e., Total of col. 7) ÷ Total trees/acre (i.e., Total of col. 1)

Average stand diameter is the diameter of a tree with average basal area. To find this diameter, convert from basal area (square feet) to diameter (inches):

Average stand diameter = square root of (Average basal area/tree ÷ 0.005454)

Now, record average basal area/tree and average stand diameter on the appropriate lines at the top of the Volume Computation Form.

Calculating basal area

On the Volume Computation Form, still on the line for 8-inch DBH, multiply 4 trees per acre (column 1) by 0.349 basal area per tree (column 6) to get a total basal area of 1.396 square feet. Repeat this process for all the diameter classes and add column 7 to get the total basal area per acre, 147.46 square feet.

Computing average basal area/tree

Per acre, total basal area is 147.46 square feet and you have 160 total trees per acre. Therefore:

$$\text{Ave. basal area/tree} = \frac{147.46 \text{ sq ft}}{160} = 0.922 \text{ sq ft}$$

Computing average stand diameter

Given an average basal area per tree of 0.922 square feet, average stand diameter is:

$$\sqrt{\frac{0.922 \text{ sq ft}}{0.005454}} = 13.00 \text{ in}$$

Using the numbers

Volume projections

Your completed Volume Computation Form (Figure 4) includes all the information you need to determine past and present stand volumes and the volume growth rate of your trees and to project future volumes. Upon completing the volume projections for your stand, you'll have information that is essential to making well-informed decisions about managing your woodland property. To project volumes, you need to perform some basic calculations and follow a few simple steps.

Step 1. Calculate beginning average stand diameter

We want to calculate average stand diameter at the beginning of the most recent 5-year growth period. (We are using 5 years as our measurement period because, when we took our increment core, growth rings in the core were quite different for the most recent 5 years.) First, double the average radial growth figure recorded on your Volume Computation Form (remember, we need diameter growth, so we double the radial growth figure). Subtract diameter growth from your current average stand diameter to find the average diameter of your trees 5 years ago.

Beginning average stand diameter = Current average stand diameter – (2 x Average radial growth)

Step 2. Calculate beginning average basal area per tree

Now we'll determine the basal area per tree at the beginning of the 5-year growth period. Convert from diameter (in inches) to basal area (in square feet) with the formula:

Beginning average basal area/tree = (Average diameter at beginning of growth period)^2 x 0.005454

Ex 3.10

Figure 4.— Sample Volume Computation Form, completed.

Stand name Coleman's Conifers
Species Doug-fir
Stand age 50
Average tarif number 39
Multiplication factor 2

Date
Average radial growth 0.6
Average basal area/tree 0.922
Average stand diameter 13.002
Board-foot volumes (16′ or 32′) 32

	1	2	3	4	5	6	7
DBH	Trees/ acre	Board ft. vol./tree (from Tree Volume Tables)	Board ft. vol./acre (col. 1 x col. 2)	Cubic ft. vol./tree (from Tree Volume Tables)	Cubic ft. vol./acre (col. 1 x col. 4)	Basal area/tree	Basal area/acre by diameter class (col. 1 x col. 6)
7						0.267	
8	4	40	160	11	44	0.349	1.396
9	2	70	140	15	30	0.442	0.884
10	10	90	900	20	200	0.545	5.45
11	20	100	2000	24	480	0.66	13.2
12	28	120	3360	30	840	0.785	21.98
13	38	150	5700	36	1368	0.922	35.036
14	30	180	5400	42	1260	1.069	32.07
15	14	210	2940	49	686	1.227	17.178
16	10	230	2300	56	560	1.396	13.96
17	4	250	1000	64	256	1.576	6.304
18						1.767	
19						1.969	
20						2.182	
21						2.405	
22						2.64	
23						2.885	
24						3.142	
25						3.409	
26						3.687	
27						3.976	
28						4.276	
29						4.587	
30						4.909	
31						5.241	
32						5.585	
33						5.939	
34						6.305	
35						6.681	
36						7.068	
	160 Total trees/acre		23,900 Total board-foot volume/acre		5724 Total cubic-foot volume/acre		147.458 Total basal area/acre

Ex 3·11

Projecting volumes

Beginning average stand diameter

Average stand diameter 5 years ago (the beginning of the growth period) is:

13.002 (Current avg. stand diameter)
− [2 × 0.6 (Avg. radial growth)]
= 11.8 in.

Beginning average basal area/tree

Given a beginning average stand diameter of 11.8 in., the average basal area per tree at the beginning of the growth period is:

(11.8 in.)^2
× 0.005454
= 0.759 sq ft.

Growth projection factor (GPF)

Inserting average basal area into the GPF formula gives the growth projection factor. Once you have determined this number, you can look to the future. GPF equals:

$$\frac{0.922 \text{ (Current avg. basal area/tree)}}{0.759 \text{ (Beginning avg. basal area/tree)}}$$
= 1.215

Future volumes

Multiplying current stand volume by the GPF shows us the stand in 5 years should have a volume of approximately 29,039 bd. ft. (23,900 × 1.215) or 6,955 cu. ft. (5,724 × 1.215).

Calculating mean annual increment

MAI is calculated for the life of the stand. Divide current total volume per acre by stand age:

$$\frac{23,900}{50}$$
= 478 bd. ft./acre per year

Periodic annual increment

To calculate PAI for the next 5 years, subtract the stand's current total volume per acre from its future volume and divide by the number of years in the growth period. (Remember, future volume was determined by using the growth projection factor.)

$$\frac{29,039 - 23,900}{5}$$
= 1,028 bd. ft./acre per year for the next 5 years

In this case, PAI exceeds MAI, suggesting the stand is not biologically mature and should be allowed to continue growing, although it may need thinning.

Step 3. Calculate growth projection factor

To estimate how fast your stand is growing, calculate its growth projection factor (GPF). Find the current average basal area per tree on your Volume Computation Form. You calculated beginning average basal area per tree in step 2.

Growth projection factor = Current average basal area/tree ÷ Beginning average basal area/tree

Step 4. Calculate future volume per acre

Now you can project the future volume per acre. Multiply current volume (from your Volume Computation Form) by the growth projection factor. This assumes that current stand volume growth will continue at the same rate as in the previous 5-year period, so the projection's accuracy will depend on how consistently your stand is growing. For most young stands (less than 50 years old), this estimate may be on the conservative side—that is, it may be slightly less than actual growth. As the stand ages beyond 50 years, tree growth rate tends to slow (see Figure 5).

Future stand volume = Current volume × GPF

Step 5. Calculate mean annual increment (MAI)

Another useful stand number is the mean annual increment (MAI) of volume growth. This represents the average volume growth per acre per year over the life of the stand. You already have generated the numbers necessary to determine MAI. They are:

Mean annual increment = Total current volume/acre ÷ Stand age (years)

You can calculate cubic-foot MAI for stands of any age, but you can't calculate board-foot MAI until trees in a stand reach a minimum merchantable size. Think of MAI as the long-term average or track record of the stand's growth.

Ex 3.12

Step 6. Calculate periodic annual increment (PAI)

The average annual volume growth of a timber stand measured over a specific period is its periodic annual increment (PAI). This figure is useful because volume growth per acre can vary substantially as the stand ages. The PAI of either board-foot or cubic-foot volumes can be calculated for any period, but 5- or 10-year periods are most common. Calculate PAI:

Periodic annual increment = (Total volume/acre at end of period – Total volume/acre at beginning of period) ÷ Number of years in the period

PAI can measure previous growth or project future growth. Core samples enable you to take measurements back from the present, and your calculated growth projection factor enables you to estimate a future periodic annual increment. This enables you to determine how your stand is growing by taking a "snapshot" in time.

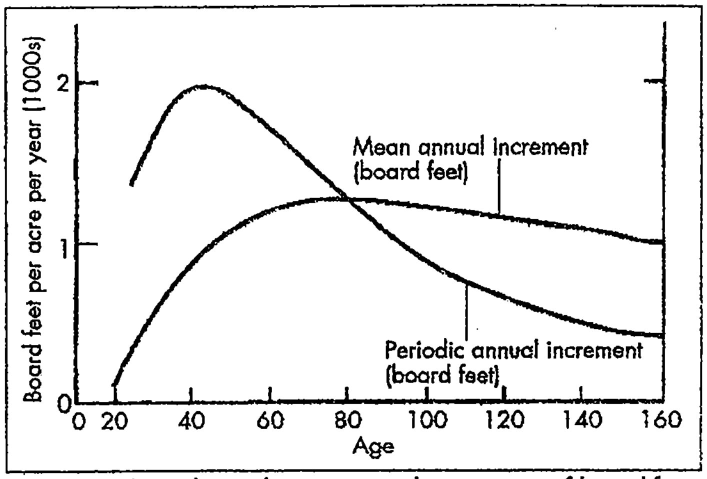

Figure 5.—Periodic and mean annual increments of board-foot volume for Douglas-fir, showing culmination of mean annual increment at about 80 years. Absolute age of culmination varies, but the pattern in this graph is similar for all species. Adapted from McArdle et al., *The Yield of Douglas Fir in the Pacific Northwest,* USDA Technical Bulletin 201, 1961.

Hypothetical ideal harvest time

Foresters have a long tradition of analyzing timber stand growth. Figure 5 shows the growth pattern for Douglas-fir, but the pattern for even-age stands tends to be similar for all tree species.

From analyses and long experience, foresters have derived the general rule that when PAI falls below MAI, the timber stand is "mature"—that is, it has passed its peak of wood growth production in the biological sense. Thus, the stand might be harvested if growth rate is the overriding factor in the harvest decision.

The point where the PAI line crosses the MAI line also is the highest value for MAI. This point, therefore, is referred to as *culmination* of MAI. The stand will continue to add volume after this point but at a slower rate than before. Thus, by comparing estimates of PAI and MAI, we can test whether our stands are biologically mature. Thinning stands can boost the growth of residual trees and delay the culmination of MAI.

Often, factors such as cash flow or market cycles dictate a timber harvest before or after culmination of MAI. By combining this biological information with financial analysis, you can tailor your management decisions to your own situation and objectives.

Where to go from here

Good stand information is essential to making the decisions necessary for managing your woodland property. Stand measurements are critical to logging and marketing options. They are also important as indicators of a stand's health and vigor and its susceptibility to insect and disease problems. And, measurements might be important in deciding whether a harvest operation will generate the desired cash flow.

Measurements taken according to the procedures described here are suitable for understanding how a timber stand may develop over time; however, they're no substitute for professional timber appraisals or inventories done by foresters.

If you want to refine these techniques or to study timber growth further, contact your Extension forestry agent for possible opportunities.

Ex 3·13

NEIL GOLDSCHMIDT
GOVERNOR

Forestry Department
OFFICE OF STATE FORESTER
2600 STATE STREET, SALEM, OREGON 97310 PHONE 378-2560

January 27, 1989

Craig Greenleaf, Acting Director
Department of Land Conservation and Development
1175 Court St. NE
Salem OR 97310

Dear Craig,

This transmits forest soil rating data that superceeds data previously sent to your Department by Forestry in July 1988.

During the past 2 years, a major part of our effort in Secondary Lands has been in helping to identify those forest soils with low and medium productivity potentials (those soils that are, from a forest productivity standpoint, suited to be included with "secondary" lands).

As agreed, we have made detailed examinations of the information available to us from the SCS, and applied the expertise of our staff professionals. As a result of those additional examinations, enclosed is our final listing of those soils for all counties from Lane County north and west, and including Hood River County.

Note that the listing shows the SCS soil survey mapping unit numbers as contained in the applicable published soil survey, followed by the soil map unit name, this department's rating of forest productivity for that soil, and the acreage for that mapping unit from the SCS published soil survey. These ratings generally group those soils capable of forest productivities above 85 cubic feet per acre per year (at culmination of mean annual increment) into the "High" rating, those from 50-85 cubic feet per acre per year into the "Medium" rating, and from 20-50 cubic feet per acre per year into the "Low" rating. We have incorporated deductions for inclusions of soils of lower, and/or of higher productivity into our ratings. We also show, where available, the Site Index (height growth indicator) as presented in the SCS published soil survey, and the computed productivity in cubic feet per acre per year where that appears in published SCS data for that soil.

Ex 4-1

Note also that we have grouped the soil mapping units into groupings, based on the forest productivity rating alone. Where insufficient information is given (or where insufficient use of the soil mapping unit for forestry exists) on which to base a forestry productivity rating, we have assigned numerical ratings based on our professional judgement, based also on previous input from Jerry Latshaw (SCS) and Herb Huddleston (OSU Extension). In these latter instances, "1" means High productivity is indicated; "2" indicates Medium; "3" indicates Low.

The listing also includes "estimated" productivity ratings based upon the vegetational characteristics and certain soil factors as they appear in SCS published data. We base these estimates on our knowledge of plant ecological relationships and on comparisons with other soils on which SCS has published more complete data.

Note that for Tillamook and Lincoln Counties, less-precise data is available from SCS. Therefore, the information provided may be of lesser utility. Note also that our field organization's work priorities would not permit our making field investigations, nor utilizing their experience in refining productivity estimates as I would have preferred to do.

I hope that this work is of use to you and to the Commission. We will continue to examine the ratings for other counties and to complete that work as soon as possible.

Sincerely,

Dave

Dave Stere
Forest Resources Planning Director

DHS DS-47

cc: Bob Madsen
Ron Eber
Jerry Latschaw
Herb Huddleston

Attachments
13 county forest soil rating lists

Ex 4-2

ds-47a 1-11-88

LANE COUNTY - FOREST SOILS RATINGS

SCS #	SCS Name	(Site Index) Rating		SCS Acreage	Cuft/Ac per yr
004G	Atring-Rock Outcrop Complex, 30-60%	Med	120	1140	86
005	Awbrig sicl	3		9890	est 40
006	Awbrig Urban Land complex	3		350	est 20
008	Bashaw c	3		9650	est 30
009	Bashaw-Urban Land complex	3		350	est 20
010	Beaches	3		1000	
017	Brallier muck, drained	3		1160	
018	Brallier muck, tidal	3		930	
019	Brenner sicl	3		860	
021B	Bullards-Ferrelo loams, 0-7%	Med	144	510	150
021C	Bullards-Ferrelo loams, 7-12%	Med	144	1560	150
021E	Bullards-Ferrelo loams, 12-30%	Med	144	1210	150
021G	Bullards-Ferrelo loams, 30-60%	Med	144	850	150
022	Camas gr sl, occ flooded	3		6370	est 40
023	Camas-Urban land complex	3		600	est 20
028C	Chehulpum sil, 3-12%	3		1970	est 40
028E	Chehulpum sil, 12-40%	3		440	est 40
033	Conser sicl	3		4200	est 50
034	Courtney gr sicl	3		2920	est 40
038	Dayton, sil, clay sub	3		4280	est 40
042E	Dixonville-Hazelair-Urban Land, 12-35%	Low		640	est 35
043C	Dixonville-Philomath-Hazelair, 3-12%	Med		11480	est 62
043E	Dixonville-Philomath-Hazelair, 12-35%	Med		22990	est 68
044	Dune Land	3		5870	
045C	Dupee sil, 3-20%	Med		20190	est 70
048	Fluvents, Nearly Level	3		9550	
052B	Hazelair sicl, 2-7%	Low		5680	est 40
052D	Hazelair, 7-20%	Low		41510	est 40
053	Heceta fs.	3		2010	est 20
073	Linslaw l	2		5700	est 80
075	Malabon sicl	2		15350	est 65
076	Malabon-Urban land complex	2		6420	est 50
077B	Marcola cob sicl, 2-7%	Med		690	est 70
085	Natroy sicl	3		15170	est 60
086	Natroy sic	3		2100	est 60
087	Natroy-Urban Land Complex	3		610	est 40
094C	Netarts fs, 3-12%	Med	80	1060	58
094E	Netarts fs, 12-30%	Med	80	420	58
098	Noti l	3		3860	est 30
100	Oxley gr sil	2		2010	est 80
101	Oxley-Urban land complex	2		870	est 60
102C	Panther sicl, 2-12%	3		8400	est 50
103C	Panther-Urban Land complex, 2-12%	3		440	est 40
105A	Pengra sil, 1-4%	3		5070	est 50
106A	Pengra-Urban land complex, 1-4%	3		780	est 30
107C	Philomath sic, 3-12%	Low		2280	est 50
108C	Philomath cob sic, 3-12%	Low		2280	est 50
108F	Philomath cob sic, 12-45%	Low		7090	est 50
109F	Philomath-Urban land complex, 12-45%	Low		270	est 20

Ex 4-3

The Agricultural Quarterly

Fall 2001

Fast growing trees becoming a "Poplar" commodity in Oregon[i]

From space, you can pick it out as you look earthward. A large green square surrounded by several smaller green circles in the Columbia Basin. The green circles represent traditional center-pivot irrigated field crops. From the ground — in fact driving next to the green square along I-84 — you notice a non-traditional agricultural commodity. A seemingly endless forest of trees between Boardman and Hermiston in an area where you wouldn't expect to see trees.

These are hybrid poplars, nearly 18,000 acres that go roughly seven miles long, seven miles deep. The plantation belongs to the Potlatch Corporation, one of a handful of companies in the hybrid poplar business. This is an agricultural operation, not a forestry one. Much like the Christmas tree industry, these trees are planted and harvested well within 12 years — much sooner than the usual timber harvest. Production of hybrid poplars has a statewide value of $11.6 million, making it Oregon's 30th ranked commodity.

When first hand planted, Potlatch placed 545 trees per acre — a tight fit for poplars that would be harvested every six or seven years. New plantings are fewer and farther between with about 293 trees per acre. The new thinking is to allow the trees to grow longer and larger. When fully harvested now at ten years, these poplars will reach more than 90 feet high with a twelve inch diameter. The marketplace is dictating the change.

"We started growing the trees in 1994 for the pulp and paper industry, but no large market has really emerged," says Greg Uhlorn of Potlatch. Still, the Potlatch Plantation in the Columbia Basin provides wood chips for pulping to two Washington mills: Boise Cascade at Wallula and Georgia Pacific at Camas. In addition, chips are used at Jeld-Wen in White Swan, Washington, for the manufacture of door skins.

Now Potlatch believes it can help timber-starved mills continue operating. Reductions in federal timber supplies are causing shortages. The bigger poplar can provide lumber. Already, Kinzua Resources, a Umatilla County lumber mill, has installed a small log line.

"No one will be using hybrid poplars for structural wood products," says Potlatch's John Finley. "You are not going to see a house built of hybrid poplars. But the wood could be used for moldings, cabinets, etc."

Ex 5-1

Hybrid Poplars in the Pacific Northwest: Culture, Commerce, and Capability Symposium Proceedings, April 7-9, 1999 - Pasco, Washington

MISC0272

Author(s): A. Blatner, Jon D. Johnson, and David M. Baumgartner

Hybrid poplars have proven to be among the fastest growing trees in the world. Their extraordinary rates of productivity, combined with diminishing traditional sources of fiber, have led to the establishment of tens of thousands of acres of hybrid poplar plantations in the Pacific Northwest over the past decade. During this period, much has been learned about the biology, genetics, breeding, plantations establishment, cultivation, harvesting and utilization of poplars grown under short rotation culture. Hybrid poplars have shown promise for use in riparian buffers, waste water utilization, remediation of contaminated sites as well as potential for carbon credits.

This volume of compiled papers from the first Tri-Society Conference of Washington, Oregon, and Inland Empire Societies of American Foresters contains a wealth of information and research about hybrid poplars. It begins with an overview of the global forestry picture, plantation forests, and economic value of the hybrid poplar. Other papers discuss the environmental benefits of hybrid poplars including the potential to help degrade contaminants in water and soil, carbon sequestration offsets of greenhouse gas emissions, suitability for paper products, lumber, plywood, and engineered wood, prevention of wildlife damage, results of herbicide tolerance and insect testing, and clonal development for short rotation fiber farming.

This is an exciting time for the hybrid poplar industry. These proceedings are a testament to the hard work and persistence of combined research and practical experience of many people.

Published: April 2000. Revised: April 2000.

Ex 5-2

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Timber West Journal

January February, 2004[i]

Kinzua finds a future in small logs

Oregon mill uses technology and innovative fiber production ideas to secure their future

by Bob Bruce

Adopt to survive – that's the name of the game in the timber business these days. Gone are the days when a mill could count on a steady supply of high-grade Douglas fir combined with a high-profit margin marketplace. One Oregon mill that has discovered a unique formula for success in the new and changing lumber products landscape is Kinzua Resources, with main offices in Eugene, Ore. and their mill in Pilot Rock, Ore. (about 10 miles south of Pendleton). By taking the capability ties of the newest generation of computer-automated log scanning and form-following small log sawing systems – specifically the McGehee SL2000 – and closely coupling that technology with an innovative fiber production scheme developed by Potlatch, Kinzua plans to within a year and a half be processing and marketing 40 million bd. Ft. of fast-growth, high-grade hybrid poplar each year, year round, with a steady market composed primarily of the furniture industry.

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[i] http://www.forestnet.com/timberwest/archives/Jan_Feb_04/kinzua.htm

Ex 5.3

Hardwood Stand

No. 413
July, 2003[1]

Potlatch Corporation

Pat Moore

Located near Boardman, Oregon, Potlatch Corporation has been growing hybrid poplar trees since 1993 to supplement regional fiber needs in the future. The company purchased 22,000 acres of circle irrigated farmland and is growing hybrid poplar trees on 17,300 acres of the project. The plantation is managed as an agricultural crop using a computerized and automated drip irrigation system that feeds each tree according to its needs, conserving water and nutrients. In 2000, Potlatch changed the management objective for the Hybrid Poplar Plantation and is now managing this acreage for the production of high quality solid wood logs targeted for the hardwood lumber and plywood markets. These fast-growing hybrids can grow 10-12 feet in a single growing season and when harvested after 11 years will produce significant volumes of high quality logs. Under transition to a solid wood management plan, selected older stands are being harvested under a pulp wood rotation, while merchandising higher value logs to develop the hybrid poplar markets.

Moore is a newly elected board member, has been an active member of the Western Hardwood Association, and a past presenter at WHA's Symposium I. He joined Potlatch Corporation as Production Superintendent in 1996 after spending 10 years with the Scott Paper Company as the Forest Engineer Manager and another 10 years in logging and sawmill equipment sales. Contact Potlatch Corporation, PO Box 38, Boardman, OR 97818, (541)481-2620 fax (541)481-2623, e-mail pat.moore@potlatchcorp.com, www.potlatchcorp.com.

[1] http://www.westernhardwood.com/newsletters/July_NL_a-_03.pdf

Ex 5-4

Fuelwood

Firewood usually is sold by the cord. Both hardwoods and conifers are popular. Conifers usually are less dense and provide less total heating value per unit of volume. Table 7 lists the approximate weight per cord and Btu's per pound for some Northwest species.

You can determine the amount of cordwood in a stack by multiplying height by width by length and dividing by 128 cubic feet. For example, the number of cords in a stack of firewood that is 8 feet wide by 6 feet high by 10 feet long is 3.8 cords:

$$8 \times 6 \times 10 = 480$$

$$480 \sqrt{}128 = 3.75 \text{ or } 3.8 \text{ cords}$$

The number of board feet in a cord varies with the average diameter of the wood and the amount of solid wood in the cord. If the wood pieces in a cord average 8 inches in diameter, there are about 90 cubic feet of solid wood and 307 board feet in a cord (Table 4, westside):

90 cu ft x 3.41 bd ft per cu ft = 307 bd ft

As the average diameter increases, the board-foot volume per cord increases. For a general estimate of cordwood volume in a young Douglas-fir stand, see Appendix D.

Table 7.—Fuelwood weight per cord and relative heat.

Species	Weight[a]	Btu's/lb[b]	Btu's/cord (millions)
Black cottonwood	2,363	7,130	16.8
Willow	2,630	6,580	17.3
Red alder	2,812	6,460	18.2
Bigleaf maple	3,262	6,795	22.2
Oregon ash	3,713	6,630	24.6
Pacific madrone	4,388	6,560	28.8
Black oak	3,825	6,750	25.8
Tanoak	4,500	6,700	30.2
Oregon white oak	4,838	6,560	31.7
Black locust	4,646	6,700	31.1
Western redcedar	2,160	7,880	17.0
Grand fir	2,498	6,710	16.8
Sitka spruce	2,700	6,540	17.7
Lodgepole pine	2,768	6,960	19.3
Ponderosa pine	2,700	7,380	19.9
Western hemlock	3,038	6,880	20.9
Douglas-fir	3,308	7,460	24.7
Western larch	3,510	7,400	26.0

[a] Approximate weight, lb/cord (90 cu ft solid wood), for air-seasoned wood with 20% moisture content. Adapted from Overholser, James, *Oregon Hardwood Timber Research Bulletin 16*, Oregon State University Forest Research Lab, 1977; and *Wood Handbook*, USDA Agriculture Handbook 72, 1974.

[b] At 20% moisture content. Adapted from *How to Estimate Recoverable Heat Energy in Wood and Bark Fuels*, USDA Forest Products Lab, General Technical Report FPL 29, 1979.

Some final notes

This publication reviews the measurement of timber products commonly harvested from small woodlands in Oregon. There are other forest products that have market potential, including railroad ties, hop poles, trolling poles, shakes and shingles, boom and bumper logs, oak wine barrel stock, burls, arrow stock, mine props, and car stakes, as well as floral greenery, mushrooms, and cascara bark. Your county Extension agent or local buyers can provide information on these products.

As a woodland owner, you may have a diverse number of products available to sell to maximize your tree farm revenues. Your ability to recognize the quality and quantity of forest products and to market them effectively depends not only on your knowledge of measurements and marketing but also on a flexible tree farm management plan tailored to your objectives.

Ex. 6

8th North American Agroforestry Conference
June 22-25, 2003, Oregon State University

Rising Oak Ranch
Agroforestry Research & Demonstration Site

During September 1990, Jim and Lu Monroe joined together with OSU Extension and the Oregon Economic Development Department Regional Strategies Program to begin an agroforestry experiment on their Rising Oak sheep ranch located on the north side of Peterson Butte in Linn County. Typical of many foothill properties throughout the Willamette Valley, Rising Oak was showing signs of heavy grazing of its pastures and high grading of its forests.

The purpose of the agroforestry study was to test the feasibility of different establishment regimes and tree species in an agroforestry project using sheep, pasture, and forest trees. After clearing and disking 12 acres of neglected pastures, the research team laid out 5 different treatments, testing 2 different establishment sequences for the trees and pasture.

Each tree containing treatment had 3 replications each of Douglas-fir, Willamette Valley Ponderosa Pine, and KnobconeMonterey Hybrid Pine (KMX). Tree species were assigned randomly to the treatment blocks. The entire study included 39 plots, with 16 measurement trees in each plot, each surrounded by at least 2 rows of buffer trees.

Survival. Tree survival varied widely by species. (Figure 4) Douglas-fir only survived well on the forest only treatment, probably because it represented the best drained soils of any of the treatments. The other treatments included plots with heavy clay soils and impeded winter drainage, conditions not suitable for the establishment of Douglas-fir. While this seems obvious in hindsight, it should be pointed out that the entire site is surrounded by stands of Douglas-fir on similar soil types, so figuring out which microsites would or would not grow Douglas-fir turned out to be very tricky. KMX faired somewhat better, even on the wetter soils, but it also suffered in both growth and survival on the wetter plots. Ponderosa pine turned out to be the best species for survival across the range of soil conditions present, testifying to its ability to withstand both drought and flooding.

Where adequate drainage existed, KMX was the clear winner in terms of height (818 cm or about 27 feet), compared to ponderosa or Douglas fir. Overall, the stands of young trees are healthy and growing well. As of this report, they have just been pruned in order to increase wood quality and keep light available for forage production.

Figure 4. Tree Survival and Growth by Species and Treatment

Tree Survival	PASTURE > TREE ROWS	TREES ROWS > PASTURE	CLUSTERED TREES	FOREST PLANTING
KMX	85%	75%	75%	81
PP	96%	100%	100%	100%
DF	56%	33%	46%	75%

Ht Growth (cm)	PASTURE > TREE ROWS	TREES ROWS > PASTURE	CLUSTERED TREES	FOREST PLANTING
KMX	818.87	511.33	589.54	656.02
PP	448.96	536	441.71	506.9
DF	644.38	647.81	524.82	497.66

Demonstration

Ex 7-1

Although this project has yielded data and answered some questions, its primary goal has been to offer landowners an area where they can see what an agroforest looks like and how it functions. Over the past ten years, hundreds of landowners have toured this site. Many have applied the concept to their land.

This project is supported by Jim and Lou Monroe and the OSU Extension Service with financial support from Linn and Benton Regional Strategies, USDA Cascade Pacific RC&D, Oregon Department of Forestry, USDA Western Region SARE.

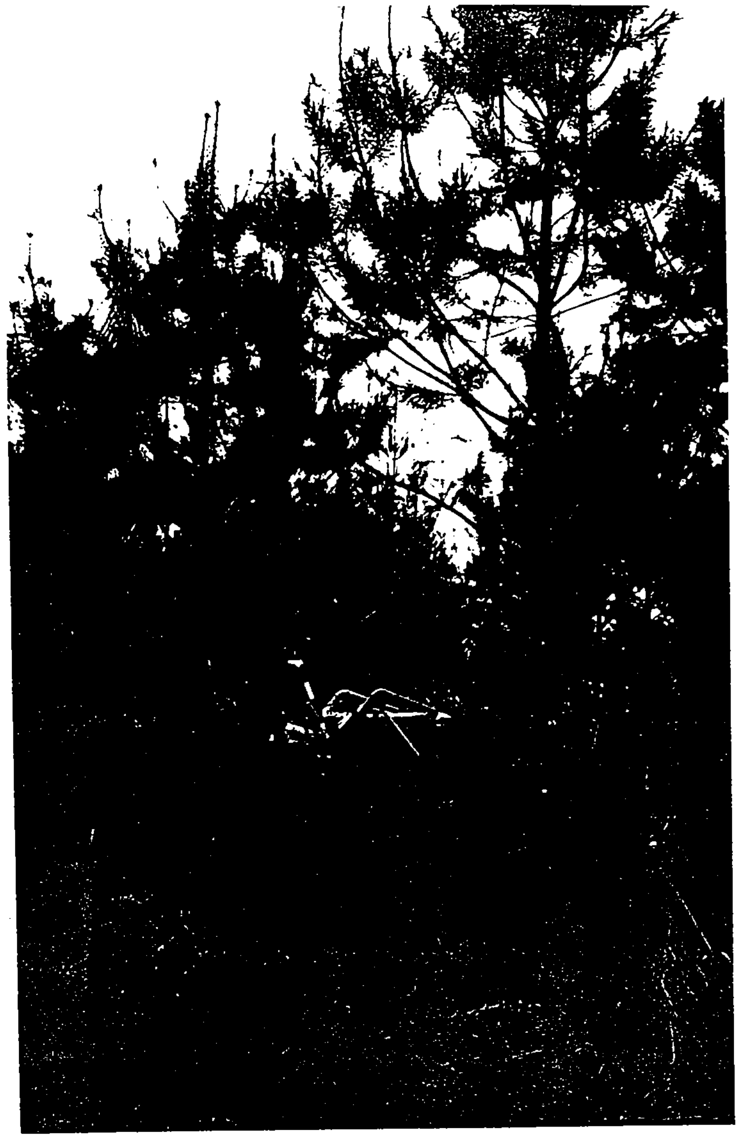
Ex 7-2

Jim Monroe's Rising Oak Ranch Lebanon Or.

KMX planted 1991 taken 1999

KMX planted [illegible] taken 2002

Ex 7-3



Jim Monroe

Rising Oak Road

Lebanon OR

KMX

planted 1991

taken 1999

Ex. 7-4

LEBANON OR
JUST KMX PLANTATION PLANTED 1996
taken 2008

EXHIBIT 7-5

Extension Circular 1193
Reprinted January 1993

EXHIBIT 8

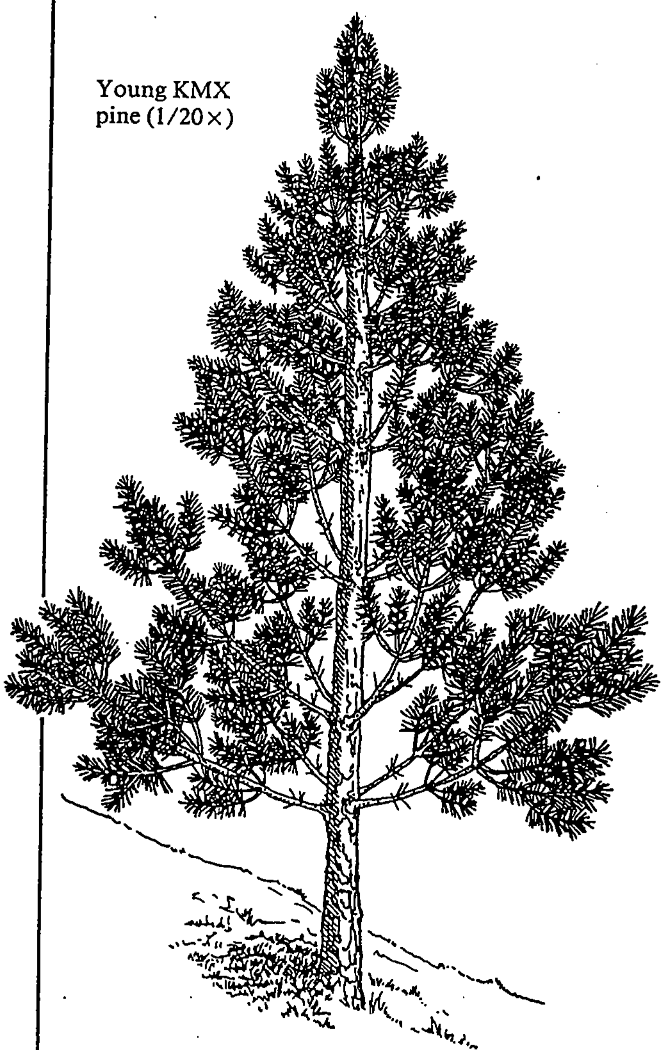
$1.50

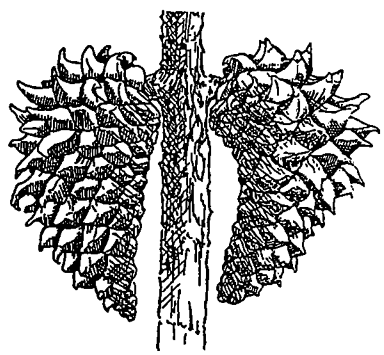
The Woodland Workbook

Stand Management

Using Knobcone x Monterey Hybrid Pine (KMX) in Western Oregon

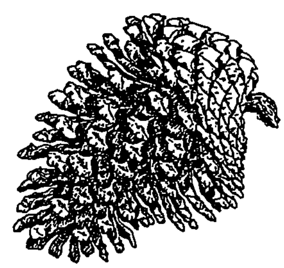
Young KMX pine (1/20×)

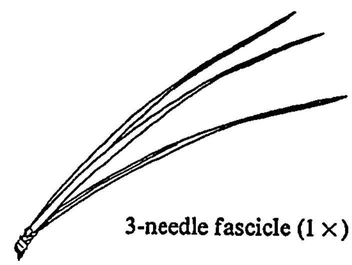




Closed cones attached to the main stem (1/3×)

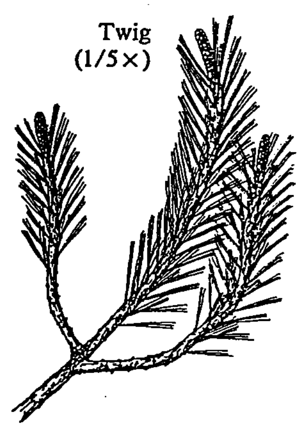
Open cone (after heating)



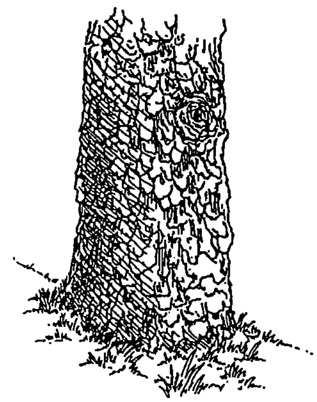


3-needle fascicle (1×)

Twig (1/5×)



Bark (1/10×)



KMX is a hybrid pine with three needles per fascicle, scaly bark, and cones that remain closed and attached to the branches or stems for more than 10 years. Normally, only the intense heat of a forest fire will open up the cones and disperse the seeds (1× = actual size).

Oregon State University Extension Service

Using Knobcone x Monterey Hybrid Pine (KMX) in Western Oregon

W.H. Emmingham and R. Logan

The knobcone x Monterey hybrid pine, called *KMX*, is a cross between knobcone pine *(Pinus attenuata)* and Monterey pine *(Pinus radiata)*. Monterey pine is native to only small areas of the southern California coast and offshore islands. It is noted for its fast juvenile growth and widespread use as a short-rotation softwood crop in mild climatic regions such as Australia and New Zealand. It does not tolerate cold climates.

Knobcone pine is found in mountains of southwestern Oregon and California on dry, rocky, or burned-over areas. Knobcone pine has a greater tolerance of frost and cold than Monterey pine.

The hybrid has some of the characteristics of both parents. It is a fast-growing, drought- and relatively frost-resistant tree that may have potential as a short-rotation timber crop in southwest Oregon.

This publication summarizes briefly the background and performance of the KMX hybrid in western Oregon. We'll discuss how KMX performance has varied in different locations and suggest management techniques, opportunities, and cautions. If you're interested in learning about what we do and do not know about KMX, this publication is for you.

We'll focus on using KMX as a timber-producing species. Because this hybrid has not existed for centuries like normal tree species, our knowledge of how it will perform in a variety of situations is incomplete. Scientists are still evaluating the wood quality, disease resistance, and growth characteristics of this interesting hybrid.

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History of KMX breeding

The first KMX hybrid crosses were made in 1927 by the U.S. Forest Service (USFS) Institute of Forest Genetics at Placerville, California. They used California sources of knobcone and Monterey pine to see if the hybrid would be a viable tree. The hybrid was a vigorous tree with rapid growth and many characteristics intermediate between the parent species.

In the late 1950's and early 1960's, the U.S. Forest Service became interested in producing KMX for use on dry sites on the Siskiyou and Rogue River National Forests of interior southwestern Oregon. Their crosses used knobcone pine from the Rogue and Siskiyou National Forests as the female or cone-bearing parent.

They brought Monterey pollen from selected Monterey trees grown at Placerville, California, and Tahkenitch Lake, Oregon, near Reedsport. The seed from these crosses was grown in nurseries and outplanted in a wide variety of test locations in southwestern Oregon (see "Results of Forest Service trials," page 3).

Later, forester and nursery manager Lee Hunt of Winston, Oregon, made crosses with the knobcone female parent from Toketee, a more northern location on the north Umpqua River. Pollen was collected from disease-free, cold-tolerant Monterey trees in plantations at Tahkenitch Lake.

The initial crosses by the Forest Service and Lee Hunt were controlled—that is, the female cones were enclosed in a pollen-proof container, and the desired male pollen was introduced to fertilize the cones (see figure 1).

Thus, wind-borne pollen from knobcone or other KMX trees was excluded, and the parents of these trees are known exactly. The offspring of such a cross are called the

William H. Emmingham, Extension silviculture specialist, Oregon State University; *Robert Logan,* former Extension agent (forestry), Douglas County, Oregon State University.

Ex 8-2

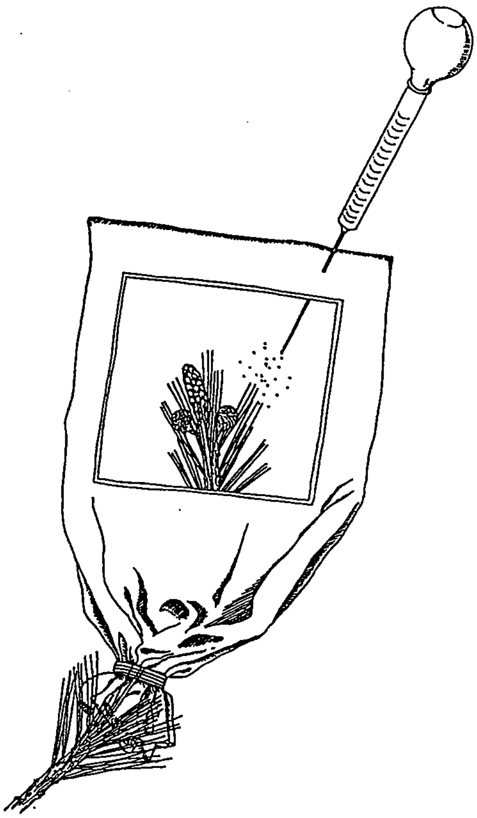


Figure 1.—In controlled crosses, a knobcone pine branch with small, fertile female cones is enclosed in a pollen-proof paper bag with a plastic window. Pollen collected from male Monterey pine cones is injected into the bag, where it fertilizes the female cones. Seed for an F1 generation is produced in this way.

F1 generation, and they are relatively uniform in appearance and performance.

When F1 trees are planted together in a plantation and allowed to breed naturally by open pollination, they will produce a second or *F2 generation.* In this case, only the female parent can be identified, since the male pollen may come from many different trees, including wild knobcone (if present in the immediate area) or any of several other F1 trees.

Seedlings of the F2 generation are quite variable in their genetic makeup, appearance, and performance. Seedlings of KMX available from nurseries are generally of the F2 generation because F1 trees are expensive to produce.

Some F2 individuals have strong Monterey traits, and they may not tolerate drought or frost as well as the F1 hybrids. Other individuals have strong knobcone traits, and they may have poor form and slower growth than the F1 hybrids. Unfortunately, there's no way to judge by looking at them what kind of a tree form F2 nursery seedlings will produce.

Performance in western Oregon

Results of Forest Service trials

Widespread planting of KMX, in formal or informal tests and for ornamental uses, started in the early 1960's. Many plantings are now available for evaluation (see figure 2). The Forest Service made more than 50 plantations in southwestern Oregon from 1963 to 1966. They planted KMX in burns and clearcuts. Some plantations covered several acres. This record provides the opportunity to see how KMX performs in a pure stand.

Initial survival of KMX in USFS plantation trials was very good when compared to survival of native Douglas-fir or ponderosa pine. Long-term survival, growth, and susceptibility to disease varied by planting location.

On some warm, dry, south-facing aspects in southwestern Oregon, long-term survival and growth were very good. Depending on family, 80 or 90% of the trees survived, and leader growth averaged 2 to 4 feet per year over the first 10 years.

KMX planted on cool, moist coastal sites survived well but soon became infected with fungi causing stem galls (see figure 3) and needle cast. Galls on the main stem caused deformity and weakening of the trunk and, in some cases, multiple tops. Needle-cast fungi reduced the amount of leaf needle area on the trees and resulted in decreased growth.

Other failures resulted from planting KMX in frost pockets, on soils with poor nutrient balance, or in treeless meadows inhabited by gophers. Severe vegetative competition was a problem in some cases. Indeed, success in establishing conventional species such as Douglas-fir or ponderosa pine was often limited during the same time period. These experiences demonstrated that KMX could not be used as a cure-all tree for tough-to-manage sites.

Of the 50 test plantations, only a few have survived the rigors of

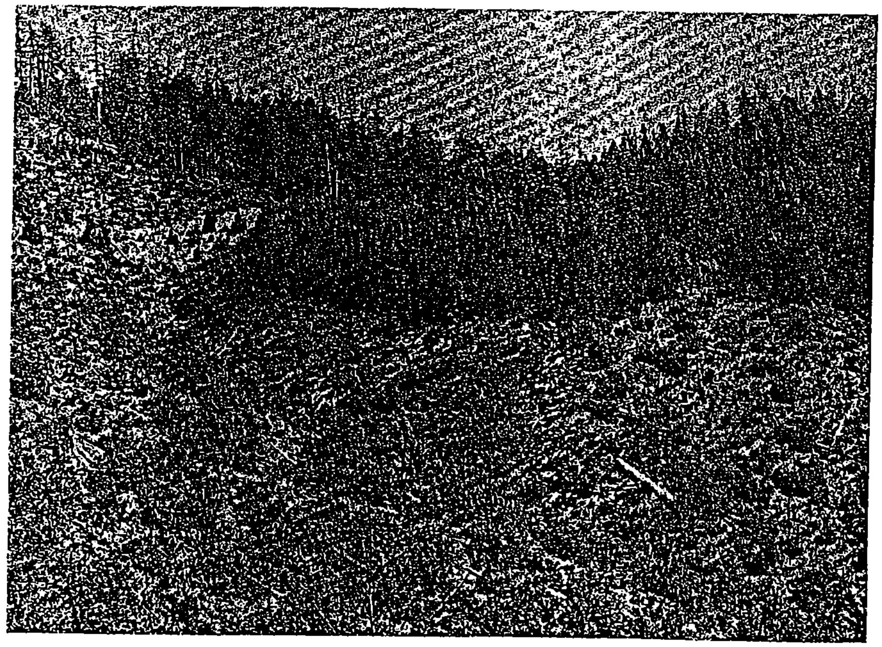


Figure 2.—A successful 20-year-old plantation of KMX in an unrehabilitated clearcut in southwest Oregon. The whole area was planted twice with Douglas-fir before KMX was introduced.

EXHIBIT 8-3

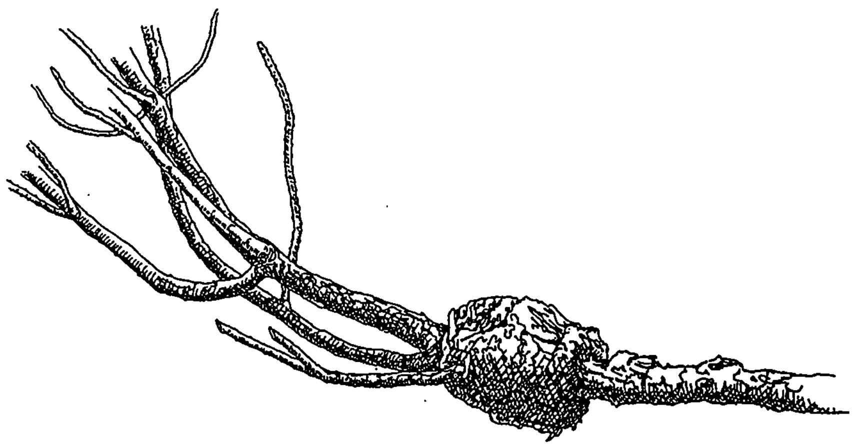


Figure 3.—Western gall rust infects the branches and main stems of KMX and other pines, causing a deformity called a *gall*. This weakens the wood and can be serious if it infects and deforms the main stem.

climate and attack from fungi. No published results are available from the USFS plantings. As a result of their evaluations, USFS geneticists and pathologists have officially terminated the breeding project.

They feel the hybrid has little promise as a timber tree because of its poor resistance to pathogens in some locations. Research in tree genetics has turned to the far more critical work of improving major species like Douglas-fir.

Results of other plantings

What makes KMX attractive to woodland owners is the excellent performance it has shown in some plantings in comparison to native tree species on the same site. Industrial owners occasionally have interplanted KMX with Douglas-fir and ponderosa pine on hot, dry south slopes. This provides the opportunity to compare the performance of KMX with other species (table 1).

In this example, average survival of KMX was nearly double that of ponderosa pine and triple that of Douglas-fir planted under the same conditions. Diameter and height growth of KMX after 8 years was generally twice that of either of the native species, indicating an even larger differential in volume growth. Doubling diameter and height growth produces an eightfold increase in volume growth.

Improvements in nursery stock and planting techniques have increased survival rates of Douglas-fir and ponderosa pine planted on such sites, but much of the volume growth superiority of KMX remains.

A 20-year-old clump of KMX F1 generation near Winston, Oregon, gives some indication of the potential growth of KMX on appropriate sites. The following data were taken from only 45 trees planted at a 17 × 17 foot spacing.

Diameter at breast height (inches)
Average, 12.7
Range, 7.4 to 15.8
Height (ft)
Average, 62.6
Range, 46 to 70
Volume/tree (bd ft to 6-inch top)
Average, 92

Estimating volume per acre from this data could be misleading because it's impossible to tell how much this clump of trees is drawing water and nutrients from surrounding open areas. The growth is, however, far superior to Douglas-fir planted on the same site. It would be misleading to extrapolate from these examples to a larger scale of operation.

A cold snap in December 1972 showed that KMX bred with knobcone from the north end of its range survived much better than those bred from California knobcone. Temperatures during that period remained below freezing for 2 weeks and reached a low of 5°F in the Willamette Valley.

In coastal Oregon locations, temperatures reached the low teens. Trees from the Placerville crosses planted near Corvallis were killed. Trees from the USFS and Lee Hunt's work survived well in southwestern Oregon and in the Portland area.

In one Willamette Valley trial, KMX was more tolerant of a high water table during winter and spring months than a local population of ponderosa pine. In 9 years, KMX planted on a wet site east of Brownsville, Oregon, grew to twice the height and four times the diameter of ponderosa pine planted at the same time. Douglas-fir do not survive on such sites.

Unfortunately, no systematic trials of KMX on droughty sites have been conducted. The information given here was gleaned from field visits to many of the available planting sites. No estimates of total area planted to KMX are available.

Insect and disease problems

The KMX hybrid is susceptible to several disease and insect problems. Western gall rust commonly infects KMX, producing galls on the branches

Table 1.—Comparison of survival and growth of KMX, ponderosa pine, and Douglas-fir (8 years after planting) on a south aspect in southwest Oregon

	KMX hybrid	Ponderosa pine	Douglas-fir
Survival (%)	74.0	40.0	24.0
Diameter at breast height (inches)	3.7	1.9	0.66
Total height (ft)	17.6	9.1	7.2
Rings per inch[a]	3.4	4.4	7.2
Height increment (inches)[b]	29.7	16.1	17.2

[a] Number of years trunk took to grow 1 inch in radius.
[b] The leader growth in inches the year after the leader reached 4.5 feet or breast height.

EXHIBIT 8-4

(figure 3) and occasionally on the main stem. Heavy infection on the trunk will create a weak spot that can increase wind or snow breakage.

Needle-cast diseases, such as red band needle blight, also are common on KMX and lead to the loss of the older age classes of needles. This can cause a loss of diameter or height growth, and repeated infections could lead to mortality.

The pine tip weevil has been observed to damage KMX trees planted in Medford. It is not known if this insect will be a serious problem in large-scale plantations.

Occurrence and severity of these problems are related to topographic location, climatic variation, and local inoculation potential. High relative humidity favors disease spread by airborne spores. Therefore, planting KMX in topographic depressions, near streams, or in areas of impeded air drainage *increases* the probability of serious infection.

Potential problems caused by disease are a major concern in the long-term use of KMX in timber production. Western gall rust and needle rusts devastated most of the USFS plantations in Oregon. Most KMX trials in California were also infected by these diseases.

Many pathologists believe the inoculum that causes these diseases to spread will build up if KMX is widely planted. Unfortunately, such problems may not appear until a plantation is 10 to 15 years old. Planting KMX on exposed south aspects may mitigate this problem, but as stands close, favorable conditions for spread of disease may develop within the canopy. Only long-term tests will settle this question.

Table 2.—Moduli of rupture (MOR[a]) and elasticity (MOE[b]) for Western tree species (larger numbers mean stronger wood)[c]

	MOR (PSI)	MOE (PSI) $\times 10^6$
KMX hybrid pine	10,334	1.23
Lodgepole pine	9,400	1.34
Ponderosa pine	9,400	1.29
Sugar pine	8,200	1.19
Grand fir	8,800	1.57
Western hemlock	11,300	1.64
Sitka spruce	10,200	1.57
Coastal Douglas-fir	12,400	1.95
Interior Douglas-fir	12,600	1.82
Australian-grown Monterey pine	11,400	1.45

[a] Modulus of rupture (MOR) measures the breaking strength of wood while bending.
[b] Modulus of elasticity (MOE) measures the stiffness of wood while bending.
[c] KMX wood specimens from 20-year-old trees were tested at the Forest Research Laboratory, Oregon State University. Results indicate KMX strength characteristics are similar to those of other pine species but inferior to those of the higher-density Douglas-fir.

Wood characteristics and potential markets

Tests of the characteristics of KMX showed that it produces high quality pulp and is suitable for studs and dimension lumber. In limited testing, it was second only to western hemlock in pulping characteristics. Tests of the wood showed that it is similar to the other western pines in its strength characteristics (see table 2).

Juvenile wood from a 20-year-old tree was lacking in compression and bending strength and, therefore, not suitable for stress-tested lumber. It was suitable for studs.

Trees grown to maturity in a stand with proper spacing should have strength characteristics suitable for veneer or stress-tested lumber because they'll have more rings per inch. The wood produced by trees in similar growing conditions is similar to that of ponderosa and other pines grown in the southeastern States. These species have been managed for high quality lumber.

In New Zealand and Australia, Monterey pine (the timber species most like KMX) is used for paper, and it's pruned and thinned to produce high quality lumber and plywood. There's no reason to expect that KMX would not be suitable for use in fiber or strand boards.

Since little KMX has grown to harvest size, market conditions are difficult to predict. Markets for KMX planted now and grown to 25 or 30 years of age are unknown.

Does KMX have a future in Oregon?

Because KMX is a hybrid and one of the parents is from a much milder climate in California, it's considered an "exotic" or introduced species. Although many exotics have been introduced to Oregon, none have performed as well as native northwestern conifer species. However, many of our preferred ornamentals are exotics.

Because KMX is a synthetic hybrid, it does not have the long history of adaptive evolution in place and (therefore) may have less tolerance of climatic extremes that occur only periodically. It's also uncertain how KMX will withstand infection by disease or attack by insects.

KMX stands planted in a few locations have withstood many environmental rigors and disease problems and have grown very well for 20 years. These few successes were accompanied by many failures. Further use of KMX must, therefore, balance the risk of a severe climatic event or disease outbreak in KMX against the potential for greater production on marginally productive land.

The best place to try KMX as a timber producer is in the interior valleys of southwestern Oregon (below 2,500 feet), on dry, exposed south aspects. On such sites, limited short-term trials of the KMX have shown it will survive and grow substantially better than either Douglas-fir or ponderosa pine. On such sites, it has grown to small saw log dimensions in 20 to 25 years.

KMX is not a good choice for planting as a timber producer on better sites in western Oregon. On such sites, Douglas-fir produces

EXHIBIT 8-5

high quality wood with few of the uncertainties of KMX.

Don't plant KMX in topographic depressions where frost, high humidity, or snow might cause problems. Don't plant it above 2,500 feet or east of the Cascade Crest.

Other possible uses include:

- in agroforestry, as a short-rotation tree crop combined with forage production (see EC 1114);
- as a "nurse tree" to provide shade for more tolerant trees like Douglas-fir on dry sites (after the more desired species have become established, you could remove the KMX, perhaps as a first commercial thinning);
- as a fast-growing ornamental; or
- as a Christmas tree.

Management characteristics and opportunities

When you examine management regimes we propose here for KMX, you'll have to consider them speculative until more information becomes available on its performance in stands. The recommendations in the next six sections are based on the assumption that KMX is similar to Monterey pine in its management characteristics.

KMX does not grow well in shaded conditions, and it is particularly sensitive to competition from adjacent trees. It should be maintained at a wide spacing compared to more shade-tolerant trees such as Douglas-fir.

Selecting a seed source

Results of existing trials indicate that there is a great deal of variation in tree form and in disease and frost resistance in KMX, depending on the location and genetic makeup of the parents. Some families tend to develop very small side branches; others are extremely coarse. Some tend to have more cones on the main trunk or are much more likely to form multiple tops than others.

All this means that Pacific Northwest tree nursery operators and tree breeders have a heavy responsibility to select seed from the best individuals within seed orchards or plantations. It also means that a careful breeding program could improve the quality and capabilities of this hybrid for future use in Oregon.

Finally, it means that you must be careful to buy trees with appropriate frost tolerance and form characteristics for your intended use. Find out if you are getting F1 or F2 generation seedlings. F1 generation seedlings are more uniform in form and growth characteristics, but are generally not available because they require the laborious process of controlled pollination.

It's important to ask where the parents of the KMX hybrid seedlings were located in order to know that you're selecting the proper KMX source for your area. This is analogous to selecting the proper seed source of Douglas-fir or ponderosa pine when ordering seedlings from the nursery.

KMX hybrids that have a knobcone parent from the northern range of knobcone pine (such as Toketee on the north Umpqua River or the Siskiyou Mountains) are best for planting in Oregon because they're more frost-hardy. Avoid trees from California sources.

Planting

Survival of planted stock is normally high, assuming good site preparation and planting conditions, so dense planting is not justified on the basis of expected mortality. If you plant trees at conventional densities of 300 to 400 trees per acre, anticipate early precommercial thinning. Planting excess trees would, however, allow for selection of better trees during precommercial thinning.

Animal damage

Deer and elk do not prefer KMX and will browse Douglas-fir before they will browse KMX. Bucks and bulls, however, will use the tree for rubbing their antlers. Porcupines will girdle KMX but seem to like ponderosa pine better.

Gopher damage may be a problem where KMX is planted in meadows with high populations of the rodents. Overall, KMX appears to have fewer animal damage problems than the native species in southwest Oregon.

Precommercial thinning

Figure 4 shows KMX trees in dense stands (8 × 8 foot spacing). At age 20, they grew much slower in diameter (8 to 12 rings per inch) than widely planted trees. Thus, it's

Figure 4.—KMX grown in relatively dense stands (8 × 8 foot spacing) shows good form and small lateral branches. Branches of this size are easily pruned.

EXHIBIT 8·6

clear that wider spacing will be necessary if trees are to reach saw log size in 25 or 30 years.

Precommercial thinning should take place after the lower branches have died, unless pruning is anticipated. Two hundred well-spaced trees per acre (about 14 × 14 feet) should provide a commercial thinning of 8- to 10-inch material at 18 to 20 years. (For more information about precommercial thinning, see EC 1189.)

KMX, like other trees, is more resistant to wind damage when it's allowed to develop in a well-spaced plantation. Trees with live crowns less than 30% of their total height appear to be susceptible to snow breakage when heavy wet snows occur. Open-grown trees may be damaged when heavy snows pull some of the limbs from the trunk.

Problems with wind and snow breakage can be expected above 3,000 feet, especially if stands are not thinned to a wide spacing. The best insurance against wind and snow break problems is to maintain the stand with adequate spacing and to use KMX only on recommended sites (that is, south aspects below 2,500 feet elevation).

Pruning

The hybrid produces heavy and abundant limbs (see figure 5), especially when grown at low densities. These limbs are extremely tough and limber—they tend to remain on the tree even after they're dead (figure 4). Therefore, if you want high quality wood in open plantations, pruning is necessary.

Pruning can take place as soon as adequate crown has developed or when lower limbs die. Pruning should leave the upper 30 to 50% of the tree bole with live branches. Because markets and values are unknown, we can't predict that the cost of pruning will be justified. Pruning of native tree species hasn't proven to be economically justified when labor costs are taken into account.

Commercial thinning

Crop tree spacing, based on trials on Monterey pine in New Zealand, should be about 100 trees per acre, which is equivalent to an average spacing of 21 feet. Depending on initial spacing, commercial thinning could take place at age 20 to 25 years.

Figure 5.—KMX naturally holds its limbs, even dead limbs, for a long period. Pruning as shown here may be necessary to produce high quality wood.

Summary

Because KMX is relatively new, there are many unknowns surrounding its use as a timber crop. We don't know if it will survive extreme cold snap conditions. We don't know how well it will survive disease problems over the long run when it's planted in large stands or over large areas. Table 3 summarizes important KMX characteristics.

Results of early trials indicate KMX may have potential for planting on south aspects below 2,500 feet in southwestern Oregon on forest-producing sites. Soils with nutrient imbalances, such as those on serpentine, peridotite, or gabbro parent rock, are not likely to produce good growth of any tree species.

Table 3.—Characteristics of KMX grouped as advantages and disadvantages

Characteristic	Advantages	Disadvantages
Planting survival	High, even with moderately intensive site preparation and vegetation management.	
Juvenile growth	Rapid, even on droughty or flooded sites.	Long-term growth potential is unknown.
Tolerance	Tolerates drought and winter flooding.	Does not tolerate: 1. Frost, especially early in fall 2. Diseases (western gall rust, needle blights)
Wood quality	Good for pulp, fiber boards, studs.	Poor for stress-tested lumber. Poor form (depending on genetics): F2's may have bushy form; tends to form large limbs; cones retained on bole; limbs retained indefinitely.

EXHIBIT 8-7

You could plant KMX on ridges and side slopes that are convex. From a disease standpoint, don't plant it in moist areas or valley bottom areas where frequent high humidity helps spread disease transmitted by spores.

On the other hand, it can grow where winter and spring flooding occur (for example, on ash bottom lands), but it may suffer from diseases when planted there. Animal damage problems are generally less severe on KMX than on native trees in southwest Oregon.

Survival of KMX planted on areas with good site preparation and proper handling and planting should be excellent. Early growth is exceptional when compared to Douglas-fir or ponderosa pine on dry sites.

KMX is sensitive to crowding. We have only tentative density targets for planting (300 t/A), precommercially thinning (200 t/A), and commercially thinning to a 100-t/A crop tree spacing. Branches are retained indefinitely along with cones, so you must practice pruning if high quality wood is your objective.

For further reading

In July 1992 the OSU Extension Service publications warehouse was destroyed by fire. We are replacing our supplies. The publications listed below may be available in the office of the OSU Extension Service that serves your county. Check with that office for current prices. You also may call Agricultural Communications at Oregon State University, (503) 737-2513, to learn the availability and current price of the publications.

Logan, Robert S., *Agro-Forestry: Growing Trees, Forage, and Livestock Together,* Oregon State University Extension Service Circular 1114 (Corvallis, 1984). 25¢

Oester, Paul T., and William H. Emmingham, *Using Precommercial Thinning to Enhance Woodland Productivity,* Oregon State University Extension Service Circular 1189 (Corvallis, 1987). $1.00

OREGON STATE UNIVERSITY
EXTENSION SERVICE

The Woodland Workbook is a collection of publications prepared by the Oregon State University Extension Service specifically for owners and managers of private, nonindustrial woodlands. *The Workbook* is organized into 11 sections, containing information of long-range and day-to-day value for anyone interested in wise management, conservation, and use of woodland properties. It's available in a three-ring binder with tabbed dividers for each section.

For information about how to order, and for a current list of titles and prices, write Agricultural Communications, Publications Orders, Administrative Services Bldg. 422, Oregon State University, Corvallis 97331-2119, or inquire at the office of the OSU Extension Service that serves your county.

Extension Service, Oregon State University, Corvallis, O.E. Smith, director. This publication was produced and distributed in furtherance of the Acts of Congress of May 8 and June 30, 1914. Extension work is a cooperative program of Oregon State University, the U.S. Department of Agriculture, and Oregon counties.

EXHIBIT 8-8

ATTACHMENT DIVIDER

KENDALL Jerry

From: Jim Just [goal1@pacifier.com]
Sent: Tuesday, August 10, 2004 9:36 AM
To: Jerry Kendall
Cc: Lauri Segel
Subject: Fw: NON-NATIVE SPECIES -KMX

Jerry,

Please enter this email into the record of Ogle, 02-5838

----- Original Message -----
From: "DEGENHARDT Dave A" <DDEGENHARD@ODF.STATE.OR.US>
To: <goal1@pacifier.com>
Cc: "DEGENHARDT Dave A" <DDEGENHARD@ODF.STATE.OR.US>; "BIRCH Kevin R" <KBIRCH@ODF.STATE.OR.US>
Sent: Tuesday, August 10, 2004 9:24 AM
Subject: NON-NATIVE SPECIES -KMX

The criteria for an acceptable species are listed in OAR 629-610-0050 & -0060. They are: a) ecological suitability for the site; capability to produce a marketable forest product in the foreseeable future; and c) evidence of success with the species on similar sites.

If the KMX tree has been used successfully, there should be no question of its suitability to the site.

Dave Degenhardt
Oregon Department of Forestry
Field Coordinator - P&CF
503-945-7473
ddegenhard@odf.state.or.us

#7 - 1p.

ATTACHMENT DIVIDER

Michael E. Farthing
Attorney at Law

Smeede Hotel Building
767 Willamette Street, Suite 203
Eugene, Oregon 97401
Office (541) 485-1141 – Fax (541) 485-1174
email - mefarthing@yahoo.com

August 11, 2004

AUG 11 2004

Lane County Board of Commissioners
%Jerry Kendall
Land Management Division
Lane County Courthouse/PSB
125 East 8th Avenue
Eugene, OR 97401

Re: Plan Amendment/Zone Change Applications
Agriculture (E-40) to Marginal Lands (ML)
Ogle-Child (PA 02-5838)

Chair Green and Commissioners:

This is the applicants' response to the materials submitted by Mr. Just on July 22, 2004. Mr. Just's information and submittal are substantially flawed. I will describe the details of those deficiencies in my final rebuttal. The most obvious, however, is Mr. Just's attempt to argue that "25" Ponderosa Pine logs are the same as "25" Douglas Fir. They are not and enclosed is the documentation that proves this very basic issue. It is dramatic proof that Mr. Just does not know what he is talking about. Mr. Just is misinformed and not a qualified expert.

The important fact is this: the subject property is marginal resource land. It is not good farm or forest land. There is nothing that Mr. Just can produce that changes or challenges this conclusion.

Sincerely,

Michael Farthing bk

Michael E. Farthing

MEF/bk

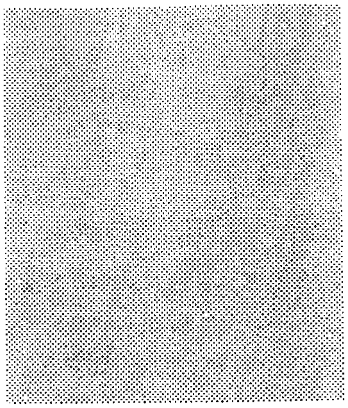
Enclosures

cc: Lane County Board of Commissioners
Brad Ogle
Marc Setchko

#8 - 6 pp.

YAHOO! Mail

Print - Close Window



GOAL ONE COALITION

39625 Almen Drive

Lebanon, Oregon 97355

Phone: 541-258-6074

Fax: 541-258-6810

goal1@pacifier.com

July 22, 2004

Lane County Board of Commissioners

125 East 8th Avenue

Eugene, Oregon 97401

RE: PA 02-5838, Ogle marginal lands application, supplemental information

Dear Commissioners:

At the July 14 hearing the Board expressed interest in receiving additional information regarding two issues relevant to the identification of marginal lands under ORS 197.247 (1991 edition): 1) the price data to be used to determine average gross income over the growth cycle, and 2) species constituting "merchantable timber." The purpose of this letter is to provide additional information regarding these two issues.

1. What time frame should be used for calculating average income over the growth cycle?

To designate land as marginal land, ORS 197.247(1)(a) requires a finding that "the proposed

marginal land was not managed, during three of the five calendar years preceding January 1, 1983, as part of a . . . forest operation capable of producing an average, over the growth cycle, of $10,000 in annual income."

LUBA has explained that ORS 197.247(1)(a) imposes a two-part inquiry: 1) was the land managed as part of a forest operation during three of the five years from 1978 through 1982?; and 2) is the forest operation in question capable of producing an average of $10,000 in annual gross income over the growth cycle? *DLCD v. Lane County, 23 Or LUBA 33 (1992) (Ericsson).*

In Ericsson, LUBA cites Lane County's decision, which states, in relevant part:

> *"'2. [The applicant's expert] conducted an on-site evaluation to determine the volume of timber located on the Subject Property prior to its partial harvesting in 1988-89. After determining that volume he calculated, using current timber values, the amount of revenue that could be generated on a yearly average over the growth cycle of the trees." Ericsson at 38 (emphasis added.)*

LUBA held:

> *"We conclude the challenged decision correctly applies ORS 197.247(1)(a), and determines that the property is not capable of producing, if reasonably managed, an average annual gross income of $10,000 over the growth cycle of the trees." Ericsson at 39.*

Thus LUBA has held that using current timber values correctly applies ORS 197.247(1)(a).

Regarding the "capability" issue, LUBA reasoned that "what occurred on the subject parcel during the 1978-82 time period is not the sole determinant of the "capability" of the subject parcel to produce trees, because the growth cycle of trees may greatly exceed the specified five year period." Ericsson at 36.

The same reasoning applies to the pricing issue. What occurred at any specified time during or at the end of the 1978-82 period is not the sole determinant. ORS 197.247 imposes no requirement to use 1983 timber prices, and there is no logical reason to do so.

Attached is a summary of log prices over the period 1983-2004 for two species, Douglas-fir and ponderosa pine, for a selected grade (2S). As can be seen, log prices fluctuate substantially. Prices were low during the 1983-87 period; rose to a peak during the 1993-96 period; then settled to their current plateau at more than double the 1983-87 level. See Exhibit 1.

It would be unreasonable to use 1983 pricing to designate land as marginal land when that pricing is dramatically lower than historical or current levels.

2. Does "merchantable timber" include species other than Douglas-fir?

ORS 197.247(1)(C) requires that, west of the summit of the Cascades, marginal land not be capable of producing 85 cf/ac/yr of "merchantable timber."

In addition to ORS 197.247, the phrase "merchantable timber" also appears in ORS 215.263, which governs land divisions in EFU zones; and ORS 215.284, which governs nonfarm dwellings in EFU zones. In addition, OAR 660 Division 33, which governs agricultural land, refers to "merchantable tree species." The issue of which forest tree species constitute "merchantable timber" or "merchantable tree species" has not been directly addressed in the case law that has developed in any of these contexts.

Goal 4 protects "forestland." It is capability or potential for production, measured as cf/ac/yr of commercial tree species, that is at issue in determining a property's suitability for commercial forest uses. Potts v. Clackamas County, 42 Or LUBA 1 (2002). The proposed marginal land in this case is forest land protected by Goal 4.

OAR 660-006-0003(1) provides:

> *"OAR Chapter 660, Division 006 applies to all forest lands as defined by Goal 4."*

OAR 660-006-0010 provides, in relevant part:

> *"Governing bodies shall include an inventory of 'forest lands' as defined by Goal 4[.] * * * If site information is not available then an equivalent method of determining forest site suitability must be used."*

OAR 660-006-0005(2) provides:

> *"'Cubic Foot Per Acre' means the average annual increase in cubic foot volume of wood fiber per acre for fully stocked stands at the culmination of mean annual increment as reported by the USDA Natural Resources Conservation Service (NRCS). Where NRCS data are not available or are shown to be inaccurate, an alternative method for determining productivity may be used. An alternative method must provide equivalent data and be approved by the Department of Forestry." (Emphasis added.)*

Thus in inventorying its forest lands, the county must determine forest site suitability by using NRCS or equivalent data approved by ODF. If such information indicates that the subject lands are not capable of producing 85 cf/ac/yr of commercial tree species, a finding could be made that the lands are not capable of producing 85 cf/ac/yr of "merchantable timber" and can therefore be designated "marginal land."

Thus, for purposes of ORS 197.247(1)(C), "merchantable timber" is equivalent to "commercial tree species."

The Court of Appeals has explained that the term "commercial tree species" includes species other than and in addition to Douglas-fir. Carlson v. Benton County, 154 Or App 62, 961 P2d 248 (1998). Similarly in the context of marginal lands, limiting the inquiry to Douglas-fir would be contrary to what the statute plainly says.

Attached is a summary of log prices over the period 1983-2004 for two species, Douglas-fir and ponderosa pine, for a selected grade (2S). It is evident that, for an equivalent grade, ponderosa pine historically has and is currently receiving a substantial premium of approximately 50% over Douglas-fir. Ponderosa pine is therefore obviously "merchantable timber."

An argument has been made that the cost of hauling ponderosa pine to mills precludes managing for that species. Historically, ponderosa pine was widespread throughout the Willamette Valley. Those early stands were logged and not replanted, although there has been sufficient supply such that local mills have bought ponderosa pine in the recent past. Over the last decades, widespread replanting of ponderosa pine has occurred. As those stands reach maturity, the local supply of and demand for ponderosa pine can be expected to increase. See App. 2-1 of Goal One letter dated July 14, 2004.

CONCLUSION

1. ORS 197.247(1)(a) is correctly applied by using current timber values.

2. "Merchantable timber" is equivalent to "commercial tree species" and includes species other than and in addition to Douglas-fir.

The Coalition requests notice and a copy of any decision in this matter.

Respectfully submitted,

Jim Just

Executive Director

LOG PRICES 1983-2004[1]

Douglas Fir, grade 2S, 1st Quarter, Region 1 (Northwest Oregon & Willamette)

83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04
258	255	245	250	240	295	360	490	365	490	825	740	705	710	690	590	610	660	535	545	550	605

Ponderosa Pine, Grade 2S, 1st Quarter, Region 4 (Grants Pass Unit)

83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04
400	450	425	530	265	565	360	505	800	990	1350	1250	1215	1065	950	950	950	950	900	900	840	885

[1] Source: ODF Timber Sales, Log Price & Scaling Information, delivered to a mill, "pond value."
http://www.odf.state.or.us/divisions/management/asset_management/LOGPPAGE.asp

ATTACHMENT
DIVIDER

Michael E. Farthing
Attorney at Law

Smeede Hotel Building
767 Willamette Street, Suite 203
Eugene, Oregon 97401
Office (541) 485-1141 – Fax (541) 485-1174
email - mefarthing@yahoo.com

August 18, 2004

HAND DELIVERED

Lane County Board of Commissioners
c/o Jerry Kendall
Land Management Division
Lane County Courthouse/PSB
125 East 8th Avenue
Eugene, OR 97401

Re: Plan Amendment/Zone Change Applications
Agriculture (E-40) to Marginal Lands (ML)
Ogle-Childs (PA 02-5838)

Chair Green and Commissioners:

This is the final response and rebuttal of the applicants for the above-referenced plan amendment and zone change applications. There are three parts to this final rebuttal: first, there is a procedural objection to Goal One Coalition's submission of new evidence after closure of the evidentiary record, a substantive response to Goal One Coalition's August 9 letter prepared by Jim Just and an overall summary of the issues and evidence in the record.

The overriding issue in this application is whether the Subject Property qualifies as Marginal Land as defined by ORS 197.247 and Lane County Rural Comprehensive Plan policies. The present record contains substantial and credible evidence which suppports affirmative findings and a conclusion that the Subject Property is Marginal Land.

Procedural Objection

In the most recent submittal from Goal One Coalition (authored by Jim Just), a pattern of misstatements, erroneous use of forest growth and soil tables and outright misrepresentations is continued. Compounding this problem is the fact that Mr. Just has submitted a significant amount of new information in violation of the post-hearing briefing rules established by the Board at the July 14 public hearing. Mr. Just's "response" was limited to comment on evidence received prior to July 28[1]. See email correspondence from Jerry Kendall confirming the Board's briefing schedule, copy of which is attached.

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[1] It was the undersigned's clear understanding that the evidentiary record for this matter closed on July ~~26~~. 28.

PER PHONE CALL
TO M.F
-JK 8-18-04

#9 – 11 pp.

Instead, Mr. Just submitted eight new exhibits which he relies upon to raise new issues. This new evidence taints his entire written submittal. All eight exhibits attached to the August 9 letter are new documents that have not been previously submitted into the record. This violates the post-hearing briefing schedule established by the Board at its July 14 public hearing.

Because of this new information, the applicants have been substantially prejudiced because we specifically declined to submit new evidence that we had available and ready to submit. Attached is a sample of that evidence, e.g. saw log specifications for Douglas fir and Ponderosa pine.[2]

Based on my review of LUBA cases involving a similar circumstance, you, the Board, have two choices: (1) you can reject the new evidence, or (2) offer all parties, including the applicants, a reasonable opportunity to respond to the new information. Brome v. City of Corvallis, 36 Or LUBA 225, 235 (1999).

Speaking for the applicants, we request that you reject the new information. At a minimum, this means that all of Mr. Just's exhibits should be rejected. We also believe that the pages of his letter which refer to those exhibits should also be rejected (pages 2-7). Each of those pages and the text thereon is related to the unauthorized evidence. Mr. Just provides no rationale for his refusal to follow the Board's procedural rules. His actions create a serious procedural problem for the County and substantial prejudice to the applicants. However, it is an issue that the Board can address by rejecting the new evidence and all of the discussion which references such evidence.

The alternative is to extend the record to allow the applicants and staff a reasonable opportunity to respond to Mr. Just's new evidence, which we will readily do if that is the direction of the Board. Either way is proper to respond and does not create further procedural problems. The applicants are certainly comfortable defending the County's action, in either case, if such were appealed to LUBA.

Goal One Coalition's July 9 Letter

It is necessary, one more time, to respond to Mr. Just's unsupported and irrelevant arguments concerning the capability of the Subject Property to produce 85 cubic feet per acre per year of merchantable timber over the growth cycle (50 years per Board Interpretation). At this point, Mr. Just apparently concedes that the Subject Property is not capable of meeting this standard for Douglas fir since he offers no challenge to the materials, analysis and information submitted by the applicants' forester, Marc Setchko. That information is conclusive and is based

---

[2] In my August 11 letter I refer to "25" Douglas fir logs. That reference should be "2S".

on published soil and forest growth tables and indexes that are common and universally accepted in the timber industry. In fact, at times, Mr. Just refers to the same information. The primary difference between Mr. Just's reference to and use of the information and Mr. Setcho's is that Mr. Setchko knows what he is doing. In contrast, Mr. Just either is unfamiliar with using this soil and forest growth information or he is purposely trying to argue points based on obvious distortions of this published information.

For example, Mr. Just, on page 5 of his August 9 letter, states that Mr. Setchko errs by assigning a 45 cf/ac/yr value to the 102C Panther soil unit. Mr. Just relies on a 1989 Dept. of Forestry letter that assigns "est 50" site index value to the soil. Mr. Setchko relied on a 1990 DOF memo which clarified that estimate and specifically assigned the "45" rating. See Exhibit 3, Setchko July 26 letter. This "45" rating is further supported by Lane County's 1997 published forest soil ratings which were previously submitted into the record by Mr. Setchko with his initial report. This is a minor point but it is a glaring example of Mr. Just using information in an erroneous and misleading manner. Mr. Just has repeatedly done this throughout the hearing process (e.g. first criticizing Mr. Setchko for using a 60-year growth cycle and then criticizing him when he provided 50-year figures).

Mr. Just's August 9 letter primarily focuses on "other tree species" and specifically, Ponderosa pine, hybrid poplar and KMX. Each of these species will be addressed in the context of the current record, keeping in mind, that Mr. Setchko has asserted there is no market for KMX or hybrid poplar and the "market" for pine is a mill in Cave Junction, Oregon, approximately 170 miles from Lane County.

a. Ponderosa pine

In his July 26 letter to the Board, Mr. Setchko analyzes the capability of the Subject Property to produce 85 cf/ac/yr of Ponderosa pine over the 50-year growth cycle. Mr. Setchko also describes the difference between "valley ponderosa pine" and that which is grown in Eastern and Southern Oregon. Since there is no established site index table for "valley" ponderosa pine, Mr. Setchko examined existing on-site stands and he bored trees in those stands. Based on this on-site analysis including preparation of tables for each of the on-site soils, Mr. Setchko concluded that the Subject Property is not capable of producing a minimum of 85 cf/ac/yr of Ponderosa pine. Mr. Setchko, based on his on-site investigation of the Subject Property, concluded that areas of the site have not and will not ever be capable of growing any merchantable timber. This includes grasslands with exposed rock and the area under two electrical (BPA and EWEB) utility corridors that pass through the property. An aerial photo of the property submitted with the application is attached to demonstrate this obvious point. These areas will not grow merchantable trees of any kind. This conclusion is based on Mr. Setchko's professional experience and his on-site analysis of the site's capability to grow trees.

Mr. Setchko's on-site analysis is specifically supported by the Ericsson case (23 Or LUBA 33) in which LUBA affirmed Lane County's decision to grant a marginal lands application based, in large part, on the on-site forest capability analysis prepared by a qualified, consulting forester. See 23 Or LUBA at 37-38. This is precisely what Mr. Setchko did in analyzing the site's capability to grow Ponderosa pine. The Board recognized this determination in the Ericsson case as one of its "main holdings" in its 1997 Interpretation.

Even Mr. Just, perhaps unwittingly, has provided the Board in his new evidence further support for the high evidentiary value that should be given to Mr. Setchko's on-site analysis versus using generalized, published growth and soil tables. Exhibit 1 to Mr. Just's August 9 letter is a technical bulletin prepared by Oregon Dept. of Forestry that describes alternatives for landowners and local governments to use to determine the productivity of forestland when, as in this case, the existing soil or site index tables are not sufficient to describe specific on-site conditions. In that case, the DOF bulletin states that the landowners should hire a consulting forester to measure the trees on-site and calculate the cubic foot site class. This is what Mr. Setchko did, in the absence of published site index tables for "Valley" Ponderosa pine. See Exhibit 1-4 of Mr. Just August 9, 2004 letter.

Mr. Just does not provide any evidence that contradicts Mr. Setchko's analysis of Ponderosa pine capability of the Subject Property. He criticizes Mr. Setchko's conclusion that trees cannot be grown within utility corridors but offers nothing that supports a contrary conclusion other than to boldly state "the presence of powerlines does not affect the capability of the land." This is simply not true. The BPA and EWEB will not allow trees to be grown within their described easements which includes an area beyond the easements for so-called "hazardous trees".

Overall, Mr. Just has devoted a significant amount of time and effort to the issue of Ponderosa pine. He has provided confusing and misleading information and analysis of the growth potential for Ponderosa pine based on erroneous references to Eastern Oregon and Northern California site index tables. At one point, Mr. Just uses Douglas fir tables as growth rates for Ponderosa pine. He has not, however, provided any information of relevance.

The bottom line is this: there are portions of the Subject Property (within utility corridors or grasslands with exposed rock) to which a reasonable and prudent forester, like Mr. Setchko, will not assign any productivity value, whether for Douglas fir, Ponderosa pine or whatever. Mr. Setchko's on-site evaluation of the forest productivity value of these areas should be given high evidentiary value due to his credentials as a consulting forester, the Ericsson case, the Board's 1997 Interpretation and the DOF technical bulletin. Mr. Just provides no evidence that is relevant or substantive which contradicts this analysis or the conclusion drawn by Mr. Setchko regarding the site's ability to grow Ponderosa pine.

b. KMX

KMX is not a merchantable species. We are unsure how many times this single fact needs to be repeated before Mr. Just accepts it. There is no present or foreseeable commercial value, even for pulp. At best, its use is as ground cover and an ornamental bush. Mr. Setchko has repeated these basic facts and Mr. Just provides nothing to contradict other than pictures of trees (presumably of KMX) and an OSU Extension publication that provides general information about KMX.

Again, Mr. Just's new evidence, in part, supports Mr. Setchko's conclusion. The photo at Ex 7-4 of his August 9 letter shows a limbed-up KMX tree. It is pathetic. After looking at the tree, Mr. Setchko said the photo confirms the problem with KMX: it is a big bush that when pruned, still will not grow into a straight, well-formed tree. It will not produce a merchantable log. It has no commercial value because no mill or manufacturer will purchase it. This is after 20 plus years of trying to make it merchantable.

c. Hybrid Poplar

Once again, Mr. Just relies on information that is irrelevant in his argument that the Subject Property will support poplar stands. It will not. The site is dry, southwest facing and exposed. There is no irrigation. Hybrid poplar will not grow on the site. It will only grow in low-lying wet areas or when irrigated. None of these conditions are present on this site. Mr. Just never addresses these basic site characteristics which limit the property's ability to grow poplar.

To paraphrase Mr. Setchko, it is laughable to suggest that this site can grow poplar stands. However, even if it could, there is no market for hybrid poplar, even for pulp chips. Again, mixing apples with bowling balls, Mr. Just states that pulp logs are $25-35/ton in the Willamette Valley. This is a true statement. What he does not state is that is for Douglas fir and other conifer logs, not hybrid poplar. There is no market for hybrid poplar pulp logs.

Finally, Mr. Just suggests poplar could be used in specialty mills. Again, a true statement except that this means tulip poplar grown in the southeast part of the country. There is no market for hybrid poplar grown in the Willamette Valley.

d. Summary of Response to Mr. Just August 9 Letter.

Mr. Just and the Goal One Coalition have persisted in their assertion of arguments that have no or little evidentiary support. This has been made worse by Mr. Just's flaunting of the Board's post-hearing briefing rules by submitting new evidence after the evidentiary record had been closed on July 26. This has created real problems for the applicants and the staff. His materials should be excluded from the record or a reasonable opportunity for response afforded to staff and all parties.

Summary of Evidence

There are many issues that have been raised by the staff, neighbors and particularly, by Mr. Just and the Goal One Coalition. The principal issue is the ability of the Subject Property to grow a merchantable tree species in excess of 85 cf/ac/yr. The following summarizes the evidence addressing this issue.

1. Soils on the property do not have high forest site index classification for Douglas fir.

2. There are not site index tables for Valley Ponderosa pine or any other tree species.

3. There are utility corridors and grassy areas with exposed rock that further limits the site's ability to grow trees.

4. Douglas fir is, by far, the most profitable and productive, in terms of growth, tree species that can be grown on this site.

5. There is no commercial market for KMX or hybrid poplar.

6. Because the site is dry the site's capability to grow Ponderosa pine is further limited.

7. The Subject Property has been physically examined and analyzed by a professional, consulting forester who has concluded that:

    a. It was not part of a forest operation capable of producing $10,000 of annual income during the growth cycle, and

    b. It is not capable of producing 85 cf/ac/yr of merchantable timber over the growth cycle.

There is no substantive evidence in the record that contradicts these conclusions.

8. The methodology used by Mr. Setchko is consistent with State law, relevant court decisions and the Board's 1997 Interpretation, and should be given the evidentiary weight suggested by LUBA in the Ericsson case.

Summary

The issues in this case have been discussed ad nauseam . Mr. Just continues to submit more and more documents, published materials, photos, memos and "other stuff" that have no real relevance to the primary issue regarding the site's ability to grow a merchantable tree species in excess of 85 cf/ac/yr. It cannot and will not even utilizing reasonable management practices.

The site is marginal forest land. Approving these applications recognizes this fact and allows for. limited residential development which might even promote more intensive forest practices because of an on-site presence. There is no evidence that suggests otherwise.

We urge the Board's approval.

Sincerely,

Michael E. Farthing

MEF/mgf

Enclosures

cc: Brad Ogle w/enclosures
Marc Setchko w/enclosures
Steve Vorhes w/enclosues

YAHOO! Mail

Print - Close Window

From: "KENDALL Jerry" <Jerry.KENDALL@co.lane.or.us>

To: "FARTHING Michael (SMTP)" <mefarthing@yahoo.com>, "'goal1@pacifier.com'" <goal1@pacifier.com>, "'lauri@friends.com'" <lauri@friends.com>

Subject: Ogle timelines

Date: Wed, 4 Aug 2004 13:54:37 -0700

To get it straight for the record, the timelines given by the BCC on June 14 are as follows:

- until July 28 for any party to comment on any aspect
- until August 11 for any party to comment on materials received during the 1st comment period above, and,
- until August 18 for the applicant's final rebuttal.

Jim: I mispoke in labeling (below) M. Farthing's materials of July 28 as "final rebuttal". My apologies.

The 3rd reading and deliberation is set for August 25.

-----Original Message-----
From: KENDALL Jerry
Sent: Friday, July 30, 2004 3:23 PM
To: 'Jim Just'
Subject: RE: Ogle

What came in is a response from DSL and final rebuttal from M. Farthing. I'm faxing both to you.

> -----Original Message-----
> **From:** Jim Just [mailto:goal1@pacifier.com]
> **Sent:** Friday, July 30, 2004 11:34 AM
> **To:** Jerry Kendall
> **Subject:** Ogle
>
> Jerry,
>
> Any new material submitted to the file that I should be aware of?
>
> Jim Just, Executive Director
> Goal One Coalition
> 39625 Almen Drive
> Lebanon, OR 97355
> phone: 541.258.6074
> fax: 541.258.6810
> www.goal1.org
>
> *Championing citizen participation in realizing sustainable communities, economies, and environments*

DOUGLAS FIR PEELER LOGS

(Psuedotsuga menziesii)

No. 1 Peeler Douglas Fir

Logs shall be suitable for rotary cutting of clear, uniform-colored face stock veneer to an amount of not less than 50% of the NET scale. Such logs shall meet at least the following minimum exterior characteristics:

Gross Diameter – 30 inches.

Gross Length – 17 feet.

Surface – 90% clear. May include logs with not more than two (2) knots.

Annual Ring Count – 8 per inch.

Slope of Grain – Not to exceed 3" per foot.

Heart off-Center – Allowable to the extent that required recovery can be met.

No. 2 Peeler Douglas Fir.

Logs shall be suitable for rotary cutting of clear, uniform-colored face stock veneer to an amount of not less than 35% of the NET scale. Such logs shall meet at least the following minimum exterior characteristics:

Gross Diameter – 30 inches.

Gross Length – 17 feet.

Surface – 75% clear. May include logs with not more than two (2) knots.

Annual Ring Count – 8 per inch.

Slope of Grain – Not to exceed 3" per foot.

Heart off-Center – Allowable to the extent that required recovery can be met.

No. 3 Peeler Douglas Fir.

Logs shall be suitable for rotary cutting of veneer center core, cross core, backs and better to an amount equal to 100% of the NET scale. Such logs shall meet at least the following minimum exterior characteristics:

Gross Diameter – 24 inches.

Gross Length – 17 feet.

Surface – Limited to knot indicators, not more than 1½" in diameter. The maximum number of knot indicators should not exceed an average of one per foot of log length. Knot indicators ½ inch and under in diameter shall not be considered a determining factor. This grading may include a log with not more than two knots.

Annual Ring Count – 6 per inch.

Slope of Grain – Not to exceed 3" per foot.

Heart off-Center – Allowable to the extent that required recovery can be met.

DOUGLAS FIR PEELER BLOCKS

Logs of Peeler quality under 17' but not less than 4' in length shall be graded as Peeler Blocks with the volume extended on log scale basis. No 1, No. 2, and No. 3 Peeler Blocks must meet the same grade requirements as the similar grade of Peeler logs as to minimum diameter, annual ring count, slope of grain, and grade recovery requirements.

DOUGLAS FIR SAWMILL LOGS

No. 1 Sawmill Douglas Fir

Logs shall be suitable for the manufacture of B and Better lumber to an amount of not less than 50% of the NET scale. Such logs shall meet at least the following minimum exterior characteristics:

Gross Diameter – 30 inches.

Gross Length – 16 feet.

Surface – 90% clear.

Annual Ring Count – 8 per inch.

Slope of Grain – Not to exceed 3" per foot.

No. 2 Sawmill Douglas Fir

Logs shall be suitable for the manufacture of (1) Construction and Better grades of lumber to an amount of not less than 65% of NET scale, or (2) B and Better or equivalent grades of lumber to an amount of not less than 25% of the NET scale. Such logs shall meet at least the following minimum exterior characteristics:

Gross Diameter – 12 inches.

Gross Length – 12 feet.

Minimum Volume – 60 board feet NET scale.

Surface – Sound, tight knots, not to exceed 2½" in diameter. Any larger knots, knot clusters, and burls shall be so distributed as to permit the required recovery.

Slope of Grain – Not to exceed:
- 2" per foot on logs 12" thru 20"
- 3" per foot on logs 21" thru 35"
- 4" per foot on logs 36" thru 50"
- 5" per foot on logs 51" and over.

No. 3 Sawmill Douglas Fir

Logs shall be suitable for the manufacture of Standard and Better grades of lumber to an amount of not less than 33⅓% of the GROSS scale. Such logs shall

PONDEROSA AND SUGAR PINE LOGS

(Pinus ponderosa and Pinus lambertiana)

Peeler Ponderosa & Sugar Pine

Logs shall be old growth and suitable for the rotary cutting of clear, uniform-colored face stock veneer to an amount of not less than 50% of the NET scale. Such logs shall meet at least the following minimum exterior characteristics:

- Gross Diameter – 30 inches.
- Gross Length – 17 feet.
- Surface – 100% clear.
- Annual Ring Count – 8 per inch.
- Slope of Grain – Not to exceed:
  - 1½" per foot on logs 30" thru 50" diameter.
  - 2½" per foot on logs 51" and over.

Peeler Blocks Ponderosa & Sugar Pine

Logs of Peeler Quality under 17" in length shall be graded as Peeler Blocks with the volume extended on the log scale basis. Peeler Blocks shall meet all the other minimum specifications required of Peeler grade logs.

No. 1 Sawmill Ponderosa & Sugar Pine

Logs shall be old growth and suitable for the manufacture of D select and Better lumber to an amount of not less than 50% of the NET scale. Such logs shall meet at least the following minimum exterior characteristics:

- Gross Diameter – 30 inches.
- Gross Length – 16 feet.
- Surface – 90% clear.
- Annual Ring Count – 8 per inch.
- Slope of Grain – Not to exceed:
  - 1½" per foot on logs 30" thru 50" diameter.
  - 2½" per foot on logs 51" and over.

No. 2 Sawmill Ponderosa & Sugar Pine

Logs shall be old growth and suitable for the manufacture of D select and Better lumber to an amount of not less than 35% of the NET scale. Such logs shall meet at least the following minimum exterior characteristics:

- Gross Diameter – 24 inches.

LARGE, OLD TREE

- Gross Length – 12 feet.
- Surface – 75% clear.
- Annual Ring Count – 8 per inch.
- Slope of Grain – Not to exceed 3" per foot.

No. 3 Sawmill (Shop Grade) Ponderosa & Sugar Pine

Logs shall be old growth and suitable for the manufacture of No. 2 Shop and Better lumber to an amount of not less than 50% of the NET scale. Such logs shall meet at least the following minimum exterior characteristics:

- Gross Diameter – 24 inches.
- Gross Length – 12 feet.
- Surface – 50% clear (collectively), with knots spaced to allow 6'-long clear cuttings.
- Annual Ring Count – 8 per inch.
- Slope of Grain – Not excessive.

No. 4 Sawmill Ponderosa & Sugar Pine

Logs shall be suitable for the manufacture of No. 2 Common (Sterling) and Better lumber to an amount of not less than 50% of the NET scale. Such logs shall meet at least the following minimum exterior characteristics:

- Gross Diameter – 12 inches.
- Gross Length – 12 feet.
- Surface – Sound, tight knots, not to exceed 2½" diameter. Any larger knots shall be spaced same as No. 3 Sawmill (Shop) logs.

No. 5 Sawmill Ponderosa & Sugar Pine

Logs shall be suitable for the manufacture of No. 3 Common (Standard) and Better grades of lumber to an amount of not less than 33⅓% of the GROSS scale. Such logs shall meet at least the following minimum exterior characteristics:

- Gross Diameter – 6 inches.
- Gross Length – 12 feet.

No. 6 Sawmill Ponderosa & Sugar Pine

Logs shall be suitable for the manufacture of No. 3 Common (Standard) and Better grades of lumber to an amount of not less than 33⅓% of the GROSS scale. Such logs shall meet at least the following minimum exterior characteristics:

- Gross Diameter – 5 inches.
- Gross Length – 12 feet.
- Minimum Volume – 10 board feet NET scale.