W.7.b

SUPPLEMENTAL MEMO

LAND MANAGEMENT DIVISION
http://www.LaneCounty.org/PW_LMD/

DATE: November 21, 2006 (Date of Memo)
November 29, 2006 (Date of Third Reading/Deliberations)

TO: LANE COUNTY BOARD OF COMMISSIONERS

DEPT.: Public Works Department/Land Management Division

PRESENTED BY: Thom Lanfear/Land Management Division

AGENDA ITEM TITLE: ORDINANCE NO. PA 1235: IN THE MATTER OF AMENDING THE RURAL COMPREHENSIVE PLAN TO REDESIGNATE LAND FROM "FOREST" TO "MARGINAL LAND" AND REZONING THAT LAND FROM "F-2/IMPACTED FOREST LANDS" TO "ML/MARGINAL LAND", AND ADOPTING SAVINGS AND SEVERABILITY CLAUSES (file PA 04-6308; Dennis)

I. ISSUE

Additional exhibits have been entered into the record for consideration during Board deliberations on this proposed Ordinance.

II. DISCUSSION

A. Background

During the public hearing held on this Ordinance on November 8, 2006, written materials were submitted by persons presenting testimony. In response to a request by one of the parties to enter additional information, the Board held the record open for one week to receive additional written testimony. The attached exhibits represent all materials submitted at the hearing and during the open record period after the hearing.

No.	Item	Date
56.	Submittal by Sherry Ann Perry	11/3/06
	a) Letter dated November 3, 2006	
	b) Letter dated December 10, 2005 (same as Exhibit 47)	
57.	Submittal by Goal One Coalition w/ 18 Exhibits	11/8/06
58.	Submittal by Steve Cornacchia	11/8/06
59.	Letter from Lauri Segel	11/8/06
60.	Letter from Robert Emmons	11/8/06
61.	Letter from Clark O. Anderson	11/14/06
62.	Letter from Jonny Watson & Martha DeWees	11/15/06
63.	Letter from Goal One Coalition	11/15/06

B. Analysis

The submittals listed above reiterate many of the arguments made before the Lane County Planning Commission but include a few variations on the issues.

1. Parcelization Test ORS 197.247(1)(b)(A)

The applicant is not relying upon the parcelization test which is one of the three tests that may demonstrate land is suitable for Marginal Lands designation. The original submittal reviewed before the Planning Commission contained an analysis of two of the three tests but the applicant has withdrawn this analysis from consideration. It is only necessary to address one of the three tests found under ORS 197.247(1)(b) and the applicant has addressed the test under subsection (C), the "productivity test".

2. Forest Productivity Test ORS 197.247(1)(b)(C)

The arguments presented in the submittals regarding this test are essentially the same as those presented to the Planning Commission. The opponents have finally submitted into the record a document[1] addressing the establishment and management of Ponderosa Pine that was referenced in the submittals to the Planning Commission. A substantial portion of the analyses submitted by Goal One for this productivity test relies upon this document for support. The applicant's forester has commented on this document in the record at the Planning Commission level, including the issues of productivity ratings and merchantability. The issue of productivity ratings assigned to soil complexes was addressed in the record before the LCPC.

3. Income Test ORS 197.247(1)(a)

The "income test" is required to be satisfied in order for the property to qualify as Marginal Lands. The test requires a determination that the subject property "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 gross income." As determined in the Board interpretation dated March 1997 (Attachment 2 to original Board packet), analysis of the productivity requires the use of log prices in effect in 1983 and a growth cycle of 50 years. Goal One Coalition contends that an average of the 1978 – 1982 log prices must be used instead of the 1983 log prices and a 100 year growth cycle must be used. Staff notes that a prior LUBA decision in *Carver* (Just v. Lane County, 49 OR LUBA 456 (2005)) upheld a Lane County decision that relied upon the use of a 50 year growth cycle and 1983 log prices for determination of the income potential under this criterion.

C. Alternatives/Options

Upon conclusion of Board deliberations, a variety of options are available to the Board:

1. If the Board finds that the application meets all applicable criteria for approval:
   a) Move to adopt the Ordinance as presented with the applicant's findings; OR
   b) Move to tentatively approve the application and direct the applicant to prepare revised findings corresponding to the Board deliberations for subsequent final adoption.

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[1] *Establishing and Managing Ponderosa Pine in the Willamette Valley*, Oregon State University Extension Service, EM 8805, May 2003.

2. If the Board finds that the application does not meet all applicable criteria for approval, move to tentatively deny the application and direct staff to prepare a Board Order for denial of the application for subsequent final adoption.

D. Recommendations

Staff recommends Option 1(a) above.

E. Timing

The Ordinance does not contain emergency clause.

III. IMPLEMENTATION/FOLLOW-UP

Notice of action will be provided to DLCD, the applicant, and other parties to the proceedings.

IV. ATTACHMENTS

1. Exhibits 56-63

GOAL ONE COALITION

Goal One *is* Citizen Involvement

Lane County Board of Commissioners
125 East 8th Avenue
Eugene, OR 97401

November 15, 2006

RE: PA 04-6308, Dennis marginal lands application

Dear Commissioners,

The Goal One Coalition (Goal One) is a nonprofit organization whose mission is to provide assistance and support to Oregonians in matters affecting their communities. Goal One has appeared in these proceedings at the request of and on behalf of its membership residing in Lane County. These comments are submitted on behalf of LandWatch Lane County and its membership in Lane County, 642 Charnleton, Suite 100, Eugene OR 97401; Robert Emmons and Nena Lovinger, 40093 Little Fall Creek Road, Fall Creek, OR 97438.

This letter responds to comments in a November 8, 2006 email from the applicant's forester to LC staff ; the email was presented at the November 8 public hearing at the BCC.

In his 11/8/06 email, Mr. Setchko states that Goal One's "Productivity numbers used for Douglas-fir calculations are from Washing DNR tables (more moisture, deeper soils, etc.) which cannot be used Oregon." (sic)

Here, we provide references for the McArdle and King Tables that establish productivity numbers for Douglas-fir used in the Tables are relevant to the Pacific Northwest, and not limited to the state of Washington:

- McArdle, Richard E. and Walter H. Meyer. 1930 The Yield of Douglas-fir in the Pacific Northwest. Technical Bulletin 201. Washington, DC: U.S. Department of Agriculture. Revised in 1948. New edition in 1961 with Donald Bruce.

- King, J.E.. 1966. Site Index Curves for Douglas-fir in the Pacific Northwest. Weyerhaeuser Forestry Paper No. 8, July 1966. Weyerhaeuser Company, Forestry Research Center, Centralia, WA

Goal One, Mr. Just, LandWatch Lane County, and Mr. Emmons and Ms. Lovinger request notice of and a copy of any decision and findings regarding this matter.

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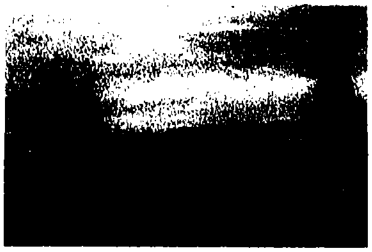
Lebanon office: 39625 Almen Drive · Lebanon OR 97355 · 541-258-6074 · Fax 541-258-6810
www.goal1.org

EXHIBITS

Exhibit	#	Pages
Establishing & Managing Ponderosa Pine	1	1-1 – 1-16
Forest Survey Site Class Table	2	2-1
NRCS Forest Productivity Table, Lane County	3	3-1 – 3-2
Soil Interpretations Records ("Green Sheets")	4	4-1 – 4-4
Ponderosa pine site index tables	5	5-1 – 5-3
CMAI Tables for ponderosa pine	5	5-4 – 5-5
Yield tables showing yield at various cycles	6	6-1 – 6-2
Yield tables for Douglas-fir & ponderosa pine	7	7-1 – 7-12
Douglas-fir log prices 1978-1982 & 1983	8	8-1 – 8-6
Setcko letter of 2/23/04 showing potential productivity	9	9-1 – 9-4
Successful Reforestation: An Overview	10	10-1 – 10-8
Example: Parcel Size Test	11	11-1
DLCD explanation of Marginal Lands bill	12	12-1 – 12-12
DLCD letter of advice re "parcel size" test	12	12-13 – 12-14
Email from Kevin Birch re merchantability of pp	13	13-1
Lane County Soil Ratings, excerpts	14	14-1 – 14-4
Setchko calculation of pp site index & productivity	15	15-1 – 15-5
NRCS explanation of soil complexes	16	16-1
NRCS listing of Lane County soils	17	17-1 – 17-3
Email from Joe Misek re King & McArdle tables	18	18-1



High Meadow Farm
Polled Herefords

Jonny Watson Martha DeWees, DVM

11-15-06A11:30 RCVD

November 12, 2006

Lane County Board of Commissioners
125 East 8th Avenue
Eugene, OR 97401

RE: PA04-6308, Dennis

Dear Commissioners,

At the heart of the applicant's effort to amend the Rural Comprehensive Plan to Re-designate Land from "Forest" to "Marginal Land" and Rezone That Land from "F-2/Impacted Forest Land" to "ML/Marginal Land" is the claim of forest un-productivity of the soils.

The applicant's attorney was dismissive of anecdotal remarks from Fall Creek residents and neighbors of the applicant's property. Yet, the application relies on the unsubstantiated claims about harvesting timber and replanting after harvest. Applicant's attorney has stated that 195 MBF of timber was harvested during a "light selective thinning". No proof of this volume is offered and there is no claim as to how much timber remained or what percentage of available stumpage the harvest represented. Harvest records should be produced to verify their claims that "there was not much timber growing on the parcel at that time (of harvest)". I suspect that such records, if produced, would show timber productivity above the standards for marginal lands.

Similarly, the contention that "owners have planted new conifer seedlings more than once" is an unsubstantiated implication that the applicant has obeyed the law and made serious management efforts to re-establish timber producing trees on the parcel. In order to determine if adequate management practices have been used it is incumbent on the applicant to document how many trees were planted, at what time of year, and if the site was properly prepared after logging.

I own 199 adjacent acres, directly north of the applicant's property. The soils and terrain of both properties are similar and are comprised of mixed soil types; some suited to timber production and some not suited to timber production. In 1996 I had 118 acres professionally planted after a 1995 harvest. I planted 36,000 trees and returned the next year to plant 14,000 more after drought damage. In 1999 and 2003 I spent many days building a new fence along the 2,296 foot property line I share with the applicant's parcel. During that time I saw substantial growth of my trees on my side of the fence and virtually no new growth on the

38533 Jasper-Lowell Road Fall Creek, OR 97438 541-746-8329

applicant's property where the many stumps from their logging bear evidence that large fir trees can grow on either side of the property line.

The applicant harvested an unverified amount of timber, left a logging mess, ignored necessary management practices and has not verified realistic planting efforts.

This land has been stripped of value and purposely marginalized by this applicant. Now the applicant wants to profit from their greed and disregard for the laws requiring re-forestation.

Please carefully consider this application and understand the enduring impact that granting the request to amend the Rural Plan will have in forever changing the environment, ecology and neighborhood in Fall Creek. I strongly urge to reject this application.

Respectfully,

Jonny B. Watson

Jonny Watson

Martha DeWees

Martha DeWees

November 14, 2006

Mr. Bill Dwyer
Chairman
Lane County Board of Commissioners
125 E. 8th Avenue
Eugene, OR 97401

RE: Additional Testimony, File Number PA 04-6308: Carol Dennis

Thank you for the opportunity to provide written testimony in the above matter..

Lynne and I own and reside on the land immediately to the west of the Dennis property.

First, I support the written and verbal testimony of my neighbors, Landwatch Lane County, and the Goal 1 Coalition as they pertain to the goals and criteria that must be considered at this stage of the resignation and rezoning process.

My comments pertain to matters I don't think have been raised so far. Mr. Cornacchia, attorney for Carol Dennis, commented at the end of his rebuttal before the Board, that parcels adjacent to the subject property were redesignated and rezoned from "Forest- " to "Marginal Land," which our property was. It was further asserted that this fact should mean that his client's should also be redesignated and rezoned. I take issue with that assertion for the following reasons.

1. The outcome of one application has no bearing on the outcome of the other. Each should stand on its own merits. We didn't own the land at the time of its redesignation and rezoning, but the process and findings may have been very different. Perhaps the application submitted in our case was more complete and compelling. It is also possible that in our case there was neither significant opposition and findings of fact supplied by neighbors and other interested parties whereas the Dennis application has stimulated both.
2. So far as I know, and there is certainly no evidence of it, our property was not logged in any recent decade and therefore the issue of replanting and productivity of logged land both has no relevance to our land and on this dimension our redesignation and rezoning has no relevance to the Dennis application.
3. Our land shows every indication of the possibility of forest productivity. Volunteer (unplanted) Douglas fir, cedar and Ponderosa Pine thrive on our property. Furthermore, I have planted fir and cedar with great success.
4. Mr. Cornacchia, has raised the issue of water supply and claims that there is a high flow well on the property. Since the property has never had electricity, I am unclear as to how this claim can be made. Furthermore, if the Dennis' ultimate goal is to develop 8 or more home sites on the property, I have grave reservations about the availability of water on surrounding properties. Our's is a low flow well and multiple home sites drawing from the same water table could negatively affect our water supply.

For these reasons and those presented by other neighbors, I oppose redesignation and rezoning of the Dennis property and it is my hope that the Board will not approve their application.

Sincerely,

Clark O. Anderson
38931 Jasper-Lowell Road
Fall Creek, OR 97438

Lane County Board of Commissioners
125 East 8th Avenue
Eugene, OR 97401

November 8, 2006

RE: PA 04-6308, Dennis marginal lands application

Dear Commissioners,

I am here today on behalf of LandWatch Lane County (LWLC). LWLC is a nonprofit organization working on behalf of the environmental health and protection of Lane County's natural amenities, especially where development pressures threaten rivers, streams, and farm and forestlands.

Focusing on the forest productivity standards of the 1991 edition of ORS 197.247(1)(b)(C), our analysis relies on Setchko's data and our calculations show that the productivity test isn't met, even if the Dixonville/Hazelair/Philomath (DPH) complex is treated as a single soil unit managed for Douglas-fir.

Setchko's analysis concludes that the subject property is capable of producing 78.175 cf/ac/yr of merchantable timber. However, there are three errors in Setchko's analysis. The first incorporates an error found in the *Lane County for Ratings for Forestry & Agriculture (August, 1997) (LC Ratings)* in assigning a productivity for the Dixonville/Hazelair/Philomath complex. The second error is in restricting the inquiry to Douglas-fir. The third error - which is related to the second - is in relying on productivity data in the Lane County Ratings, which provide potential productivity ratings only for Douglas-fir.

First Error: The productivity ratings for the 43C and 43E Dixonville/Philomath/Hazelair complex soils units in the Lane County Ratings do not provide a basis for approval of the request. The potential productivity data for the Dixonville/Philomath/Hazelair soil mapping units found in the LC Ratings do not constitute "substantial evidence" of the productivity of the mapping units because 1) zero productivity for the Hazelair and Philomath units is assumed, and 2) because only ratings for Douglas-fir are provided.

Second Error: An analysis of potential forest productivity must consider Ponderosa pine. Regarding forest productivity, the "productivity" test established by ORS 197.247(1)(b)(C) asks whether the proposed marginal land "is not capable of producing * * * eighty-five cubic feet of merchantable timber per acre per year."

ORS 197.247(1)(b)(B) specifically requires that productivity for "merchantable timber" be considered. The statute expressly does not allow the inquiry to be restricted to Douglas-fir or only the highest-value timber species.

Third Error: The Setchko *Forest Productivity Analysis* states at p. 2 that "Douglas-fir was used because it is the highest value merchantable tree species." ORS 197.247(1)(b)(B) does not restrict the inquiry to the "highest value merchantable tree species." Available evidence demonstrates that Ponderosa pine is far better suited for several of the soils found on the subject site. Any decision made in reliance on Setchko's conclusions limited to productivity data for Douglas-fir would misconstrue and violate ORS 197.247(1)(b)(B).

Conclusion

The subject property is capable of producing well in excess of 85 cf/ac/yr of merchantable timber for a combination of Douglas-fir and ponderosa pine grown in the appropriate soils. The forest productivity test of ORS 197.247(1)(b)(C) is not met.

Thank you for your consideration of these comments and the supporting documentation prepared and submitted by the Goal One Coalition.

Robert Emmons, President, LandWatch Lane County

GOAL ONE COALITION

Goal One *is* Citizen Involvement

Lane County Board of Commissioners
125 East 8th Avenue
Eugene, OR 97401

November 8, 2006

RE: PA 04-6308, Dennis marginal lands application

Dear Commissioners,

The Goal One Coalition (Goal One) is a nonprofit organization whose mission is to provide assistance and support to Oregonians in matters affecting their communities. Goal One is appearing in these proceedings at the request of and on behalf of its membership residing in Lane County. This testimony is presented on behalf of LandWatch Lane County and its membership in Lane County, 1192 Lawrence, Eugene OR 97401; Robert Emmons and Nena Lovinger, 40093 Little Fall Creek Road, Fall Creek, OR 97438.

Speaking to the income test of ORS 197.247(1)(a), Goal One's analysis generally relies on Setchko's assumptions and data except where we apply average prices over the 1978-82 period rather than 1983 prices and provide calculations based on 50, 60, and 100-year growth cycles. Based on our analysis, the income test of ORS 197.247(1)(a) is not met.

As a preliminary matter, it is necessary to address two issues: what prices should be used, and what is the appropriate growth cycle.

1978-82 prices must be used. LUBA has held that the legislature intended the gross income test under ORS 197.247(1) to be applied based on the five-year period preceeding January 1, 1983. *Just v. Lane County (Carver)*, 49 Or LUBA 456 (2005). However, the applicant's forestry consultant has used 1983 prices in computing potential income.

ORS 197.247(1)(a) looks back in time to the 1978-82 period. LUBA in *Carver* pointed out that both the "farm operation" and "forest operation" prongs of the test are specifically linked to January 1, 1983. Tying the test to January 1, 1983 requires that pricing *prior* to the first quarter of 1983 be used, as even first quarter 1983 prices would only begin to apply after January 1, 1983.

The use of a 50-year growth cycle has not been justified and is not appropriate.

The applicant has used a 50-year growth cycle to calculate average gross annual income over the growth cycle. This is predicated on the Board's Direction on Issue 5: "What 'growth cycle' should be used to calculate gross annual income?" in its March 1997 *Supplement to Marginal Lands Information Sheet.*

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Lebanon office: 39625 Almen Drive · Lebanon OR 97355 · 541-258-6074 · Fax 541-258-6810
www.goal1.org

In the case *DLCD v. Lane County (Ericsson),* 23 Or LUBA 33, 36, LUBA explained that the choice of the phrase "capable of producing" in ORS 197.247(1)(a) requires the application of an objective test:

An objective test for determining gross annual income averaged over the growth cycle would require selecting a growth cycle that would maximize average annual income over the growth cycle. The applicant and his representatives and experts have not argued that using a 50-year growth cycle would maximize average gross annual income. Rather, they rely entirely on the Board's 1997 directive. In fact, for a similar marginal lands application, the applicant's forestry consultant has produced reports finding that the use of a 60-year growth cycle would result in a 27.2% higher average gross annual income over the growth cycle than would the use of a 50-yr growth cycle.

As the income test established by ORS 197.247(1)(a) is not met, the request to redesignate the subject property as marginal lands must be denied.

Goal One Coaltion and Lauri Segel, LandWatch Lane County, and Mr. Emmons and Ms. Lovinger request notice of and a copy of any decision and findings regarding this matter.

Respectfully submitted,

Lauri Segel

Lauri Segel
Community Planner

RECEIVED 11/8/06

Steve Cornacchia

From: marc Setchko [msetchko@gmail.com]
Sent: Wednesday, November 08, 2006 11:19 AM
To: Steve Cornacchia
Subject: Re: FW: Dennis

To clarify a few of Goal One suppositions. 1- The productivity numbers on page 8 are not generated using ODF approved methodology or on site trees. 2- The calculations then assume a productivity from Witzel rock outcrops. 3- No discussion of holding or opportunity costs, which exceed returns, in rotations longer than 50 years. 4 - Productivity numbers used for Douglas-fir calculations are from Washington DNR tables (more moisture, deeper soils, etc.) which cannot be used Oregon. 5- Prices used for income calculations assume higher grades than can be attained within the time frames given.

On 11/8/06, Steve Cornacchia <scornacchia@hershnerhunter.com> wrote:
>
>
> FYI
>
> Steve Cornacchia
> Hershner Hunter, LLP
> 180 East 11th Avenue
> Eugene OR 97401
> Phone: (541) 686-8511
> fax: (541) 344-2025
> www.hershnerhunter.com
>
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> ________________________________
> From: LANFEAR Thom [mailto:Thom.LANFEAR@co.lane.or.us]
> Sent: Wednesday, November 08, 2006 8:54 AM
> To: Steve Cornacchia
> Subject: Dennis
>
>
>
>
>
> Hi Steve:
>
> Here are the cover memo and goal one submittal without attachments:
>
> <<BCC_COVER_MEMO_hearing.doc>>
>
> <<Goal 1 Submittal Dennis BoC 10-31-06.doc>>
> Thom
>

58

GOAL ONE COALITION

Goal One *is* Citizen Involvement

Lane County Board of Commissioners
125 East 8th Avenue
Eugene, OR 97401

November 8, 2006

RE: PA 04-6308, Dennis marginal lands application

Dear Commissioners,

The Goal One Coalition (Goal One) is a nonprofit organization whose mission is to provide assistance and support to Oregonians in matters affecting their communities. Goal One is appearing in these proceedings at the request of and on behalf of its membership residing in Lane County. This testimony is presented on behalf of LandWatch Lane County and its membership in Lane County, 1192 Lawrence, Eugene OR 97401; Robert Emmons and Nena Lovinger, 40093 Little Fall Creek Road, Fall Creek, OR 97438.

I. Introduction

The applicant is requesting approval of an amendment of the Lane County Rural Comprehensive Plan (RCP) to redesignate and rezone a 102.61-acre property from "Forest" and "Impacted Forest Land" (F-2) to "Marginal Land" and "Marginal Lands" (ML). The subject property is identified as 18-01-33 TL 106, and is located north of Jasper-Lowell Road immediately north of the unincorporated community of Fall Creek.

The subject property contains open meadows, and rock outcroppings, and contains forested areas including copses and scattered trees. Tree species present include Douglas-fir, Incense cedar and Ponderosa pine. The property slopes generally upward towards the north.

The property adjacent to the subject property along its western boundary is zoned ML. Along the subject property's southern boundary are small parcels zoned for non-resource use, many of which are within the unincorporated community boundary of Fall Creek. To the north is 18-01-28 TL 101, a 199.35 acre parcel zoned F-1. To the east are lands zoned F-2.

The owner of the subject property, during the relevant 1978-82 period, also owned an additional 12+ acres adjacent to the subject TL 106, consisting of tax lots 100, 102, 104, 107 and 600.

II. Marginal Lands criteria

ORS 197.247 (1991 edition) provides, in relevant part:

> "(1) In accordance with ORS 197.240 and 197.245, the commission shall amend the goals to authorize counties to designate land as marginal land if the land meets the following criteria and the criteria set out in subsections (2) to (4) of this section:
>
> "(a) The proposed marginal land was not managed, during three of the five calendar years preceding January 1, 1983, as part of a farm operation that produced $20,000 or more in annual gross income or a forest operation capable of producing an average, over the growth cycle, of $10,000 in annual gross income.
>
> "(b) The proposed marginal land also meets at least one of the following tests:
>
> "(A) At least 50 percent of the proposed marginal land plus the lots or parcels at least partially located within one-quarter mile of the perimeter of the proposed marginal land consists of lots or parcels 20 acres or less in size on July 1, 1983.
>
> "* * *
>
> "(C) The proposed marginal land is composed predominantly of soils in capability classes V through VIII in the Agricultural Capability Classification System in use by the United States Department of Agriculture Soil Conservation Service on October 15, 1983, and is not capable of producing fifty cubic feet of merchantable timber per acre per year in those counties east of the summit of the Cascade Range and eighty-five cubic feet of merchantable timber per acre per year in those counties west of the summit of the Cascade Range, as that term is defined in ORS 477.001(21)."

The applicant argues that the "income" tests of ORS 197.247(1)(a) are met, and that the "parcelization" test of ORS 197.247(1)(b)(A) and the "capability" test of ORS 197.247(1)(b)(C) are both met. This letter will address the tests established by ORS 192.247(1)(b) first, as those tests are dispositive of this matter.

A. The parcel size test of ORS 197.247(1)(b)(A) is not met.

ORS 197.247(1)(b)(A) requires that "[a]t least 50 percent of the proposed marginal land plus the lots or parcels at least partially located within one-quarter mile of the perimeter of the proposed marginal land consists of lots or parcels 20 acres or less in size on July 1, 1983."

The applicant has fundamentally misconstrued what this test requires: that "at least 50 percent of the [land] consist of lots or parcels 20 acres or less in size[.]" The applicant's analysis concludes only that more than 50% of the *parcels* within the test area are 20 acres or less in size.

This test requires that a line be drawn ¼ mile from the perimeter of the subject property; that all lots or parcels within or partially within the test area be identified and the size of the lot or parcel determined; that the total area of all of the lots and parcels within or partially within the test area be determined; and that the total area of all lots or parcels 20 acres in size or less be determined. If the total area of all lots and parcels ≤20 acres is ≥50% of the total acreage of the test area, the subject property may be designated marginal land.[1]

The applicant has failed to undertake the required analysis. A finding that 50% of the *lots or parcels* are ≤20 acres does not address the required inquiry: whether 50% of the *land* within the study area consists of lots or parcels ≤20 acres.

A cursory look at applicant's Exhibit I reveals that a great majority of the lands within the test area consists of lots or parcels >20 acres. A computation using data provided by the applicant in Exhibit H of the application confirms this impression. The applicant determined that 38 parcels fell within or partly within a line drawn ¼ mile from the perimeter of the property. The total acreage of those 38 parcels is 791.26. The total acreage of parcels >20 acres is 704.67. The total acreage of parcels ≤20 is 86.59. Lots or parcels ≤20 constitute only 11% of the land within the study area.

The applicant's argues that ORS 197.247(1)(b)(A) establishes a "parcelization" test rather than an "area" test. The legislative history of SB 237 establishes that ORS 197.247(1)(b)(A) was intended as an "area" test.[2] Interpreting ORS 197.247(1)(b)(A) to establish a "parcelization" test would yield absurd results, as the existence of as few as three tiny parcels within an area of completely dominated by extremely large resource parcels could be used to justify a finding that the large resource parcels were "marginal" for farm and forest uses.[3]

50 percent of the proposed marginal land plus the lots or parcels at least partially located within one-quarter mile of the perimeter of the proposed marginal land did not consist of lots or parcels 20 acres or less in size on July 1, 1983. The "parcel size" criterion of ORS 197.247(1)(b)(A) is not met

B. The forest productivity test of ORS 197.247(1)(b)(C) is not met.

ORS 197.247(1)(b)(C) requires that "[t]he proposed marginal land * * * is not capable of producing * * * eighty-five cubic feet of merchantable timber per acre per year in those counties west of the summit of the Cascade Range[.]"

The applicant has submitted a Forest Productivity Analysis, prepared by Consulting Forester Marc Setchko, which lists the soils present on the 102.61 acre TL 106. Setchko's analysis concludes that the subject property is capable of producing 78.175 cf/ac/yr of merchantable timber.

There are three flaws in Setchko's analysis. The first incorporates an error found in the *Lane County Ratings for Ratings for Forestry & Agriculture (August, 1997) (LC Ratings)* in assigning a productivity for the Dixonville/Hazelair/Philomath complex. The second error is in restricting the inquiry to Douglas-fir. The third error - which is related to the second - is in relying on productivity data in the LC Ratings, which provide potential productivity ratings only for Douglas-fir.

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[1] See Exhibit 12, 12-4, a memorandum from the James Ross, DLCD Director, which explains that this test is an area test. See also Exhibit 12-13, reaffirming that the test is not a parcel counting test but rather an area test.

[2] See Exhibit 12, 12-4 and 12-13, 14.

[3] See Exhibit 11.

1. The productivity ratings for the 43C and 43E Dixonville/Philomath/Hazelair complex soils units in the *Lane County Ratings* do not provide a basis for approval of the request.

The productivity ratings for the 43C and E Dixonville/Philomath/Hazelair complex soils units in the *Lane County Soil Ratings for Forestry and Agriculture* (*LC Ratings*) cannot be relied upon as the basis for an amendment to the comprehensive plan.

The *LC Ratings* is not an acknowledged planning document of the kind that Goal 2 contemplates. Goal 2 requires that comprehensive plans be the basis for specific implementation measures, which in turn must be consistent with and adequate to carry out the plan. Plans and implementing measures must be adopted by ordinance after public hearing, and acknowledged by the Land Conservation and Development Commission. Lane County may not rely on the LC Ratings as *establishing* the productivity of the soil units. *See 1000 Friends of Oregon v. City of Dundee*, 203 Or App 207, 216 (2005). At best, the *LC Ratings* may provide "substantial evidence."

The potential productivity data for the Dixonville/Philomath/Hazelair soil mapping units found in the LC Ratings do not constitute "substantial evidence" of the productivity of the mapping units because 1) zero productivity for the Hazelair and Philomath units is assumed, and 2) because only ratings for Douglas-fir are provided.

Two soil units of the Dixonville/Philomath/Hazelair complex are found on the subject property: 43C, 3 to 12 percent slopes; and 43E, 12 to 35 percent slopes. The *LC Ratings* gives a cf/ac/yr rating of 54 for the 43C unit and 63 for the 43E unit.[4] Entrees for the Dixonvill/Philomath/Hazelair units are noted with three asterisks. A footnote at p. 6 of that document notes:

> "*** Indicates soil complexes with multiple site indices, refer to the CuFt/Acre/Year column for a composite volume rating for the complex."

The *Soil Survey of Lane County Area, Oregon (Soil Survey)* was published in 1987. The fieldwork for that publication was completed in 1980 and on soil names and descriptions approved in 1981. This information is found in the "green sheets" that were available and in use in 1983.[5] Neither the green sheets nor current NRCS data indicate forest productivity for the 43C or the 43E complexes; rather, productivity is given for the individual soil units which comprise the complexes. Productivity data is available only for the Dixonville component.[6] Since no site indices were available for the Philomath and Hazelair units, site indices for those soils could not have been included in any calculation of a composite rating for the complex.

The methodology used to compile productivity data for soil complexes in the August 1997 *Lane County Soil Ratings for Forestry and Agriculture* is explained at p. 8 of that document as follows:

> "The methodology used in this table to calculate forest productivity volume ratings for soil complexes involves applying a weighted average to each component of the

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[4] See Exhibit 14-2.

[5] *Soil Survey*, p. ii.

[6] See Exhibit 3 and Exhibit 4.

> complex and then normalizing to base it on 100% excluding the inclusions. The following example illustrates this calculation for a soil complex which has a site index for only one of the two components."

The example given is for the 43C Dixonville/Philomath/Hazelair complex.[7] The example table – which shows a productivity rating only for the Dixonville unit and includes no productivity for the other soil components of the complex - makes it clear that the methodology assumes zero cf/ac/yr capability for soil components that do not have NRCS productivity ratings for forest productivity.[8] LUBA has rejected the argument that soils lacking a NRCS productivity rating will produce zero cf/ac/yr. *Wetherell v. Douglas County,* 50 Or LUBA 167 (2005).

As illustrated above, the *LC Ratings* results for the Dixonville/Philomath/Hazelair complexes can only be achieved by assuming zero productivity for the nonrated soils in the complex.

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

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

As LUBA explained in *Wetherell,* OAR 660-006-0010 requires that any inventory of forest land requires objective measures of productivity:

> "Goal 4 and the Goal 4 rule strongly suggest that determinations of suitability for commercial forestry must be made based on published productivity data or, in the absence of such data, on an 'equivalent method of determining forest land suitability.' OAR 660-006-0010. An expert opinion that is not based on published productivity data or equivalent data, but instead relies heavily on the absence of such data, is not a sufficient basis for concluding that land is not subject to Goal 4." Slip op 31.[9]

The inquiry into whether a property is capable of producing 85 cf/ac/yr of merchantable timber requires that a county examine its inventory of forest land. 85 cf/ac/yr is the productivity threshold separating cubic foot site class IV and cubic foot site class V forest lands. [10]

LUBA concluded that OAR 660-006-0010 requires that Goal 4 inventory decisions be based on objective measures of productivity and that OAR 660-066-0010 applies when making inventory decisions regarding forest lands. *Wetherell v. Douglas County,* 50 Or LUBA 167,

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[7] The table computes a "normalized" cf/ac/yr capability of 46. This differs from the capability given in the ratings themselves, in which this unit is listed as having a cf/ac/yr capability of 54.The discrepancies arise because the example table erroneously uses a cf/acyr productivity of 130 rather than 152 for the Dixonville component. Caculations based on 152 cf/ac/yr yield the results reported in the *LC Survey*: 54 cf/ac/yr and 63 cf/ac/yr for the 43C and 43E units, respectively.

[8] See Exhibit 14-4.

[9] While *Wetherell* was a "nonresource" case, the same reasoning applies in the context of a "marginal lands," which likewise requires a forest inventory as a basis for any decision.

[10] See Exhibit 2, USDA Table 45 - Forest Survey Site Class

200 (2005); *Wetherell v. Douglas County,* 50 Or LUBA 275, 290 (2005). Determining whether a property is Forest Site Class IV or Forest Site Class V forest land is an inventory decision regarding forest lands.

LUBA has rejected the argument that the lack of an NRCS productivity rating constitutes substantial evidence that the soils will produce zero cf/ac/yr. *Wetherell, 50 Or LUBA 167, 203; Wetherell v. Douglas County, 50 Or LUBA 275, 292 (2006).*

The *LC Ratings*, and the Setchko *Forest Productivity Analysis* insofar as it relies on the *LC Ratings*, does not provide substantial evidence as to the potential forest productivity of the Dixonville/Philomath/Hazelair complexes because they provide no information concerning the potential productivity of unrated soils included in the complexes. Both assume that unrated soils within the Dixonville-Hazelair-Philomath complex have a productivity of zero cf/ac/yr. There is not substantial evidence in the record upon which to base a finding that the forest productivity test of ORS 197.247(1)(b)(C) is met.

2. Analysis of potential forest productivity must consider Ponderosa pine.

Regarding forest productivity, the "productivity" test established by ORS 197.247(1)(b)(C) asks whether the proposed marginal land "is not capable of producing * * * eighty-five cubic feet of merchantable timber per acre per year."

ORS 197.247(1)(b)(B) specifically requires that productivity for "merchantable timber" be considered. The statute expressly does not allow the inquiry to be restricted to Douglas-fir or only the highest-value timber species.

The dictionary definition of "merchantable" is: "marketable; that can be or usually is marketable."[11] OAR 629-610-0050 addresses species suitable for reforestation. OAR 629-610-0050(1)(c) requires only that "[t]he species must be marketable in the foreseeable future." The Oregon Department of Forestry considers ponderosa pine to be a merchantable species in the Willamette Valley and specifically in Lane County.[12]

For forest tree species that may have growth cycles measured in many decades, the foreseeable future could be as long as fifty or a hundred years, or even longer. Markets fluctuate; while the market for a particular species may be momentarily weak or nonexistent, conditions change over time. As demand for pulp rises and falls, paper manufacturers may be able to rely on their own plantations, or may begin to purchase chip logs on the open market. For forest tree species, markets are a function of availability. For example, if no pine species are available in a particular area, it is not feasible for mills to set up to utilize such species. As plantations mature and logs become available, it becomes feasible for mills to begin to utilize the resource. Logs that are not suitable for milling into lumber may still be merchantable as firewood, chips, pellets, etc.

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[11] Webster's Unabridged Dictionary. LC 16.090 provides, in relevant part:

> "Where terms are not defined, they shall have their ordinary accepted meanings within the context with which they are used. Webster's Third New International Dictionary of the English Language, Unabridged, Copyright 1981, Principal Copyright 1961, shall be considered as providing ordinary accepted meanings."

[12] Personal communication with Kevin Birch, ODF Senior Policy Analyst, Forest Resources Planning. See Exhibit 13.

The Setchko *Forest Productivity Analysis* states at p. 2 that "Douglas-fir was used because it is the highest value merchantable tree species." ORS 197.247(1)(b)(B) does not restrict the inquiry to the "highest value merchantable tree species." Available evidence demonstrates that Ponderosa pine is far better suited for several of the soils found on the subject site. Any decision made in reliance on Setchko's conclusions limited to productivity data for Douglas-fir would misconstrue and violate ORS 197.247(1)(b)(B).

The inquiry is not and cannot be limited to Douglas-fir as either the "indicator" species or as the most valuable species. The capability of the subject land for producing any and all merchantable tree species for which the soils on the subject property may support. To properly determine whether the land is "capable," the inquiry must consider the species for which particular soils are best suited.

It is apparent that several of the soils on the subject property are not particularly suitable for the production of Douglas-fir. However, these soils may be suited for the production of ponderosa pine, which grows on wet or droughty soils in which Douglas-fir does not thrive. Such soils on the subject property include the Hazelair, Philomath, and Witzel units.[13] As OSU Extension Forester Rick Fletcher has reported in an OSU publication:

> "Native ponderosas are commonly found on three general soil types:
> "1. Poorly drained, heavy clay soils on the Valley bottom or in the low foothills.
> "2. Shallow, rocky clay soils in the Valley foothills.
> "3. Well-drained, sandy soils in the flood plain of the Willamette River and it tributaries.
>
> "These soil types represent the low end of growth potential for ponderosa pine. It grows better on soils with good drainage and depth."[14]

Site indices and cf/ac/yr ratings for ponderosa pine were not prepared or published by the Soil Conservation Service and are not readily available. This does not relieve the applicant of his burden to establish that the soils on the subject property are not capable of producing 85 cf/ac/yr of merchantable timber, considering potential productivity for Douglas-fir on soils suitable for Douglas-fir and potential productivity for ponderosa pine on soils suitable for ponderosa pine.

50-year site indices have been published for Hazelair, Philomath, and Witzel soil units. Tables converting site index to cf/ac/yr productivity require the use of 100-year site indices. Fortunately, the data published by OSU Extension includes height and age data. Tables are

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[13] The Soil Survey describes Chehulpum, Panther, Pentra, and Steiwer soils as follows:
Chehulpum: "This shallow, well-drained soil is on low foothills in the Willamette Valley. * * * The vegetation in areas not cultivated is mainly * * * Oregon white oak * * * and poison-oak."
Panther: "This deep, poorly drained soil is in swales and on benches of foothills adjacent to valleys of the Willamette River and its tributaries. * * * The native vegetation is mainly * * * Oregon white oak[.]"
Pengra: "This deep, somewhat poorly drained soil is on toe slopes and fans. * * * The vegetation in areas not cultivated is mainly * * * Oregon white oak * * * and poison-oak."
Steiwer: "This moderately deep, well drained soil is on low foothills adjacent to terraces in the Willamette Valley. * * * The vegetation in areas not cultivated is mainly * * * Oregon white oak * * * and poison-oak."

[14] Fletcher, p. 3. See Exhibit 1-3.

available which allow for the determination of 100-year site indices and then cf/ac/yr productivity, as follows[15]:

TABLE 1: SITE INDEX AND PRODUCTIVITY, PONDEROSA PINE

Soil Type	Height	Age (BH)	Site Index (100)	cf/ac/yr (CMAI)
Hazelair	93	52	123	141
Philomath	87	42	131	168
Witzel	92	98	86	78

The absence of published productivity information does not relieve the applicant of the responsibility of providing ponderosa pine productivity data for the Chehulpum, Panther, Pengra, and Steiwer soil units. OAR 660-006-0010 requires that productivity data be a mapping of forest site class or equivalent methodology.

The forest site class system includes site classes from 1 through 7 based on potential yield in cf/ac/yr.[16] "Qualitative" evaluations, even from experts including forestry consultants and soil scientists, do not satisfy the requirement for "objective" site information including a mapping of forest site class or, if published site information is not available, the use of an equivalent method of determining forest site suitability from which a mapping of forest site class can be produced.

Soils in the 43C and 43E complexes that do not have NRCS ratings for forestry have been rated for forestry production. The Hazelair unit has a 50-year site index of 92, the Philomath unit 104, and the Witzel unit 59 for ponderosa pine.[17]

Conversion tables from a 100-year site index to cf/ac/yr are available. See Appendix 3. As the table published in *Establishing and Managing Ponderosa Pine in the Willamette Valley* provides data for tree height and age, it is possible, using a 100-year Ponderosa pine site index table, to arrive at a 100-year site index.[18] Then the 100-year Culmination of Mean Annual Increment table can be used to determine productivity measured in cf/ac/yr.[19]

The applicant's forestry expert has himself measured growth and calculated productivity for ponderosa pine on Philomath soil units in Lane County. His measurements and calculations

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[15] Tables in Fletcher, p. 3, are included at Exhibit 1-3.

[16] See Exhibit 2. The USDA Forest Service Forest Survey Site Class system is incorporated in ODF administrative rule. See OAR 629-610-0020. ODF (consistent with USDA Forest Service and BLM) does not consider lands capable of producing less than 20 cf/ac/yr to be forest lands. Reforestation is not required of Site Class 7 lands.

[17] *Establishing and Managing Ponderosa Pine in the Willamette Valley,* Oregon State University Extension Service, EM 8805, May 2003. See Appendix 1-14.

[18] See Exhibit 5, 5-1 – 5-3.

[19] See Exhibit 5, 5-4 & 5-5.

show that Philomath soil units have a site index of 104 and a potential productivity of 110 cf/ac/yr.[20]

Productivity of the subject property, considering productivity for Ponderosa pine where appropriate, using published data, is shown in the tables below. Site indices and productivity for Douglas-fir are from 50-year site index tables; for ponderosa pine, site indices and productivity are from 100-year site index tables.

Table 2 assumes that the soils on the property - including individual soil units within soil complexes - are planted with the most suitable species, either Douglas-fir or ponderosa pine. Productivity is calculated using published data: for Douglas-fir, Lane County Ratings for the Dixonville, Panther, and Ritner units, State Forester's memo for Rock Outcrop unit, and OSU data for Hazelair, Philomath, and Witzel units.

TABLE 2: POTENTIAL PRODUCTIVITY
DOUGLAS-FIR AND PONDEROSA PINE
PUBLISHED DATA

Unit	Soil Name	Acres	Species	Site Index	Cf/ac/yr	Total productivity cf/ac/yr
41C	Dixonville	3.30	DF	109	152	501.6
41E	Dixonville	18.63	DF	109	152	2,831.8
43C	Dixonville/Philomath/ Hazelair Complex	14.40				
	Dixonville (0.30)	4.32	DF	109	152	656.7
	Philomath (0.30)	4.32	PP	131	168	725.8
	Hazelair (0.25)	3.60	PP	123	141	507.6
	Inclusion -Panther (0.0375)	0.54		na	45	24.3
	Inclusion.-Ritner (0.0375)	0.54	PP	107	149	80.5
	Inclusion-Witzel (0.0375)	0.54	PP	86	78	42.1
	Inclusion-Rock (0.0375)	0.54	-			
43E	Dixonville/Philomath/ Hazelair Complex	10.85				
	Dixonville (0.35)	3.80	DF	109	152	577.6
	Philomath (0.30)	3.26	PP	131	168	547.7
	Hazelair (0.20)	2.17	PP	123	141	306.0
	Inclusion.-Ritner (0.05)	0.54	DF	107	149	80.5
	Inclusion-Witzel (0.05)	0.54	PP	86	78	42.1
	Inclusion-Rock (0.05)	0.54	-			
107C	Philomath	13.77	PP	131	168	2,313.4
113G	Ritner	5.34	DF	107	149	795.7
116G	Rock outcrop/Witzelcomp.[21]	14.90	DF	na	21	313.0

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[20] See Exhibit 15 at 15-15-3, 15-4.

[21] The Soil Survey describes this unit as "70 percent Rock outcrop and 20 percent Witzel very cobbly loam. The components of this unit are so intricately intermingled that is was not practical to map them separately at the scale

	Witzel (0.20)	2.98	PP	86	78	232.4
138E	Witzel	21.42	PP	86	78	1,670.8
	TOTALS	102.61				12249.6

Average Productivity = 12249.6 cubic feet + 102.61 acres = 119.4 cf/ac/yr

CONCLUSION: The subject property is capable of producing well in excess of 85 cf/ac/yr of merchantable timber for a combination of Douglas-fir and ponderosa pine grown in the appropriate soils. The forest productivity test of ORS 197.247(1)(b)(C) is not met.

Table 3 repeats the analysis in Table 2, substituting Setchko's data for ponderosa pine on the Philomath soil units.

TABLE 3: POTENTIAL PRODUCTIVITY
DOUGLAS-FIR AND PONDEROSA PINE
PUBLISHED DATA FOR UNITS OTHER THAN PHILOMATH
SETCHKO DATA FOR PP, PHILOMATH UNITS

Unit	Soil Name	Acres	Species	Site Index	Cf/ac/yr	Total productivity cf/ac/yr
41C	Dixonville	3.30	DF	109	152	501.6
41E	Dixonville	18.63	DF	109	152	2,831.8
43C	Dixonville/Philomath/ Hazelair Complex	14.40				
	Dixonville (0.30)	4.32	DF	109	152	656.7
	Philomath (0.30)	4.32	PP	104	110	475.2
	Hazelair (0.25)	3.60	PP	123	141	507.6
	Inclusion -Panther (0.0375)	0.54		na	45	24.3
	Inclusion.-Ritner (0.0375)	0.54	PP	107	149	80.5
	Inclusion-Witzel (0.0375)	0.54	PP	86	78	42.1
	Inclusion-Rock (0.0375)	0.54	-			
43E	Dixonville/Philomath/ Hazelair Complex	10.85				
	Dixonville (0.35)	3.80	DF	109	152	577.6
	Philomath (0.30)	3.26	PP	104	110	358.6
	Hazelair (0.20)	2.17	PP	123	141	306.0
	Inclusion.-Ritner (0.05)	0.54	DF	107	149	80.5
	Inclusion-Witzel (0.05)	0.54	PP	86	78	42.1
	Inclusion-Rock (0.05)	0.54	-			
107C	Philomath	13.77	PP	104	110	1514.7

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used. Included in this unit are small areas of Nekia and Ritner soils and a soil that is similar to the Witzel unit but is less than 12 inches deep to bedrock. Included areas make up as much as 10 percent of the total acreage."

113G	Ritner	5.34	DF	107	149	795.7
116G	Rock outcrop/Witzel comp.[22]	14.90	DF	na	21	313.0
	Witzel (0.20)	2.98	PP	86	78	232.4
138E	Witzel	21.42	PP	86	78	1,670.8
	TOTALS	102.61				11011.2

Average Productivity = 11011.2 cubic feet ÷ 102.61 acres = 107.3 cf/ac/yr

CONCLUSION: The subject property is capable of producing well in excess of 85 cf/ac/yr of merchantable timber for a combination of Douglas-fir and ponderosa pine grown in the appropriate soils. The forest productivity test of ORS 197.247(1)(b)(C) is not met.

Table 4 replicates Secthko's methodology and data, except that it assumes that all complexes are managed entirely for Douglas-fir and that ponderosa pine is grown only on the 107C Philomath soil unit, with productivity calculated using Setchko's data for ponderosa pine on that unit. As in the Setchko analysis, site index and cf/ac/yr data for the Dixonville/Philomath/Hazelair complexes and the Witzel unit are from the 1990 Office of State Forester memorandum. ***The only difference between this analysis and the one produced by Setchko in his analysis of June 2004 is the assumption that the 107C Philomath unit is managed for ponderosa pine; for all other soil units, productivity in this table is identical to Setchko data.***

TABLE 4: POTENTIAL PRODUCTIVITY
LANE COUNTY RATINGS DATA FOR D/P/H & WITZEL COMPLEXES
SETCHKO DATA FOR PHILOMATH UNITS, PONDEROSA PINE

Unit	Soil Name	Acres	Species	Site Index	Cf/ac/yr	Total productivity cf/ac/yr
41C	Dixonville	3.30	DF	109	152	501.6
41E	Dixonville	18.63	DF	109	152	2,831.8
43C	Dixonville/Philomath/ Hazelair Complex	14.40	DF	med	54	777.6
43E	Dixonville/Philomath/ Hazelair Complex	10.85	DF	med	63	683.6
107C	Philomath	13.77	PP	104	110	1514.7
113G	Ritner	5.34	DF	107	149	795.7
116G	Rock outcrop/Witzel[23]	14.90	DF	low	21	313.0
138E	Witzel	21.42	DF	med	70	1499.4
	TOTALS	102.61				8917.4

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[22] The Soil Survey describes this unit as "70 percent Rock outcrop and 20 percent Witzel very cobbly loam. The components of this unit are so intricately intermingled that is was not practical to map them separately at the scale used. Included in this unit are small areas of Nekia and Ritner soils and a soil that is similar to the Witzel unit but is less than 12 inches deep to bedrock. Included areas make up as much as 10 percent of the total acreage."

[23] The Soil Survey describes this unit as "70 percent Rock outcrop and 20 percent Witzel very cobbly loam. The components of this unit are so intricately intermingled that is was not practical to map them separately at the scale used. Included in this unit are small areas of Nekia and Ritner soils and a soil that is similar to the Witzel unit but is less than 12 inches deep to bedrock. Included areas make up as much as 10 percent of the total acreage."

Average Productivity = 8917.4 cubic feet + 102.61 acres = 86.91 cf/ac/yr

CONCLUSION: The subject property is capable of producing well in excess of 85 cf/ac/yr of merchantable timber for a combination of Douglas-fir and ponderosa pine grown in the appropriate soils. This is the minimum potential productivity for the subject parcel, relying on data found in the Lane County Ratings (which, for the Dixonville/Philomath/Hazelair complexes, improperly assumes zero productivity for the Philomath and Hazelair soils) and data produced by the applicant's own forestry consultant. The forest productivity test of ORS 197.247(1)(b)(C) is not met.

3. Soil Complexes and *Carver*

The staff report asserts that LUBA's decision in *Carver* controls issues pertaining to the treatment of soil complexes, and allows or even requires that the productivity of the complex as a whole be considered rather than the productivity of the individual soil components of the complex.

The issue before LUBA in *Carver* involved the agricultural capability portion of the capability test of ORS 197.247(1)(b)(C), which requires that the "Agricultural Capability Classification System in use by the United States Department of Agriculture Soil Conservation Service on October 15, 1983" be used. LUBA's holding does not extend to the forest portion of the capability test. LUBA in its decision noted that the statute does not impose this requirement on the forest productivity portion of the capability test. *Just v. Lane County,* 49 Or LUBA 456 (2005), n. 11.

The 1987 Soil Survey of Lane County Area, Oregon at p. 368-369 does not identify or list any complexes as "soils."[24] The *Soil Survey* states that a complex includes soils that could not be mapped separately because of the scale used, and explains what a "complex" is:

> "Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes. A complex consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Dixonville-Philomath-Hazelair complex, 3 to 12 percent slopes, is an example."[25]

The *Soil Survey* explains that the objective of mapping is not to delineate pure taxonomic classis but rather to separate the landscape into segments that have similar use and management requirements, and states:

> "If intensive use of small areas is planned, onsite investigation to precisely define and locate the soils and miscellaneous areas is needed."[26]

SCS data as reported in the published *Soil Survey* and on the "green sheets" prior to publication, and NRCS data today both report forest capabilities by the individual components of soil complexes. The "green sheets" look at the individual soils comprising the complex,

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[24] See Exhibit 17.

[25] *Soil Survey* at p. 21. See Exhibit 16-1.

[26] *Soil Survey* at p. 21. See Exhibit 16-1.

assign capabilities to those sub-units, and do not give a productivity rating for the complex as a whole. Similarly, NRCS data lists soils within complexes separately, and gives site indexes and cf/ac/yr ratings for the individual components and not the complex as a whole. See the "green sheets" for the soil complex found on the subject property, and NRCS forest productivity data, which has been introduced into the record.

C. The income test of ORS 197.247(1)(a) is not met

ORS 197.247(1)(a) allows land to be designated as marginal land if "[t]he 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 gross income."

ORS 197.247(5) authorizes counties to use "statistical information compiled by the Oregon State University Extension Service other objective criteria to calculate income[.]" The legislative intent of this provision was to ensure that the marginal lands provisions did not "reward someone who was not industrious." In addressing both the farm and the forest income tests, it is necessary for the applicant to provide objective information regarding the income capability of the farm and forest operations of which the subject property was managed as a part.

As a preliminary matter, it is necessary to address two other issues: what prices should be used, and what is the appropriate growth cycle?

a. 1978-82 prices must be used.

LUBA has held that legislature intended the gross income test under ORS 197.247(1) to be applied based on the five-year period proceeding January 1, 1983. *Just v. Lane County (Carver)*, 49 Or LUBA 456 (2005).

Douglas fir prices rose substantially beginning in 1979, peaking in 1981; and then declined dramatically – more than 16% - by 1983. Prices over the 1978-1982 period averaged about 19.4% higher than in 1983. Using 1983 prices substantially underestimates income potential during the relevant time period.[27]

The applicant's forestry consultant has used 1983 prices in computing potential income. ORS 197.247(1)(a) looks back in time to the 1978-82 period. LUBA in *Carver* pointed out that both the "farm operation" and "forest operation" prongs of the test are specifically linked to January 1, 1983. Tying the test to January 1, 1983 requires that pricing *prior* to the first quarter of 1983 be used, as even first quarter 1983 prices would only begin to apply after January 1, 1983. LUBA further explained that the legislative history is reasonably clear that the legislature intended the gross income test to be applied based on the five-year period *preceding* January 1, 1983.

b. The use of a 50-year growth cycle has not been justified and is not appropriate.

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[27] See Exhibit 8.

The applicant has used a 50-year growth cycle to calculate average gross annual income over the growth cycle. This is predicated on the Board's Direction on Issue 5: "What 'growth cycle' should be used to calculate gross annual income?" in its March 1997 *Supplement to Marginal Lands Information Sheet.* No Lane County interpretation or application of ORS 197.247 or any of its terms or concepts will be due or receive any deference upon review. *Marquam Farms Corp. v. Multnomah County*, 35 Or LUBA 392, 403 (1999) (ORS 197.829 does not require that LUBA defer to county interpretations of state statutes).

LUBA has explained that the choice of the phrase "capable of producing" in ORS 197.247(1)(a) requires the application of an objective test:

> "[T]he choice of the word "capable" requires the application of an objective test in determining a parcel's potential productivity. In other words, that a particular forest operator may use poor management techniques, and thereby cannot produce the requisite income from the parcel over the growth cycle, would not establish that the parcel was not "capable" of producing the requisite income level over the growth cycle. The statutory requirement that the land be "capable" of producing the specified annual income "over the growth cycle" requires an evaluation of the income potential of the property assuming the utilization of reasonable forest management practices over the growth cycle." (Emphasis added). *DLCD v. Lane County (Ericsson),* 23 Or LUBA 33, 36.

An objective test for determining gross annual income averaged over the growth cycle would require selecting a growth cycle that would maximize average annual income over the growth cycle. The applicant and his representatives and experts have not argued that using a 50-year growth cycle would maximize average gross annual income. Rather, they rely entirely on the Board's 1997 directive.

The applicant's forestry consultant, for a similar marginal lands application, has produced reports finding that the use of a 60-year growth cycle would result in a 27.2% higher average gross annual income over the growth cycle than would the use of a 50-yr growth cycle.[28] As will be shown below, a 100-year growth cycle would result in even higher average annual gross income. Application of an "objective test" for determining income capability would require the application of a growth cycle other than 50 years.

c. Calculation of income capability of subject property

The following table shows yield in board feet at growth cycles of 50, 60 and 100 years, by site index of soil types on the subject property, for either Douglas-fir or ponderosa pine as most suited for the specific soil. Data for Douglas-fir is from *The Yield Table of Douglas Fir, Base 50 Years*; for ponderosa pine, *The Yield Table of Ponderosa Pine, Base 100 Years.*[29] For the Philomath unit, productivity is from Setchko measurements in Lane County. For Witzel unit, yield at 50 years is as given by Setcko in his analysis in the record dated June, 2004; site index is from yield tables, rounded down to nearest multiple of 5 for ease of calculation, yield at 60 and 100 years is from table.

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[28] Compare Exhibit 4 in Goal One's submittal of February 9, 2005 – Setchko's calculation of average gross annual income over a 50-year cycle - with Exhibit 5 – Setchko's calculation of average gross annual income for the identical property over a 60-year cycle.

[29] See Exhibit 7.

TABLE 3: YIELD IN BOARD FEET AT GROWTH CYCLES OF 50, 60, AND 100 YEARS

Soil #	Soil name	Site index	Species	Scrib 6" Board Feet/acre, 32' log		
				50 yr	60 yr	100 yr
102C	Panther	na	DF	na	na	na
138E	Witzel	80	DF	10,994	15,278	36,271
113G	Ritner	107	DF	20,988	31,048	70,053
41C	Dixonville	109	DF	21,987	32,287	72,627
52C	Hazelair	123	PP	22,776	31,107	57,990
108C	Philomath	104	PP	11,992	18,155	40,187
116G	Rock/Witzel	na*	DF	3,298	5,034	12,735

* Setcko's value for bf/ac/yr yield is 81% of the yield for Site Index 60 at 50 years. To estimate yields at rotations of 60 and 100 years, the values in the Site Index 60 yield table at 60 and 100 years is multiplied by .81.

The income calculations in the table below are for the subject property only. Data is for Douglas-fir unless otherwise noted. Douglas-fir site indices are 50 years, ponderosa pine 100 years. Productivity data is as used by Setchko in his letter of February 23, 2004, except for ponderosa pine, for which published OSU data is used for Hazelair unit and Setchko data for Philomath unit.[30] Where data is for ponderosa pine, data is in italics. Total volume is computed by multiplying acreage by board feet/acre from Table 3.

TABLE 4: PRODUCTIVITY IN BD. FT. OF SUBJECT PROPERTY

Map #	Soil Name	Acres	Site Index	Scrib 6" Board Feet/acre, 32' log		
				50 yr.	60 yr	100 yr
41C	Dixonville	3.30	109	72,557	106,547	239,669
41E	Dixonville	18.63	109	409,618	601,507	1,353,041
43C[31]	D-P-H complex	14.40				
	Dixonville (0.30)	4.32	109	98,984	139,480	313,749
	Philomath (0.30)	4.32	*104***	*51,805*	*78,430*	*173,608*
	Hazelair (0.25)	3.60	*123**	*100,559*	*134,021*	*250,268*
	Panther incl. (.0375)	0.54	na	-	-	-
	Ritner incl. (.0375)	0.54	107	11,334	16,766	37,829
	Witzel incl. (.0375)	0.54	80	5,607	8,250	19,586
	Rock incl. (.0375)	0.54	--			
43E[32]	D-P-H complex	10.85				

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[30] See Exhibit 9.

[31] The Lane County Soil Survey states: " This unit is 30 percent Dixonville silty clay loam, 30 percent Philomath cobbly silty clay, and 25 percent Hazelair silty clay loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used. Included in this unit are small areas of Panther, Ritner, and Witzel soils and Rock outcrop. Included areas make up about 15 percent of the total acreage."

	Dixonville (0.35)	3.80	109	83,551	122,691	275,983
	Philomath (0.30)	3.26	*104***	*39,094*	*59,185*	*131,010*
	Hazelair (0.25)	2.17	*123**	*49,434*	*67,502*	*125,838*
	Ritner incl. (0.05)	0.54	107	11,334	16,766	37,829
	Witzel incl. (0.05)	0.54	80	5,607	8,250	19,586
	Rock incl. (0.05)	0.54	-			
107C	Philomath	13.77	*104***	*165,130*	*249,994*	*553,375*
113G	Ritner	5.34	107	112,076	165,796	374,083
116G	Rock/Witzel complex	14.90		49,140	75,007	189,752
138E	Witzel	21.42	80	235,549	327,255	776,925
TOTALS		102.61	DF	1,095,357	1,588,315	3,638,032
			PP	*240,892*	*339,138*	*680,724*

* Ponderosa pine, 100 year site index. Data from Fletcher et al., *Establishing and Managing Ponderosa Pine in the Willamette Valley,"EM 8805,* OSU Extension Service, May 2003, p. 3. See Exhibit 1. Site indices from tables at Exhibit 5-2.

** Data from Setchko. See Exhibit 15 at 15-3.

Average annual gross income over the growth cycle is then computed by multiplying the quantities times the average prices over the 1978-82 period. Average prices are found in tables appended as Exhibit 8. Grading assumptions are as recommended by the applicant's forestry consultant: 40% 2S, 50% 3S, and 10% 4S for Douglas-fir, and 40% 4s, 50% 5S, and 10% 6S for ponderosa pine. These grading assumptions are extremely conservative for the 60-year and 100-year rotations, as a greater percentage of higher grades would be expected.

50-YEAR CYCLE

Douglas-fir
40% 2S = 438,143 bf x $316/mbf= $ 138,453
50% 3S = 547,679 bf x $268/mbf= $ 146,778
10% 4S = 109,536 bf x $235/mbf= $ 25,741
Ponderosa pine
40% 4S = 96,357 bf x $245/mbf= $ 23,607
50% 5S = 120,446 bf x $213/mbf= $ 25,655
10% 6S = 24,089 bf x $197/mbf= $ 4,746
$ 364,980 ÷ 50 = **$7,300 per year**

Managed on a 50-year growth cycle, the subject 102.61 acre subject property is capable of producing an average, over the growth cycle, of $11,873 in annual gross income.

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[32] The Lane County Soil Survey states: " This unit is 35 percent Dixonville silty clay loam, 30 percent Philomath cobbly silty clay, and 20 percent Hazelair silty clay loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used. Included in this unit are small areas of Ritner and Witzel soils and Rock outcrop. Included areas make up about 15 percent of the total acreage."
"

60-YEAR CYCLE

Douglas-fir		
40% 2S =	635,326 bf x $316/mbf=	$ 200,763
50% 3S =	794,158 bf x $268/mbf=	$ 212,834
10% 4S =	158,832 bf x $235/mbf=	$ 37,326
Ponderosa pine		
40% 4S =	135,655 bf x $245/mbf=	$ 33,235
50% 5S =	169,569 bf x $213/mbf=	$ 36,118
10% 6S =	33,914 bf x $197/mbf=	$ 6,681
		$ 526,957 ÷ 60 = **$8,783 per year**

100-YEAR CYCLE

Douglas-fir		
40% 2S =	1,455,213 bf x $316/mbf=	$ 459,847
50% 3S =	1,819,016 bf x $268/mbf=	$ 487,496
10% 4S =	363,803 bf x $235/mbf=	$ 85,494
Ponderosa pine		
40% 4S =	272,290 bf x $245/mbf=	$ 66,711
50% 5S =	340,362 bf x $213/mbf=	$ 72,497
10% 6S =	68,072 bf x $197/mbf=	$ 13,410
		$1,185,669 ÷ 100 = **$11,857 per year**

CONCLUSION: The 102.61 acre subject property was capable of producing an average, over the growth cycle, of over $10,000 in annual gross income assuming the property were to be managed for a combination of Douglas-fir and ponderosa pine on appropriate soils over a 100-year growth cycle, applying average log prices during the period 1978-82.

Productivity data for Douglas-fir is that used by Setchko; yields at 60 and 100 years are taken from published yield tables. Productivity data for ponderosa pine on the Philomath unit is based on on-site measurements and calculations performed by Setchko. Productivity data for ponderosa pine on the Hazelair unit is based on published OSU data.

d. Income capability of adjacent property

In addition, potential income from other lands, income from the adjacent 12.239-acre adjacent parcel which was managed as part of the forest operation must also be considered. The calculations are provided below. For the 50-year growth cycle, with the exception of data for ponderosa pine, productivity data is that used in Setchko's analysis as reported in the letter from Hershner Hunter to the Lane County Department of Land Management dated June 3, 2005. Setchko data is used for ponderosa pine data. Where otherwise not available, site indices are based on Setchko board foot yield figures at 50 years provided in the Hershner Hunter letter of June 3, 2005.[33] For Douglas-fir, for ease and simplicity in calculating yields at 60- and 100-year growth cycles, site indices were rounded to the nearest multiple of 5 (e.g., 81 is rounded down to 80) which results in a conservative estimate.

TABLE 5: YIELD IN BOARD FEET AT GROWTH CYCLES OF 50, 60, AND 100 YEARS

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[33] See Exhibit 7.

Soil #	Soil name	Site index	Species	Scrib 6" Board Feet/acre, 32' log		
				50 yr	60 yr	100 yr
31	Coberg	80	DF	10,208	15,278	36,271
75	Malabon	130	DF	34,191	47,423	100,719
96	Newberg	120	DF	29,252	40,583	87,835
118	Salem	115	DF	25,443	37,250	81,329
107C	Philomath	104	PP	11,992	18,155	40,187
138E	Witzel	80	DF	10,994	15,278	36,271

The income calculations in the table below are for the adjacent property. Data is for Douglas-fir unless otherwise noted. Douglas-fir site indices are 50 years unless otherwise noted; ponderosa pine 100 years. Productivity data is highest productivity as reported by Setchko in his letter of February 23, 2004, except for ponderosa pine, for which published data is used. Where data is for ponderosa pine, data is in italics. Total volume is computed by multiplying acreage by board feet/acre from Table 3.

TABLE 6: PRODUCTIVITY IN BD. FT. OF ADJACENT PROPERTY

Map #	Soil Name	Acres	Site Index	Scrib 6" Board Feet/acre, 32' log		
				50 yr.	**60 yr**	**100 yr**
31	Coberg	2.6	80	26,541	39,723	94,305
75	Malabon	3.2	130	109,411	151,754	322,301
96	Newberg	1.8	120	52,654	73,049	158,103
118	Salem	0.1	115	2,544	3,725	8,133
107C	Philomath	3.8	*104*	*45,570*	*68,989*	*152,711*
138	Witzel	1.0	80	10,994	39,723	94,305
TOTALS		12.5	DF	202,144	307,974	677,147
			PP	*45,570*	*68,989*	*152,711*

Average annual gross income over the growth cycle is then computed by multiplying the quantities times the average prices over the 1978-82 period. Average prices are found in tables appended as Exhibit 8. Grading assumptions are as recommended by the applicant's forestry consultant: 40% 2S, 50% 3S, and 10% 4S for Douglas-fir, and 40% 4s, 50% 5S, and 10% 6S for ponderosa pine. These grading assumptions are extremely conservative for the 60-year and 100-year rotations, as a greater percentage of higher grades would be expected.

50-YEAR CYCLE

Douglas-fir			
40% 2S =	80,858 bf x $316/mbf=	$	25,551
50% 3S =	101,072 bf x $268/mbf=	$	27,087
10% 4S =	20,214 bf x $235/mbf=	$	4,750
Ponderosa pine			
40% 4S =	18,228 bf x $245/mbf=	$	4,466
50% 5S =	34,495 bf x $213/mbf=	$	7,347
10% 6S =	4,570 bf x $197/mbf=	$	900
		$	70,101 ÷ 50 = **$1,402 per year**

Managed on a 50-year growth cycle, the subject 102.61 acre subject property is capable of producing an average, over the growth cycle, of $11,873 in annual gross income.

60-YEAR CYCLE

Douglas-fir			
40% 2S =	123,190 bf x $316/mbf =	$ 38,928	
50% 3S =	153,987 bf x $268/mbf =	$ 41,269	
10% 4S =	30,797 bf x $235/mbf =	$ 7,237	
Ponderosa pine			
40% 4S =	27,596 bf x $245/mbf =	$ 6,761	
50% 5S =	34,495 bf x $213/mbf =	$ 7,347	
10% 6S =	6,899 bf x $197/mbf =	$ 1,359	
		$ 102,901	÷ 60 = **$1,715 per year**

100-YEAR CYCLE

Douglas-fir			
40% 2S =	270,859 bf x $316/mbf =	$ 85,591	
50% 3S =	338,574 bf x $268/mbf =	$ 90,738	
10% 4S =	67,715 bf x $235/mbf =	$ 15,913	
Ponderosa pine			
40% 4S =	61,084 bf x $245/mbf =	$ 14,966	
50% 5S =	76,356 bf x $213/mbf =	$ 16,264	
10% 6S =	15,271 bf x $197/mbf =	$ 3,008	
		$ 226,480	÷ 100 = **$2,265 per year**

e. Income capability of forest operation

To arrive at the total income capability of the forest operation, the potential income of the subject property and the adjacent property must be combined:

TABLE 7
TOTAL ANNUAL GROSS INCOME OF FOREST OPERATION AVERAGED OVER 50-, 60-, AND 100-YEAR GROWTH CYCLES

	50 YR	60 YR	100 YR
Subject property	$ 7,300	$ 8,783	$11,857
Adjacent property	$ 1,029	$ 1,261	$ 1,615
TOTAL INCOME	**$ 8,329**	**$10,044**	**$13,472**

As is seen in Table 7, the subject 102.61-acre property managed in conjunction with the adjacent 12.4-acre adjacent property as part of the forest operation, was capable of producing an average, over the growth cycle, of over $10,000 in annual gross income, assuming the forest operation were to be managed for a combination of Douglas-fir and ponderosa pine on appropriate soils over both 60- and100-year growth cycles, applying average log prices during the period 1978-82.

Productivity data for Douglas-fir is that used by Setchko, with yields at 60 and 100 years taken from published yield tables. Productivity data for ponderosa pine on the Philomath unit is based on on-site measurements and calculations performed by Setchko. Productivity data for ponderosa pine on the Hazelair unit is based on published OSU data.

Using a 50-year growth cycle results in substantially less income, averaged over the growth cycle, than does using a 60-year or a 100-year growth cycle.

CONCLUSION: INCOME TEST

The forest operation was capable of producing in excess of $10,000 in gross annual income averaged over growth cycles of 60, and 100 years if managed for a combination of Douglas-fir and ponderosa pine on appropriate soils.

While the calculations have not been carried out here, it is apparent that the $10,000 income threshold would be exceeded applying a 100-year growth cycle even were all the soils within the Dixonville/Philomath/Hazaelir complexes – which comprise approximately 25% of the soils on the subject property – to be managed entirely with Douglas-fir rather than with a combination of Douglas-fir and ponderosa pine. Similar results could possibly or probably be seen applying growth cycles of 70, 80, or 90 years.

As the income test established by ORS 197.247(1)(a) is not met, the request to redesignate the subject property as marginal lands must be denied.

IV. CONCLUSION

Approval of the request requires findings of compliance with one or more of the tests established by ORS 197.247(1)(b). The applicant argues that the proposal complies with ORS 197.247(1)(b)(A) and (C).

50 percent of the proposed marginal land plus the lots or parcels at least partially located within one-quarter mile of the perimeter of the proposed marginal land did not consist of lots or parcels 20 acres or less in size on July 1, 1983. The "parcel size" test of ORS 197.247(1)(b)(A) is not met.

The subject property is capable of producing in excess of 85 cf/ac/yr standard established by forest productivity test of ORS 197.247(1)(b)(C). The "forest productivity" test is not met.

The subject forest operation was capable of producing an average, over the growth cycle, of well over $10,000 in annual gross income, if managed for a mix of Douglas-fir and ponderosa pine on appropriate soils at both 60- and 100-year growth cycles.

As this "marginal lands" request fails to meet the forest income test of ORS 197.247(1)(a), and also fails to meet any of the tests established by ORS 197.247(1)(b), the request must be denied.

Goal One, Mr. Just, LandWatch Lane County, and Mr. Emmons and Ms. Lovinger request notice of and a copy of any decision and findings regarding this matter.

Respectfully submitted,

Jim Just
Executive Director

EXHIBITS

Exhibit	**#**	**Pages**
Establishing & Managing Ponderosa Pine	1	1-1 – 1-16
Forest Survey Site Class Table	2	2-1
NRCS Forest Productivity Table, Lane County	3	3-1 – 3-2
Soil Interpretations Records ("Green Sheets")	4	4-1 – 4-4
Ponderosa pine site index tables	5	5-1 – 5-3
CMAI Tables for ponderosa pine	5	5-4 – 5-5
Yield tables showing yield at various cycles	6	6-1 – 6-2
Yield tables for Douglas-fir & ponderosa pine	7	7-1 – 7-12
Douglas-fir log prices 1978-1982 & 1983	8	8-1 – 8-6
Setcko letter of 2/23/04 showing potential productivity	9	9-1 – 9-4
Successful Reforestation: An Overview	10	10-1 – 10-8
Example: Parcel Size Test	11	11-1
DLCD explanation of Marginal Lands bill	12	12-1 – 12-12
DLCD letter of advice re "parcel size" test	12	12-13 – 12-14
Email from Kevin Birch re merchantability of pp	13	13-1
Lane County Soil Ratings, excerpts	14	14-1 – 14-4
Setchko calculation of pp site index & productivity	15	15-1 – 15-5
NRCS explanation of soil complexes	16	16-1
NRCS listing of Lane County soils	17	17-1 – 17-3
Email from Joe Misek re King & McArdle tables	18	18-1

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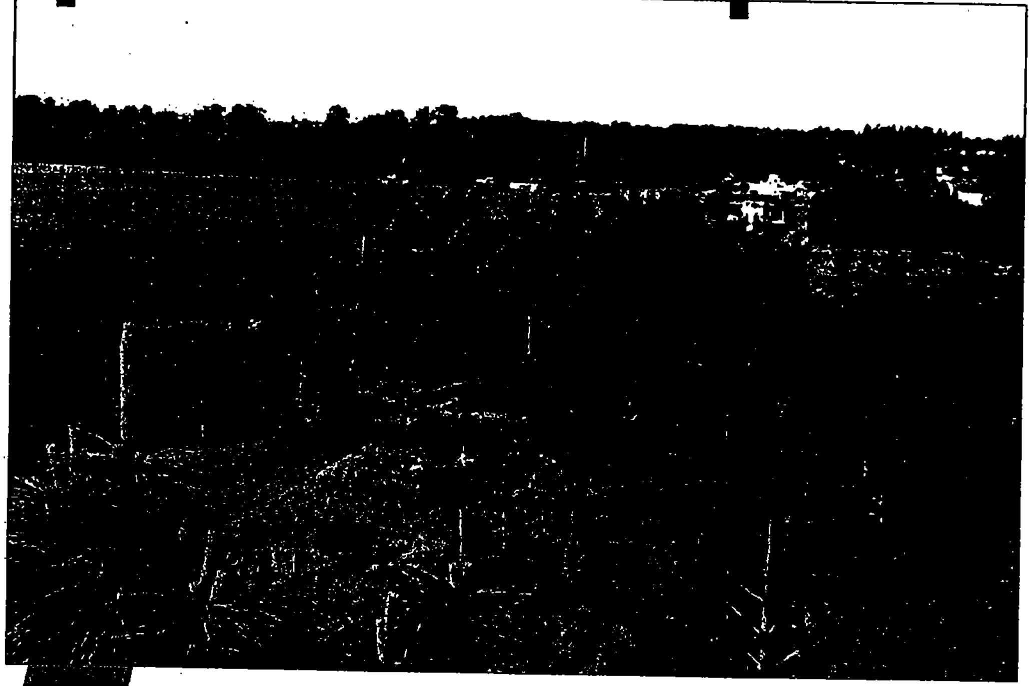
EXHIBIT 1

Establishing & managing ponderosa pine



in the Willamette Valley

OREGON STATE UNIVERSITY
EXTENSION SERVICE

1-1

Rick Fletcher examines a 2-year-old planting of Willamette Valley pine near Elkton, OR.

Contents

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An overview of Willamette Valley ponderosas

R. Fletcher and D. Hibbs

Many people are surprised to learn that ponderosa pine (*Pinus ponderosa*), a common tree east of the Cascade Mountains, also is native to the Willamette Valley in western Oregon. No one is quite sure how ponderosa got into the Willamette Valley, but the local race is genetically different from those growing east of the Cascades.

This management guide will describe what is known about this unique race of ponderosa pine, how to establish, manage, and protect it on rural and urban sites in the Willamette Valley, and how to harvest and market ponderosa pine timber.

Figure 1.—An old-growth ponderosa pine logging operation near Lebanon, OR in 1912.

History of ponderosa pine in the Willamette Valley

The year was 1852, and white settlement of the Willamette Valley was well underway. The town of Monroe was just getting its start with a new water-powered sawmill. The mill's records indicate that it cut ponderosa pine exclusively for several years until the supply ran out.

Other reports and studies of ponderosa pine in the Valley picture ponderosa in scattered pure stands or mixed in groves with Douglas-fir, ash, and oak. Two studies using pollen counts in deep cores from Valley bogs track pines' presence for the last 7,000 to 10,000 years. The hypothesis is that lodgepole was the dominant pine until about 7,000 years ago when a major climate shift removed lodgepole and brought in ponderosa. Pollen counts covering these 7,000 years indicate that ponderosa pine, while widespread across the Valley, has never been the dominant vegetation type.

Undoubtedly there is some connection between indigenous peoples' practice of burning and the distribution of pine in the Valley at time of white settlement. Ponderosa pine is very common in other fire-impacted landscapes and is quite tolerant of ground fires, especially when the trees are mature. The frequent ground fires set by native peoples very likely resulted in the widely spaced groves of "yellow pines" (ponderosas), surrounded by grass prairie, which confronted early settlers.

Surveyors, botanists, and historians in the 1850s recorded yellow pines in oak woodlands, on areas subject to flooding, and on foothill slopes and ridges where they were widely spaced and mixed with oak and Douglas-fir. These open stands have been called savannahs.

1-3

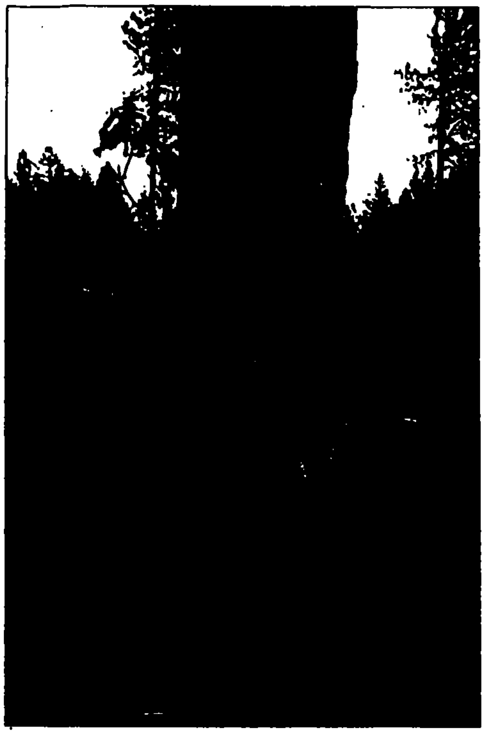


Figure 2.—Old-growth ponderosa pine on private forestland near Brownsville, OR.

Willamette Valley ponderosa's genetic difference from ponderosa east of the Cascades was the focus of a pine-race study begun in 1928 by Thornton Munger and T.J. Starker. The study featured seed sources from throughout the western United States, planted on six field sites. Included were seven sources east of the Cascades and three westside sources. The latter included Peoria (south of Corvallis, along the Willamette River); El Dorado, California, in the Sierras south of Sacramento; and Steilacoom, Washington, near Olympia.

The latest measurement of the study, completed by Roy Silen, found that after 65 years, only the westside sources were still alive and actively growing at the Willamette Valley test site on McDonald Forest, near Corvallis. Trees from eastside sources all appeared poorly adapted for the weather and pest conditions in the Willamette Valley.

The bottom line is that one should not plant ponderosa pine trees from eastside seed sources in the Willamette Valley. While the trees may survive 15 to 20 years, they aren't likely to reach mature size and may become carriers for all sorts of pine pests.

Another lesson from the Willamette Valley test site is that even the trees from westside sources that were still living were not doing very well. This might be expected because the McDonald Forest site was not on a soil and exposure common for pine in the Willamette Valley.

Concern about the dwindling supply of native Willamette Valley ponderosa pines, and the realization that the local source could not be replaced with eastside sources, led to the formation of the Willamette Valley Ponderosa Pine Conservation Association, in 1996.

A group of local foresters, landowners, and scientists had been studying the local pines for 15 years and had begun propagating local parent sources. The Association seeks to further this work in restoring ponderosa pine to the Willamette Valley through research, education, and increased availability of seed from the local race of pines. To date, more than 900 native stands have been mapped, and about 150 individual sources have been grafted into a seed orchard near St. Paul, Oregon.

The Association's work will be complete when landowners can buy native planting stock readily and when research has shown how best to plant and grow this tree.

Figure 3.—Principals in the Willamette Valley Ponderosa Pine Conservation Association admire the Robert H. Mealey gene conservation planting of Willamette Valley ponderosas at the State of Oregon seed orchard near St. Paul, OR.

Ponderosa pine growing sites in the Willamette Valley

Ponderosas grow on a wide variety of both rural and urban sites throughout the Willamette Valley. Native groves are in Beaverton, in parks and on the grounds of such prominent businesses as Nike. Scattered trees and small groves are found on neglected bottomland farm sites the whole length of the Valley. Along riverbanks, it often is associated with black cottonwood, ash, or bigleaf maple. In the foothills, ponderosas occupy the harshest of forest sites, where Douglas-fir and other species cannot dominate. On sites suitable for other conifers, ponderosa may grow for some time but eventually is shaded out by the taller, more dominant species. Commonly, ponderosas are found in association with Oregon white oak and many times in thick patches of poison-oak.

Native ponderosas are commonly found on three general soil types:

1. Poorly drained, heavy clay soils on the Valley bottom or in the low foothills
2. Shallow, rocky clay soils in the Valley foothills
3. Well-drained, sandy soils in the flood plain of the Willamette River and its tributaries

These soil types represent the low end of growth potential for ponderosa pine. It grows better on soils with good drainage and depth.

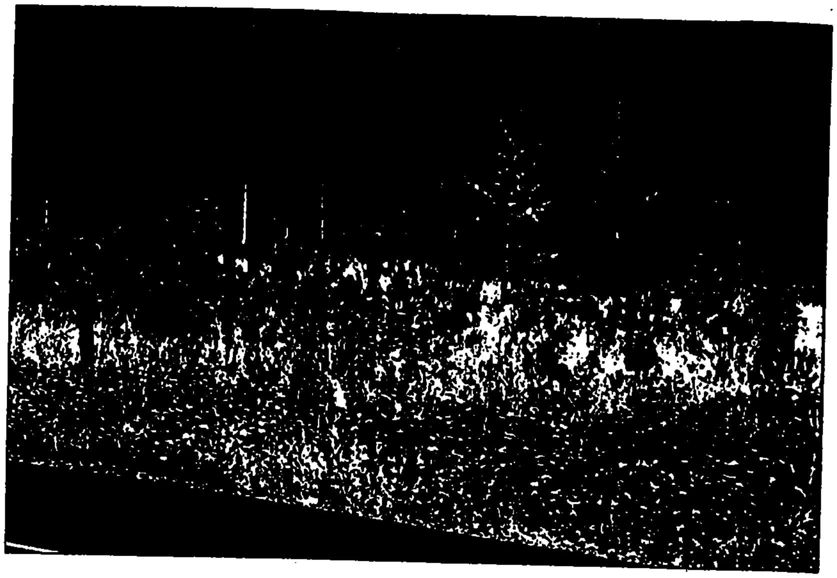


Figure 4.—Ponderosa pine replaces Douglas-fir on a typical, wet Willamette Valley site.

Benefits of planting Valley ponderosa pine

Willamette Valley ponderosa pine plantings can meet a number of objectives that include producing valuable wood, filling the need for a stately conifer in an urban setting, and restoring woodland and riparian habitat.

Wood production

Wood from Willamette Valley ponderosa pine was an important building material for the settlers in the Valley in the 1840s and 1850s. Next to Douglas-fir, ponderosa pine has been the most widely used species for wood products in Oregon during the past 150 years. Most of it has come from eastern and southern Oregon; however, new plantings in the Willamette Valley have the potential to once again fuel a ponderosa-pine-based wood industry later in this century. Excellent growth rates and good wood quality will make maturing plantings in the Willamette Valley an attractive option for wood purchasers in the future.

Ornamental trees

Most native conifers in the Willamette Valley are poorly suited to urban uses. Not so, however, with ponderosa pine. Its deep rooting structure, tolerance of drought and

Figure 5.—Ten-year-old Valley ponderosa agro-forest on Rising Oak Ranch near Lebanon, OR. Spacing is 9 feet between trees and 18 feet between rows.

1.5

flooding, and stately form make it an ideal choice for parks, schools, factories, and other urban locations where a large conifer is desired. Many fine specimens are in urban areas such as Eugene (Figure 6) and Beaverton.

Habitat restoration

Habitat restoration is the order of the day for streams, rivers, and oak savannahs throughout the Willamette Valley.

Ponderosa grew historically in much of this habitat, so it is only natural that it would be a key species to reestablish. On the dry knobs and prairies, ponderosa is being intermingled with oaks and firs. In riparian areas or wet clay soils, it is planted alone or mixed with ash, maple, oak, and cottonwood.

One of the main features it offers for these habitat plantings is a long-lived conifer that will provide nesting, shade, and other habitat features while living and large woody debris for a healthy riparian system after it dies.

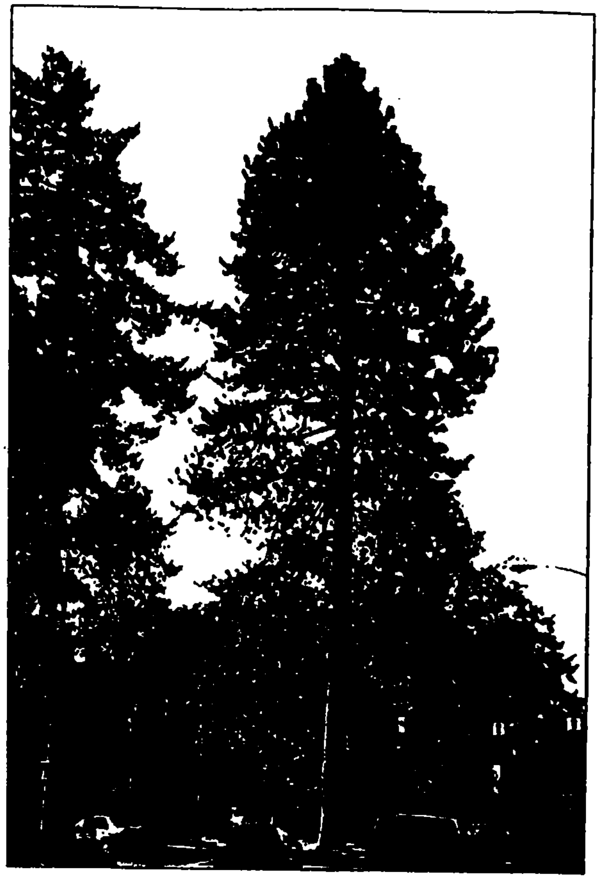


Figure 6.—Mature ponderosa pines thrive on city streets in Eugene, OR.

Figure 7.—Ponderosa pine planted in a riparian restoration project near Brownsville, OR.

1-6

2

Managing a new ponderosa pine plantation

H. Dew and B. Kelpsas

Attention to the details of site preparation, stock type selection, and plantation maintenance is probably more critical in establishing Valley ponderosa pine than any other species planted west of the Cascades. This is because of the tough sites that ponderosa pine is expected to occupy.

No other tree is asked to survive and grow in conditions as adverse as these. From rocky, dry, and poison-oak-infested south slopes to marshy, heavy clay that cracks wide open in summer, sites that won't grow another commercial tree are typically where this durable species is planted.

For more information on site preparation and general reforestation topics, refer to OSU Extension publications EC 1188, "Site Preparation: An Introduction for Woodland Owners"; EC 1498, "Successful Reforestation: An Overview"; EC 1504, "The Care and Planting of Tree Seedlings on Your Woodland"; EC 1196, "Selecting and Buying Quality Seedlings"; and PNW 33, "Plant Your Trees Right" (see page 39).

Site selection

Many times the search is for a tree that will grow on a site where a planting has already failed. It is true that ponderosa pine will grow in a flood-prone area, but is this really the place to grow trees at all? Often, the best sites are reserved for more profitable species such as Douglas-fir or western redcedar, as well they should be, but ponderosa will do very well on some good sites and may be the best choice for them. If you have questions about your site's suitability for growing ponderosa pine, contact your local office of the OSU Extension Service or Oregon Department of Forestry.

Figure 8.—Pine shelterwood unit near Brownsville, OR, cleared of debris and ready for planting.

Site preparation

Site preparation is the most important step in reforestation with any species. Improper site preparation results in poor growth and a much higher risk of plantation failure. More tree-planting failures can be attributed to poor site preparation than to any other cause.

At the very least, make sure the site is free of weeds and grass for the first few years. Competing vegetation places moisture stress on newly planted trees with poorly established roots and is a primary cause of plantation failure. Whether you use herbicides, mulch mats, or hoeing, you must control vegetation to ensure the seedlings' survival and growth. An adequate

1.7

Figure 9.—One-year-old container seedling at Kintigh's Nursery, Springfield, OR.

weed-free space around each tree generally is thought to be a radius of about 2 to 3 feet for the first 3 years.

The secondary cause of plantation failure is girdling damage caused by rodents that use the grass for cover (see Chapter 7). Vegetation control is the best way to prevent rodent damage.

Site preparation sprays

The best feature of site preparation sprays compared to herbicide applications after planting is that they involve little risk to seedlings you will plant later. You also have more flexibility in timing sprays when weather is favorable.

In applying any herbicide, follow the instructions on the label regardless of what is said elsewhere, including in this publication. The herbicide label is the legal guide to how that chemical may be used. Also, you must notify the Oregon Department of Forestry any time you plan to apply an herbicide on forestland, and you might also have to be licensed by the Oregon Department of Agriculture. In addition, you must report any pesticide use on your forestland annually to the Oregon Department of Forestry.

[illegible]

Chemical name	Target vegetation
glyphosate	Deciduous brush, grasses, forbs, bracken fern
imazapyr	Maples, madrone, deciduous brush and trees
atrazine	Annual grasses, grass and forb germinants
2,4-D	Alder, madrone, manzanita, thistles, and forbs
metsulfuron	Blackberries (*Rubus* spp.), ferns, deciduous brush
triclopyr	Blackberries, Scotch broom, evergreen brush
sulfometuron	Grasses and forbs; suppresses blackberries
clopyralid	Thistles, some forbs, elderberry
hexazinone	Established grasses and forbs

Table 1 lists the most common herbicides used for site preparation in ponderosa plantings.

Glyphosate and products like imazapyr work well on most species but are weaker on blackberries. Products such as metsulfuron and triclopyr often are added to spray mixes to improve blackberry control. These commonly are applied in midsummer or fall before planting. Evergreen weed species such as Scotch broom, snowbrush, manzanita, and madrone are best treated with triclopyr, imazapyr, or 2,4-D from spring through summer.

Herbaceous weeds also can be controlled for the following growing season by adding sulfometuron to the fall site-preparation mix. Pine seedlings planted the following spring can develop in relatively weed-free environments. Table 1 gives more detail on target vegetation.

Planting considerations

The two stock types are containerized and bareroot. Both come in many different sizes; generally, the biggest are best. Containerized seedlings have many advantages. One of the best is that timed-release fertilizer can be incorporated into the planting medium to give the tree a boost the first year after planting. This is a great benefit on some of the poor sites where ponderosa is expected to grow. Also, containerized trees generally are easy to plant and suffer less transplant shock than bareroot seedlings.

The disadvantages to using containerized trees are (a) their high cost relative to size and (b) the seedlings' vulnerability to animal browsing, because they tend to have more lush growth. Sometimes container seedlings must have tubelike tree protectors, which can be as expensive as the seedlings to purchase and install.

Bareroot seedlings can be cheaper to purchase, but are often hard to find due to the current shortages of seed and the unwillingness of many purchasers to wait two seasons for their seedlings versus one for container seedlings.

Seed sources are particularly important. Be sure to ask whether the parent seed was truly Willamette Valley ponderosa pine seed. Seed from eastside sources will not grow well on the westside, as many plantations have proved.

Whether the seed comes from the north or the south Valley doesn't seem to make a large difference. Getting a source that is close to your plantation site is, however, highly desirable.

Until the Willamette Valley ponderosa pine seed orchard at St. Paul begins to produce seed, infrequent wild crops are still the only source for local nurseries, so seedling availability may be an issue for the next 5 years or so. When the orchard begins to produce seed, it will be the best available.

Use pesticides safely!

- **Wear** protective clothing and safety devices as recommended on the label. **Bathe or shower** after each use.
- **Read the pesticide label**—even if you've used the pesticide before. Precisely follow label instructions (and any other instructions you have).
- **Be cautious** when you apply pesticides. Know your legal responsibilities as a pesticide applicator. You may be liable for injury or damage resulting from your pesticide use.

Figure 10.—Mixed plantings of ponderosa pine and Douglas-fir might be a good idea on sites where there is a question about which species is better suited.

Plantation spacing depends on management goals. Plant in a way that gives you the most flexibility for future management decisions:

- Will you manage for an uneven-age or an even-age stand?
- Do you want a mixed-species stand?
- What is the site's carrying capacity?
- Will the stand be thinned later?

Discuss these questions with your OSU Extension forester or a forestry consultant *before* planting. Common spacing for newly planted ponderosa pine plantings is about 10 to 12 feet apart.

Vegetation management around newly planted ponderosa pines

No matter which type of stock you choose to plant, controlling competing vegetation around newly planted trees is essential for good survival and growth. Strategies to manage competing vegetation involve physical removal through scalping or tilling, treated paper or other mats that smother competing weeds, and herbicides. For more information on weed control, refer to the current edition of the "Pacific Northwest Weed Management Handbook" (see page 39).

Figure 11.—Blackberry competition has left this ponderosa pine seedling deformed and weak.

Scalping or tilling to control vegetation can be effective if you are persistent and if you remove the vegetation in a way that does not damage the tree seedlings' tops or roots.

Scalping works best before the trees are planted. Tillage can work before planting and up until the tree roots begin to invade the scalped area.

One disadvantage of tillage is that it tends to leave competing weeds closest to the trees. Treated paper or other mats can be effective around newly planted trees if they are properly installed and maintained. Their main drawbacks are high cost and the fact that they sometimes provide cover for mice, which will girdle the young trees.

Ponderosa pine is more sensitive than Douglas-fir to many herbicides used in forestry. In addition, various surfactants and oils that are added to spray mixtures can increase the risk of pine damage.

[illegible] herbicides
[illegible] tolerance for selected [illegible]

Chemical name	Pine tolerance [1]	Use over pine?
atrazine	excellent	yes
imazapyr	marginal [2]	site prep only
metsulfuron	poor	site prep only
triclopyr	poor	no – only as directed spray
2,4-D	poor to fair	possible but risky
sulfometuron	good	yes
glyphosate [3]	fair to good	yes
clopyralid	excellent	yes
hexazinone	excellent	yes

[1] Herbicide injury is variable and is highly dependent on rate, timing, and tree condition.

[2] Imazapyr products can reduce shoot growth the next growing season.

[3] Some glyphosate products contain surfactant, which increases the risk of damaging pine.

Take care when using herbicides over seedlings, to avoid injury or death. In many cases, vegetation management around pine involves balancing seedling injury with weed control.

Two spraying strategies for controlling weeds around newly planted ponderosas are:

- Directed spraying, and
- Broadcast release applications

Directed spraying

Directed spraying uses herbicides in a spray directed around seedlings but not contacting them. Spot spraying with backpack sprayers is an example. Using a spray shield is another technique. The risk of injury is limited to seedlings that are sprayed or are overdosed through the soil. This method also allows you to use non-selective herbicides and a much wider effective spraying window of time.

Herbaceous weeds can be controlled effectively at any time with spot applications of glyphosate around seedlings. Since glyphosate has no soil activity, overdosing through the root system is not a risk. Often, glyphosate can be mixed with soil-active herbicides to give longer lasting pre-emergent activity. Using this treatment with spring residual soil-active products such as sulfometuron, atrazine, or hexazinone requires precise sprayer calibration and application in order to avoid damaging seedlings through the soil. Be very careful to keep glyphosate off the foliage, however; it is toxic to the plant.

Blackberries and Scotch broom are often problems on Valley sites. Both are treated effectively with directed foliar spot applications of triclopyr. Unfortunately, pine is extremely sensitive to any triclopyr spray drift, and triclopyr ester is volatile at warmer temperatures, so take care.

Blackberries are best treated in fall after conifer budset. Scotch broom can be treated any time during the growing season, but applications before conifer budbreak or after budset in the fall may be safer for trees.

1-10

Other evergreen species such as madrone, manzanita, and snowbrush also can be treated with a directed spray of triclopyr, 2,4-D, or imazapyr. However, these products can damage pine and should be used only as a site preparation or spot treatment. Larger weeds that cannot be efficiently controlled with a foliar spray from a backpack unit may be treated individually with a basal-bark application of triclopyr in an oil carrier.

Deciduous plants such as poison-oak, deerbrush, hazel, and bracken fern are sensitive to mid- to late summer foliar applications of glyphosate and/or imazapyr in water. Avoid spraying over pine, even though it has some tolerance to glyphosate (see the section on broadcast release applications, below). Maples and other hardwoods or brush often can be treated with a hack-and-squirt application using imazapyr, glyphosate, or triclopyr amine.

Broadcast release applications

Another strategy for vegetation control uses herbicides selectively over seedlings in a calibrated broadcast treatment. Application methods include helicopter, backpack waving wand, meter jet, and backpack with flat-fan spray tips.

This strategy might give the most complete weed control, but it also carries the greatest risk of damaging pine seedlings. In addition, not all herbicides can be used selectively over pine. Table 2 shows pine tolerance to foliar-applied herbicides.

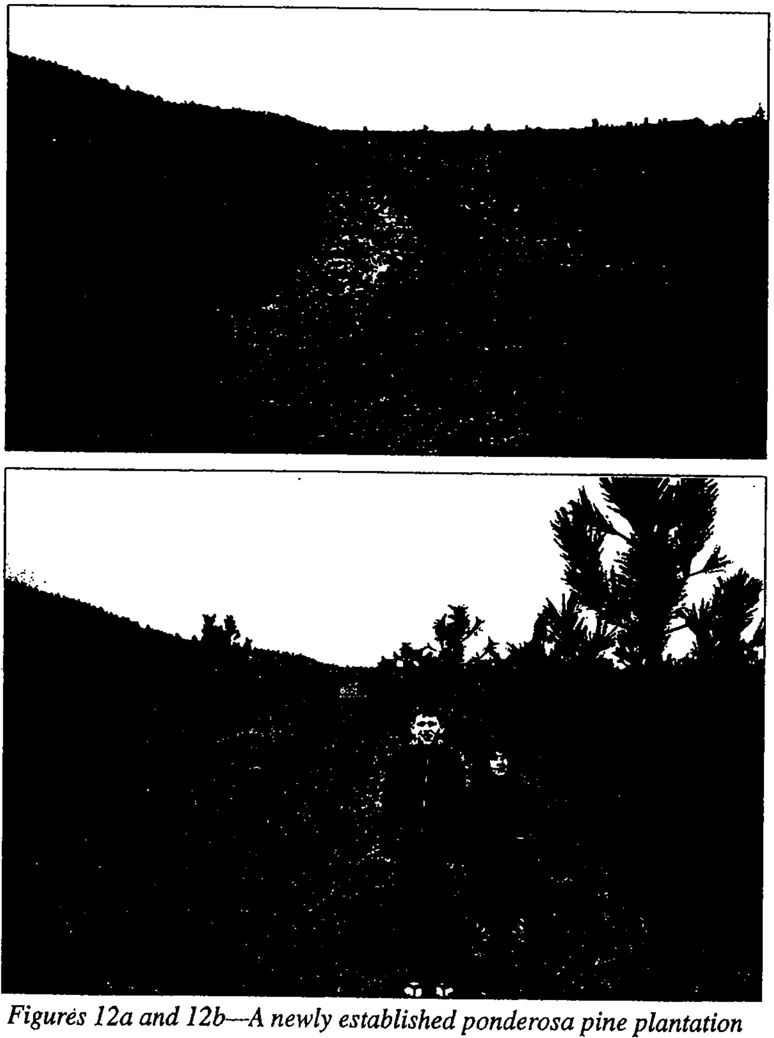
Broadcast release treatments for herbaceous weeds can be made selectively over newly planted or established pine with atrazine, sulfometuron, or hexazinone in spring before conifer budbreak.

Atrazine is least likely to injure pine but also has limited ability to control established vegetation. Ponderosa pine is extremely tolerant to hexazinone, which is a good choice on sites that have perennial grasses and forbs. Sulfometuron gives intermediate vegetation control; higher rates can affect seedling development temporarily on some sites.

Tank-mixes of these herbicides are effective and can help reduce per-acre costs. Note that all these products are soil active, so precise calibration is important to avoid overdosing seedlings.

Glyphosate products that contain no surfactant can be applied at reduced rates in spring before budbreak over established (second-year) seedlings. In western Oregon, sulfometuron also can be used over pine in spring or fall to suppress blackberries. Mixtures of sulfometuron and glyphosate as fall blackberry treatments may be a reasonable substitute for damaging triclopyr applications.

Thistles and some broadleaf plants are sensitive to clopyralid. Applications can be made at any time because clopyralid has little activity on pine or other conifers at any growth stage. Clopyralid has been a good addition to atrazine, sulfometuron, or hexazinone during spring weed control programs and makes a good substitute for the more injurious 2,4-D.



Figures 12a and 12b—A newly established ponderosa pine plantation near Lebanon, OR (top) and after five growing seasons (above).

Release applications of 2,4-D over pine have been made but usually cause some injury. Damage can range from mild to severe depending on weather, seedling growth stage, and spray adjuvants, among other variables.

Avoid adding oils or surfactants to spray mixes to improve selectivity. Spring treatments target madrone, manzanita, alder, and forbs. Since 2,4-D is the only herbicide for broadcast release pine programs on evergreen brush, some conifer injury may be acceptable. Applications in early spring before candle elongation or in fall after budset can help reduce risk of injury.

Unlike evergreen brush, deciduous brush species such as poison-oak, hazel, and deerbrush often are treated selectively over pine with glyphosate products. Typical release treatments are timed after budset in late summer or fall to reduce risk of damage.

Conifers still can be injured, however, especially if a surfactant is added or is in the formulation. The type of surfactant used with glyphosate over pine can have a very large impact on damage. Carefully screen new surfactant additions in small trials before using them in a full program. You also might want to consult with someone in the agricultural pesticides industry for recommendations on surfactants.

Because Valley sites often contain numerous plant competitors, no one herbicide will do the job in all cases. Combinations of these strategies probably will be the most effective on vegetation and least injurious to pines. Herbicide labels change frequently, so read and carefully follow the label on the product in hand.

3

Managing stands of Willamette Valley ponderosa pine

R. Fletcher

Both natural and planted stands of ponderosa pine can be managed using thinning, pruning, and fertilization, although little research has been done on these practices for the Willamette Valley race of ponderosa pine. What is known has been gathered from general observation, from small test plots, and from a survey of native stands by OSU Extension forester Max Bennett.

Natural stand development

It is difficult to define what normal stand development means for ponderosa pine in the Willamette Valley.

Historical stands apparently were either scattered groves of large trees in grassy bottoms or mixed-species stands in the foothills. In either case, the indigenous tribes' broad-scale burning shaped those forests in ways not available today.

Current stands have come about by colonizing neglected areas or soils with severe limitations for other tree species. The stands we see today are much denser than their counterparts in the past. What this means for future development and growth is uncertain. However, because ponderosa pine is a shade-intolerant species, preferring open spaces, it is likely that the high stocking will be reduced over time, either through insect and disease outbreaks, or some weather-related event, or by selective thinning.

Expected growth of Valley ponderosa pine stands

Anderson's 1938 study on central Willamette Valley ponderosas reported young ponderosas grew rapidly, but growth rates peaked by about 30 years of age. The small sample of trees had a 20-year-old tree with a 15-inch diameter at breast height (DBH), while a 100-year-old tree was only 34 inches in diameter. The pine races study that Munger began in 1928 showed a height growth spurt between 20 and 30 years of age, but the trees from the best seed source in the study have continued to grow well in height up to their last measurement at 65 years of age.

Max Bennett's recently completed study of 16 native Willamette Valley ponderosa stands on 12 different soil types found a wide variety of growth rates, depending on soil type (Table 3, page 12). Site indexes (estimates of site productivity based on

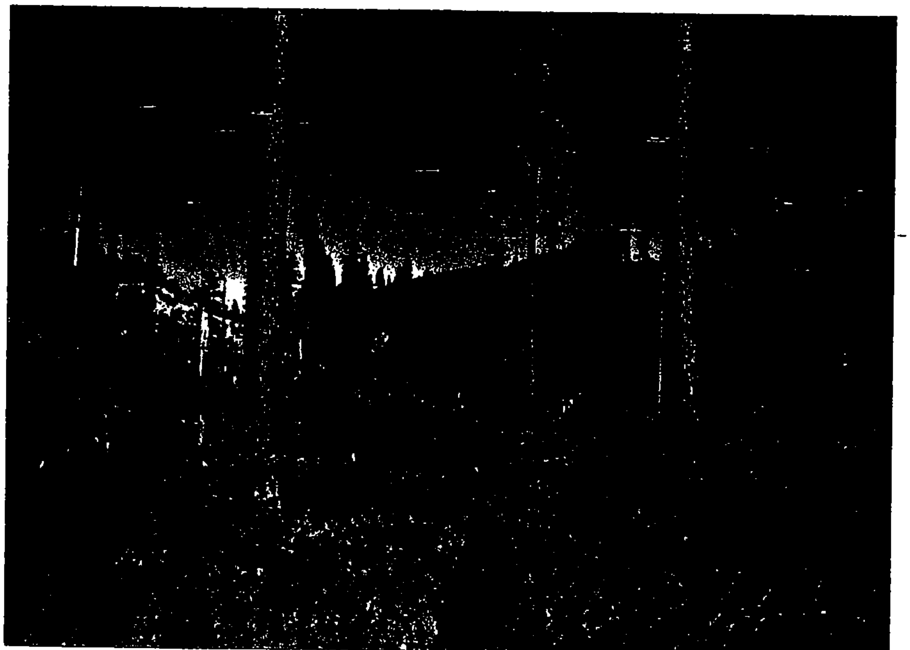


Figure 13.—Regeneration of a natural stand of ponderosa pine old growth on Willamette National Forest, near Oakridge, OR.

Figure 14.—Native, 40-year-old ponderosa pine stand on wet soil near Lacomb, OR.

how tall a tree of a given species will grow on a site in a given number of years) for each site were extrapolated from existing site index curves from ponderosa pine in southwest Oregon, based on expected total height at 50 years.

On most sites, ponderosas are expected to grow nearly 100 feet in the first 50 years. Exceptions were on very severe sites where the high water table and shallow soils converged. When these trees will slow down or stop growing taller is not known and undoubtedly will vary widely by soil type, but large specimen trees on suitable soils have grown up to 150 feet tall.

[illegible]

Soil type	Height	Age	Site index (50) 130
Bashaw silty clay loam	98	59	92
Dayton silt loam	84	42	98
Dixonville/Hazelair/Philomath	96	98	63
Dupee silt loam	110	56	101
Hazelair silty clay* loam	93	52	92 123
McBee silty clay loam	104	59	92
Philomath cobbly, silty clay*	87	42	104 125
Ritner cobbly, silty clay loam	101	54	95
Salem gravelly loam	111	63	93
Waldo silty clay loam	83	41	96
Witzel very cobbly loam	92	98	59 85

* An average of more than one site

No studies of volume growth per acre have been done. Currently, large stands of ponderosa are few, but they appear to have volumes similar to local Douglas-fir stands of similar ages. The exception may be on the very severe (either wet or dry) sites, where volumes per acre will be less.

Managing natural stands of Valley ponderosa pine

If you are one of the lucky Willamette Valley landowners with a natural stand of ponderosas on your property, your trees might benefit from thinning or possibly pruning if they are still pole size.

Thinning

Thinning spaces out trees and improves the health and vigor of the overall stand. The key feature is not what you cut but the stand left behind after harvest. It is these trees, generally referred to as crop trees, that will determine future growth and overall stand health. In deciding which will be crop trees, and which ones you'll remove, consider the following factors.

1. Overall stand age and stocking Stands that respond best to thinning are young, moderately stocked ones. Older stands (50 years plus) likely have passed the time when thinning will greatly benefit growth rates, unless the stand was previously thinned. Thinning an older stand still might make sense, however, if you want to reduce longer term competition for crop trees or to remove unhealthy trees. Very dense stands may need several light thinnings, spaced by recovery periods, to move the stand gradually to a healthy density.

Possibly the most important thinning is a very early one, while the trees are not yet of merchantable size. This precommercial thinning sets the growth curve for the future stand and can have a dramatic, positive impact on growth if done at the right time.

2. Type of future stand desired If you want an even-age stand, then it makes sense to space crop trees evenly for maximum

1·14

growth. If you want to develop an uneven-age stand, your selection may be more in groups, to provide open areas for young trees to establish.

3. Individual tree characteristics The arboricultural principle of "right tree, right place" works well for forest thinning, also. If your need in a particular spot is high growth, then leave the best growers. If you want to leave a wildlife tree, look for one with big branches and good nesting opportunities. Even trees with obvious defects can be valuable in providing habitat for cavity-nesting birds such as woodpeckers. If you plan a continual-selection thinning system to promote natural regeneration, then you want to get rid of the super-dominant trees and keep the vigorously growing medium-size trees that have narrow crowns and fine branches.

4. Individual tree spacing As trees get larger, they need more room to grow. Foresters' rule of thumb for this size–space relationship is based on diameter of the tree at breast height (DBH).

For example, a tree 12 inches in diameter might need 16 feet of space to be happy, while a 20-inch-diameter tree might need 24 feet. This often is referred to as the "D+ rule."

Although there is no known D+ relationship for Valley ponderosa pine, they likely need a bit more space than Douglas-fir because of their intolerance of shade. Ponderosa might be more comfortable at a minimum spacing of D+2 or D+3. For a tree 12 inches in diameter, this means the next closest 12-inch tree should be at least 14 or 15 feet away. You might want to space your 12-inch trees 18 to 20 feet apart (i.e., at D+6 or D+8), anticipating that they will continue to grow in diameter over time and eventually get back to the minimum D+2 spacing.

Other ways to keep track of tree spacings:

- On a per-acre basis, either by total number of trees, or
- Some other measure of density such as basal area (the cross sectional area of a tree, measured at breast height), or
- Relative density (the amount of basal area on a given stand compared to the maximum that can possibly grow)

For more information on measuring stand density, refer to OSU Extension publication EC 1190, "Stand Volume and Growth: Getting the Numbers" (see page 39).

As more becomes known about the Valley ponderosas, better per-acre guidelines will be developed.

Managing plantations of Valley ponderosa pine

During the past decade, thousands of acres of Valley pine plantations have been established in the Willamette Valley. These represent a very different type of forest stand than has ever existed naturally.

Historical records indicate that natural stands were widely spaced groves of large trees, intermixed with hardwood species such as oak and ash. The pine plantations of today represent fast-growing monocultures whose growth far exceeds that of their natural cousins. No management history of similar stands exists, so only time will reveal how these plantations will develop. Experience to date, however, suggests some practices that are useful in tending young plantations.

Thinning

One genetic trait in the Valley pine population is a wide variance in tree forms. Progeny from various parent trees differ vastly in such characteristics as forking, branch angle, number of branches, and growth rate. By years 5 to 10, characteristics of individual trees in plantations are easily distinguishable, and you can favor trees with characteristics suited to your objectives. For example, if timber production is a primary goal, trees with high wood-to-branch ratios and good growth can be favored in thinning programs. Likewise, in riparian plantings where lots of branching can be good for

Figure 15.—Five-year-old pine plantation on a good site near Albany, OR.

birds and other wildlife, the heavily branched trees can be favored.

When to thin and how many trees to remove is largely unknown at this time. Answers will depend to some degree on what types of future products and stand are desired. Guidelines for thinning in plantations are similar to those discussed under thinning natural stands (pages 13–14). The same D+ relationship applies; i.e., D+2 minimum and D+6 desirable.

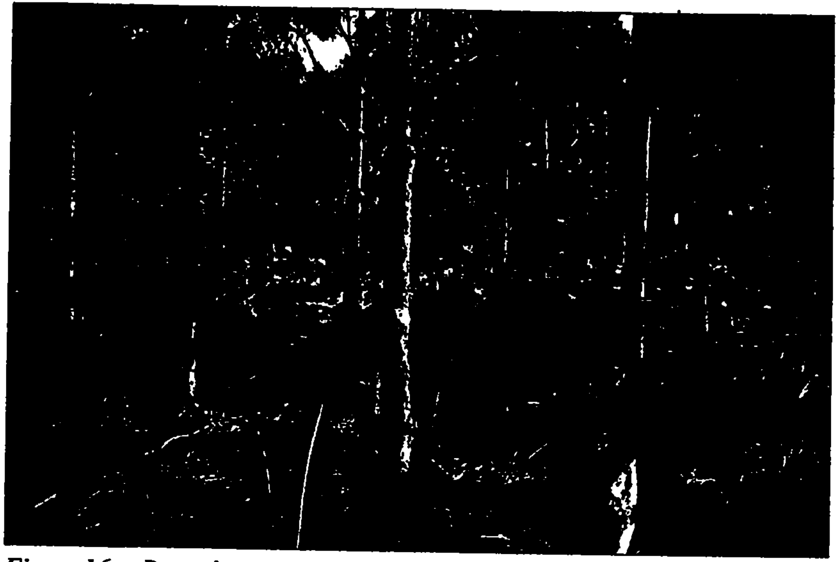


Figure 16.—Pruned 8-year-old ponderosa pine stand near Albany, OR. Orange paint marks branch scars where live limbs were removed.

One feature that is particularly observable in young pine plantings is the much lower ratio of needle biomass to wood compared with other species such as Douglas-fir. Thinning is best timed according to live crown ratio (the percent of the total tree height that is occupied by green limbs); try to keep it at 30 percent or higher.

You also might want to take periodic increment core samples to determine growth rate. Ponderosa pine is an excellent producer of diameter growth and might maintain rates of three to six rings per inch in vigorously growing, young pole-size stands. Thinning directs this growth into the most productive trees in the stand.

For more information on harvesting and marketing, see Chapter 8.

Pruning

The fact that ponderosa is a naturally limby species, combined with the fact that clear pine wood has high value, makes pruning important in young Valley pine stands.

If done correctly, pruning scars will heal quickly, and the tree will produce a rind of clear, valuable wood outside the pruning scars. You might also improve the form of young trees—the taper point of the tree is at the base of the live crown, so when you remove live limbs, you are pushing the bottom of the live crown up the tree.

Pruning ideally should begin once the trees reach 10 to 15 feet tall. Carefully clip all lower limbs as near the stem as possible without damaging the branch collar. Removing too many limbs in one pruning may impair tree growth, so leave at least 30 to 50 percent live crown at all times. For example, if your trees are 16 feet tall, you could prune up about 8 feet without being concerned about harming growth. If you delay limb pruning too long, the limbs will be larger and harder to remove. This also will increase the size of the knotty core of wood in the center of the tree and reduce recovery of clear wood.

Prune between September and March to avoid pitch moth attacks on pruning wounds. Pile and burn larger limbs and stems to avoid bark beetle infestations.

For information on potential insect problems, see Chapter 5. For a fuller description of proper tree pruning, refer to OSU Extension publication EC 1457, "Pruning to Enhance Tree and Stand Value" (see page 39).

Fertilizing

To date, not much is known about fertilizing Valley pine. A few growers have had some success applying balanced fertilizers, based on foliar and soil analyses, but you should get professional assistance from a fertilizer dealer or professional consultant before investing too much in fertilizers.

In any case, apply fertilizers only to well-weeded trees that have good root systems to take up the fertilizer.

EXHIBIT 2

Table 45 - Forest Survey Site Class

This value will be assigned by strata label, and will be the results of the Forest Inventory.

Size = 1; Type = numeric

Code	Potential Yield, Mean Annual Increment
1	225 or more cubic feet per acre
2	165 to 225 cubic feet per acre
3	120 to 165 cubic feet per acre
4	85 to 120 cubic feet per acre
5	50 to 85 cubic feet per acre
6	20 to 50 cubic feet per acre
7	Less than 20 cubic feet per acre

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USDA Forest Service

Corresponds to OAR 629-610-0020

EXHIBIT 3

Table E1. - Forest Productivity - Continued

Lane County Area, Oregon

Map Symbol and Soil Name	Potential Productivity			Trees to Manage
	Common Trees	Site Index	Volume of Wood Fiber Cu Ft/Acre	
37C:				
Cupola	Douglas Fir	100	136	Douglas Fir Incense Cedar Western Hemlock
37E:				
Cupola	Douglas Fir	100	136	Douglas Fir Incense Cedar Western Hemlock
38:				
Dayton	—	—	—	—
39E:				
Digger	Bigleaf Maple	—	—	Douglas Fir
	Douglas Fir	102	140	
	Red Alder	—	—	
	Western Hemlock	—	—	
39F:				
Digger	Bigleaf Maple	—	—	Douglas Fir
	Douglas Fir	102	140	
	Red Alder	—	—	
	Western Hemlock	—	—	
40H:				
Digger	Bigleaf Maple	—	—	Douglas Fir
	Douglas Fir	102	140	
	Red Alder	—	—	
	Western Hemlock	—	—	
Rock Outcrop	—	—	—	—
41C:				
Dixonville	Douglas Fir	109	152	Douglas Fir Ponderosa Pine
	Grand Fir	—	—	
	Oregon White Oak	—	—	
	Pacific Madrone	—	—	
41E:				
Dixonville	Douglas Fir	109	152	Douglas Fir Ponderosa Pine
	Grand Fir	—	—	
	Oregon White Oak	—	—	
	Pacific Madrone	—	—	
41F:				

Table E1. - Forest Productivity - Continued

Lane County Area, Oregon

Map Symbol and Soil Name	Potential Productivity			Trees to Manage
	Common Trees	Site Index	Volume of Wood Fiber	
			Cu Ft/Acre	
41F:				
Dixonville	Douglas Fir	109	152	Douglas Fir
	Grand Fir	—	—	Ponderosa Pine
	Oregon White Oak	—	—	
	Pacific Madrone	—	—	
42E:				
Dixonville	Douglas Fir	109	152	Douglas Fir
	Grand Fir	—	—	Ponderosa Pine
	Oregon White Oak	—	—	
	Pacific Madrone	—	—	
Hazelair	—	—	—	—
Urban Land	—	—	—	—
43C:				
Dixonville	Douglas Fir	109	152	Douglas Fir
	Grand Fir	—	—	Ponderosa Pine
	Oregon White Oak	—	—	
	Pacific Madrone	—	—	
Philomath	—	—	—	—
Hazelair	—	—	—	—
43E:				
Dixonville	Douglas Fir	109	152	Douglas Fir
	Grand Fir	—	—	Ponderosa Pine
	Oregon White Oak	—	—	
	Pacific Madrone	—	—	
Philomath	—	—	—	—
Hazelair	—	—	—	—
44:				
Dune Land	—	—	—	—
45C:				
Dupee	—	—	—	—
46:				
Eilertsen	Bigleaf Maple	—	—	Douglas Fir
	Douglas Fir	133	199	Western Hemlock
	Grand Fir	—	—	
	Red Alder	—	—	
	Western Hemlock	—	—	
	Western Redcedar	—	—	

3.2

LANE COUNTY AREA, OREGON

EXHIBIT 4

USDA-
4

SOIL INTERPRETATIONS RECORD

43E DIXONVILLE-PHILOMATH-HAZELAIR COMPLEX, 12 TO 35 PERCENT SLOPES
DIXONVILLE PART

THE DIXONVILLE SERIES CONSISTS OF WELL DRAINED SOILS FORMED IN FINE TEXTURED COLLUVIAL AND RESIDUAL MATERIALS FROM BA IGNEOUS ROCK IN THE FOOTHILLS. TYPICALLY, THE SURFACE LAYER IS VERY DARK BROWN SILTY CLAY LOAM ABOUT 14 INCHES THICK. THE SUBSOIL IS DARK BROWN SILTY CLAY AND COBBLY CLAY ABOUT 12 INCHES THICK. THE SUBSTRATUM IS WEATHERED BASIC ROCK. ELEVATIONS ARE 300 TO 1800 FEET. MEAN ANNUAL PRECIP IS 40 TO 60 INCHES. MEAN ANNUAL AIR TEMP IS 52 TO 54 DEGREES. FRO FREE PERIOD IS 165 TO 210 DAYS.

ESTIMATED SOIL PROPERTIES

DEPTH (IN.)	USDA TEXTURE	UNIFIED	AASHTO	FRACT >3 IN (PCT)	PERCENT OF MATERIAL LESS THAN 3" PASSING SIEVE NO. 4	10	40	200	LIQUID LIMIT	PLAS TICI INDE
0-14	SICL	CL	A-6	0-10	90-100	90-100	85-100	75-95	35-40	15-2
14-26	C, CB-C, SIC	CH	A-7	0-30	75-100	70-100	65-100	60-95	50-80	30-5
26	WB									

DEPTH (IN.)	CLAY (PCT)	MOIST BULK DENSITY (G/CM3)	PERMEA-BILITY (IN/HR)	AVAILABLE WATER CAPACITY (IN/IN)	SOIL REACTION (PH)	SALINITY (MMHOS/CM)	SHRINK-SWELL POTENTIAL	EROSION FACTORS K	T	WIND EROD. GROUP	ORGANIC MATTER (PCT)	CORROSIVITY STEEL	CONCRE
0-14	27-40	1.30-1.50	0.6-2.0	0.18-0.21	5.6-6.5	-	MODERATE	.32	3	-	3-6	MODERATE	MODERA
14-26	40-60	1.30-1.60	0.06-0.2	0.12-0.17	5.6-6.5	-	HIGH	.24					
26													

FLOODING FREQUENCY	DURATION	MONTHS	HIGH WATER TABLE DEPTH (FT)	KIND	MONTHS	CEMENTED PAN DEPTH (IN)	HARDNESS	BEDROCK DEPTH (IN)	HARDNESS	SUBSIDENCE INIT. (IN)	TOTAL (IN)	HYD GRP	POTENT FROST ACTIO
NONE			>6.0			-		20-40	SOFT	-		C	-

SANITARY FACILITIES		CONSTRUCTION MATERIAL	
SEPTIC TANK ABSORPTION FIELDS	SEVERE-DEPTH TO ROCK,PERCS SLOWLY,SLOPE	ROADFILL	POOR-DEPTH TO ROCK,LOW STRENGTH
SEWAGE LAGOON AREAS	SEVERE-DEPTH TO ROCK,SLOPE	SAND	IMPROBABLE-EXCESS FINES
SANITARY LANDFILL (TRENCH)	SEVERE-DEPTH TO ROCK,SLOPE,TOO CLAYEY	GRAVEL	IMPROBABLE-EXCESS FINES
SANITARY LANDFILL (AREA)	SEVERE-DEPTH TO ROCK,SLOPE	TOPSOIL	POOR-LARGE STONES,SLOPE
DAILY COVER FOR LANDFILL	POOR-DEPTH TO ROCK,TOO CLAYEY,HARD TO PACK		

BUILDING SITE DEVELOPMENT		WATER MANAGEMENT	
		POND RESERVOIR AREA	SEVERE-SLOPE
SHALLOW EXCAVATIONS	SEVERE-SLOPE	EMBANKMENTS DIKES AND LEVEES	SEVERE-HARD TO PACK
DWELLINGS WITHOUT BASEMENTS	SEVERE-SHRINK-SWELL,SLOPE	EXCAVATED PONDS AQUIFER FED	SEVERE-NO WATER
DWELLINGS WITH BASEMENTS	SEVERE-SLOPE,SHRINK-SWELL	DRAINAGE	DEEP TO WATER
SMALL COMMERCIAL BUILDINGS	SEVERE-SHRINK-SWELL,SLOPE	IRRIGATION	LARGE STONES,PERCS SLOWLY,DEPTH TO ROCK
LOCAL ROADS AND STREETS	SEVERE-LOW STRENGTH,SLOPE,SHRINK-SWELL	TERRACES AND DIVERSIONS	SLOPE,LARGE STONES,DEPTH TO ROCK
LAWNS, LANDSCAPING AND GOLF FAIRWAYS	SEVERE-SLOPE	GRASSED WATERWAYS	LARGE STONES,SLOPE,DEPTH TO ROCK

4-1

43E DIXONVILLE-PHILOMATH-HAZELAIR COMPLEX, 12 TO 35 PERCENT SLOPES
DIXONVILLE PART

USDA-SCS
4-83

RECREATIONAL DEVELOPMENT

CAMP AREAS	SEVERE-SLOPE	PLAYGROUNDS	SEVERE-SLOPE
PICNIC AREAS	SEVERE-SLOPE	PATHS AND TRAILS	MODERATE-SLOPE

CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE (HIGH LEVEL MANAGEMENT)

	CAPA-BILITY		FILBERTS (TONS)		PASTURE (AUM)				BARLEY (BU)		WHEAT, WINTER (BU)		CORN, SWEET (TONS)			
	NIRR	IRR.	NIRR	IRR.	NIRR	IRR.	NIRR	IRR.	NIRR	IRR.	NIRR	IRR.	NIRR	IRR.	NIRR	IRR.
	4E		0.5		6				30		40					

WOODLAND SUITABILITY

	ORD	MANAGEMENT PROBLEMS					POTENTIAL PRODUCTIVITY			
	SYM	EROS'N HAZARD	EQUIP. LIMIT	SEEDL. MORT'Y	WINDTH HAZARD	PLANT COMPET	COMMON TREES	SITE INDX	PROD CLASS	TREES TO PLANT
	8C	SLIGHT	MODER.	MODER.	SLIGHT	SEVERE	DOUGLAS-FIR PACIFIC MADRONE OREGON WHITE OAK GRAND FIR	120	8	DOUGLAS-FIR PONDEROSA PINE

WINDBREAKS

	SPECIES	HT	SPECIES	HT	SPECIES	HT	SPECIES	HT
	NONE							

WILDLIFE HABITAT SUITABILITY

	POTENTIAL FOR HABITAT ELEMENTS								POTENTIAL AS HABITAT FOR:			
	GRAIN & SEED	GRASS & LEGUME	WILD HERB.	HARDWD TREES	CONIFER PLANTS	SHRUBS	WETLAND PLANTS	SHALLOW WATER	OPENLD WILDLF	WOODLD WILDLF	WETLAND WILDLF	RANGELD WILDLF
	POOR	FAIR	FAIR	GOOD	GOOD	GOOD	V. POOR	V. POOR	FAIR	GOOD	V. POOR	-

POTENTIAL NATIVE PLANT COMMUNITY (RANGELAND OR FOREST UNDERSTORY VEGETATION)

COMMON PLANT NAME	PLANT SYMBOL (NLSPN)	PERCENTAGE COMPOSITION (DRY WEIGHT)				

POTENTIAL PRODUCTION (LBS./AC. DRY WT): FAVORABLE YEARS NORMAL YEARS UNFAVORABLE YEARS					

FOOTNOTES

* SITE INDEX IS A SUMMARY OF 5 OR MORE MEASUREMENTS ON THIS SOIL.

4-2

SOIL INTERPRETATIONS RECORD

43E DIXONVILLE-PHILOMATH-HAZELAIR COMPLEX, 12 TO 35 PERCENT SLOPES
PHILOMATH PART

THE PHILOMATH SERIES CONSISTS OF SHALLOW, WELL DRAINED SOILS FORMED IN FINE TEXTURED COLLUVIAL AND RESIDUAL MATERIALS FROM BASALT. THEY OCCUR IN THE FOOTHILLS. TYPICALLY THE SURFACE LAYER IS VERY DARK BROWN COBBLY SILTY CLAY ABOUT 4 INC THICK. THE SUBSOIL IS VERY DARK BROWN COBBLY SILTY CLAY ABOUT 8 INCHES THICK. WEATHERED BASALT BEDROCK IS AT A DEPTH O 14 INCHES. ELEVATION IS 300 TO 1800 FEET. MEAN ANNUAL PRECIP IS 40 TO 60 INCHES. MEAN ANNUAL AIR TEMP IS 52 TO 54 DEGREES. FROST FREE PERIOD IS 165 TO 210 DAYS.

ESTIMATED SOIL PROPERTIES

DEPTH (IN.)	USDA TEXTURE	UNIFIED	AASHTO	FRACT >3 IN (PCT)	PERCENT OF MATERIAL LESS THAN 3" PASSING SIEVE NO. 4	10	40	200	LIQUID LIMIT	PLAS-TICIT INDEX
0-6	CB-SIC	CH	A-7	15-30	85-100	75-90	70-85	60-80	50-60	35-45
6-14	C, CB-SIC, CB-C	CH	A-7	0-30	90-100	70-95	60-90	60-85	60-80	40-50
14	WB									

DEPTH (IN.)	CLAY (PCT)	MOIST BULK DENSITY (G/CM3)	PERMEA-BILITY (IN/HR)	AVAILABLE WATER CAPACITY (IN/IN)	SOIL REACTION (PH)	SALINITY (MMHOS/CM)	SHRINK-SWELL POTENTIAL	EROSION FACTORS K	T	WIND EROD. GROUP	ORGANIC MATTER (PCT)	CORROSIVITY STEEL	CONCRETE
0-6	40-55	1.30-1.40	0.6-2.0	0.14-0.17	5.6-6.5	-	HIGH	.28	1	-	2-4	MODERATE	MODERAT
6-14	40-60	1.30-1.40	0.06-0.2	0.14-0.16	5.6-7.3	-	HIGH	.24					
14													

FLOODING FREQUENCY	DURATION	MONTHS	HIGH WATER TABLE DEPTH (FT)	KIND	MONTHS	CEMENTED PAN DEPTH (IN)	HARDNESS	BEDROCK DEPTH (IN)	HARDNESS	SUBSIDENCE INIT. (IN)	TOTAL (IN)	HYD GRP	POTENT'L FROST ACTION
NONE			>6.0			-		12-20	SOFT	-		D	-

SANITARY FACILITIES

SEPTIC TANK ABSORPTION FIELDS	SEVERE-DEPTH TO ROCK,SLOPE
SEWAGE LAGOON AREAS	SEVERE-DEPTH TO ROCK,SLOPE
SANITARY LANDFILL (TRENCH)	SEVERE-DEPTH TO ROCK,SLOPE,TOO CLAYEY
SANITARY LANDFILL (AREA)	SEVERE-DEPTH TO ROCK,SLOPE
DAILY COVER FOR LANDFILL	POOR-DEPTH TO ROCK,TOO CLAYEY,HARD TO PACK

BUILDING SITE DEVELOPMENT

SHALLOW EXCAVATIONS	SEVERE-DEPTH TO ROCK,SLOPE
DWELLINGS WITHOUT BASEMENTS	SEVERE-SHRINK-SWELL,SLOPE
DWELLINGS WITH BASEMENTS	SEVERE-DEPTH TO ROCK,SLOPE,SHRINK-SWELL
SMALL COMMERCIAL BUILDINGS	SEVERE-SHRINK-SWELL,SLOPE
LOCAL ROADS AND STREETS	SEVERE-LOW STRENGTH,SLOPE,SHRINK-SWELL
LAWNS, LANDSCAPING AND GOLF FAIRWAYS	SEVERE-SLOPE,DEPTH TO ROCK,TOO CLAYEY

CONSTRUCTION MATERIAL

ROADFILL	POOR-DEPTH TO ROCK,LOW STRENGTH
SAND	IMPROBABLE-EXCESS FINES
GRAVEL	IMPROBABLE-EXCESS FINES
TOPSOIL	POOR-DEPTH TO ROCK,TOO CLAYEY,LARGE STONES

WATER MANAGEMENT

POND RESERVOIR AREA	SEVERE-DEPTH TO ROCK,SLOPE
EMBANKMENTS DIKES AND LEVEES	SEVERE-HARD TO PACK
EXCAVATED PONDS AQUIFER FED	SEVERE-NO WATER
DRAINAGE	DEEP TO WATER
IRRIGATION	LARGE STONES,SLOW INTAKE,PERCS SLOWLY
TERRACES AND DIVERSIONS	SLOPE,LARGE STONES,DEPTH TO ROCK
GRASSED WATERWAYS	LARGE STONES,SLOPE,DEPTH TO ROCK

43E DIXONVILLE-PHILOMATH-HAZELAIR COMPLEX, 12 TO 35 PERCENT SLOPES
HAZELAIR PART

USDA-SCS
10-85

RECREATIONAL DEVELOPMENT

CAMP AREAS	SEVERE-SLOPE,WETNESS	PLAYGROUNDS	SEVERE-SLOPE,WETNESS
PICNIC AREAS	SEVERE-SLOPE	PATHS AND TRAILS	MODERATE-WETNESS,SLOPE

CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE (HIGH LEVEL MANAGEMENT)

	CAPA-BILITY		WHEAT, WINTER (BU)		BARLEY (BU)		BLACK-BERRIES (TONS)		GRASS HAY (TONS)		PASTURE (AUM)					
	NIRR	IRR.	NIRR	IRR.	NIRR	IRR.	NIRR	IRR.	NIRR	IRR.	NIRR	IRR.	NIRR	IRR.	NIRR	IRR.
	6E										6					

WOODLAND SUITABILITY

	ORD	MANAGEMENT PROBLEMS					POTENTIAL PRODUCTIVITY			
	SYM	EROS'N HAZARD	EQUIP. LIMIT	SEEDL. MORT'Y	WINDTH HAZARD	PLANT COMPET	COMMON TREES	SITE INDX	PROD CLAS	TREES TO PLANT
							NONE			

WINDBREAKS

SPECIES	HT	SPECIES	HT	SPECIES	HT	SPECIES	HT
NONE							

WILDLIFE HABITAT SUITABILITY

	POTENTIAL FOR HABITAT ELEMENTS								POTENTIAL AS HABITAT FOR:			
	GRAIN & SEED	GRASS & LEGUME	WILD HERB.	HARDWD TREES	CONIFER PLANTS	SHRUBS	WETLAND PLANTS	SHALLOW WATER	OPENLD WILDLF	WOODLD WILDLF	WETLAND WILDLF	RANGELD WILDLF
- - - -	POOR	FAIR	GOOD	GOOD	FAIR	GOOD	V. POOR	V. POOR	FAIR	GOOD	V. POOR	-

POTENTIAL NATIVE PLANT COMMUNITY (RANGELAND OR FOREST UNDERSTORY VEGETATION)

COMMON PLANT NAME	PLANT SYMBOL (NLSPN)	PERCENTAGE COMPOSITION (DRY WEIGHT)				
COMMON SNOWBERRY	SYAL					
RUSH	JUNCU					
OTHER ANNUAL GRASSES	AAGG					
OTHER ANNUAL FORBS	AAFF					
ROSE	ROSA+					

POTENTIAL PRODUCTION (LBS./AC. DRY WT):					
FAVORABLE YEARS					
NORMAL YEARS					
UNFAVORABLE YEARS					

FOOTNOTES

4-4

EXHIBIT 5

Base 100 Ponderosa Pine Site Index Tables _20/

Witzel 86

Site Index		60	65			70	75			80	85
Tot. Age	BH Age	Site Ht. feet	Site Ht. feet	Tot. Age	BH Age	Site Ht. feet	Site Ht. feet	Tot. Age	BH Age	Site Ht. feet	Site Ht. feet
20	4	18	19	20	5	21	22	20	6	24	25
25	9	22	24	25	10	26	28	25	11	30	32
30	14	27	29	30	15	31	33	30	16	35	38
35	19	29	32	35	20	34	37	35	21	39	42
40	24	33	35	40	25	38	41	40	26	44	46
45	29	35	38	45	30	41	44	45	31	47	50
50	34	38	41	50	35	45	48	50	36	51	54
55	39	41	44	55	40	48	51	55	41	55	58
60	44	43	47	60	45	51	54	60	46	58	62
65	49	46	49	65	50	53	57	65	51	61	65
70	54	48	52	70	55	56	60	70	56	64	68
75	59	50	54	75	60	58	63	75	61	67	71
80	64	52	56	80	65	61	65	80	66	70	74
85	69	54	59	85	70	63	68	85	71	72	77
90	74	56	61	90	75	65	70	90	76	75	79
95	79	58	63	95	80	68	72	95	81	77	82
100	84	60	65	100	85	70	75	100	86	80	85
105	89	62	67	105	90	72	77	105	91	82	87
110	94	63	68	110	95	74	79	110	96 98	84	89
115	99	65	70	115	100	76	81	115	101	86	92
120	104	67	72	120	105	77	83	120	106	89	94
125	109	68	74	125	110	79	85	125	111	91	96
130	114	70	75	130	115	81	87	130	116	93	98
135	119	71	77	135	120	83	89	135	121	95	100
140	124	73	79	140	125	84	90	140	126	96	102
145	129	74	80	145	130	86	92	145	131	98	104
150	134	75	82	150	135	88	94	150	136	100	106
155	139	77	83	155	140	89	96	155	141	102	108
160	144	78	84	160	145	91	97	160	146	104	110

Witzel 86

_20/ Wycoff, E., and Atterbury, T., Age-Site Index Regression Equations for Base 100 Tables CrownZellerbach Corp., FMSS, 90pp. 1974

5-1

Hazelair
123

Base 100 Ponderosa Pine Site Index Tables

Site Index		90	95	100	105			110	115			120	125
Tot. Age	BH Age	Site Ht. feet	Site Ht. feet	Site Ht. feet	Site Ht. feet	Tot. Age	BH Age	Site Ht. feet	Site Ht. feet	Tot. Age	BH Age	Site Ht. feet	Site Ht. feet
20	7	27	28	30	31	20	8	33	36	20	9	39	40
25	12	34	36	37	39	25	13	41	45	25	14	51	53
30	17	40	42	44	47	30	18	49	53	30	19	63	66
35	22	44	47	49	52	35	23	54	57	35	24	59	62
40	27	49	52	55	57	40	28	60	63	40	29	66	69
45	32	53	57	60	63	45	33	66	69	45	34	72	75
50	37	58	61	64	67	50	38	71	74	50	39	77	81
55	42	62	65	68	72	55	43	75	79	55	44	82	86
60	47	65	69	73	76	60	48	80	84	60	49	87	91
65	52	69	73	76	80	65	53	84	88	65	52 54	92 92	96
70	57	72	76	80	84	70	58	88	92	70	59	97	101
75	62	75	80	84	88	75	63	92	97	75	64	101	105
80	67	78	83	87	92	80	68	96	101	80	69	105	109
85	72	81	86	90	95	85	73	100	104	85	74	109	114
90	77	84	89	94	98	90	78	103	108	90	79	113	117
95	82	87	92	97	102	95	83	107	111	95	84	116	121
100	87	90	95	100	105	100	88	110	115	100	89	120	125
105	92	92	97	103	108	105	93	113	118	105	94	123	129
110	97	95	100	105	111	110	98	116	121	110	99	127	132
115	102	97	103	108	114	115	103	119	124	115	104	130	135
120	107	100	105	111	116	120	108	122	127	120	109	133	139
125	112	102	108	113	119	125	113	125	130	125	114	136	142
130	117	104	110	116	122	130	118	127	133	130	119	139	145
135	122	106	112	118	124	135	123	130	136	135	124	142	148
140	127	108	114	120	127	140	128	133	139	140	129	145	151
145	132	110	117	123	129	145	133	135	141	145	134	147	154
150	137	113	119	125	131	150	138	137	144	150	139	150	156
155	142	114	121	127	133	155	143	140	146	155	144	153	159
160	147	116	123	129	136	160	148	142	149	160	149	155	161

HAZELAIR
123

Ibid Ponderosa Pine Site Index Tables

PHILOMATH
131

Base 100

Ponderosa Pine Site Index Tables

Site Index		130	135	140	145			150
Tot. Age	BH Age	Site Ht. feet	Site Ht. feet	Site Ht. feet	Site Ht. feet	Tot. Age	BH Age	Site Ht. feet
20	10	39	40	42	43	20	11	45
25	15	49	51	52	54	25	16	56
30	20	58	60	62	64	30	21	66
35	25	64	67	70	72	35	26	75
40	30	71	74	77	80	40	31	83
45	35	78	81	84	87	45	36	90
50	40	84	87	90	94	50	41	97
55	12 45	87 89 86	93 ✓ 90.8	96	100	55	46	104
60	50	95	99	102	106	60	51	110
65	55	100	104	108	112	65	56	116
70	60	105	109	113	117	70	61	121
75	65	109	114	118	122	75	66	127
80	70	114	118	123	127	80	71	132
85	75	118	123	127	132	85	76	137
90	80	122	127	132	137	90	81	141
95	85	126	131	136	141	95	86	146
100	90	130	135	140	145	100	91	150
105	95	134	139	144	149	105	96	155
110	100	137	143	148	153	110	101	159
115	105	141	146	152	157	115	106	163
120	110	144	150	155	161	120	111	167
125	115	147	153	159	165	125	116	170
130	120	151	156	162	168	130	121	174
135	125	154	160	166	172	135	126	178
140	130	157	163	169	175	140	131	181
145	135	160	166	172	178	145	136	184
150	140	162	169	175	181	150	141	187
155	145	165	172	178	184	155	146	191
160	150	168	174	181	187	160	151	194

PHILOMATH
131

Ibid Ponderosa Pine Site Index Tables

5.3