

Figure 6.27

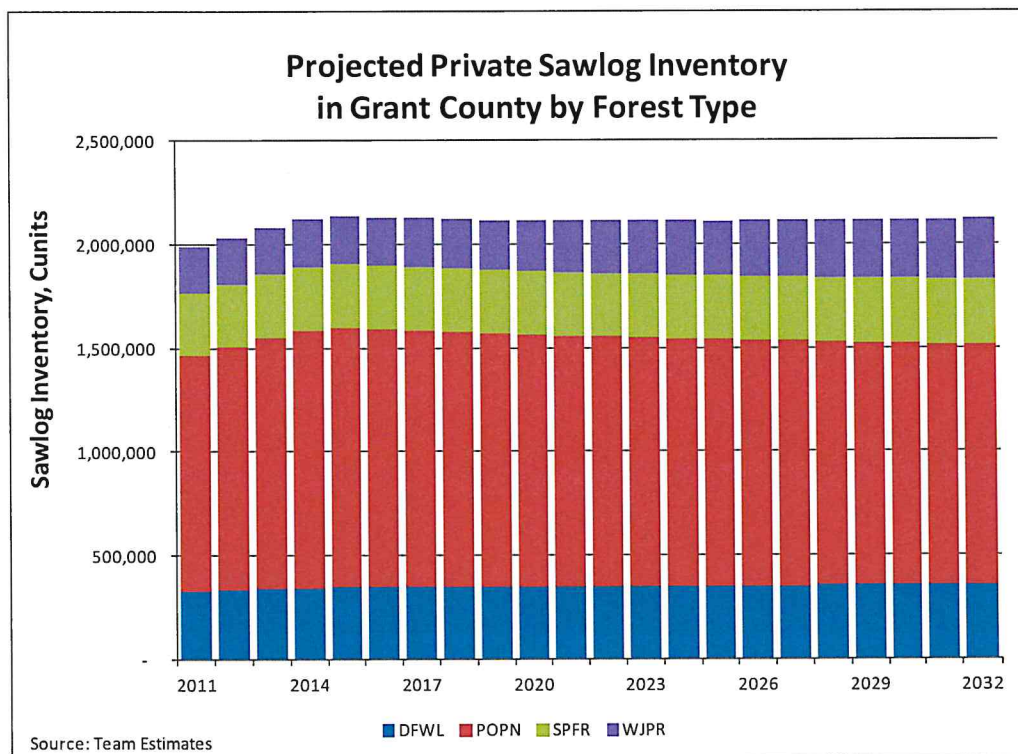


Figure 6.28

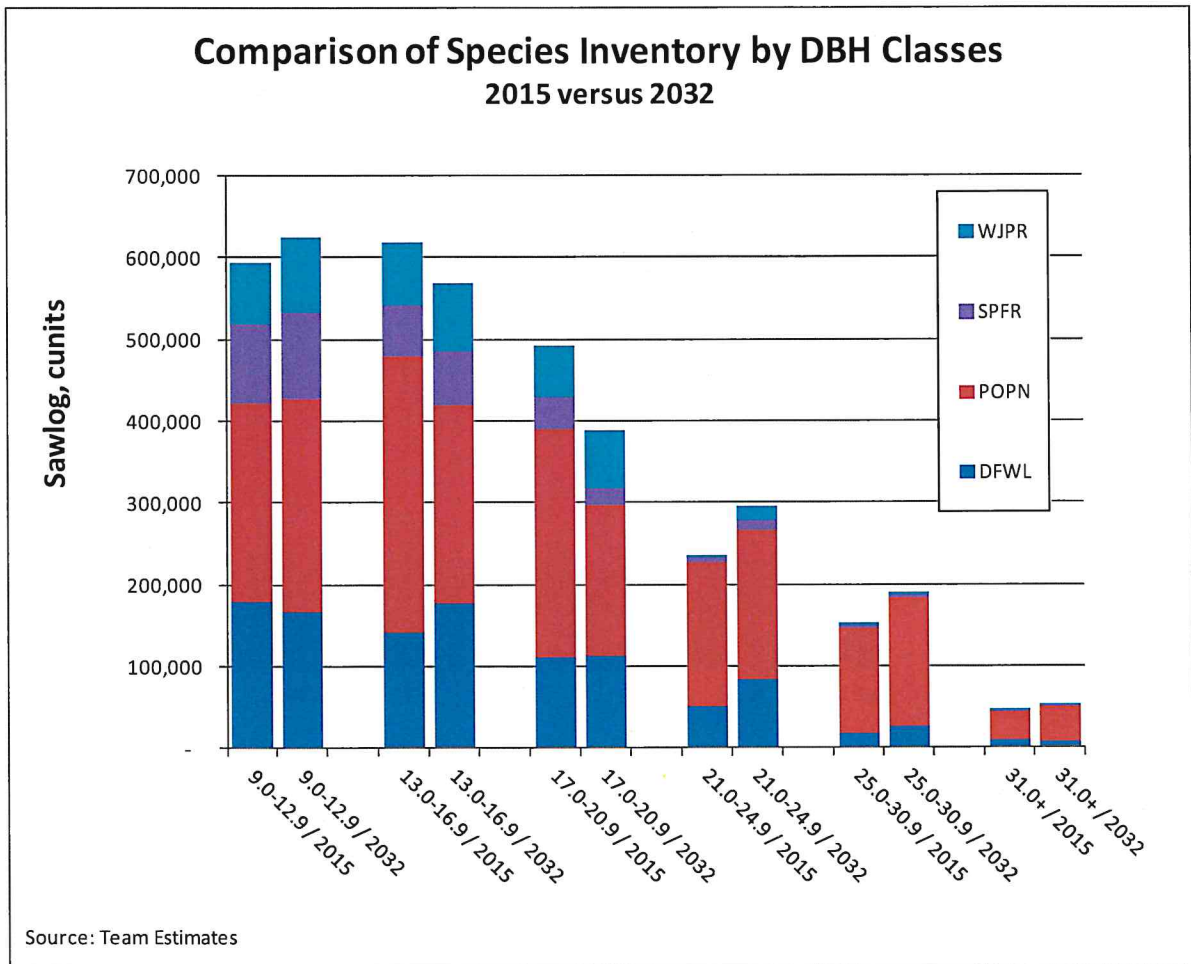


Figure 6.29

During the analysis of the potential harvest levels for Grant County's private forestlands, several questions that were not posed at the initial stages of this project surfaced and were addressed.

Question #1. Is the merchantable inventory on private forestlands on steep slopes or other hard to access areas?

Answer: The merchantable inventory appears to be generally located in areas accessible by current harvest systems.

Sawlog Harvest as a Percentage of Currently Operable Inventory						
Forest Type	Size Class	Percent SLOPE			Inventory 80 Ft2+ BA Large & Medium	Total Inventory All Acres
		0-20	21-40	41-60		
cubic feet						
Sawlog Inventory - 80 FT2 BA and higher in Large and Medium Stand Size Classes						
Douglas-Fir	Large	-	22,710,859	6,520,756		
	Medium	-	-	-		
Ponderosa Pine	Large	20,653,599	22,058,383	7,725,636		
	Medium	8,972,753	3,782,328	-		
Spruce-Fir	Large	11,764,720	9,480,465	-		
	Medium	-	-	-		
Total	Large	32,418,319	54,249,707	14,246,392		
	Medium	8,972,753	3,782,328	-		
					113,669,499	206,694,030
Rate of Harvest	Large	7.75%	5.81%	2.91%		
Factors	Medium	3.88%	2.91%	1.45%		
Generating Sawlog Harvest ONLY from Sawlog Inventory of 80 FT2 BA and higher in Large and Medium Stand Size Classes						
Harvest	Large	2,512,419.72	3,153,264.22	414,035.77	HARVEST as a	
	Medium	347,694.18	109,923.91	-	PERCENT of INVENTORY	
Harvest Grand Total		6,537,337.80			5.75%	3.16%
MBF at x BF / CF	4.6	30,072	MMBF			

Question #2. Is the merchantable inventory so dispersed across the landscape so that it is economically inoperable?

Answer. Certainly some of the standing inventory on private forestlands is so dispersed as to make harvest uneconomical in most log market scenarios. However,

some private forestlands would biologically benefit from a regeneration harvest and this approach would reduce the impact of this concern. Appropriate regeneration harvests and harvests of 25 to 30 percent of standing inventory would generate sufficient volume to support economically viable harvest operations on Grant County's private timberlands.

Sawlog Inventory per Acre - 80 FT2 BA and higher, Average MBF per Acre						
Sawlog Inventory - 80 FT2 BA and higher in Large and Medium Stand Size Classes						
Forest Type	Size Class	Percent SLOPE			Inventory	Total
		0-20	21-40	41-60	80 Ft2+ BA	Inventory
MBF per Acre					Large & Medium	All Acres
Douglas-Fir	Large	-	8.71	4.82		
	Medium	-	-	-		
Ponderosa Pine	Large	8.96	12.09	6.32		
	Medium	5.89	1.93	-		
Spruce-Fir	Large	6.02	7.66	-	MBF Volume Per Acre	
	Medium	-	-	-	Total Inventory & Acres	
Grand Totals		7.11	on Large and Medium		All Forest (juniper included)	2.98
			Forestland, 0 to 60 percent slope 80+ FT2 BA			Non-juniper only 4.35

Question #3. Will the species composition within higher harvest levels change?

Answer. The volume for all species including ponderosa pine would increase with higher harvest levels.

Distribution of Ponderosa Pine Inventory						
Percentage of Total Ponderosa Pine Inventory on 80 FT2 Basal Area and higher						
Forest Type	Size Class	Percent SLOPE			PONDEROSA PINE INVENTORY - MMBF	
		0-20	21-40	41-60	80 Ft2+ BA	Inventory
		Percent of TOTAL Ponderosa Pine Inventory			Large & Medium	All Acres
Douglas-Fir	Lg & Med	7%	0%	0%	34.829	51.464
Ponderosa Pine	Lg & Med	24%	21%	6%	271.353	458.570
Spruce-Fir	Lg & Med	0%	0%	0%	-	1.552
Western Juniper	Lg & Med	0%	0%	0%	-	20.879
Other Hardwood	Lg & Med	0%	0%	0%	-	-
Non-Stocked	Lg & Med	0%	0%	0%	-	-
Grand Totals	Lg & Med	31%	21%	6%	306.182	532.466
					58% of Total	
Data sources: Updated (during 4Q2012) FIA 2010 inventory						
NOTE: The updated FIA 2010 inventory, the basis of the analysis shown here, reports 319 thousand acres of private forest land (196 thousand acres of non-juniper forest land). The study acres estimates private forest land in the county at 335 thousand acres (209 thousand acres of non-juniper forest land).						

Appendix #7

Economics of Grant County's Estimated Private Timber Supply

The economic impacts to Grant County's private timberland owners are depicted in Table 1. The valuations presented are based on estimated timber cash flow. While the absolute valuation cannot be completely accurate due to the other market values inherent in land ownership, the differences due to changes in timber production are informative. As the various supply cases depict the average harvest, the implied timber production per acre is calculated by dividing the harvest by the non-juniper forest acres. The average cash flow loosely corresponds to stumpage less some annual management expenses.

If the current harvest level is perpetuated for an extended period of time, the inherent value of the property declines due to the low cash flow level. In addition, a continuing low level of timber supply from Grant County's private timberlands increases the risk to an already vulnerable forest products infrastructure. A financial valuation of the timberlands would likely account for such a risk by applying a higher investment (discount) rate to the stream of cash flows resulting in a reduced value for the property.

If the level of harvest from Grant County's private timberlands increased from current level to a level similar to the "probable scenario", timberlands valuations increase by \$105 to \$165 per acre compared to valuations based on current harvest and market conditions. This increase is due to higher timber production and lower risk of local mill closures. In addition, there is a prospect of an increase in demand from outside of Grant County as those mills drop more distant and high cost timber for more plentiful Grant County timber. The increase in demand could increase stumpage prices, supporting even higher valuations as shown within the gray dotted lines.

If supply moves to the “sustainable scenario”, values increase due to higher timber production. The influence of lower market risk is minimal in this case, but there is additional upside for stumpage price valuation. Taking the center of the upside range as indicative of upside risk, this could represent an increase in value of \$201 to \$289 per acre.

If supply increases to the “potential scenario”, supply valuations increase even further. Infrastructure risk is further reduced, timber production increases and heightened demand through competition provides greater improvement on stumpage returns.

To illustrate how an expansion in supply could result in an increase in demand, an illustration of a hypothetical Grant County mill supply curve is provided in Figure 7.1. While the data is hypothetical, it does reflect current market conditions and portrays log supply market mechanics. The key point is that by increasing the log supply from private timberlands in Grant County, the risk to the local manufacturing infrastructure can be reduced, demand may rise as other eastern Oregon mills opt to purchase stumpage from Grant County’s private timberlands and stumpage and land valuations can increase resulting in financial gains for both the landowners and mill owners.

Table 7.1. Illustrative Table of Forest Land Valuation Based Solely on Expected Timber Cash Flow

Annual Private Harvest	Per Acre Yield* BF/AC/Yr	Average Cash Flow \$/MBF	Investment Rate				
			3%	4%	5%	6%	7%
			Harvest Cash flow Valuation - \$'s per Acre				
4,000 (Current)	19	\$ 105	67	50	40	34	29
		\$ 115	73	55	44	37	31
		\$ 125	80	60	48	40	34
		\$ 135	86	65	52	43	37
		\$ 145	93	69	56	46	40
16,000 (Probable)	77	\$ 105	268	201	161	134	115
		\$ 115	294	220	176	147	126
		\$ 125	319	240	192	160	137
		\$ 135	345	259	207	173	148
		\$ 145	371	278	222	185	159
23,000 (Sustain)	110	\$ 105	386	289	231	193	165
		\$ 115	422	317	253	211	181
		\$ 125	459	344	276	230	197
		\$ 135	496	372	298	248	213
		\$ 145	533	400	320	266	228
29,000 Potential	139	\$ 105	486	365	292	243	208
		\$ 115	533	400	320	266	228
		\$ 125	579	434	347	290	248
		\$ 135	625	469	375	313	268
		\$ 145	672	504	403	336	288

*Harvest essentially on non-juniper acres only

Table Formatting Legend

	Most Likely Range within the Harvest Scenario
	Possible Range within the Harvest Scenario
	Less Likely Range within the Harvest Scenario
	Potential Upside within the Harvest Scenario

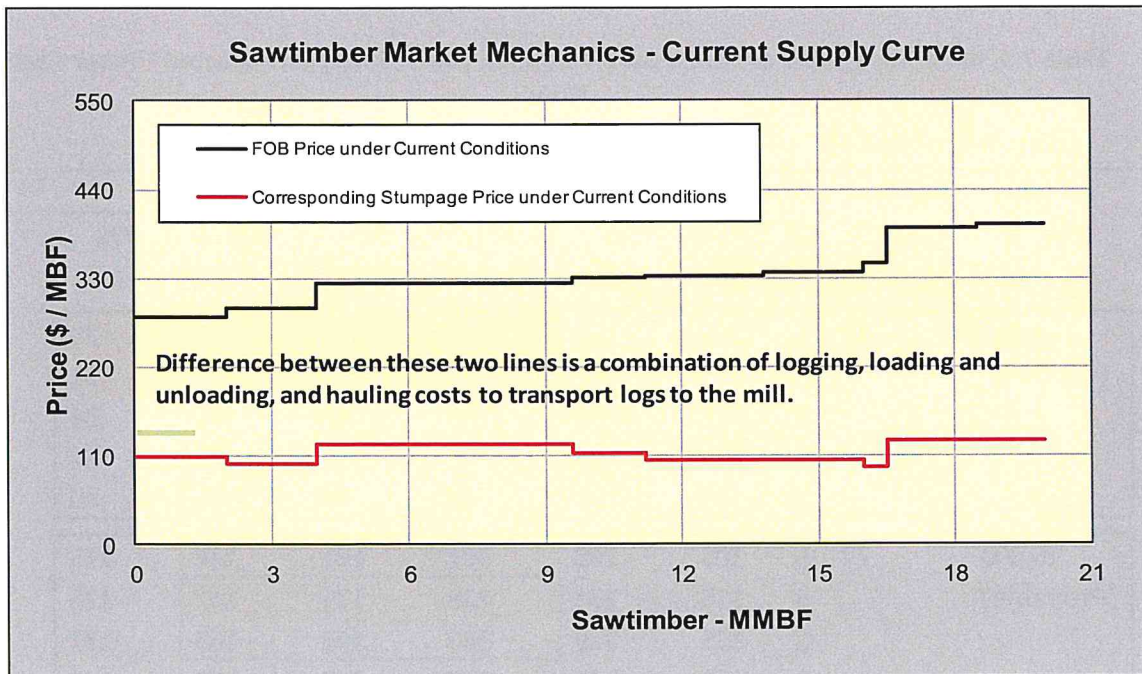


Figure 7.1

Figure 7.1 shows supply curve for hypothetical mill in Grant County. The red line shows the stumpage price received as a component of the delivered log price paid by the mill.

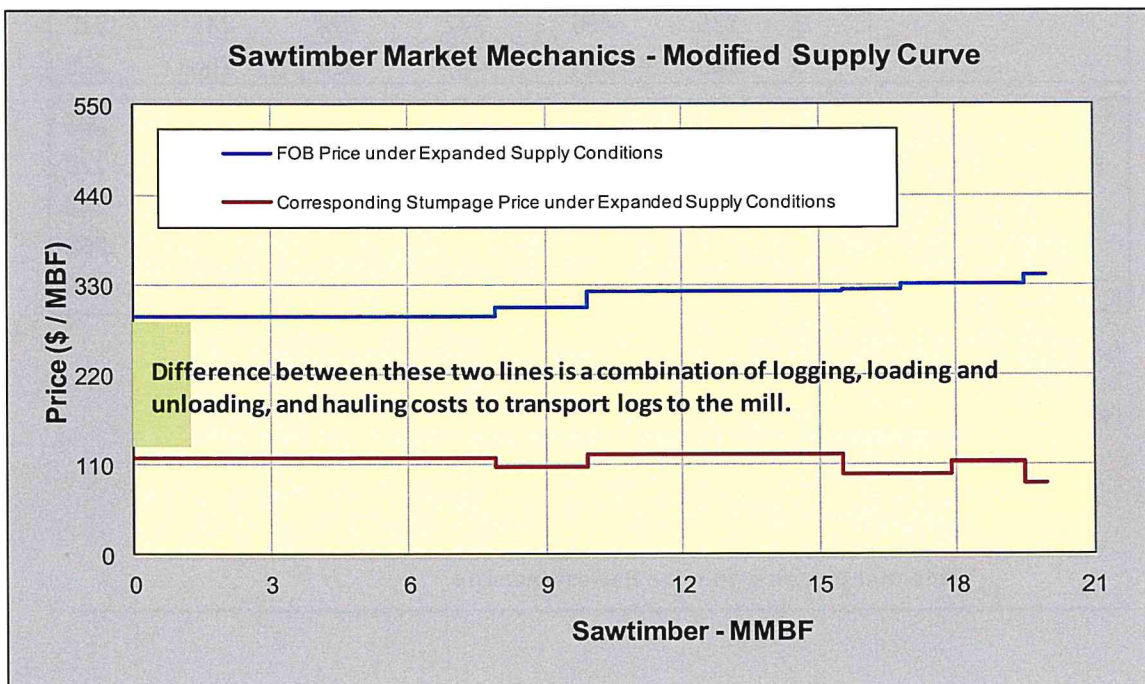


Figure 7.2

Figure 7.2 shows revised marginal cost curve with expanded supply from Grant County.

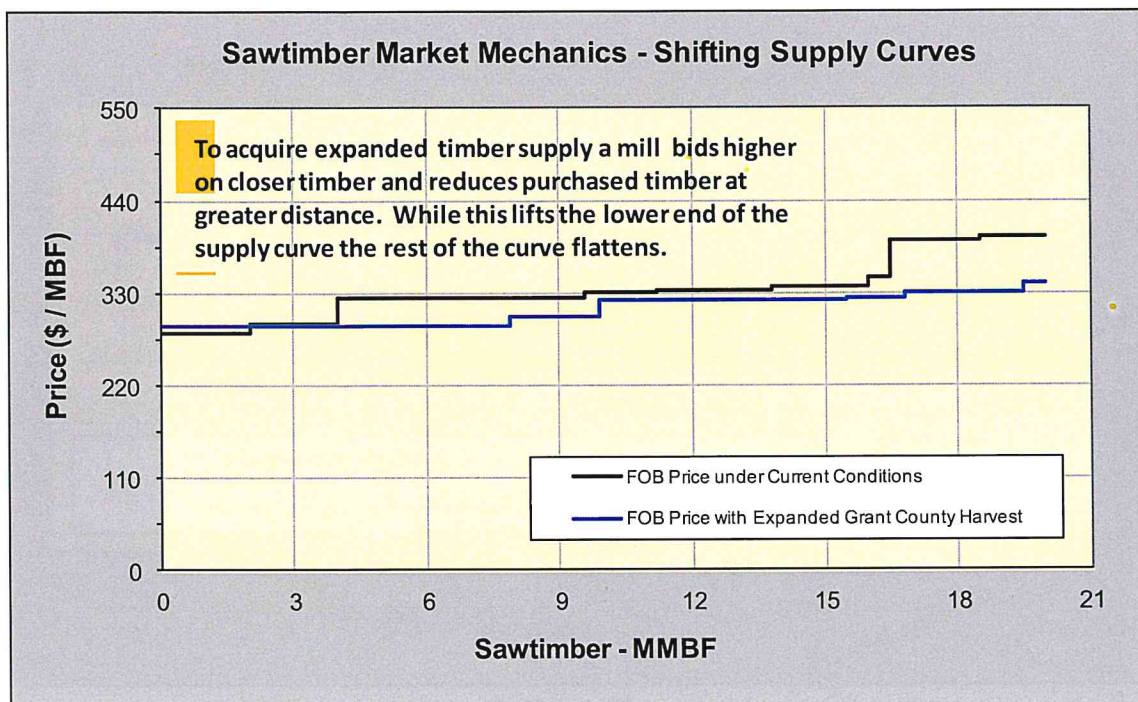


Figure 7.3

Figure 7.3 compares the two supply curves. The bottom end of the revised supply curve is slightly higher as increasing demand produces higher stumpage prices paid to Grant County timber owners. However, the back end of the supply curve is lower because the more distance sources of supply have been dropped. On net, the delivered cost for the highest costing 25% for the mill is down by 15 percent and the average cost is mill is down by seven percent. The competitiveness of the local mill infrastructure is improved.

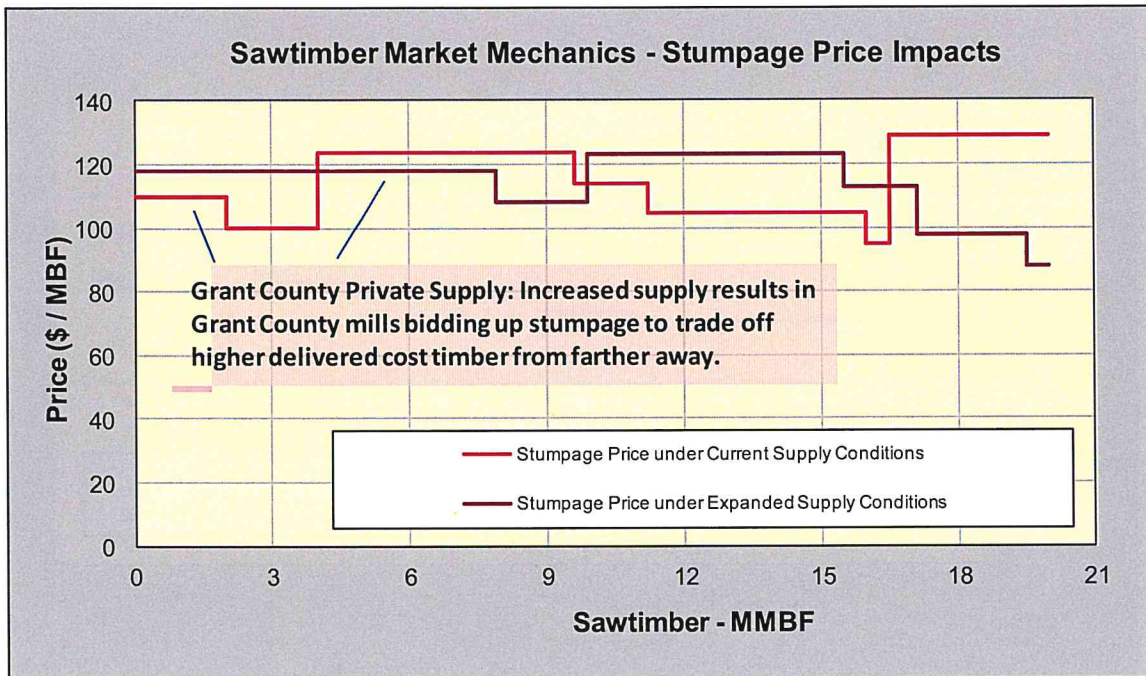


Figure 7. 4

Despite average mill costs declining, the stumpage price paid for Grant County private timber is seven percent higher due to increased competition as mills in eastern Oregon outside of Grant County seek to reduce their costs by purchasing Grant County logs with lower transportation costs. Also, even though Grant County stumpage prices are higher, the weighted cost of stumpage in the mill's supply curve is essentially unchanged as demand shifts in other areas of eastern Oregon impact stumpage prices.

Appendix 8

Opportunities for Non-Timber Revenue from Grant County's Private Timberlands

It has long been recognized that timberlands provide a wide range of benefits beyond producing wood fiber. A variety of ecological structures and conditions provide habitat for many vertebrate and invertebrate species. Trees sequester carbon and produce oxygen. Forests reduce soil erosion and sediment deposition into water bodies thereby protecting water quality and regulating water quantity. Forests growing near riparian areas provide shade that reduces water temperature and improves habitat conditions for aquatic species. And forests provide aesthetic beauty supporting recreational opportunities as well as enhancing general quality of living.

When forests are converted to other economic uses, some or all of these other benefits may be lost to both the local community and society. Increasingly, markets are being developed to compensate the timberland owner for providing these general societal benefits. This provides a countervailing financial incentive for the timberland owner to continue to provide these benefits in lieu of other traditional commercial alternatives. These types of markets are referred to in this report as Ecosystem Services; another common title is Environmental Markets.

The PDF file entitled "The Matrix" and produced by Forest Trends and the Ecosystem Market Place illustrates the opportunities for Ecosystem Services payment.² Its companion document titled "Payments for Ecosystem Services: Market Profiles" provides details on several of these opportunities.³ Another report authored by American Farmland Trust, "Guide to Environmental Markets for

² http://www.ecosystemmarketplace.com/documents/acrobat/the_matrix.pdf

³ http://moderncms.ecosystemmarketplace.com/repository/moderncms_documents/PES_Matrix_Profiles_PROF_OR.1.pdf

Farmers and Ranchers”, provides an overview of opportunities for private landowners.⁴ A document by the same organization tailored to the Pacific Northwest is also available.⁵ Finally, there is a new office within the USDA specifically aimed at environmental market. Its mission is,

“...to catalyze the development of markets for ecosystem services. OEM [Office of Environmental Markets] has a unique role in the federal government's efforts to develop uniform standards and market infrastructure that will facilitate market-based approaches to agriculture, forest, and rangeland conservation.”⁶

In addition to these ecosystem benefits, forests offer other opportunities for revenue generation outside more traditional extractive, albeit renewable, uses such as timber harvest. One emerging area of interest is in renewable energy. In addition to woody biomass energy, forestlands also offer other potential renewable energy options such as wind, solar and geothermal. The following pages identify and describe several of these opportunities. Assessing the potential for any of these opportunities in Grant County is beyond the scope of this project, but the listed opportunities are indicative of the types of activities others are pursuing which may have revenue generating potential for the owners of Grant County's private timberlands.

⁴ <http://www.farmland.org/documents/GuidetoEnvironmentalMarketsforFarmersandRanchers.pdf>

⁵ <http://www.farmland.org/programs/environment/solutions/Conservation-Markets-Pacific-Northwest-American-Farmland-Trust.asp>

⁶ <http://www.fs.fed.us/ecosystems-services/OEM/>

Ecosystem Services - Carbon

One ecosystem service that has received considerable attention recently is carbon sequestration and carbon offsets. The motivation behind the carbon sequestration and carbon offsets is the view that both the developed and developing world's utilization of fossil fuels has significantly contributed to the increased production of greenhouse gases including carbon dioxide. The concern is that as concentrations of greenhouse gases increase in the earth's atmosphere, radiating energy from sunlight striking the earth is trapped within earth's atmosphere which causes the earth's surface temperature to rise resulting in deleterious impacts to global living conditions. Limiting the production of greenhouse gases, including carbon dioxide, has been proposed to mitigate this risk. An alternative to limiting actual production of greenhouse gases is for the producers of greenhouse gases to offset that production by paying others to employ management practices that boost carbon sequestration. Thus, "additional" carbon produced offsets a greenhouse gas emitter's production of green house gases.⁷

While the concepts of carbon offsets seem simple, it is a complex situation. There are many differing protocols even within the same general category of "forestry projects". In addition, some protocols (e.g. Climate Action Reserve Forest Protocols⁸) include criteria that are not strictly related to carbon sequestration but instead a more holistic view of what constitutes "good" forest management. The report, "Building Forest Carbon Projects: Step-by-Step Overview and Guide", provides useful information on evaluating and selecting an appropriate protocol to use.⁹

Carbon sequestration occurs in carbon sinks. Landfills, agricultural crops, rangeland and forests are commonly recognized carbon sinks capable of producing

⁷ <http://www.global-greenhouse-warming.com/additionality.html>

⁸ <http://www.climateactionreserve.org/how/protocols/forest/dev/>

⁹ http://www.forest-trends.org/documents/files/doc_2555.pdf

marketable carbon offsets. Many people think a carbon-offset project is foregoing the harvest of existing forest stands for an extended period of time. However, one of the more common types of forestry carbon offset projects is afforestation and reforestation that establish forest on areas currently without forest cover. Afforestation refers to establishing forest cover in an area where not previously common. Reforestation refers to establishing forest cover where forest cover previously was dominant.

While national carbon trading legislation failed to pass Congress¹⁰ and the voluntary Chicago Climate Exchange (“CCX”) market closed in 2010,¹¹ carbon trading in the United States is still being actively pursued. In early 2012, analysts at Point Carbon, a provider of news, analysis and consulting services for European and global power, gas and carbon markets, estimated U.S. carbon trading would reach \$782 million in 2012.¹² Ecosystem Marketplace’s report, “The State of Voluntary Carbon Markets, 2012” explains the voluntary market in this way:

Carbon credits can be voluntarily purchased in one of two ways – through a private exchange or on the decentralized “over-the-counter” (OTC) market, where buyers and sellers engage directly through a broker or online retail “storefront.” This report primarily focuses on OTC transactions, the source of most voluntary offset transactions and market value, as few transactions currently occur on an exchange. From 2004 to 2010, a significant volume of voluntary credit transactions were conducted on the Chicago Climate Exchange (CCX). The CCX was a cap-and-trade system that organizations joined voluntarily to track and reduce their GHG emissions. The exchange was launched as a pilot program and completed its final trades in 2010.¹³

The report also states,

The voluntary carbon market remains illiquid – meaning that ready buyers are not always at hand; one or a few market players can dramatically influence pricing; and prices are highly stratified and often unpredictable, even within similar classes of offset. The details of payment and offset delivery vary

¹⁰ <http://www.reuters.com/article/2010/01/06/us-usa-carbonmarkets-interview-idUSTRE60500420100106>

¹¹ <http://www.popsoci.com/science/article/2010-11/us-carbon-trading-grinds-halt-while-other-nations-step>

¹² <http://www.businessgreen.com/bg/news/2136743/analysts-carbon-trading-reach-usd782m-2012>

¹³ http://www.forest-trends.org/publication_details.php?publicationID=3164

*tremendously from one project to the next, as do the projects' design, risk, start date and other factors that contribute to their eventual price.*¹⁴

With the closure of the CCX, regional carbon exchanges provide a forum for interested parties to buy and sell carbon offsets in North America. One group, formed in December 2005, is the Regional Greenhouse Gas Initiative (RGGI), based in the northeastern and mid-Atlantic states. A newer group, the Western Climate Initiative (WCI), was formed in February 2007 between Arizona, California, Oregon and Washington. Participants have continued to shift since its formation. In late 2011, six states pulled out of WCI: New Mexico, Arizona, Washington, Oregon, Montana and Utah. These six have announced plans to join a new organization, the North America 2050 Initiative.^{15,16} California and the Canadian provinces of British Columbia, Manitoba, Ontario and Quebec are continuing their plans for the WCI trading bloc.¹⁷

In November 2012, the State of California held its first carbon auction.¹⁸ This carbon auction is part of the state's implementation of its AB32 climate legislation that targets reducing the state's CO₂ emissions to 1990 levels by 2020. While some firms have voluntarily elected to purchase carbon allowances motivated by social concerns and/or for public relations, the more common driver of carbon markets is in conjunction with legislated or regulatory "caps" on carbon emissions. These programs are often referred to as "cap and trade". The legislation includes caps on CO₂ that can be released into the atmosphere from various sources and industries that release more than the legislated cap have to buy carbon allowances.¹⁹

¹⁴ http://www.forest-trends.org/publication_details.php?publicationID=3164

¹⁵ <http://www.environmentalleader.com/2011/11/22/states-abandon-western-climate-initiative/>

¹⁶ <http://www.georgetownclimate.org/states-and-provinces-form-north-america-2050-initiative-to-coordinate-on-climate-change-and-clean-en>

¹⁷ <http://www.westernclimateinitiative.org/wci-partners>

¹⁸ <http://www.ocregister.com/news/credits-378207-auction-carbon.html>

¹⁹ <http://energy.aol.com/2012/02/07/analysts-see-energy-shock-from-california-climate-law/>

California regulators proclaimed the first auction a success. The auction was well attended and all 2013 allowances were purchased with a 3:1 bid ratio.²⁰ However, the attendance and number of bids didn't translate into higher prices for carbon allowances. While average bid price was \$13.75, the average 2013 purchase price settled for only \$0.09 above the minimum reserve price of \$10.00.²¹ In addition, only 14 percent of the 2015 allowances were purchased and those purchased were at the minimum reserve price of \$10.

The world's largest carbon market remains the regulated EU market. Of the estimated US\$176 billion in carbon offset transactions in 2011, 84 percent occurred in the EU market. In comparison, the voluntary carbon market represented three percent of the total global transactions. EU carbon prices have been plummeting recently due to expanding supply of offsets as well as reduced demand due to the recession gripping Europe.²² In April 2012, prices fell to 5.99 euros per tonne of carbon dioxide emissions (approximately \$7.40 per tonne).²³ In early August, prices moved above 7.00 euros per tonne (approximately \$8.85 per tonne). The December 2013 delivery price for California Carbon Allowances Over-The-Counter market has been above \$19 per carbon dioxide equivalent (CO₂e) tonne for July 2012 (see graphic below) after dropping to \$13 in January 2012.²⁴

Based on the results of the recent California auction and these market reports, the price of carbon exhibits a fairly significant degree of volatility. It also appears that not all carbon tonnes are created equal, as there is some evidence of differential pricing between protocols. It's difficult to determine if the pricing differential is due

²⁰ <http://energy.aol.com/2012/11/27/carbon-auction-results-cheer-california-regulators-investors-an/>

²¹ <http://www.sacbee.com/2012/11/20/4998625/californias-first-cap-and-trade.html>

²² <http://www.guardian.co.uk/environment/2012/jul/25/eu-price-carbon-emissions>

²³ <http://www.reuters.com/article/2012/07/25/eu-ets-idUSL6E8IPCLZ20120725>

²⁴ <http://www.pointcarbon.com/news/marketdata/ca/forward/cca/>

to buyer preference for a particular protocol or how a protocol is marketed (negotiated vs. over-the-counter vs. auction).²⁵

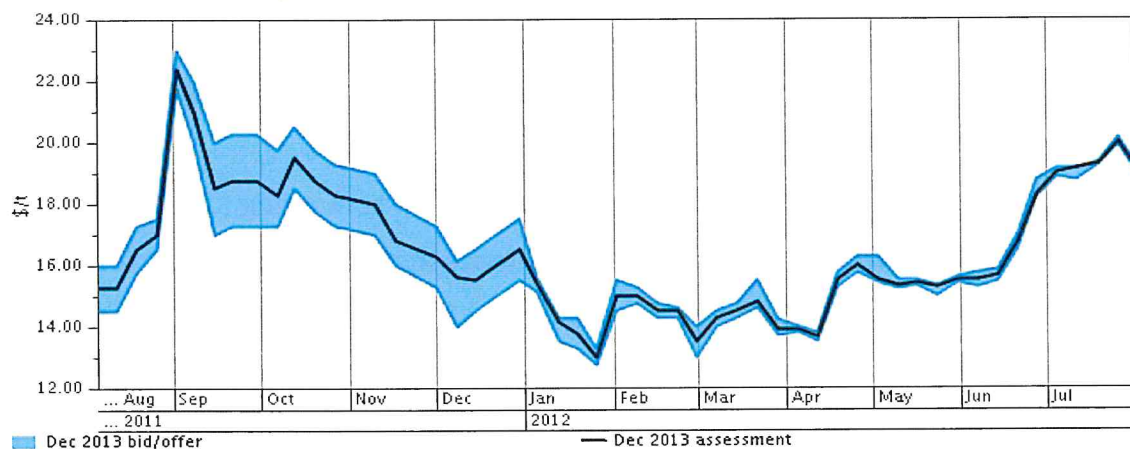
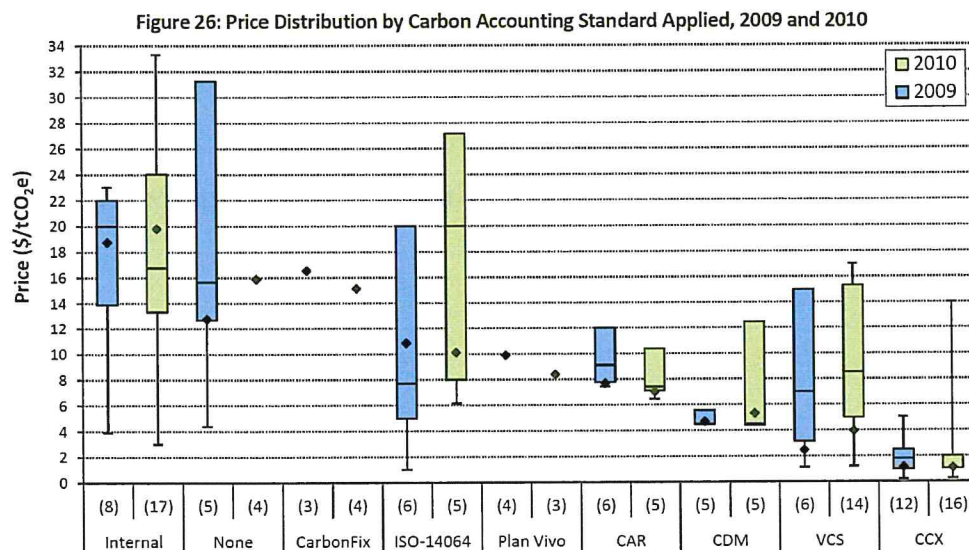


Figure 8.1



Notes: The price distributions shown here incorporate contracts signed across a range of stages in the project cycle (e.g., pre- and post-validation and verification) and with different delivery terms. These values are also closely related to the size of the transactions, and the total volume contracted under each standard varies considerably.

Source: Ecosystem Marketplace

Figure 8.2

One unknown with carbon projects is the impact on land values when sequestered carbon on a carbon project is “retired”, i.e. management options for a particular

²⁵ http://www.forest-trends.org/documents/files/doc_2963.pdf

tract of land are permanently altered.²⁶ Once credits are purchased, that carbon needs to stay out of the atmosphere from that point forward. As a result, a project becomes “an encumbrance” on a property when it is sold. Due to the relatively short period of time such projects have been actively implemented, there is no track record for how land values are affected if carbon offsets have been sold.

Finally, there may be a risk to carbon markets from a competing idea; a carbon tax. Experts differ on whether a carbon cap and trade approach is superior to a carbon tax as an instrument of public policy. However, the debate over the effectiveness of one versus the other may become moot as the U.S. federal government seeks to increase revenue to address both the annual fiscal deficit as well as indebtedness. Carbon taxes have emerged as one of the tools that might be used to increase revenues to the federal government.²⁷ If such a tax were enacted nationally it is unclear what impact that would have on landowners who sold carbon.

For those interested in learning more about carbon trading, a good starting point would be the website: Carbon Trading: A Primer for Forest Landowners.²⁸

²⁶ http://www.forest-trends.org/publication_details.php?publicationID=3164

²⁷ <http://thehill.com/blogs/congress-blog/economy-a-budget/269343-carbon-tax-could-be-part-of-eventual-tax-reform-package>

²⁸ <http://www.carbon.sref.info/>; Disclaimer: we are not advocating the information on this site nor implying it is completely accurate by mentioning it. We offer it simply as a point at which interested landowners could begin to learn more about their options. Consulting with professionals in this area would be highly recommended if the landowner has a desire to pursue in greater depth.

Ecosystem Services: Water Quality and Quantity

Forests can mitigate sediment delivery to streams and rivers, influence water flow, assist in water temperature control and maintain streambank integrity. This is a classic case where decisions by landowners can affect the quantity and quality of societal goods such clean water, moderated water flow (i.e. not dramatic swings in water flow), healthy habitat conditions for aquatic species and landform integrity. The common approach has been developing, monitoring and enforcing a regulatory framework that requires compliance by landowners to protect these societal benefits.

However, such an approach carries its own set of challenges and problems. First, developing regulations and the regulatory framework to monitor and enforce compliance is expensive. Secondly, a regulatory approach can and frequently becomes a never-ending escalator of ever more stringent regulations. Landowners that “do the right thing” are penalized as a more stringent regulatory framework reduces the market value of the landowners’ property. This can lead to additional costs if a landowner contends the effect of a regulation has reduced the value of their property without just compensation. While laws have been passed to mitigate this risk, the reality is such issues are complex and can result in costly legal battles that escalate societal costs.²⁹ This issue was a catalyst for Oregon’s Measure 37 (2004), later amended in Measure 49 (2007).³⁰

Given the contentious environment created by the regulatory development, monitoring, and compliance enforcement framework, an alternative approach is gaining traction. During the last decade, an increasing number of private and public (utilities and government agencies) initiatives are providing “market based” payments for watershed improvements. Similar to carbon markets, a market is

²⁹ <http://www.mrsc.org/subjects/legal/takings.aspx>

³⁰ <http://cms.oregon.gov/LCD/MEASURE49/Pages/index.aspx>

emerging to financially compensate landowners who manage their resources in a manner that maintains or enhances these societal goods.

In the United States, the federal government through the federal Farm Bill pays the majority of funding for such approaches.³¹ For example, in early 2012 the USDA announced available funding for up to \$10 million in Conservation Innovation Grants (CIG) as part of its water trading initiative administered by the Natural Resources Conservation Service (NRCS).³² There are now six different federal programs involved with funding market-based watershed improvement. Five of the six are administered within USDA's NRCS and the sixth is within EPA's Section 319 program. A seventh program area, focused on protection of drinking water, is administered through four programs administered by state- and local environmental health agencies. A 2010 report reports program funding has grown from \$628 million in 2002 to \$1.35 billion in 2008. When all programs are viewed collectively payments between 2002 and 2008 totaled \$8.4 billion.³³

Based on the authors' previous analysis for the U.S. Forestry and Community Endowment in 2011, partnership programs such as Oregon's own Willamette Partnership and the New York City Department of Sewer and Water are functioning examples of such initiatives. Another example of payments for watershed services is the City of Denver.

The Willamette Partnership was established in 2008³⁴ and partners a number of regional public utilities, environmental groups and the USDA. The stated objectives of this partnership are:

- Integrated and strategic investment in ecosystems

³¹ http://www.forest-trends.org/documents/files/doc_2438.pdf

³² http://www.usda.gov/oce/environmental_markets/files/FundingWaterQualityTrading.pdf

³³ http://www.forest-trends.org/documents/files/doc_2438.pdf

³⁴ <http://willamettepartnership.org/>

- A fair and transparent system for people to buy and sell environmental restoration benefits
- Business models to move beyond compliance-based projects to stewardship of ecosystems

In August of 2012, the Willamette Partnership received a \$1.5 million dollar “Conservation Innovation Grant from USDA”³⁵ to eventually cover a three state region. As stated by the US Secretary of Agriculture, *“These grant awards will help develop projects that create new revenue streams for farmers and ranchers while they are helping to improve water quality.”*

The New York City partnership is focused on annual payments for voluntary modifications to agricultural crop management within the utilities broader watershed. This program was recently recognized for its contributions to market-based water quality improvement:

“The Whole Farm Agreement was signed in November of 1991. All relevant deadlines were met and ultimately 93% of all the farms in the New York City watershed chose to participate. Whole Farm planning is arguably the most successful non-point pollution control programs in the United States. Its success played a critical role in stabilizing and reducing watershed pollution loads and in enabling the City to avoid the multi-billion dollar cost of filtering the Cat-Del water supply. Perhaps the greatest testimony to its success has been the growing number of reports of farmers outside the watershed's boundaries who keep asking how they can become part of the New York City watershed program.”

Active watershed pilot projects in North Carolina and Maine are directly comparing the costs of “green investment” to “gray infrastructure”, performing “beneficiary analysis” and working to include payments for watershed services (PWS) into a Unified Development Ordinance. To date the pilot projects have shown market-based solutions like PWS can play a large role in bringing flexibility and cost savings to public investment decision-making and communities’ land-use planning processes. For example, in Maine, preliminary results indicate that investing in

³⁵ <http://willamettepartnership.org/news-and-publications/willamette-partnership-receives-1-5-million>

green infrastructure could represent a cost-savings of \$68 - \$72 million (or 51% - 76%) over a 20-year period. Clear demonstration of cost-savings and/or public benefits as well as documentation of water quality and quantity risks will elevate interest for initiating similar projects.

The State of Washington enacted a program to promote watershed services market demonstration projects as part of a broader Ecosystems Services Market initiative for private forestland owners. Per the 2010 progress report to the State Legislature, the purpose of the demonstration project,

*"...is to take advantage of the opportunities presented by an as-yet untapped potential for the development of viable ecosystem service markets involving forest landowners and potential buyers of ecosystem services in Washington". The specific intent of the project is to create the necessary preconditions and attempt to stimulate a small set of real market or market-like transactions in one or more pilot watersheds in Washington."*³⁶

The fundamental value-driver for the Ecosystem Services Market including PWS is risk mitigation. To have a risk there must be a threat. In the case of Grant County, the threat relative to water quality and quantity is evident: the John Day River and many of its tributaries have been listed by the Oregon Department of Environmental Quality as a Clean Water Act 303(d) listed river system for which total maximum daily loads limits are being established. Part of this listing in 2010 includes a requirement for stakeholders in the basin to develop a basin "Water quality management plan"³⁷ (Figure 8.3³⁸).

³⁶ http://www.dnr.wa.gov/Publications/frc_research_dec11_eshb2541_rprt.pdf

³⁷ Pollution Limits and Water Quality Plan for the John Day River Basin - Oregon DEQ, <http://www.deq.state.or.us/wq/tmdls/docs/johndaybasin/TMDLandWQMPFINAL.pdf>, Malheur Basin also encompasses a portion of Grant County: <http://www.deq.state.or.us/wq/tmdls/basinmap.htm> <http://www.deq.state.or.us/wq/tmdls/docs/malheurriverbasin/MalheurTMDLWQMPFinal.pdf>

³⁸ <http://www.deq.state.or.us/wq/assessment/docs/MapImpairedWaters.pdf>



Figure 8.3

There may be several opportunities for private timberlands and rangeland owners to participate in market-based partnerships for watershed services.

- Reducing the reversion of “ prairie lands” to juniper savannahs and forests thus enhancing stream water yields
- Increasing the number of small seasonal water impoundment structures in order to increase late summer and autumn stream flows. Note: this activity is currently being promoted and funded in western Colorado.
- Reducing private road and tracks erosion
- Increasing stream riparian tree planting to increase stream shade and reduce summer stream temperatures
- Increasing noncommercial and commercial forest thinning in order to improve forest health and increase summer watershed water yields

While such partnerships will not likely produce significant net revenue to private timberlands owners, they can potentially provide funding for road improvements, pre-commercial thinning and juniper removal.

Western Juniper Management and Control

Defining what constitutes “juniper forest” is as much about art as science. The following selections from “The Western Juniper Resource of Eastern Oregon”³⁹ provide background into the challenges and methods employed to classify the western juniper resource in eastern Oregon. (Emphasis added)

“Western juniper grows on xeric lands across eastern Oregon with the majority of stands growing where precipitation is between 10 and 20 inches per year and at elevations between 3,000 and 5,000... Crown closure in juniper stands ranges from 60 percent to very sparse with only one to a few trees per acre.”

*“The definition of **juniper forest** for the 1988 inventory was **10 percent or greater crown** cover on the plot interpreted from aerial photography. The crown cover definition was a surrogate for the area occupancy of juniper or other trees. Because of their relative size, the [juniper] seedlings and saplings **contribute almost nothing to a definition that considers only crown cover**. The persistence of juniper seedlings and saplings suggests that these junipers should be accounted for when defining forestland⁴⁰. **We used stocking of 5 percent or greater (meaning 5 percent of full stocking), which includes the contribution of the seedlings and saplings, to define juniper forest**.”*

*“We defined **juniper savanna** as land with juniper trees growing on it but less than 5 percent stocking. Despite their low current stocking, such lands may well transition to juniper forest...”*

*“With the exception of the ponderosa pine type, which covers 4.9 million acres,... juniper forests occupy more area than any other forest type in eastern Oregon, over 3.5 million acres.... **If the crown density of juniper trees continues to increase on these savanna lands, juniper forests may become the forest type with the most acres in eastern Oregon...**”*

³⁹ Azuma, David L.; Hiserote, Bruce A.; Dunham, Paul A. 2005. The western juniper resource of eastern Oregon, 1999. Resour. Bull. PNW-RB-249. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 18 p.

⁴⁰ Further explanation: There were enough juniper stems and seedlings that, if it was a typical forest tree species, would have been sufficient to contribute to percent crown cover calculations and classify the land as forestland; however, because of how juniper grows it did not and so under the 10 percent rule would not have been classed as forest land. Thus, a new rule for juniper was developed to classify juniper forestland, the 5 percent rule.

The definition of “juniper forest” is somewhat in the eye of the beholder. For this study, lands that meet a minimum stocking threshold of five percent are classified as juniper forest while lands that have western juniper as the dominant tree species but are below the minimum stocking threshold are classified as “juniper savanna”. Based upon comparing various sources and consulting satellite imagery, an estimate of juniper forestland and what is referred to in this report as “juniper habitat”, the equivalent of “juniper savanna”, within Grant County was developed.

Lands classed as juniper forest have increased over the last 60 years from 420 thousand acres in 1936 to 3.3 million acres in 1999. If lands with juniper cover (not forest only) are considered, the change is 1.5 million acres in 1936 to 6.5 million acres in 1999. A portion of the change is due to definitional changes, but it is clear the extent of the juniper resource in eastern Oregon is rapidly expanding. It is also likely that a significant proportion of the lands currently classified as juniper savanna will grow into juniper forest; making the juniper forest the most prevalent forest type in eastern Oregon. Changes like this have significant ramifications on grazing capacity, precipitation interception and wildlife habitat conditions.

Lack of market outlets for juniper wood has hampered attempts to effectively manage the resource.⁴¹ Phil Chang reported the results of a western juniper commercialization feasibility study for the Prineville Area in 2007.⁴² The study found, “there is significant market demand and market opportunity for juniper products that are currently being produced in Central Oregon (house logs, dimensional lumber for flooring and paneling, and firewood).” However, despite the existence of both demand and opportunity, “the development of a cluster of businesses that can treat juniper-encroached Central Oregon watersheds and utilize

⁴¹ http://juniper.oregonstate.edu/bibliography/documents/phpyKXSaq_status7-00.pdf

⁴² **Western Juniper Commercialization Feasibility Study for the Prineville Area Local Innovation Fund Project Completion Report, Project No. 206-400**, Prepared by Phil Chang, Central Oregon Intergovernmental Council on behalf of the Juniper Working Group, http://juniper.oregonstate.edu/coic/Final_Report.pdf

the by-product material is not a certain future outcome.” The challenges to developing a “western juniper industry” were listed in this study.

- **High cost of processing juniper and delivering juniper products to market relative to the market value.** The cost of processing and transporting juniper from stump to market is very expensive relative to its price in the market place. The principal reason for this is the proportion of the volume that can be used for higher value uses (house logs, dimensional lumber) is very small, meaning the balance of the material harvested and processed will need to be directed toward lower value uses such as hog fuel. Because of this, the market value alone is generally insufficient to cover the full cost. The proposed solution was cost subsidies, either from private landowners or government sources, to make up the cost differential.
- **Lack of economic stability in the juniper supply chain.** The study notes, “juniper material is not reliably available and businesses face the real concern of building demand for a juniper product and then not being able to supply that demand because the material is not available.” The lack of stable supply is a recurring theme. This comment is from Oregon State’s Western Juniper site’s fact sheet⁴³ (emphasis added):

“To date, the most significant hurdles to a “booming” juniper industry are high harvest costs (short, highly-tapered and very limby trees combined with few trees per acre) and lack of a steady supply of raw material to the manufacturers.”

Oregon Solutions’ November 2011 statement⁴⁴ regarding the status of addressing issues related to use of juniper as a feedstock for biomass projects in

⁴³ <http://juniper.oregonstate.edu/factsheet.php>

⁴⁴ <http://orsolutions.org/beta/wp-content/uploads/2012/07/Oregon-Juniper-and-Biomass-Status-proposed-approach-11.9.11.pdf>

Oregon cited the lack of supply and more particularly supply information as challenges. (Emphasis added)

*“The **issue of supply has consistently arisen as a primary concern for parties interested in utilizing juniper resources in Oregon.** At present there is not a comprehensive detailed inventory of where juniper is located and at what densities on either public or privately-owned lands. A new method for a comprehensive study was completed in 2007 and focused on juniper in the vicinity of Prineville (see Phil Chang, Western Juniper Commercialization Feasibility Study for the Prineville Area <http://juniper.oregonstate.edu/coic/>).*

- **Relatively few businesses engaged in juniper harvest, transport, and processing.** Chang reports⁴⁵:

“There are currently relatively few businesses engaged in juniper harvest, transport, primary processing, secondary processing and manufacturing, marketing, and product sales in Central Oregon. For forest products based on other materials the cluster of involved businesses has more players and is more robust. Because the juniper cluster is so sparsely populated right now the few existing businesses feel tremendous pressure to vertically integrate – to be loggers, be truckers, run mills, run kilns, make deliveries, build markets for finished products, and on and on.”

There are at least two key issues identified in these comments. First, there is limited infrastructure to harvest and transport juniper to primary processors. Much work has been done to look at harvesting methods and systems suited to harvest juniper, but to date no configuration has emerged as a definitive solution.⁴⁶ Debarking juniper is also a challenge but methods exist to cope with at least some of the challenges.⁴⁷ Second, the variable stem form creates both the challenge as well as opportunity for efficiently sorting material to its highest value use. However, the harvesting and product market issues are hopelessly intertwined.⁴⁸ Without sufficient market size there is no financial incentive for

⁴⁵ http://juniper.oregonstate.edu/coic/Final_Report.pdf

⁴⁶ <http://juniper.oregonstate.edu/hvst.php> as an index. The following are representative of work done to develop an optimal harvest equipment configuration: <http://juniper.orst.edu/harvest.htm>; <http://juniper.orst.edu/harvest01.pdf>; <http://juniper.orst.edu/harsys.htm>

⁴⁷ <http://juniper.oregonstate.edu/newsletter/debark.htm>

⁴⁸ <http://www.swst.org/meetings/AM08/proceedings/WS-31.pdf>

entrepreneurs to invest in equipment and labor to produce sufficient levels of juniper volume. Without sufficient logging and forest product delivery capacity, entrepreneurs will not invest in a business where there is no assurance of a reliable raw material supply.

- **Need to establish juniper-based niche product markets.** Chang observed that juniper's greatest market potential lies in the area of niche marketing, not commodity marketing.⁴⁹ Other studies⁵⁰ have come to the same conclusion.

"'Green' utilization practices including all aspects of sustainable forestry and environmental restoration appear to be important factors in the choice of juniper in the markets surveyed. Efforts by the Western Juniper Commercialization Steering Committee to highlight the environmental benefits of juniper utilization are commendable. Smartwood or similar certification of sustainable forestry practices will enhance the appeal of juniper in the marketplace."

Niche marketing requires understanding the unique traits of a tree species and then finding how those traits can be profitably manufactured to better satisfy existing consumer needs and preferences. One trait that is fairly well known is juniper heartwood naturally resists decay and so offers possibilities as landscape and garden products including fencing, posts, landscape timbers grape and hop poles and decorative pieces. The challenge is finding a profitable use for the sapwood, as only the heartwood is decay resistant.^{51,52} An evaluation performed in 1996 for the Klamath County Economic Development Association

⁴⁹ http://juniper.oregonstate.edu/coic/Final_Report.pdf

⁵⁰ <http://juniper.oregonstate.edu/danielsn.htm>

⁵¹ <http://juniper.oregonstate.edu/exterior.php>

⁵² http://www.oregonlive.com/hg/index.ssf/2012/03/vern_nelson_selecting_durable.html ;
<http://www.oregonbusiness.com/articles/117-september-2012/8038-the-juniper-solution>

in conjunction with the Western Juniper Commercialization Industry Steering Committee had the following observations regarding western juniper:⁵³

"Western Juniper has some rather unique characteristics. First noticeable is its great visual appeal. The wood is multicolored with dramatic heart and sapwood variations. There are often knots and bark pockets which are especially pleasing in rustic uses. It is highly aromatic so it could be used for hangers, blanket chests, even potpourri. It is also fairly limited in range (Eastern Oregon, Northeastern California, and Owyhee County in Idaho), which means a distinctive western style and brand awareness could be created."

"Western Juniper is a strong wood, yet is on the softer side of the hardwood scale. It has great flexibility; it can be bent and even woven! The wood glues well. Many fasteners have been tested and holding ability is superior in some cases to other woods. The wood appears to be hydrophobic, or moisture retardant, and pest resistant. It is highly resistant to rot and could be used for exterior uses, such as posts or flower boxes."

"Finally, the wood takes a stain and finish consistently, but it should be noted that it is also good-looking unfinished and will then retain its scent this way. (When filling small knots and voids in surfaces before finishing my recommendation is a water base wood filler by Famowood in the color Cherry/Dark Mahogany."

"The wood machines relatively well. However, there are a few manufacturing disadvantages - hidden, longitudinal cracks in some of the wood can cause weak grain structure and radical problems with machining. When shaping or routing edge grain, curved or serpentine shapes should be avoided (the grain will tear and fray). Another solution is to form a two-ply glue lamination panel. (Take two boards of equal thickness and bond together their longitudinal face-grain parallel to one another.) Finger-jointed panels can also help to strengthen and stabilize Western Juniper."

"Finally, large, clear and solid stock pieces are rare. Boards thicker than 1" and wider than 3 1/2" usually have knots and bark pockets in lengths over 18"."

⁵³ <http://juniper.oregonstate.edu/bibliography/documents/hanson.pdf>

There are juniper manufacturers pursuing the niche marketing strategy including leveraging the environmental benefits generated by utilizing juniper as a product for watershed improvement and vegetation diversity.⁵⁴ However, some commodity applications are possible for juniper. For example, Collins Pine's hardboard mill has utilized clean juniper chips generated as part of a BLM stewardship contract for a portion of its wood furnish.⁵⁵ The following table is a compilation of mill directory sources in eastern Oregon utilizing western juniper.

⁵⁴ <http://earthfix.opb.org/communities/article/creating-a-market-for-juniper-wood-to-help-oregons/>

⁵⁵ <http://biomass.forestguild.org/Case-Studies/1008.html>

Facilities in Eastern and Central Oregon that Process Western Juniper

County	Company Name	OFID	WJO	City	Species of Interest
Baker	Elkhorn Biomass	✓		Baker City	Pulp logs (All species), Douglas-fir, Fir, white, Juniper, western, Larch, western (tamarack), Pine, lodgepole, Pine, ponderosa
Crook	Juniper Firewood L.L.C.	✓		Prineville	Juniper, western
Crook	Line Shack Log Structures LLC	✓	✓	Prineville	Fir, white, Juniper, western, Larch, western (tamarack), Pine, ponderosa
Crook	Prineville Sawmill Company, Inc.	✓		Prineville	Pine, blue-stained, Exotic Hardwood, Douglas-fir, Juniper, western, Pine, lodgepole, Pine, ponderosa, Pine, s. yellow
Crook	Central Oregon Juniper	✓		Prineville	Juniper, western
Crook	Burls by Burleigh	✓		Powell Butte	Juniper, western
Deschutes	MoreWood Products	✓		Bend	Alder, Red, Ash, white, Birch, white, Walnut, black, Cherry, Maple, bigleaf (western), Maple, hard, Myrtlewood, Oregon, Oak, Oregon white, Oak, red, Oak, white (eastern U.S.), Madrone, Pacific, Douglas-fir, Hemlock, western, Juniper, western, Pine, lodgepole, Pine, ponderosa
Deschutes	Central Oregon Firewood, Inc	✓		Bend	Juniper, western, Larch, western (tamarack), Pine, lodgepole
Deschutes	BH Horsecworks	✓		Sisters	Pine, blue-stained, Juniper, western, Pine, lodgepole
Deschutes	Ranch City Furnishings~Cowboy Creations	✓		Terrebonne	Juniper, western
Deschutes	Rockey Pine Custom Milling	✓		Terrebonne	Pine, blue-stained, Juniper, western, Pine, ponderosa
Deschutes	Sisters Forest Products, LLC	✓		Sisters	Douglas-fir, Juniper, western, Pine, lodgepole, Pine, ponderosa
Deschutes	Rocky Mountain Timber Products	✓		Sisters	Juniper, western
Grant	Storm Carpenter Log Homes	✓	✓	John Day	Douglas-fir, Juniper, western, Larch, western (tamarack), Pine, lodgepole, Pine, ponderosa, Spruce, Engelmann
Grant	Daves Custom Log Furniture	✓		Prairie City	Pine, blue-stained, Juniper, western, Pine, lodgepole, Pine, ponderosa
Grant	Juniper Plus Inc.	✓	✓	Mt Vernon	Juniper, western
Grant	Roy Peterson		✓	Monument	Custom logging and milling on your property using a portable (Mobile Dimension) sawmill.

-- continued on next page --

Disclaimer:

No attempt has been made to verify this list is a comprehensive listing of all western juniper processors in eastern and central Oregon or if companies included on this list are still operating. Inclusion on this list does not imply endorsement. Businesses and/or individuals included on this list from sources deemed to be reliable. Before entering into a business transaction of any type standard due diligence business practices should be exercised.

Sources:

OFID = Oregon Forest Industries Directory website search; data search on 1/24/2013

Search Criteria: Species = Juniper, western
Counties = Gilliam; Hood River; Sherman; Wasco; Wheeler; Baker; Grant; Morrow; Umatilla; Union; Wallowa; Crook; Deschutes; Jefferson; Klamath; Lake; Harney; Malheur

WJO = Western Juniper Organization website, Lumber and Log Homes; website data updated as of 7/23/2012

Facilities in Eastern and Central Oregon that Process Western Juniper - continued

County	Company Name	OFID	WJO	City	Species of Interest
Harney	Creations by Joseph	✓	✓	Burns	Pine, blue-stained, Douglas-fir, Juniper, western, Larch, western (tamarack), Pine, ponderosa
Harney	Soldier Creek Custom Juniper and Pine	✓		Burns	Juniper, western, Pine, ponderosa
Harney	Steve Basey		✓	Burns	Green or air-dried landscape timbers, fence posts, and special orders
Harney	Mac Runnels		✓	Burns	Custom logging and milling on your property. Air-dried Lumber and special orders.
Jefferson	Juniper Wood Products	✓	✓	Madras	Juniper, western
Klamath	Vintage Woodworks	✓		Dorris	Juniper, western
Klamath	Woods Of The West Gallery	✓		Crescent	Alder, Red, Chinkapin, Exotic Hardwood, Juniper, western, Pine, lodgepole, Pine, ponderosa
Klamath	Southern Oregon Round Stock Inc.	✓		Worden	Juniper, western, Pine, lodgepole, Pine, ponderosa
Klamath	Old 7 Inc.	✓	✓	Keno	Juniper, western
Klamath	JMAR (Juniper Mill at REACH Inc.)		✓	Klamath Falls	Post, poles, lumber products, landscaping bark, firewood, decking, and paneling.
Lake	Northwest Forest Industries	✓	✓	Paisley	Juniper, western, Pine, ponderosa
Malheur	WoodshopWonders, LLC	✓		Vale	Pine, blue-stained, Juniper, western
Wallowa	JayZee Lumber Inc	✓		Joseph	Walnut, black, Douglas-fir, Fir, white, Juniper, western, Larch, western (tamarack), Pine, lodgepole, Pine, ponderosa, Spruce, Engelmann, Spruce, Sitka, Pine, radiata
Wheeler	In The Sticks Juniper Sawmill	✓	✓	Fossil	Pine, blue-stained, Juniper, western, Pine, ponderosa
Wheeler	Juniper Log Homes	✓	✓	Mitchell	Juniper, western
Wheeler	Redwood Bench & Table Co.	✓	✓	Mitchell	Juniper, western
Disclaimer:		No attempt has been made to verify this list is a comprehensive listing of all western juniper processors in eastern and central Oregon or if companies included on this list are still operating. Inclusion on this list does not imply endorsement. Businesses and/or individuals included on this list from sources deemed to be reliable. Before entering into a business transaction of any type standard due diligence business practices should be exercised.			
Sources:					
		OFID = Oregon Forest Industries Directory website search; data search on 1/24/2013			
Search Criteria:					
		Species = Juniper, western			
		Counties = Gilliam; Hood River; Sherman; Wasco; Wheeler; Baker; Grant; Morrow; Umatilla; Union; Wallowa; Crook; Deschutes; Jefferson; Klamath; Lake; Harney; Malheur			
		WJO = Western Juniper Organization website, Lumber and Log Homes; website data updated as of 7/23/2012			

Table 8.1

Oregon State's Scott Leavengood comments on developing markets for species like western juniper.

"Full utilization -- for a wood species with unique characteristics (e.g., color, odor, etc.), generating sufficient demand from secondary manufacturers for high-value lumber is likely to be far less of a challenge than generating demand for low-value materials. That is, the real challenge is to establish viable markets for mid- to lower grades of lumber as well as residues such as bark, chips, sawdust, and hog fuel."

"Lessons learned with western juniper suggest that a good approach is to focus first on assessing standing timber inventory and accessibility and harvest systems and costs. For species where there will be large volumes of residues (e.g., a species with poorly-formed stems), it is recommended to pursue markets that can use high volumes of residues before focusing on markets for lumber. Markets for secondary/ value-added products may develop without significant effort."

The low volume per acre for harvesting juniper makes it paramount to generate maximum revenue per acre for profitable operations. Even when a juniper product is "commodity-oriented", the goal should be to differentiate the product by using its unique characteristics to command a price premium. The premium may only be willing to be paid by a small slice of the market, but juniper will likely remain a niche market product.

A simple example highlights the opportunity to leverage juniper's characteristics even when being utilized as a commodity-oriented product: commercial firewood. As this figure indicates, western juniper has one of the highest heating values of tree species likely to be used as firewood. This is differentiation

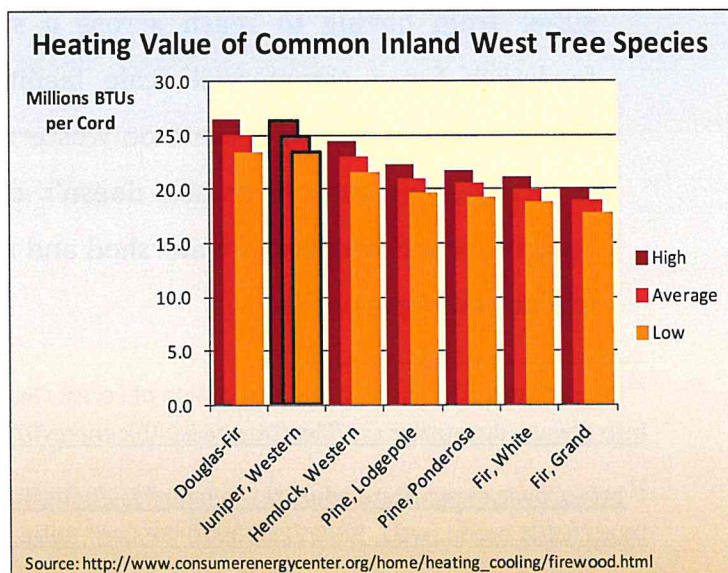


Figure 8.4

advantage #1. The aroma given off by burning juniper is differentiation advantage #2. The environmental benefits of utilizing western juniper to improve watershed conditions and promote native vegetation diversity on the landscape are differentiation advantage #3. The target market is a firewood purchaser who would pay more if they were educated to see the benefits of buying western juniper firewood.

The key to building a successful juniper industry is finding profitable markets for the fall-down and residual products as these value-added markets will only add to profitability. For juniper those “fall down” uses may be augmented by emerging technologies of the energy sector as well as providing positive environmental benefits.⁵⁶ Harvesting and grinding conventional hog fuel for commercial biomass energy generation is likely to make a project non-economic owing to the dispersed nature of the western juniper resource. An alternative may be small-scale community heating projects where the transportation costs to collect western juniper biomass feedstock could be better contained.⁵⁷

Torrefaction, the processing of biomass as a substitute for coal, may be one possible commercial energy market for western juniper.⁵⁸ However, it too may suffer from having to reach across a significant area to provide sufficient feedstock for a commercial scale facility. If torrefaction facilities can be economically scaled to operate on western juniper such that the transport cost to acquire biomass feedstock doesn't overwhelm the project, the positive environmental benefits of watershed and range improvement could still be part of a marketing program.

⁵⁶ Report funded by the National Association of Forest Owners (NAFO):

<http://www.dovetailinc.org/files/DovetailLCABioenergy0711.pdf>

⁵⁷ <http://owic.oregonstate.edu/sites/default/files/pubs/Stimulating%20Rural%20Economies.pdf>;
http://0101.nccdn.net/1_5/39c/2c8/36b/IFRP-Conf-Boise-ID-Jim-Boyer-20120201.pdf

⁵⁸ <http://www.oregonbusiness.com/articles/102-august-2011/5587-the-audacious-plan-of-hiroshi-morihara>

Yet another option on the near-horizon may be cellulosic ethanol or other types of liquid biofuels made from wood biomass. There are indications the day of commercial biofuels from woody biomass is fast approaching. A biofuels industry report details projects in 20 different U.S. states, several Canadian provinces, as well as China, Denmark, Italy, Germany, and Spain.⁵⁹ Included in the project list is ZeaChem's project with Greenwood Resources in Washington to utilize hybrid poplar as a biofuel stock.⁶⁰ In December 2012, a Canadian company, Woodland Biofuels, announced it was on track to begin producing cellulosic ethanol early in 2013 at a demonstration plant in Sarnia, Ontario.⁶¹ Another Canadian company, Ensyn, has various demonstration facilities in Ontario Canada, Wisconsin, California and Texas utilizing pyrolysis techniques to develop liquid fuels such as biodiesel.⁶²

Among the biomass sources listed in the Western Governors' Association strategic assessment of biofuels development in the Western States was treatment of pinyon/juniper lands.⁶³ As can be seen in the table below from the Western States Assessment report, treatments of pinyon-juniper woodland (this would include what was earlier referred to as both juniper forestland and juniper savanna) represent the single largest biomass opportunity category in the U.S. West in terms of volume: 37 percent in the Base case and 41 percent in the High case.

⁵⁹ http://ethanolrfa.3cdn.net/d9d44cd750f32071c6_h2m6vaik3.pdf;
http://www.biofuelstp.eu/cell_ethanol.html

⁶⁰ <http://www.woodycrops.org/NR/rdonlyres/B3645F29-CA4D-4F49-AE4A-8612EDC48D7B/3443/1Zerpa.pdf>

⁶¹ <http://biomassmagazine.com/articles/8421/woodland-biofuels-lands-new-investment-as-demo-progresses>

⁶² <http://www.ensyn.com/technology/overview/>; <http://www.ensyn.com/technology/application/>;
<http://www.ensyn.com/technology/key-rtp-facilities/>

⁶³ http://www.fpl.fs.fed.us/documnts/pdf2009/fpl_2009_skog001.pdf

Table 1: Potential annual wood biomass supply from selected western states (million oven-dry tons).

	Source	Base Case	High Case	WGA CDEAC ^a	BTSR ^a
A	Fire hazard thinning on timberland	5.2	7.5	7.2	
B	Logging residue	4.7	4.1	5.3	5.3
C	Treatment of pinyon-juniper woodland	7.6	11.5		
D	General thin on private timberland	2.7	4.3		
E	Pre-commercial thin on National Forest in western counties of Oregon and Washington	0.3	0.3		
F	Mill residue	0.2	0.2	0.3	0.3
	TOTAL	20.7	27.9		
	Thinning to reduce fire hazard on timberland				10.8
	Thinning on other forest land			9.2	9.2
	TOTAL			22	25.6

^a BTSR, Perlack et al. (2005); WGA CDEAC, WGA (2006).

Source: **A strategic assessment of biofuels development in the Western States**

http://www.fpl.fs.fed.us/documnts/pdf2009/fpl_2009_skog001.pdf⁶⁴

Table 8.2

The study assumed a stumpage cost of \$2 per oven dry ton would be paid for juniper biomass harvested from private lands. Estimated roadside cost in the study for this biomass source was roughly \$73 per oven dry ton and this is before the cost to transport it to a biofuel conversion facility. In the High Case scenario the report assumed costs would be subsidized at \$20 per oven dry ton based on proposed legislation. Even with subsidies, these high costs would render such a project non-economic.

In some biofuels processes, extractives are isolated and processed to produce value-added products in addition to the biofuels. Since juniper has unique extractives, the marketing of these other products could mitigate some of the higher cost of harvest and processing. The environmental benefits accruing

⁶⁴ Skog, Kenneth E.; Rummer, Robert; Jenkins, Brian; Parker, Nathan; Tittman, Peter; Hart, Quinn; Nelson, Richard; Gray, Ed; Schmidt, Anneliese; Patton-Mallory, Marcia; Gordan, Gayle. 2009. **A strategic assessment of biofuels development in the Western States**. In: McWilliams, Will; Moisen, Gretchen; Czaplewski, Ray, comps. Forest inventory and analysis (FIA) symposium 2008; 2008 October 21-23; Park City, UT. Pro. RMRS-P-56CD. Fort Collins, CO: U.S. Department of Agriculture, Forest service Rocky Mountain Research Station. 13 p. 2009

from juniper treatments would be a plus when marketing a biofuel product made from juniper. The biofuel plant scale size will also be a key variable due to the low volume per acre of juniper.

In summary, emerging energy technologies may offer some opportunities for commercial juniper applications in the future. However, none of them at present “the silver bullet” that solves lack of consistent commercial markets for western juniper. Maintaining awareness of developments within the state is an important step to take advantage of these developing technologies.

Renewable Energy

The most commonly evaluated form of renewable energy is biomass-based (woody biomass or agricultural biomass). Since Grant County recently completed a study addressing woody biomass as an energy source, that topic will not be addressed in this report. However, landowners may have opportunity to participate in other renewable energy sectors.

Wind Energy. Wind energy can be used to provide electricity for local farm and ranch needs or to sell to the commercial power grid. Commercial wind farms require access to transmission grids, locations where wind is reliable and sufficient land area. The Farmers’ Legal Action Group website provides access to useful materials for those interested in learning more about wind energy.⁶⁵ A cursory review of the following maps suggests opportunities for wind power generation in Grant County are limited. The maps on the next page are for estimated wind power density at 50⁶⁶ and 80⁶⁷ meters above the ground, respectively. This is not to

⁶⁵ <http://www.flaginc.org/topics/pubs/wind.php>

⁶⁶ http://www.windpoweringamerica.gov/maps_template.asp?stateab=or

⁶⁷ http://www.windpoweringamerica.gov/wind_resource_maps.asp?stateab=or

suggest localized opportunities do not exist for Grant County private landowners, only that wind energy is not a high priority for further evaluation.

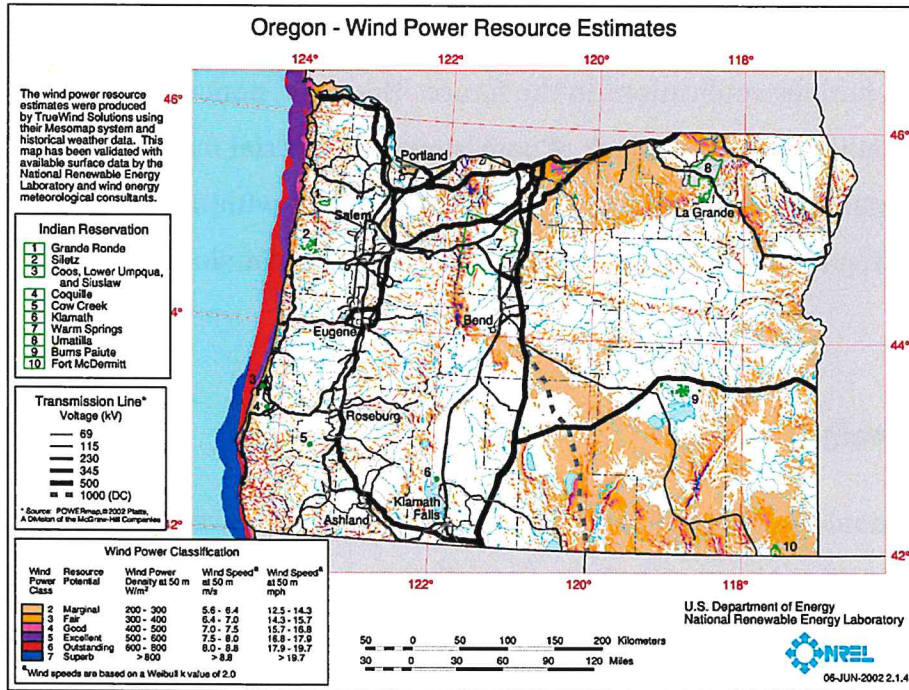


Figure 8.5 Oregon Wind Density at 50 meters above Ground -

http://www.windpoweringamerica.gov/images/windmaps/or_50m_800.jpg

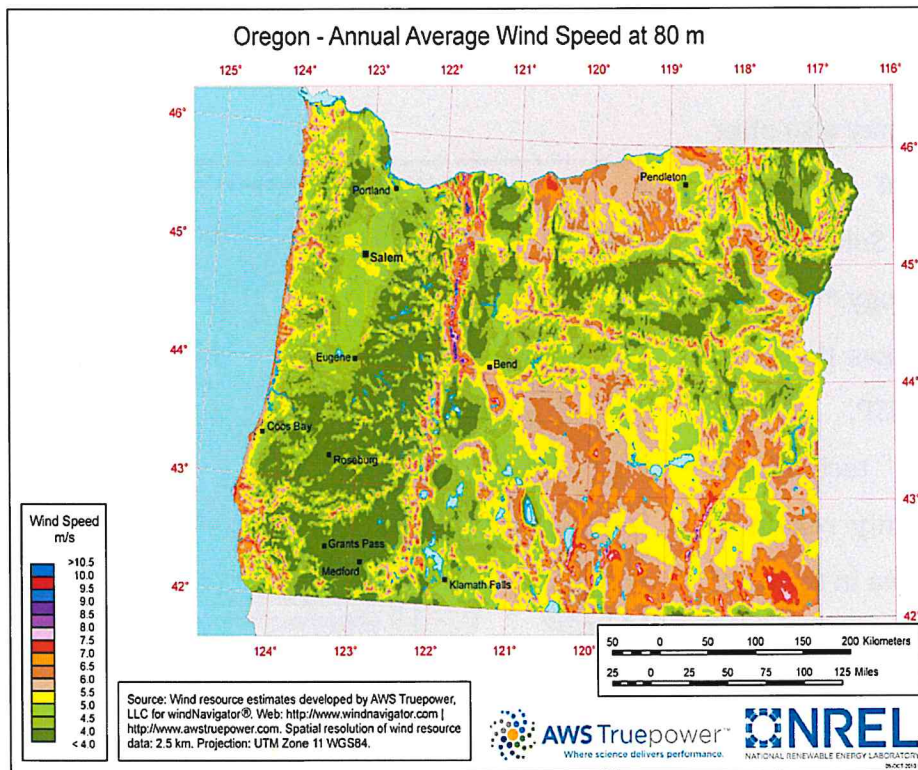
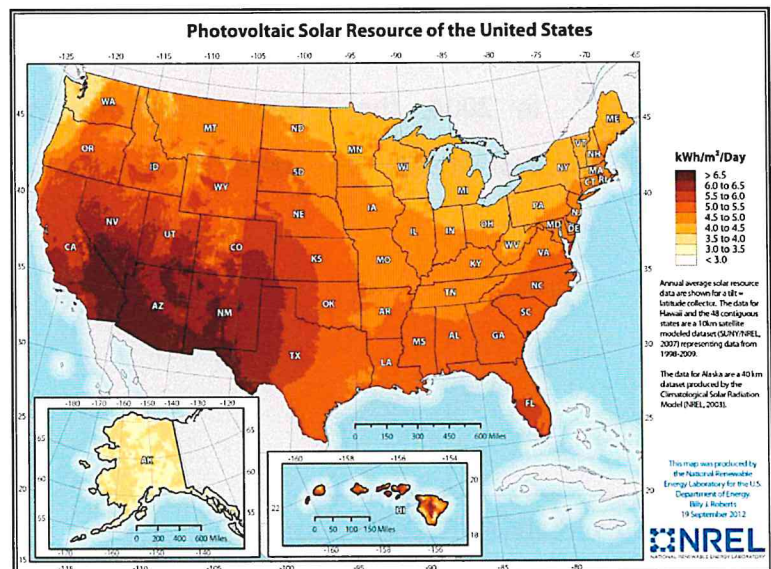


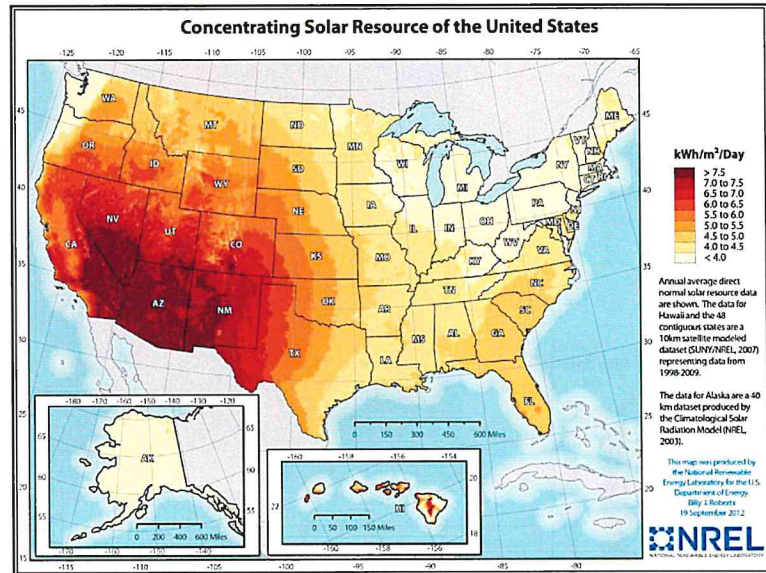
Figure 8.6 Oregon Wind Density at 50 meters above Ground - http://www.windpoweringamerica.gov/images/windmaps/or_80m.jpg

Solar Energy. According to the NREL solar resource maps, solar energy collected through photovoltaic panel⁶⁸ could offer some potential for Grant County. As with wind energy, access to the transmission grid and sufficient land area are important considerations.



⁶⁸ http://www.nrel.gov/learning/re_photovoltaics.html

Grant County may also offer some potential for newer Concentrating Solar Power (CSP) technology.⁶⁹ The NREL map shows the solar resource for CSP. As with photovoltaic technology, the Grant County region is not the best area in terms of solar energy reception. However, it still offers distinct possibilities.

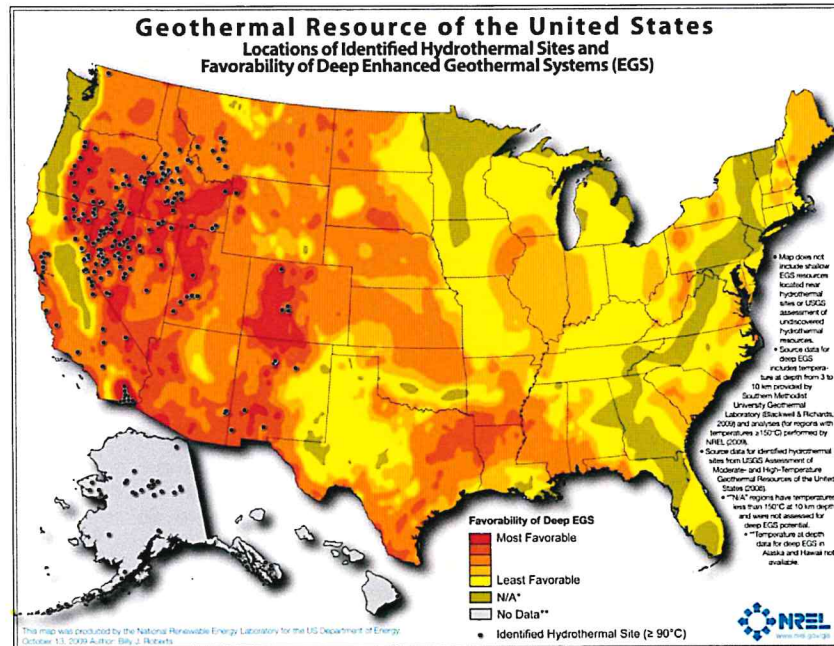


Geothermal Energy. Geothermal energy may offer the greatest potential for Grant County landowners. As can be seen in Figure 8.7, the western U.S. including eastern Oregon contains most of the thermal resources in the United States. Despite significant potential, geothermal energy generation has not been widely developed in eastern Oregon.⁷⁰ In 2004, the Oregon Department of Energy developed the Oregon Geothermal Working Group to better understand the potential for geothermal energy in

⁶⁹ http://www.nrel.gov/learning/re_csp.html

⁷⁰ <http://www.nrel.gov/gis/images/Developing%20Capacity%20Hydrothermal%202012%2009%2010%20Stand%20Alone-01.jpg>

central and eastern Oregon.⁷¹ The working group has developed a number of informational resources to assist and facilitate geothermal energy development.⁷²



Source: http://www.nrel.gov/gis/images/geothermal_resource2009-final.jpg

Figure 8.7

⁷¹ http://www.oregon.gov/energy/RENEW/Geothermal/docs/Report_DOE_Final_Geothermal_0906.pdf and www.oregon.gov/energy/renew/geothermal/docs/easternorionplant.ppt

⁷² <http://www.oregon.gov/energy/renew/geothermal/Pages/index.aspx> and http://www.oregon.gov/energy/renew/geothermal/Pages/geo_index.aspx

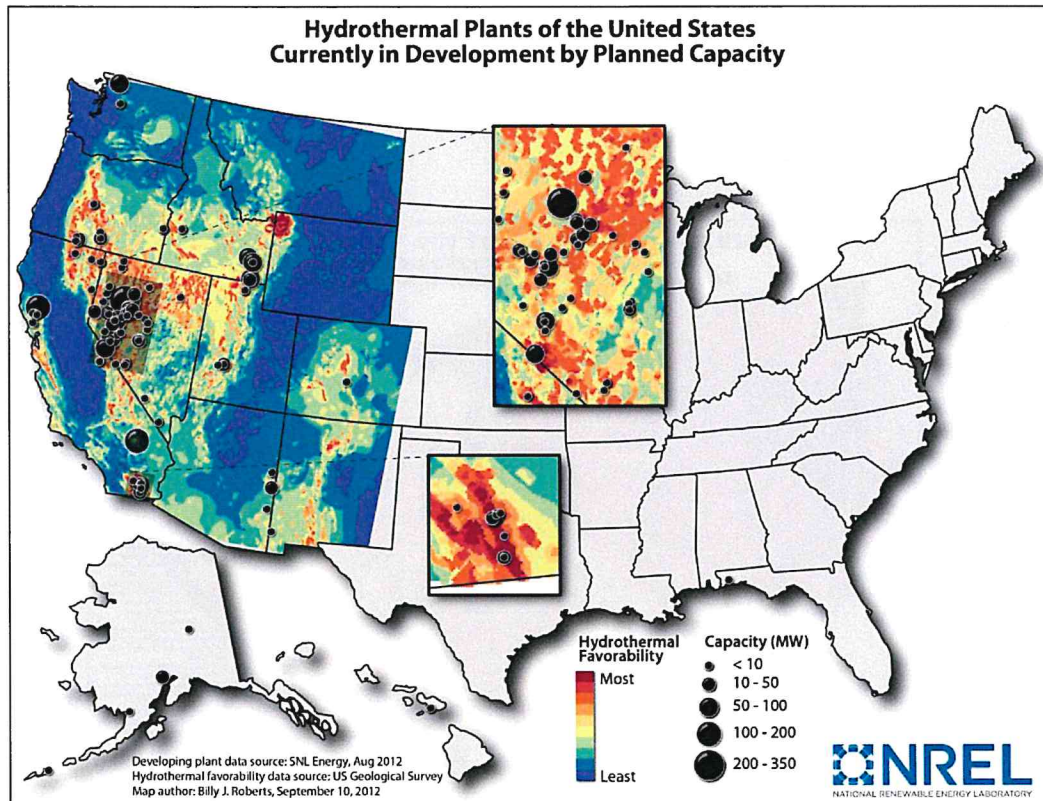


Figure 8.8

Ecosystem Services: Ecotourism

Another means of generating non-timber revenue from private lands that has gained market traction in some areas is ecotourism. Payment is received for providing access for recreationists to unique ecological, cultural and/or historical environments.⁷³ A successful ecotourism program would require active marketing, by individual landowners or a public-private collaborative effort.⁷⁴

In some cases, the ecotourism opportunity may have to be developed. An opportunity may be BLM's program to locate eco-sanctuaries for wild horses and burros on private lands. This past year, grants totaling \$300,000 were approved for

⁷³ <http://www.nal.usda.gov/ric/ricpubs/tourism.html>, http://www.flsteward.org/working_hunting_ecotourism.html, http://nercrd.psu.edu/publications/reports/FINAL_REPORTS/mcdill.pdf

⁷⁴ See <http://www.nal.usda.gov/ric/ricpubs/tourism.html>, http://nercrd.psu.edu/publications/reports/FINAL_REPORTS/mcdill.pdf, and http://www.flsteward.org/working_hunting_ecotourism.html for examples and information.

projects to improve western rangeland habitat for wild horses and burros with eight of the twelve projects in Nevada and Northern California. Sage grouse habitat restoration and enhancement may offer additional opportunities for private forest and range landowners in Grant County.⁷⁵

Conservation Easements

Throughout the United States including Oregon, a well-developed market for conservation easements has been operating for decades.⁷⁶ Major environmental groups such as Trust for Public Lands, The Nature Conservancy, Conservation Fund and Rocky Mountain Elk Foundation have acquired conservation easements on private lands.⁷⁷ The conservation easement is a common element for many ecosystem market strategies and can be employed either as a single effort or in conjunction with other conservation programs and mechanisms.

Common environmental values that may be monetized and protected under a conservation easement include:

- Improving watershed quality
- Protecting critical river and stream riparian areas and wetlands including mitigation banking⁷⁸
- Providing for critical species habitat⁷⁹ (“species banking”⁸⁰ or “conservation banking”)

⁷⁵ <http://www.blm.gov/wo/st/en/prog/more/sagegrouse.html>

⁷⁶ <http://www.tpl.org/publications/books-reports/book-the-conservation-easement.html>

⁷⁷ <http://mckenzieriver.org/protected-lands/how-to-protect-your-land/protect-your-land-conservation-easements/>

⁷⁸ http://www.ecosystemmarketplace.com/pages/dynamic/web.page.php?section=biodiversity_market&page_name=uswet_market

⁷⁹ http://www.forest-trends.org/documents/files/doc_2848.pdf and http://www.ecosystemmarketplace.com/pages/dynamic/article.page.php?page_id=9506§ion=biodiversity_market&eod=1

- Allowing public access for recreation and/or hunting
- Protecting aesthetic values
- Designing forest management activities
- Limiting and/or prohibiting the development of forest lands into other non-forest uses e.g. commercial properties or residential subdivisions

Conservation easements can be a diverse range of legal structures.⁸¹ The landowner retains title to the property, but surrenders specific ownership rights in exchange for the conservation easement payment. The easement is then legally attached to the property. The concept is similar to paying a landowner for permanent right-of-way for access. Organizations acquiring conservation easements typically generate funding for landowner compensation through a combination of private funding and government grants.

The value of a conservation easement is usually determined by the threat, perceived or real, posed to the conservation resource.⁸² Since conservation organizations have limited funds, conservation efforts are prioritized based in part on the imminence of the threat to conservation values. These factors, as well as the threatened alternative use, are important considerations in determining the value of the conservation easement.

As an example and only as an example, since Grant County lies along a key migratory bird flyway (see Figure 8.9⁸³), conservation easements to protect wetlands, riparian areas and similar resources may be an opportunity. Any such action should be preceded by a feasibility study that includes an assessment of the

⁸⁰ <http://www.speciesbanking.com/>

⁸¹ <http://www.epa.gov/owow/NPS/ordinance/documents/A2e-ModelLand.pdf>

⁸² http://www.ecosystemmarketplace.com/pages/dynamic/article.page.php?page_id=9138§ion=news_articles&eod=1

⁸³ <http://www.birdnature.com/pacific.html>

federal and state tax implications, reviews the impacts on land values and other significant issues.

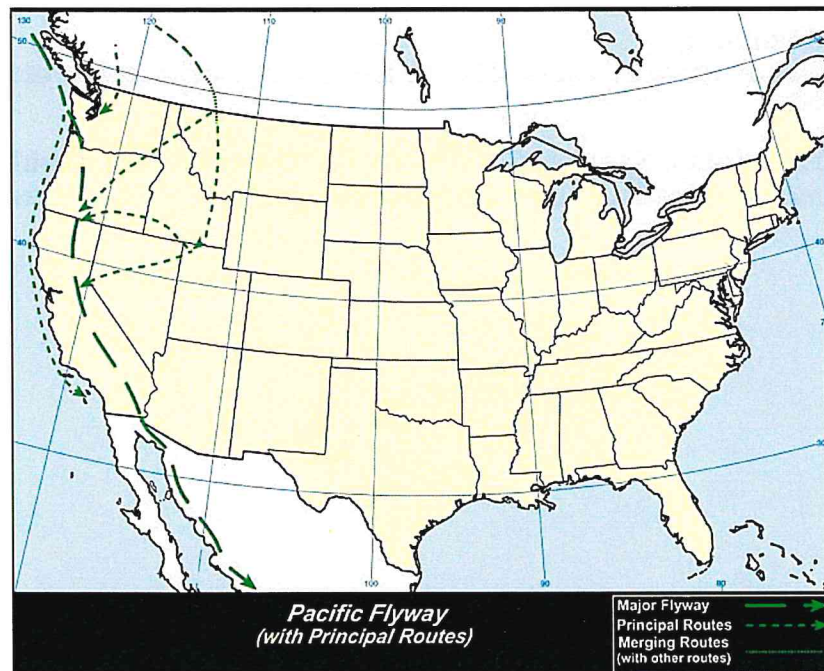


Figure 8.9

Ecosystem Services: Biodiversity and Species Banking

If there is interest in this new opportunity for revenue from ecosystems services, the following websites should be examined.

State of Biodiversity Markets 2011

http://www.forest-trends.org/documents/files/doc_2848.pdf

State_Biodiversity_Mkt-2011(doc_2848).pdf

Supporting document to State of Biodiversity Markets 2011

Methods - 2011 Update - State of Biodiversity Markets

http://www.forest-trends.org/publication_details.php?publicationID=2849

State_Biodiversity_Mkt-2011(methods.doc_2849).pdf

Biodiversity

<http://www.fs.fed.us/ecosystemservices/biodiversity.shtml>

Species Banking

<http://www.speciesbanking.com/>

US Conservation Banking

http://www.ecosystemmarketplace.com/pages/dynamic/web.page.php?section=biodiversity_market&page_name=uscon_market

US Wetland Banking

http://www.ecosystemmarketplace.com/pages/dynamic/web.page.php?section=biodiversity_market&page_name=uswet_market

The Rise of Candidate Species: Good News For Conservation Banking?

http://www.ecosystemmarketplace.com/pages/dynamic/article.page.php?page_id=9138§ion=news_articles&eod=1

Appendix #9

Cross Laminated Lumber

Following an unprecedented downturn, in terms of both length and depth, it appears U.S. housing is finally turning the corner. The Federal Reserve Bank of Philadelphia's recent survey of professional business forecasters reported a projected average housing start level of 0.91 million units from all respondents,⁸⁴ up from the 2012 level of 0.78 million units.⁸⁵ By way of comparison, the forecasted average for 2012 made in November 2011 was 0.67 million units.⁸⁶ Blue Chip Economic Indicators consensus housing start forecast from January 2013 for January is similar to the Philadelphia Federal Reserve survey, but also provides a 2014 forecast as well: 0.95 million units for 2013 and 1.16 million units for 2014.

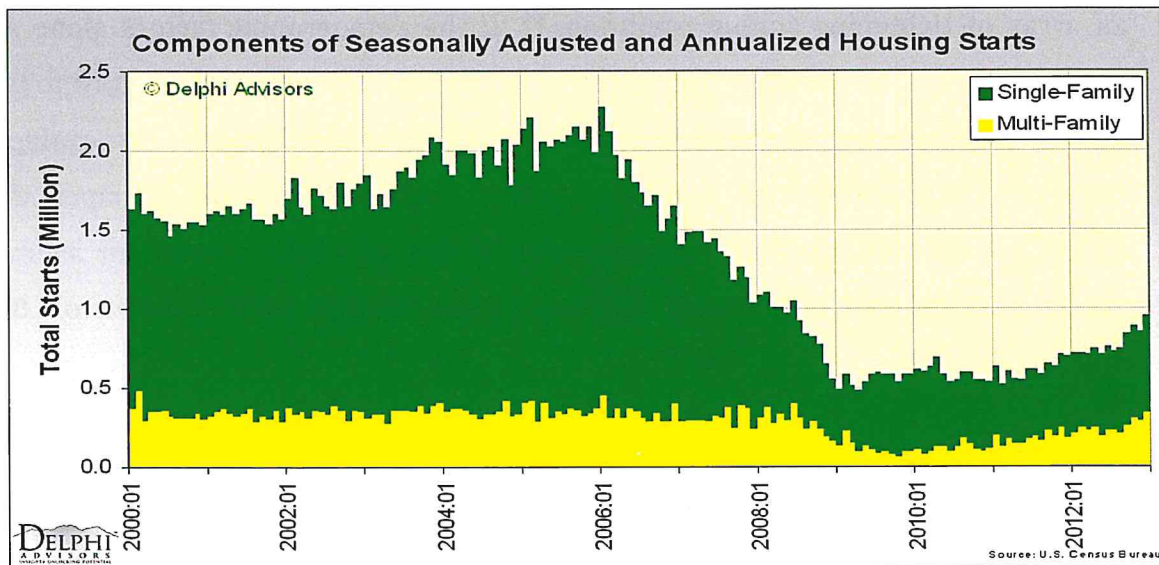


Figure 9.1 U.S. Housing Starts: Single Family and Multi-Family, 2000 - 2012⁸⁷

⁸⁴ <http://www.phil.frb.org/research-and-data/real-time-center/survey-of-professional-forecasters/2012/spfq412.pdf>

⁸⁵ http://www.census.gov/construction/nrc/pdf/newresconst_201212.pdf

⁸⁶ <http://www.philadelphiafed.org/research-and-data/real-time-center/survey-of-professional-forecasters/2011/spfq411.pdf>

⁸⁷ <http://delphiadvisorsmacropulse.blogspot.com/2013/02/december-2012-us-construction.html>; Delphi Advisors is joint venture company of one of the consulting team's members.

The projected level for 2013 represents an increase of 17 to 22 percent over 2012 housing start activity. Although the forecasted gain is impressive, that pace represents a slowdown in terms of rate of change compared to an improvement of over 28 percent between 2011 and 2012.⁸⁸ Percentage changes can be misleading when coming off such a low base. It takes relatively little improvement to register a large percentage increase in such cases. Despite these significant consecutive year-over-year gains, if the forecasts are accurate, 2013 housing starts will still be approximately 38 percent below the historical average of 1.5 million units.

There is growing sentiment that the wood products sector is about to enter a “super cycle” with growth and perhaps explosive growth spurred by an increasing global demand for wood products, a recovering battered wood products supply chain and an array of tightening supply conditions.⁸⁹ If the demographic factors alone are considered, the Echo Boomer demographic in the U.S. could support a return to two million plus housing starts before the start of the next decade. For example, Harvard’s Joint Center for Housing Studies published a working paper that concluded the demographic underpinnings in the U.S. will support an average annual housing start level during the time period 2010 to 2020 of 1.644 to 1.870 million units.⁹⁰

Given that three years of that time period are in the past and with housing start levels well below one million, the demographics are present to push housing start levels up substantially during the balance of the decade if the projected levels are to be achieved. The principal demographic driver for this is the “Echo Boomer” cohort --- children of the “Baby Boomers” – is nine percent larger than the Baby Boomer cohort when compared for comparable ages today and 35 years ago. Most of that

⁸⁸ http://www.census.gov/construction/nrc/pdf/newresconst_201212.pdf

⁸⁹ <http://www.woodmarkets.com/Press%20Releases/12-12-07%20WM%202013%20-%20Press%20Release%20FINAL.pdf>

⁹⁰ http://www.jchs.harvard.edu/sites/jchs.harvard.edu/files/w10-9_masnick_mccue_belsky.pdf

difference is focused in the leading age of the Echo Boomer cohort, which is now in their late 20s.

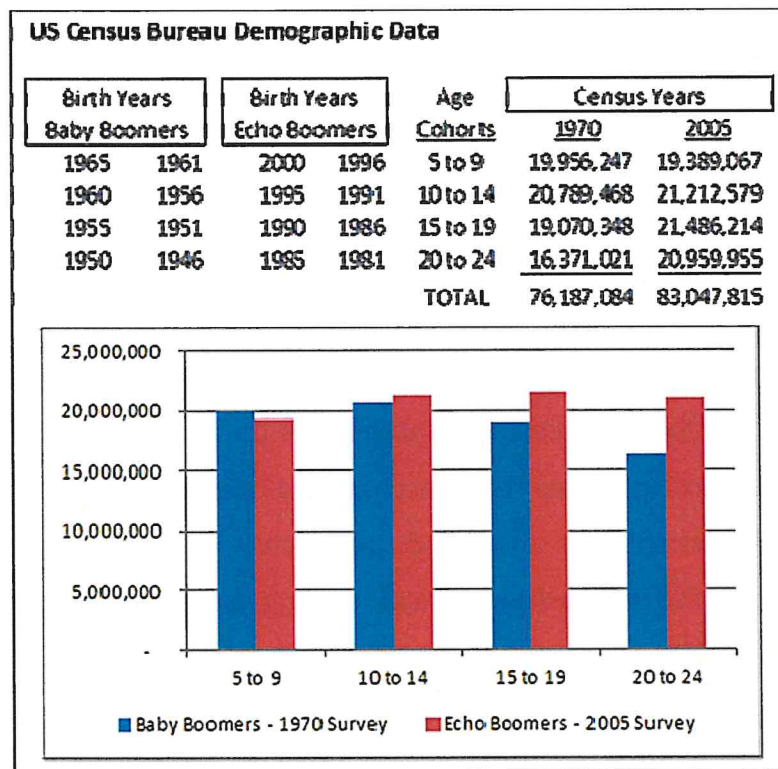


Figure 9.2 Comparison of Baby Boomer and Echo Boomer Cohorts

However, there are other issues that are like to moderate the impact of pure demographics. While these issues will not overrule demographic forces, it is likely they will affect both the timing as well as the magnitude of impact on the U.S. housing market. These are the counter-balancing considerations to Echo Boomer demographic pressures.

- The stock of “excess” unsold homes including shadow inventory
- The pace of household formation both currently and coming out of the current recession
- Home affordability and income levels particularly for the Echo Boomer cohort

- Credit worthiness and debt levels, i.e. student debt, for potential home buyers;
- The interaction of housing supply and demand with the transition of the Baby Boomer cohort into other living accommodations and the Echo Boomer cohort into starter homes
- The potential changes in societal preference that may make home ownership less desirable

The last point above was one of the findings of recent work by the Cleveland Federal Reserve Bank that found an emerging preference on the part of this “Echo Boomer” cohort towards renting rather than purchasing a home.⁹¹ If these results are truly indicative and persistent, it could indicate a shift in housing preference. This potentially affects the composition of total housing starts with a higher mix of multi-family units than single-family units than has been seen in the past.

Traditionally, wood structures have captured less than 11% of the multi-family (and more broadly, commercial construction) market since a lower percentage of the building materials in multi-family units are wood products. However, with the increasing application of green building standards and the evolving building codes that better recognize the benefits and capabilities of wood, there are significant opportunities for engineered wood products for these markets.⁹²

There is an evolution occurring in the United States residential and commercial building industry. Multi-story wood buildings are gaining popularity.⁹³ Green building certification programs are expanding. The use of engineered wood products for both residential and commercial construction is on the rise.

⁹¹ <http://www.clevelandfed.org/research/Commentary/2012/2012-12.cfm>

⁹² <http://www.naturallywood.com/design-environment/life-cycle-assessment>

⁹³ <http://southerndesignandbuilding.org/item/95-mid-rise-light-woodframe-construction-gains-momentum>, <http://continuingeducation.construction.com/crs.php?L=285&C=883>

The quality of slow growing Inland West softwood species and the potential availability of smaller diameter logs from both federal and private lands combined with European secondary engineered wood products manufacturing technologies could provide Grant County an economic opportunity; the development of a small to medium-size cross laminated lumber (CLL; also referred to as cross laminated timber or CUT) manufacturing facility. Utilizing existing regionally manufactured lumber, such a mill could potentially add significant value and profitability to the local timber supplies while also supporting the existing primary lumber manufacturing facility.

Why cross laminated lumber? While the US residential building demand will likely remain below historic levels in the near future, the construction of residential and commercial multi-story wood structures is increasing. In the last three years, construction of multi-family residential structures and commercial buildings has increased more rapidly than traditional single story residential homes (Figure 9.4). From 2000 to 2006, multi-family units represented 19 percent of total starts. Since 2007, multi-family units have represented 26 percent of total starts. As previously noted, there is some evidence this trend is not an anomaly but likely the start of a more fundamental change in consumer preference toward shelter.

CLL was developed in Europe in the 1990s and is increasingly used in EU markets. Unlike structural lumber, plywood or laminated veneer lumber manufacturing, CLL does not require large supplies of lumber, energy or capital investment. As energy costs have escalated, CLL use has increased in Germany and the United Kingdom especially in the construction of smaller commercial buildings and residential homes. CLL production is particularly well-suited to regions having relatively strong softwood species, but faced with higher yields of knotty shop grade lumber – the current timber supply situation in Grant County. Medium scale CLL manufacturing plants (30,000 sq. ft. building space) have been recently built in Europe that

annually produce about 350,000 ft.³ of product using 6.0-6.2 million board feet of shop lumber.

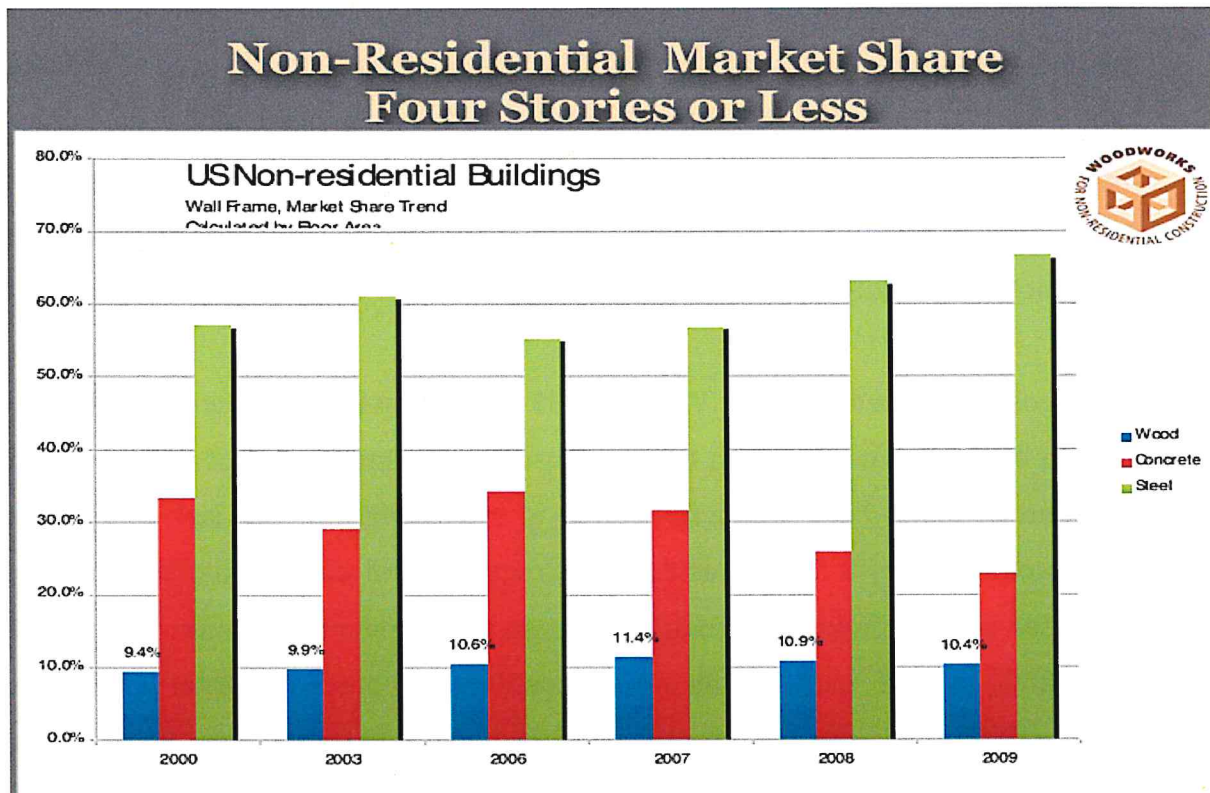


Figure 9.3

Wood in Non Residential

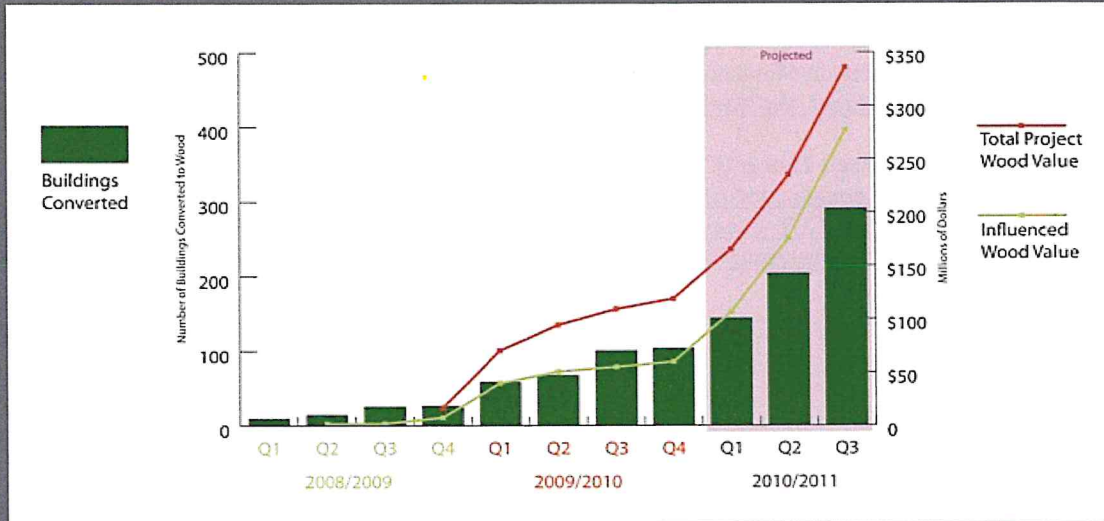


Figure 9.4

Cross Laminated Timber

- ▣ Offers many economic, building performance and environmental advantages.
- ▣ A 5%–15% penetration of the non-residential North American market potential will consume 1.5–2.0 BBF of lumber annually.

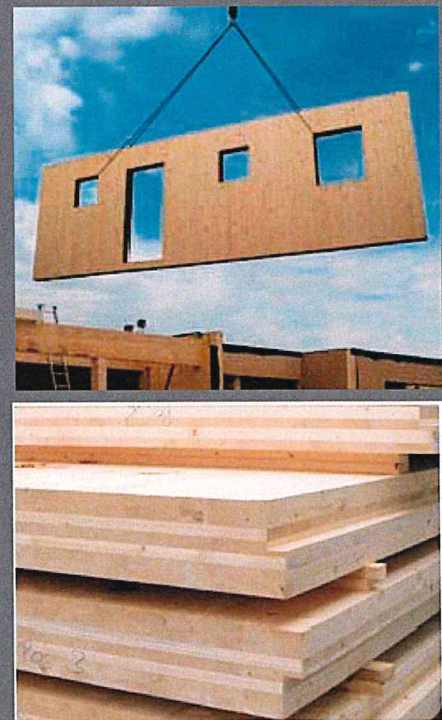


Figure 9.5

Some other CLL information sources

- (1) The Case for Tall Wood Buildings - <http://www.woodworks.org/wp-content/plugins/download-monitor/download.php?id=152>
- (2) CLT – Solid Advantages – <http://www.woodworks.org/wp-content/plugins/download-monitor/download.php?id=157>
- (3) CLT Milestone in Montana - <http://www.woodworks.org/wp-content/plugins/download-monitor/download.php?id=156>
- (4) Cross Laminated Timber (CLT) coming soon to North America --
https://www.google.com/url?q=http://woodworks.org/wp-content/uploads/CLT_Coming_to_NA.pdf&sa=U&ei=dpIVUcuUGYWWjAK4oYGADA&ved=0CBYQFjAG&client=internal-uds-cse&usg=AFQjCNEIDVaLV3Xb2fGckXN2Pm1R55pQNA

Appendix #10

Grant County Timberlands Real Estate Investment Trust

Private timberlands owners in Grant County share many challenges.

- Generational transition of timberlands assets in a costly and complicated federal tax environment
- Tax deferral or avoidance when timber harvest income dramatically increases personal tax rates
- Affordable professional forest management consulting and timber marketing services for small acreages
- Sufficient cash flow to support necessary and beneficial forest management investments

In 1963, Congress passed tax legislation allowing multi-party ownership of real estate within the framework of a Real Estate Investment Trust (REIT). In addition to providing a mechanism for multi-party and/or multi-generational ownership, REITs offer a reduced federal tax rate of 15% and the opportunity for an annual cash flow to REIT owners. Today, billions of dollars of assets including commercial real estate, condominiums and similar properties are held and managed by both private and publicly traded REITs. For timberlands ownership, REITs are a frequently used option for large timber investment organizations (TIMOs) as they invest and manage pension funds and insurance company assets. Families owning timberlands, rangelands, farms and other real estate assets are also taking advantage of REITs.

The REIT structure can be utilized by a collaborative group of smaller landowners seeking to:

- Convert future timber related income into annual REIT share dividends
- Transfer ownership to heirs through the distribution of REIT shares

- Reduce the direct cost of forest management investments
- Reduce the annual or periodic tax implications of personal ownership
- Maintain ownership rights for access, personal use and related activities

The challenges of creating a private REIT in Grant County include:

- Recruiting the qualifying number of like-minded timberlands owners
- Recruiting sufficient acreage to warrant the costs for establishing and operating a private REIT
- Understanding the risk of timber markets and those impacts on REIT share values and future REIT dividends
- Maintaining ownership rights for access, personal use and related activities

A private timber REIT of Grant County landowners could address the risks to private timberlands with some opportunities.

- Single-source of timber supply could facilitate timber market transactions within Grant County to support maintaining the existing mill infrastructure.
- The REIT dividend share structure mitigates that risk of landowners selling timber in low markets or missing high market opportunities as REIT owners can receive REIT dividends from both current harvest as well as future harvest.
- For an individual landowner, a wildfire could eliminate or greatly reduce their timberland asset value. However, by owning equivalent value in REIT shares, that exposure to catastrophic loss is spread over more acres, and reduces the exposure of any single landowner.

A REIT structure could easily be extended beyond Grant County. This would potentially provide greater organizational efficiency and effectiveness while capitalizing on the advantages and benefits.

Appendix #11

Assembled Land Exchanges

Assembled land exchanges are equal value, concurrent large or small real estate exchanges between two or more property owners including public lands agencies. Over the last thirty years, assembled land exchanges have been successfully completed in Oregon, Washington, Idaho and Montana. Transactions are based on willing parties that are seeking to consolidate ownership, reduce risk or management costs and/or assist public agencies in acquiring critical watersheds, wildlife habitat, unique sites or similar resources.

A preliminary analysis of Grant County lands identified 75,900 acres of isolated private lands, those lands surrounded or largely surrounded by public lands. This acreage includes 57,282 acres on non-forested lands and 4,086 acres of juniper forested lands. Within these lands, it is likely that some owners are experiencing low productivity (AUMs per annum), limited or no access, minimal positive or negative cash returns and no prospect of changing these factors. An assembled land exchange can potentially increase the private ownership of timberlands in Grant County, reduce the risk of wildfire and insect infestations to private lands and reduce forest management costs for both private and federal landowners.

The Malheur National Forest has 526, 811 acres classified as suitable for commercial timber production. Some of these lands are in close proximity to private timberlands and could be part of an assembled exchange. The success of assembled land exchange in Grant County is dependent upon a commitment by the Forest Service to participate and assist in funding the project. Political support from Oregon's governor and Congressional delegation would facilitate an exchange.

Each successful assembled exchange has unique elements, but all share some basic steps. For Grant County, these include;

- Utilizing an experienced assembled land exchange consultant to explain the exchange process in detail the Grant County Court, local foresters and interested private landowners
- Securing the support of Forest Service's local forest supervisors and regional forester
- Securing the support of state government, relevant state agencies and Oregon's Congressional representatives
- Developing Memorandums of Agreement with willing private landowners for potential candidate lands for an exchange
- Identifying acceptable candidate lands with all landowners and the Forest Service
- Developing indicative appraisals for properties and timber assets
- Gaining approval of all parties to proceed with third party appraisals of candidate lands
- Negotiating for final approval of all parties to identify lands for exchange
- Closing the real estate transactions to complete the exchange

Grant Private Timberlands

Private lands assessment process. Private lands with acreage 20 and LE 700 were selected for a shared USFS boundary line (LS). Private lands within 50 m show corner connected tax lots (50). The second level are private lands that share a common boundary with either the (LS) or (50) lands. timberlands in the county.

Legend

gran_DBO_private_700

Anomaly

- Shared USFS Boundary
- Within 50 Meters of USFS
- Shared Private Boundary

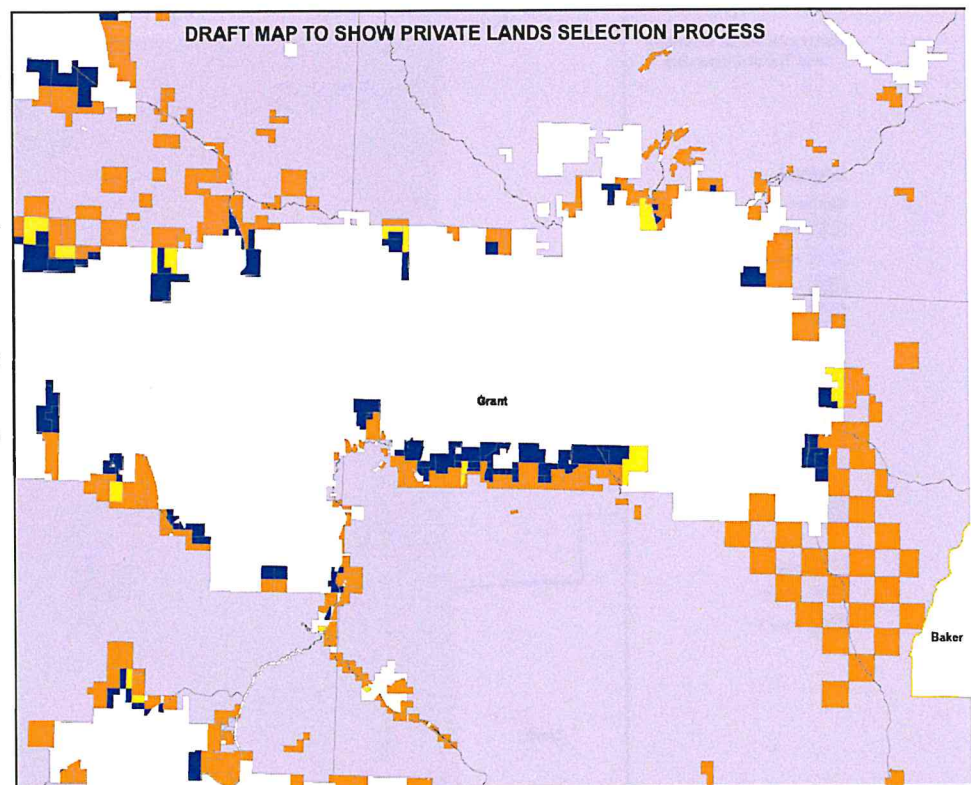


Figure 11.1

Grant Private Timberlands
County Basis for Inventory
and Taxlot Ownership

Legend

MapLabel

- No Tax Record
- AGENCY
- CITY
- COUNTY
- DISTRICT
- FOREST-LND
- STATE-NOT OOF
- STATE-ODF
- PRIVATE
- PRIVATE-PP
- TREEFARM
- TRIBAL
- JSA-BLM
- JSA-FS
- JSA-INT

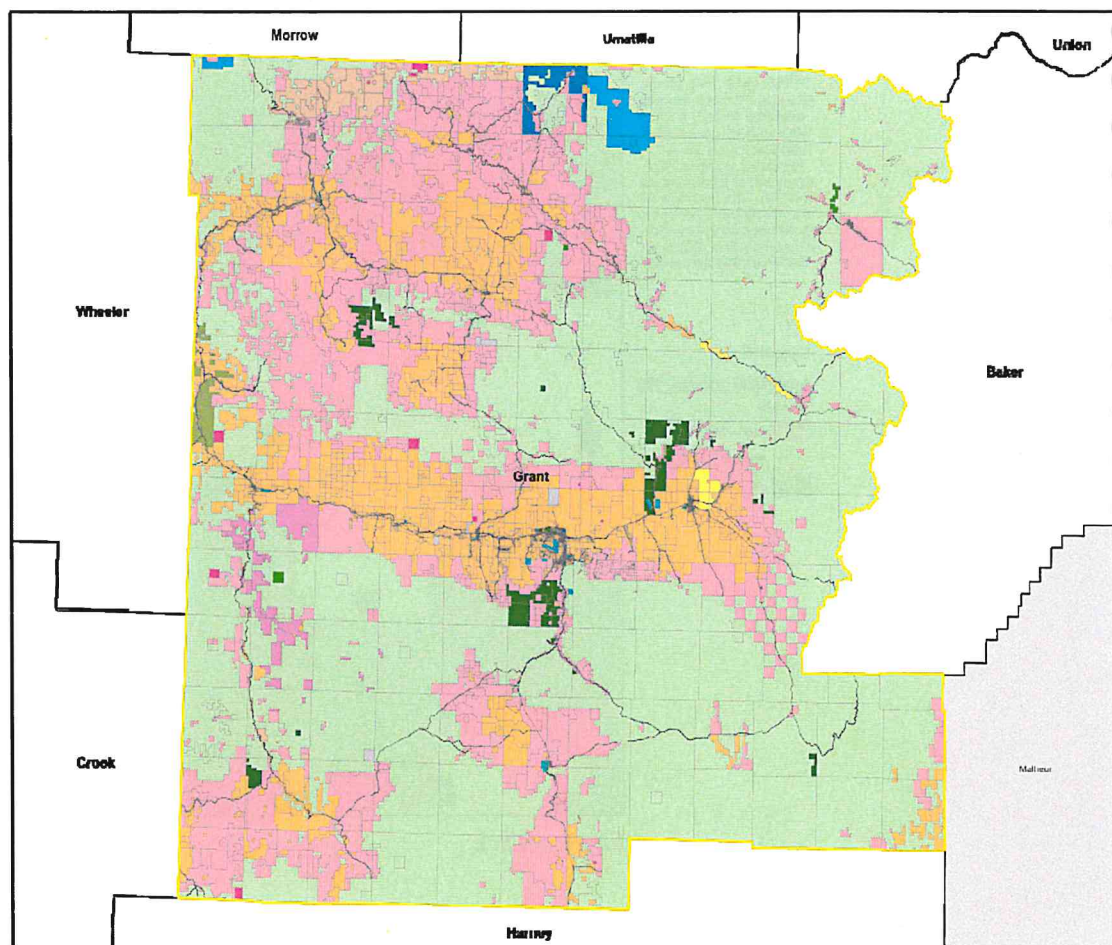


Figure 11.2

Appendix #12

The Oregon Wildfire Protection Act

2013 Proposed Legislation

The Oregon Department of Forestry (ODF) protects about 16 million acres, just over half of Oregon's forestlands and a \$60 billion asset, from fire. Protected lands are primarily privately owned, but also include state and other non-federal public lands and, by contract, U.S. Bureau of Land Management lands in western Oregon. All non-federal forestlands in Grant County are included in the ODF fire protection program.

Landowners and the State of Oregon share protection costs. This financial partnership recognizes the broad public benefits of a healthy forest landscape including clean air and water, economic contributions, recreation and more plus the importance of wildfire protection to public safety.

In a coordinated and cooperative fire suppression program with landowners, forest protective associations and other local, state and federal agencies, ODF fire crews, engines and other resources extinguish up to 97 percent of all fires at ten acres or less. In addition, air tankers, and other supplemental resources are available during peak times and can be relocated to areas with the greatest immediate fire danger. Although only a small percentage of fires escape initial attack, suppressing even one large fire can cost millions of dollars while also negatively impacting the economic and environmental health of local communities for years. For additional information, please review Appendix #4.

To help reduce the number of large fires on ODF protected lands, a new concept has been developed and is being proposed for consideration by the 2013 Oregon Legislature. This proposal would better control and more equitably distribute the costs of Oregon's wildfire protection system to the benefit of Oregon's private landowners, rural communities and the public values and benefits derived from those lands for all Oregonians.

The proposed Wildfire Protection Act would;

- Redirect some landowner funds now used to fight large fires to increasing initial attack capabilities so that fires are suppressed while still small to effectively reduce costs, resource damage and threats to public safety.
- Phase in 50/50 public and private cost sharing of large fire suppression, a cost currently fully borne by landowners. The Oregon General Fund (GF) would likely share some large fire costs each season. However, the amount reserved each biennium to cover maximum GF liability would be reduced to reflect the increased initial attack capacity.
- Address the affordability of fire protection on lower productivity, fire-prone eastern Oregon lands including the private timberlands and grazing lands in Grant County.
- Address changes in weather and forest conditions that are leading to more frequent and larger fires.
- Address fires that escape initial attack and damage natural resources, threaten communities and generate significant short and long-term costs.

The proposed Wildfire Protection Act recognizes that over time, an up-front investment in initial attack firefighting capacity is the best means of suppressing fires when they are small. Key features of this proposal include;

- Shifting \$3 million annually in landowner funds currently allocated to suppressing large fires to support enhanced initial attack capabilities. These funds would supplement an existing \$2 million annual GF appropriation that provides pre-positioned air tankers, helicopters and other critical resources.
- Moving large fire suppression costs towards a 50/50 public and private partnership. Currently, landowners pay the first \$10 million for large fire suppression and the GF is then liable for the next \$15 million. That \$25 million satisfies the annual deductible for a purchased insurance policy that

provides the next \$25 million for large fire suppression costs. Over the last five years, actual large fire suppression costs have averaged \$8 million annually and has been fully funded by landowners.

- Enhancing the firefighting capacity would permit a \$5 million reduction in the deductible to \$20 million. The current provisions that have landowners responsible for the first \$10 million of the deductible would be phased out. In 2013-2015, the first \$2 million would be shared 50/50 between landowners and the State of Oregon. In 2017-2019, the entire \$20 million deductible would be shared 50/50.
- Adding \$1.6 million in GF support for 2013-2015 to bolster firefighting resources during critical fire danger times and to offset eastside protection costs. This reduction in landowner per acre assessments would be a substantial benefit to the owners of private timberlands and grazing lands in Grant County.
- Providing new authority to permit future investments of state and landowner funds in evolving fire protection strategies such as the use of fire detection cameras. The early detection of fires and ODF's enhanced initial attack capabilities would keep fires small and provide a substantial economic and environmental benefit to Grant County landowners and residents.

2013-15 Financial Impact Summary

- Additional \$1.6 million GF biennial appropriation for firefighting resources and eastside cost offset.
- GF reserves for large fire liability would decrease annually from \$15 million to \$10 million, a \$5 million savings to the State of Oregon.
- An estimated \$2 million GF cost for large fire suppression payments in 2013-15 within the new cost sharing structure.

- By changing the Oregon Forestland Protection Fund authority, an additional \$3 million annually from landowner funds to increase ODF's initial attack capabilities.
- Up to ten seasonal positions to primarily manage air tanker and helicopter operations.

Appendix #13

Standing Inventory—Live and Dead—Forest Service Lands in Grant County

Figure 13.1

Live & Dead Standing Inventory on Forest Land in Grant County

	National Forest	Bureau of Land Management	Total Federal	State	Private	Federal Dead / Private Live
Thousands Bone Dry Short Tons except where noted						Ratio
2010 FIA Data Source - 10/30/2012						
All Forest Land						
Live Trees, merchantable bole	43,290	645	43,935	738	3,981	2.42
Dead Trees, above ground biomass	9,141	497	9,638	59	520	
Percent Dead	21%	77%	22%	8%	13%	
2010 FIA Data Source - 1/31/2013						
Not Reserved						
Live Trees, merchantable bole	37,393	605	37,998	725	3,849	1.86
Dead Trees, above ground biomass	6,735	424	7,159	70	380	
Percent Dead	18%	70%	19%	10%	10%	
Reserved ("Wilderness")						
Live Trees, merchantable bole	5,744	-	5,744	-	-	Undefined
Dead Trees, above ground biomass	1,847	-	1,847	-	-	
Percent Dead	32%	N/A	32%	N/A	N/A	
All Forest Land						
Live Trees, merchantable bole	43,137	605	43,742	725	3,849	2.34
Dead Trees, above ground biomass	8,582	424	9,006	70	380	
Percent Dead	20%	70%	21%	10%	10%	
2011 FIA Data Source - 1/31/2013						
Not Reserved						
Live Trees, merchantable bole	37,728	619	38,347	686	4,087	1.70
Dead Trees, above ground biomass	6,520	424	6,943	25	338	
Percent Dead	17%	68%	18%	4%	8%	
Reserved ("Wilderness")						
Live Trees, merchantable bole	5,710	-	5,710	-	-	Undefined
Dead Trees, above ground biomass	1,858	-	1,858	-	-	
Percent Dead	33%	N/A	33%	N/A	N/A	
All Forest Land						
Live Trees, merchantable bole	43,438	619	44,057	686	4,087	2.15
Dead Trees, above ground biomass	8,377	424	8,801	25	338	
Percent Dead	19%	68%	20%	4%	8%	

Notes: Data developed from two data queries of 2010 FIA dataset. Dataset was originally queried 10/31/2010; in that query Reserved and Not Reserved were not differentiated. Since that time FIA has released 2011 dataset. As part of that release algorithm changes have been made and data revisions performed so when querying the 2010 data set as before slightly different results are received. Those results, queried on 1/31/2013, are shown in the table. The same two 1/31/2013 queries were repeated on recently released 2011 FIA dataset as well to confirm prior results with most recent data.

Source: Miles, P.D. Thu Jan 31 12:07:18 CST 2013. Forest Inventory EVALIdator web-application version 1.5.1.04. St. Paul, MN: U.S. Department of Agriculture, Forest Service, Northern Research Station. [Available only on internet: <http://apps.fs.fed.us/EvalIdator/tmattribute.jsp>]

Appendix #14

Shaded Fuel Breaks

In the 1990s, the Bureau of Land Management (BLM) instituted an effort to provide shaded fuel breaks where BLM lands were adjacent to high value private lands. High value private lands included both residential and resource uses. The purpose of a shaded fuel break is to provide a corridor that a crown fire will not traverse and where firefighting resources, either federal or state, can work to suppress a ground fire. Site-specific plans that addressed the slope of the land, species, size and density of the trees and the condition of understory vegetation were developed for each shaded fuel break. Where merchantable trees were to be removed, timber harvest contracts were used to conduct the operation. When merchantable timber was not available, BLM managers were creative in finding other resources to complete the work. In today's operating environment, the Forest Service's stewardship contracting authority is ideally suited for this type of work.

Appendix #15

Grant County Healthy Private Timberlands Project Glossary

Best management practices (BMPs). A practice or combination of practices for protection of water and soil quality that is determined by a federal, provincial, state, or local government or other responsible entity, after problem assessment, examination of alternative practices, and appropriate public participation, to be the most effective and practicable (including technological, economic, and institutional consideration) means of conducting a forest management including road construction and/or maintenance operation while addressing any environmental considerations. (1) For private timberlands In Oregon, the State Board of Forestry shall establish best management practices (BMPs) and other rules applying to forest practices as necessary to insure that to the maximum extent practicable nonpoint source discharges of pollutants resulting from forest operations on timberlands do not impair the achievement and maintenance of water quality standards established by the Environmental Quality Commission for the waters of the state. Such best management practices (BMPs) shall consist of forest practices rules adopted to prevent or reduce pollution of waters of the state. (3)

Biodiversity. The variability and abundance of species, processes, functions, and structures of plants, animals and other living organisms, including the relative complexity and diversity of species, communities, gene pools and ecosystems at spatial scales that range from local to regional to global. (1,2)

Community viability. The relationship between private sector and public sector that provides the resources, both economic and social conditions, to retain and attract people to be gainfully employed and sustainably support community infrastructure such as schools, roads and other local government services.

Ecosystem services. The full suite of goods and services vital to human health and livelihood that are provided by forest ecosystems. Ecosystem services include traditional commercial products as well as goods and services that are generally viewed as public goods such as wildlife habitat and diversity, watershed services, carbon storage, and scenic landscapes. (4)

Fiber outputs. The full range of commercial forest products including, but not limited to, sawlogs, post and poles, veneer and plywood, lumber, biomass fuelstock, hogfuel, wood chips, planer shavings, sawdust, firewood, peeler cores landscaping timbers, hop poles and other products.

Forest health. The perceived condition of a forest derived from concerns about such factors as its age, structure, composition, function, vigor, and presence of unusual levels of insects or disease, and resilience to disturbance. (1)

Forest sustainability. Meeting the needs of the present without compromising the ability of future generations to meet their own needs by practicing a land stewardship ethic that integrates reforestation and the managing, growing, nurturing, and harvesting of trees for useful products and ecosystem services such as the conservation of soil, air and water quality, carbon, biological diversity, wildlife and aquatic habitat, recreation, and aesthetics. (1)

Hydrologic function. The soil, stream, wetland and riparian area properties related to the storage, timing, distribution, and circulation of water. (3)

Native species. Plants and animals that occur naturally in an area, endemic and not the result of recent intentional or unintentional human activity. (1,2)

Private timberlands. Non-public owned lands capable of growing and harvesting forest tree species. Typically, timberlands are capable of annual wood production of at least 20 cubic feet per acre at culmination of mean annual increment (Cubic Foot

Site Class VI or better) (3) and have at least 10% cover (or equivalent stocking) of live trees of any size or is land that formerly had such tree cover and will be naturally or artificially regenerated within the next ten years.

Protection. The maintenance of the status or integrity, over the long term, of identified attributes or values including management where appropriate and giving consideration to historical disturbance patterns, fire risk and forest health when determining appropriate conservation strategies. (1)

Watershed conservation (health). The management of a defined watershed with the objective of sustaining its hydrologic functions in perpetuity while providing for human use compatible with sustainability of the resource.

Wildland restoration. The use of an array of management practices to improve forest health for private timberlands.

(1) Sustainable Forestry Initiative

(2) Forest Stewardship Council

(3) Oregon Department of Forestry Forest Practices Administrative Rules and Forest Practices Act

(4) US Forest Service

