

# Title III

## Wood Fiber Utilization Project



Grant County • 201 S. Humbolt • Canyon City, OR 97820

# **An Assessment of the Availability and Utilization of Wood Fiber from the Forests of Grant County, Oregon**

## **ASSESSMENT TEAM REPORT PRESENTED TO COURT, APRIL 2009**

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*Disclaimer/Proprietary Stipulation:*

*During the research phase of this assessment, the team spoke with individuals with business interests in Oregon and Grant County.*

*It is with respect and gratitude to those individuals that certain information was easily forthcoming and assessable. To protect those individuals' privacy and their proprietary procedures, processes, and information they are not mentioned in this work by name and there is no reference to the names of their businesses.*

*The essence of this project has been a projection of a possible future situation. The team members have made their best professional assessment, based on current and historical information, making what they believe are reasonable assumptions of future circumstances. This being the case, caution should be applied in assessing the uncertainties associated with these forward estimates.*

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## INTRODUCTION

The objective of this project is to conduct an assessment of local resources for support of productive wood fiber utilization. Potential sources range from conventional logging slash and pre-commercial thinning to juniper clearance. Productive opportunities for utilization of these sources of wood fiber include renewable energy, in addition to forest restoration and watershed conservation.

This objective falls within the mandate of the Secure Rural Schools and Community Self-Determination Act of 2000, Public Law 106-393, Title III funding. Title III funding replaces timber receipts for counties with high losses in taxes, jobs, and the local economy due to the decline of timber industry activities tied to the National Forests.

The assessment team chose to start with renewable energy potential, since the Grant County Court and Grant County Economic Development have seen an increased level of interest by companies to build a wood pellet plant in Grant County. This increased level of interest began in the fall of 2007 with an approach from a Norwegian company. Unfortunately, none of these manufacturers were able to develop a reliable estimate of volumes of needed raw material sustainably available from National Forest and private forest lands in the locality.

Having close to two million acres of forest land within its boundary, and surrounded by further extensive tracts of forest land including the Malheur National Forest (N.F.), the Wallowa-Whitman N.F. and the Umatilla N.F., Grant County is an obvious candidate for consideration as a wood fiber based renewable energy source. Since the early 1990s the amount of treatment and harvesting from these forests has been limited due to increased regulation, increased litigation, and the lack of funding to support active management of National Forest lands. The assessment team in this study chose to research the principal forest lands in Grant County, which are the Malheur National Forest and private forest lands including juniper forests. The assessment team recognized the opportunity to significantly increase treatment level from that of the past 15 years.

The assessment team was composed of local volunteers and representatives from Federal, State and local agencies and private forest industry. The team members have a wide

range of expertise in forest health issues, wildfire risk management, forest restoration, logging practices, renewable energy issues, watershed conservation practices, business management and local community issues. Their diverse backgrounds contributed significantly to the teams' ability to address the issues presented in this assessment project.

This assessment addressed: 1) availability of wood fiber and sustainability of supply; 2) cost of harvesting, processing and transporting wood fiber raw material; 3) characteristics and requirements of a wood pellet plant; and 4) potential benefit to the people and communities of Grant County associated with the establishment of a wood pellet plant in the county.

The public benefit to Grant County from this assessment derives from the information it provides to potential manufacturers of wood biomass energy products about the local availability and sustainability of the supply of raw materials and the associated economics. The assessment documents for our U.S. Forest Service partners the need to substantially increase the level of treatment to improve the ecological health of National Forest Lands and to provide economic contributions to the support of local communities.

The assessment has several components including: 1) review of previous studies and assessments and a broad review of current literature; 2) compilation of available field research; 3) team meetings to share, discuss, and debate the appropriateness of the research and materials; 4) interviews with manufacturers, foresters, forest contractors, private land owners, and government agency staff; and 5) surveys of current residential and commercial energy usage.

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## EXECUTIVE SUMMARY

Grant County, Oregon has been endowed with extensive forest lands. In total there are close to two million acres, comprised of a major portion of the Malheur National Forest, other national forests, and private forest lands.

The condition of these forests is deteriorating, with large tracts in extreme over-crowded condition with a heightened risk of wildfire and further ecological health decline. Current treatment regimes are addressing less than 0.5% of the forest each year, while wildfires burn 1% of the forest each year. The frequency, severity and extent of wildfires have escalated sharply in the past 50 years, and appear to be on a continuing upward trend. Over a million acres are currently in an overcrowded condition. Annual growth is well over 1 million green tons (gt) of biomass per year. The removal of wood fiber even at the level of 1 million gt per year would only marginally help the forest revert to a healthier overall condition.

It is not only the forests of Grant County that face a crisis; it is also our communities. In February 2009, Grant County had an unemployment rate of 19.3 %, one of the highest rates of unemployment in the state of Oregon, not to mention the nation. Grant County's high unemployment rate in recent years has been due to the lack of material available from the National Forest lands, exacerbated in the past 18 months by the slowdown in the house construction industry.

This assessment looked at historical levels of forest treatment and wood fiber extraction, and estimates of the level that is realistically attainable; and also a potential level of treatment and extraction that could be attained and readily supported if there was a more determined effort to achieve a healthy ecological balance in these forests. Our assessment found that a level of non- sawlog wood fiber extraction of over 400,000 gt per year is a realistic prospect, and over 800,000 gt is potentially extractable while maintaining a healthy forest balance.

Wood fiber utilization considerations were focused mainly on the ability to supply an industrial scale wood pellet plant. The team believes this is the best opportunity to use the available wood fiber in a way that can support good forest management practices

and provide the greatest economic opportunity to the communities of Grant County. The information presented in this report can readily be applied to other wood fiber utilization options.

Present wood pellet manufacturing technology can produce premium grade pellets from clean ground-up whole tree and logging slash material. Tests are in progress to confirm that supply of clean wood fiber can be relied on.

Included in this study is an assessment of the economics of supplying a pellet plant with suitable wood fiber raw material from sources including precommercial thinning and logging slash on public and private forest lands, juniper clearance, and residue from our local saw mills.

The assessment team concluded that a 120,000 ton per year output pellet mill can be sustainably supported by the forests of Grant County if the present level of U.S. Forest Service funding for pre-commercial thinning, and other federal and state funding support for pre-commercial thinning on private lands is maintained. In addition the current level of Oregon tax credit to collectors of wood biomass for energy generation would need to be retained. Removal of any of these supports for needed forest treatment would jeopardize ability to support a full industrial scale plant.

Increased funding support, in particular an increase up to \$1.5 million for pre-commercial treatment on National Forest lands would allow at least 10,000 acres per year to be treated. This would get closer to the needed level of treatment to sustain a healthy forest and enable a larger scale pellet plant operation to be supported. There is also a necessity for the U.S. Forest Service to give assurance to a pellet manufacturer that they will make sufficient acreage of pre-commercial treatment available to achieve the required level of raw material.

Establishment of an industrial scale pellet plant in Grant County would have a substantial impact on the economic well being of our local communities.

The construction phase would incur a capital expenditure of \$10 million, a welcome economic injection that Grant County is very capable of supporting in terms of skilled workforce. Once in operation the pellet mill would add \$20 million per year to revenue flowing into the county. Between activities in the forest, in transportation and at the pellet plant 75 directly related jobs would be supported, an enormous boost to quality of life opportunities for many residents of the county. The nature of these jobs is very complementary to the diversity of skills already available in the county, both in terms of directly related jobs and the support services available within the county.

Grant County can readily support the establishment of a pellet mill in terms of land available, utility supply and road transport capabilities. Railroad transportation is available in Baker City, 80 miles away.

This assessment confirms that Grant County is well positioned to support the establishment of an industrial scale wood pellet manufacturing operation, and will enthusiastically facilitate the due diligence and preparatory work of companies seriously interested in locating here.

Wood pellets should be an invaluable contributor to the future renewable energy resources of our nation. They are a clean, efficient and convenient energy source. They are very cost competitive to oil, gas and electricity. They are not a fossil fuel, and do not add to greenhouse gas emissions. They support the work that has to be done in our forests if we are to have a hope of improving their ecological condition. They reduce the need for foreign oil, a critical national security and energy policy goal. They are virtually a 100% contributor to our domestic economy.

As elsewhere in this report we must emphasize the dependence of the success of a pellet plant project on the assurance that sufficient wood fiber supply will be available from our local National Forests. The National Forests are the primary natural resource provider to the communities of this county. This project team does not believe they are overstating the case when we say the future economic well-being and quality of life of people of Grant County is dependent on an effective partnership with the U.S. Forest Service and their unfaltering commitment to ecological health of our forests and the economic health of our communities.



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## SOURCES OF WOOD FIBER IN GRANT COUNTY

The public and private forest lands of Grant County cover approximately 2 million acres composed of 1.5 million acres of National Forest land, 250,000 acres of private non-juniper forest land and approximately 250,000 acres of juniper forest.

Based on a recent assessment of the fire regime condition class of the Malheur N. F. it is estimated that at least 1 million acres of non-juniper forest lands are in condition class 2 or 3, most of which is considered to be significantly overstocked from a historical and forest health perspective. Furthermore forest growth on the 1.2 million acres of forest available for active management is adding a gross volume well in excess of 1 million gt per year.

Over recent years treatment of public and private forest lands through pre-commercial and commercial thinning has averaged less than 10,000 acres per year, leading to removal or burning of less than one third of the annual growth rate.

The average standing inventory of juniper is estimated at 11 gt per acre, hence there is approximately 2.75 million gt of standing juniper in the county.

In assessing sources of non-sawlog wood fiber for renewable energy use the team considered the following options:

- pre-commercial thinning on public and private forest lands
- logging slash on public and private forest lands
- juniper removal
- mill residue

The assessment considered:

- the historical level of wood fiber availability from these sources;
- a probable future availability provided the demand level and economics of extraction and processing is satisfactory
- a potential availability level that can readily be supported from the perspective of annual growth and forest health needs

The team estimated that pre-commercial thinning of non-juniper forest lands will generate

24 to 30 gt per acre of wood fiber; 25 gt per acre was used in the analysis. This is based on removal of 2" to 8" diameter material to the stand density levels typical of U.S. Forest Service pre-commercial thinning prescriptions. The team further estimated that logging slash generates an average of 12 gt per acre, and that clearance of juniper can generate an average 11 gt per acre.

In this assessment mill residue includes only sawdust and does not include material that would only be usable as hog fuel, since this will be consumed on site in the lumber company operations. It also excludes shavings from planing operations, which represent a modest tonnage that have higher value use options than are being considered in this study.

*Table 3.1 summarizes the green tons of non-sawlog wood fiber available from each of these sources in the three cases; historical, probable and potential.*

	Historical	Probable	Potential
<b>Public Forest Lands</b>			
<b>Pre-commercial Thinning</b>			
Acres per year	3,500	10,000	20,000
Green tons per year	90,000	250,000	500,000
<b>Logging Slash</b>			
Acres per year	4,000	5,000	8,000
Green tons per year	50,000	60,000	100,000
<b>Private Forest Lands</b>			
<b>Pre-commercial Thinning</b>			
Acres per year	1,000	2,000	4,000
Green tons per year	25,000	50,000	100,000
<b>Logging Slash</b>			
Acres per year	1,000	2,000	3,000
Green tons per year	12,000	24,000	36,000
<b>Juniper Clearance</b>			
Acres per year	2,200	3,000	5,000
Green tons per year	24,000	33,000	55,000
<b>Mill Residue</b>			
Green tons per year	24,000	24,000	30,000
<b>Total Green Tons per Year</b>	<b>225,000</b>	<b>441,000</b>	<b>821,000</b>

From Table 3.1 the "Probable Future" column indicates that over 400,000 gt of wood fiber could be available each year from the forests of Grant County for the indefinite future.

There are two primary critical issues impacting the achievability of this level of supply:

- an assurance that the infrastructure controlling treatment of National Forest lands will in practice and over a long timeframe execute pre-commercial thinning at the level of 10,000 acres per year.
- that the cost of extraction and preparation of the wood fiber raw material is supported by the prices that will be paid for the raw material, plus support financing from the U.S. Forest Service, other federal or state agencies and other grant funds and tax credits for forest treatment or biomass utilization.

The first of these critical issues has been reviewed with local U.S. Forest Service management. Currently there is no mechanism in place to guarantee that the projected level of treatment will be supported. However, there is clear agreement by U.S. Forest Service management that the target level of pre-commercial treatment is appropriate for the needs of the forest, and that U.S. Forest Service management would support programs to execute treatment at this level.

There is also believed to be a broad consensus across most constituencies that pre-commercial thinning at least at this level is necessary to improve the ecological health of our forests and to reduce the risk of high severity wildfires. Mechanisms such as long term Stewardship Contracting may improve forward visibility of treatment levels that would give greater confidence in long term supply to potential investors in a wood fiber utilization facility.

The second critical issue will be discussed in the next section of this report, specifically relating to use of wood fiber as a raw material for pellet manufacturing.

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## WOOD FIBER RAW MATERIAL FOR A WOOD PELLET FUEL MILL

The assessment team decided to use wood pellet manufacturing as the “model” wood fiber utilization in this study since it gives the highest added value potential for high volume utilization of non-sawlog wood fiber. The information presented can readily be applied to other potential applications, in particular heat and/or power generation.

Wood pellet fuel plants can be established at a wide range of scales, from mobile units that manufacture a few thousand tons per year to full scale plants that can produce several hundred thousand tons per year. For the purpose of this evaluation we have considered a full industrial scale plant producing 140,000 tons of premium pellets per year. These pellets would be sold in bags or bulk for residential or small to medium commercial operations. Particular characteristics of premium pellets to bear in mind are ash content; the industry standard for premium pellets is less than 1% ash content; and moisture content (mc) that is typically 6%.

The low ash content of premium pellets dictates that the wood fiber raw material *must be clean*; there is no margin for error in this respect. To put it in perspective, two pounds of dirt in a ton of wood fiber would contribute 0.1% to ash content. Wood pellets made from clean whole tree material including bark and foliage would create pellets of approximately 0.7% ash content. Cleanliness is a critical factor in raw material handling and preparation. Sample tests have been made to assess the cleanliness of wood fiber prepared locally from various operations and sources, and preliminary results confirm that ash content levels below 1% can be attained. More extensive tests should be performed to confirm our confidence that operators can produce material of the required cleanliness.

The 6% mc of the finished product means that any raw material has to be dried to this level. This takes energy which adds cost. As a consequence the moisture content of the wood fiber is a primary determinant of the price a manufacturer will pay for raw material. 140,000 tons of pellet output translates into 132,000

bone dry tons (bdt) and 264,000 gt of raw material. An additional volume of raw material would be needed to dry the wood fiber to the 10% mc required to enter the pelletizing process. For the purpose of this analysis the team assumed the raw material required to support a 140,000 ton pellet plant to be 280,000 gt.

This assessment considered each alternative raw material source since they each have individual characteristics affecting cost and utility. Following is a discussion of costs, prices and tax credits that apply generally.

## COSTS, PRICES AND TAX CREDITS

### COSTS

Table 4.1 summarizes cost estimates of processing wood fiber for delivery to a pellet plant. These “costs” reflect what a contractor would require for a sustainably viable operation. They should not be interpreted as the internal cost to the contractor of his operation. These costs were derived from conversations with operating contractors, studies, and assessments of past contract data. They include a range of operating processes from manual operations, to small machine systems to full scale feller bunchers and skidders. Chipping and shipping costs are based on large scale high volume equipment and a delivery range of 50 miles.

*Table 4.1 Raw Material Processing Cost Estimates*

*(Processing logging slash involves only the “Chip and Fill” and “Ship to Plant” steps)*

<b>Pre-Commercial Thinning</b>	<b>Non-Juniper</b>	<b>Juniper</b>
<b>(\$ per green ton)</b>		
Cut and Bunch	\$10 to \$13	\$13 to \$15
Skid and Pile	\$3 to \$5	\$7
Chip and Fill	\$13 to \$15	\$14
Ship to Plant	\$10	\$9
<b>Total</b>	<b>\$36 to \$43</b>	<b>\$43 to \$45</b>

### PRICES

Table 4.2 shows the most recent “guidance” on raw material pricing based on information provided to prospective suppliers by a pellet manufacturer at a local meeting in 2007. This information has not been confirmed as current due to the present uncertain economic conditions.

Table 4.2 DIRT FREE wood fiber delivered to a pellet plant (chipped or ground material)

Moisture Content	\$ per bdt
<10%	\$66
< 20%	\$62
< 30%	\$58
< 40%	\$54
< 50%	\$50
≥ 50%	\$35

In the following discussion relating to specific raw material sources two cases were considered: provision of green material (50% mc) at \$50 per bdt, and material air-dried in the woods for a year. This material is assumed at 30% mc and priced at \$58 per bdt.

## TAX CREDITS

Oregon tax codes include an incentive to producers and collectors of biomass for use as an energy source. A \$10 per gt tax credit can be claimed to offset tax liabilities of the producer or collector. A particular feature of this provision is the ability to transfer the credit in certain cases. This is an important consideration since many dedicated biomass “collectors” would not generate sufficient tax liability from their collecting operations to fully utilize the available tax credit.

Since this credit can be used by the collector, or transferred by the collector to a supplier or customer, or another third party, the tax credit has a similar effect to a price addition or cost reduction. However it would not be reasonable to assume that the credit can be transferred at the full \$10 value. This analysis assumes that the credit is worth \$8 per gt to the operating contractor. The tax credit is not available in the case of mill residue.

The biomass tax credit is scheduled to expire in 2013.

*(Any reader interested in fully understanding the Oregon biomass tax credit should consult a tax professional).*

## ALTERNATIVE WOOD FIBER SOURCING MILL RESIDUE

Mill residue in the form of sawdust is the premier raw material for a pellet plant, and is the raw material most used in Oregon for pellet production. By the nature of the way it is produced it is very clean and is sized to require minimal preliminary processing prior to the actual pelletizing stage. It is however green, i.e. 50% mc, and as such will not command the price premium of a lower moisture content raw material. Since it is a by-product there

is no inherent cost to produce it. However it can be used by the lumber manufacturer as an energy source, and it has an opportunity cost associated with it equivalent to the cost of hog fuel that the lumber manufacturer would have to buy to displace the sawdust for fueling their boilers. The cost of the alternative hog fuel has been assumed to be \$35 per bdt. There is also a cost associated with shipping the sawdust to the pellet plant from the lumber mill.

For the purposes of this study the pellet plant is assumed to be located in the John Day valley between Prairie City and Dayville. In this case the shipping distance for the sawdust would be less than 20 miles with an assumed cost of \$5 per gt for loading and shipping.

Hence in an assessment of whether to supply sawdust to a pellet plant the lumber mill would consider the price it could get for the sawdust, the cost to ship the sawdust and the cost of the hog fuel alternative. In this case it would amount to a potential pellet raw material price of \$50 per bdt vs. the alternative of \$45 per bdt ( \$35 per bdt for hog fuel plus \$5 per gt for shipping).

- Delivered price at pellet mill.....\$50 per bdt
- Cost of hog fuel alternative.....\$35 per bdt
- Filling and shipping to pellet plant.....\$5 per gt

On this basis it is reasonable to assume that sawdust mill residue would be sold to the pellet plant.

Currently we have one mill in operation in the county. It is working a single shift producing lumber at an annual output of approximately 30 million board feet (bf). The sawdust generated by that mill is 24,000 gt per year.

We have a second mill in the county. This mill operates a co-generation plant in association with its milling operations. This mill has not run at “normal” capacity over the past two years; such capacity would be 60 million bf. At this output level the mill would generate approximately 24,000 gt of shavings and 48,000 gt of other residue. The team understands that this operation purchases approx. 50,000 gt of locally produced hog fuel per year. The study assumptions are that 20% of pre-commercial thinnings, and 40% of logging slash material would be more suitable for hog fuel than pellet plant raw material. At the extraction volumes anticipated hog fuel should be available to support supplemental supply to the co-generation plant at levels well above historical usage. There is no anticipation in this study that this second mill will be making any material available to supply a pellet plant.

Hence sawdust mill residue could contribute 24,000 gt of wood fiber raw material to a pellet plant for the foreseeable future.

## LOGGING SLASH FROM PUBLIC AND PRIVATE LANDS

Logging slash piles have traditionally been either burned in the woods or chipped for hog fuel. They are produced through log processing (cutting to length and de-limbing) at a landing. There has typically been no great regard for cleanliness in the slash piling operation. Experienced people associated with logging operations believe that clean logging slash piles can be produced if the logging operators know that their slash piles will be used as a raw material source for a pellet mill, and that they would not have to burn the piles. If a small incentive payment was made to the logging operator for use of the slash piles or if the logging operator was also the slash pile processor, there would be a clear motivation to produce clean slash piles.

The most convenient way to remove slash pile material from the forest is by chipping (or grinding) at the landing, and filling into a chip van for delivery to the pellet mill.

From Table 4.1 the cost estimates for chipping, filling and shipping within 50 miles of the pellet plant are \$23 to \$25 per gt (equivalent to \$46 to \$50 per bdt).

If the material is processed green then the price at the pellet mill would be \$50 per bdt; hence little margin over the base price needed to make the operation viable for the contractor. If the material is allowed to air-dry in the woods for a year allowing it to dry to a moisture content of 30% or less, then the price at the pellet mill would be \$58 per bdt, providing an additional \$8 per bdt (\$4 per gt) to the contractor. This could be used to provide an incentive to the logging operator to process the slash piles clean. In addition the Oregon biomass tax credit would apply.

Price at Pellet Mill per bdt	\$58 @ 30% mc	\$50 @ 50% mc
Cost to Process and Deliver per gt	\$23 to \$ 25	
Biomass Tax Credit Value per gt	\$8	
Net Cost to Operator per gt	\$15 to \$17 (= \$30 to \$34 per bdt)	

Hence we can conclude that processing clean logging slash piles to produce a suitable raw material for a pellet plant is practically and economically feasible.

From Table 3.1 we can see that 84,000 gt of slash material can be generated per year in the probable case. It cannot reasonably be assumed that all these piles would be suitable for grinding to pellet grade raw material. For the purpose of this study the team assumed that 60% of the slash piles generated would produce suitable material for the pellet mill. This is an expected contribution of 50,000 gt per year of pellet plant raw material.



## PRE-COMMERCIAL THINNING ON PRIVATE LANDS

Traditionally on private lands pre-commercial thinning has consisted of cutting, piling and burning; or cutting, bunching, skidding and piling at a landing for chipping and shipping as hog fuel.

For pre-commercial thinning material to be used as a pellet plant raw material the process would need to parallel the hog fuel process of cutting, bunching, skidding, piling, chipping and shipping; with particular attention given to cleanliness. Typically a land owner will only engage in pre-commercial thinning if they have cost share assistance from the state or other grant funding. The level of funding available has been a determinate factor in the historical level of pre-commercial thinning on private lands. There is no guaranteed future funding level; however there has been a continuity of cost share funding of approximately \$200,000 per year to support these operations over recent years in Grant County.

Table 4.1 shows the cost estimate for the entire process including shipping from within 50 miles of the pellet plant to be \$36 to \$43 per gt at the pellet plant.

If green material is supplied to the pellet mill, then a price of \$50 per bdt can be anticipated (= \$25 per gt). This is \$11 to \$18 per gt short of what is required to make the operation viable without other funding considerations.

If material is left to air-dry for a year in the woods, then a price of \$58 per bdt can be anticipated (= \$29 per gt). This is \$7 to \$14 per gt short of what is required to make the operation viable without other funding considerations. However the other funding considerations have a marked impact on the opportunity to sustain a viable operation.

<b>Price at Pellet Mill per bdt</b>	\$58 @ 30% mc	\$50 @ 50% mc
<b>Cost to Process and Deliver per gt</b>	\$36 to \$43	
<b>Biomass Tax Credit per gt</b>	\$8	
<b>Gap between Cost and Price per gt</b>	\$(1) to \$6 @ 30% mc	\$3 to \$10 @ 50% mc

<b>Cost Share Support per gt</b>	\$0	\$3	\$6	\$10
<b>Green tons Supportable by \$200,000 of Cost Share Funding</b>	N/A	67,000	33,000	20,000

The assessment concludes that an efficient operator could supply air-dried material without cost share support. This is an important conclusion implying that treatable acreage is *not* solely dependent on cost share funding.

Hence the probable treatment level of 2000 acres per year referred to in Table 3.1 appears to

be a reasonable expectation that could generate 50,000 gt of wood fiber per year. This study assumed that 80% of that wood fiber would be processed suitably for use as pellet plant raw material, so 40,000 gt would be available from pre-commercial thinning on private lands.

## PRE-COMMERCIAL THINNING ON PUBLIC LANDS

The considerations relating to pre-commercial thinning on public lands are similar to private lands, with particular differences being the process of planning and approval of projects which are far more complicated and expensive on public lands and take far longer; and the more limited use of skidding, chipping and shipping of pre-commercial thinnings from public lands to date. In other respects we can assume the processing costs to be similar, i.e. in the \$36 to \$43 per gt range.

In recent years the level of pre-commercial thinning has been limited by funds available for on-the-ground execution of projects. The Malheur National Forest has typically paid \$10 per gt for cutting, bunching and burning, with a total available budget for execution work of approximately \$1 million per year.

If green material is supplied to the pellet mill, then a price of \$50 per bdt can be anticipated (= \$25 per gt). This is \$11 to \$18 per gt short of what is required to make the operation viable without other funding considerations.

If material is left to air-dry for a year in the woods, then a price of \$58 per bdt can be anticipated (= \$29 per gt). This is \$7 to \$14 per gt short of what is required to make the operation viable without other funding considerations. However the other funding considerations have a marked impact on the opportunity to sustain a viable operation.

<b>Price at Pellet Mill per bdt</b>	\$58 @ 30% mc	\$50 @ 50% mc
<b>Cost to Process and Deliver per gt</b>	\$36 to \$43	
<b>Biomass Tax Credit per gt</b>	\$8	
<b>Road Maintenance Charge per gt</b>	\$1 to \$2	
<b>Net Cost to Operator per gt</b>	\$29 to \$37	
<b>Gap between Cost and Price per gt</b>	\$0 to \$8 @ 30% mc	\$4 to \$12 @ 50% mc

<b>USFS Funding per gt</b>	\$0	\$4	\$8	\$12
<b>Green tons Supportable by \$1 million USFS Funding</b>	N/A	250,000	125,000	83,000
<b>Green tons Supportable by \$1.5 million USFS Funding</b>	N/A	375,000	188,000	125,000

Typically pre-commercial thinnings on public land are left in the woods to dry prior to burning, however if material cannot be left in the woods for a year due to volume, space and fire risk considerations, then the 250,000 gt of biomass extraction we projected in Table 3.1 cannot be confidently expected. However if we anticipate good efficiency level, together with a modest increase in funding to \$1.5 million, then at the \$6 per gt funding level 250,000 gt of biomass extraction could be supported.

If material can be left in the woods for a year to dry, then an efficient operator would be viable at the \$4 per gt funding level, allowing up to 375,000 gt of biomass extraction to be supported.

It is reasonable to conclude that if the funding level remains at \$1 million per year and material cannot be left to dry then the expected biomass extraction would be limited to 150,000 gt per year. If the funding level is increased to \$1.5 million per year or extraction of dry material became the norm then extraction at a level of at least 250,000 gt per year could be supported.

Hence with the 80% suitable material assumption from pre-commercial thinnings, between 120,000 gt and 200,000 gt of suitable pellet mill raw material could be available from National Forest lands, depending on funding level and extraction protocol.

## JUNIPER CLEARANCE

In recent years an average of 2,200 acres per year of juniper clearance has been achieved in Grant County. The primary limiting factor has been cost share funding available to assist land owners with their clearance projects. Land owners are enthusiastic to have their lands treated, but are reluctant to incur the necessary costs themselves.

Typical processing involves cutting only, with a follow up burn several years later. In many cases the juniper remains unattended many years after the cut.

If juniper were to be used as a raw material for a pellet plant, the full process of cutting, bunching, skidding, piling, chipping and shipping would be required. There is very little experience or data available to provide a robust cost estimate for the full process. Juniper is definitely a more difficult species to handle in the various stages of the treatment process. It also requires that more ground is covered to process the same volume. However, there would appear to be little evidence to argue against leaving the cut material to air-dry, hence the \$58 per bdt would appear to be a reasonable presumption.

Assuming a total process cost of \$44 per gt can be achieved, then there is a shortfall of \$15 per gt between the delivered cost and delivered price. Cost share arrangements have been in place for many years to support juniper clearance, and can be expected to remain in place indefinitely. They have typically been at the \$70 per acre level. This equates to \$6 per gt. The biomass tax credit would also apply to juniper used to supply a pellet facility.

<b>Price at Pellet Mill per bdt</b>	<b>\$58 @ 30% mc</b>
<b>Cost to Process and Deliver per gt</b>	<b>\$44</b>
<b>Biomass Tax Credit per gt</b>	<b>\$8</b>
<b>Net Cost to Operator per gt</b>	<b>\$36</b>
<b>Historical Support Funding per gt</b>	<b>\$6</b>

This leaves a gap of \$1 per gt that, based on current assumptions, implies that the economics of supplying juniper to a pellet mill will probably be marginal. If a pellet mill is established in Grant County, it may well be that some enterprising operators will succeed in providing clean material at a satisfactory cost, however it is not considered wise to presume that at this stage.

Cut juniper has typically been left for several years prior to burning. The moisture content of such juniper should be assessed to determine if there is a higher delivered price potential for lower mc material.

## SUMMARY

Cost assumptions were based on a range of operating processes, from small light-on-the-land equipment to full scale feller bunchers and skidders. Some consideration was also given to brush bundling rather than chipping. However, there appears to be no advantage in capital cost or productivity, and pellet mill pricing for bundled slash will probably be lower than for clean chips, hence the team concluded that this approach did not merit in depth study. There is also very limited actual experience of using that approach.

To summarize the above information:

<b>MATERIAL SOURCE</b>	<b>PROBABLE</b>	<b>POTENTIAL</b>
Mill Residue	24,000 gt	30,000 gt
Logging Slash	50,000 gt	82,000 gt
Pre-commercial - Private	40,000 gt	50,000 gt
Pre-commercial - Public	120,000 - 200,000 gt	400,000 gt
<b>Total</b>	<b>234,000 - 314,000 gt</b>	<b>562,000 gt</b>

Our conclusion is that we need to be assured of the current level of support funding from the U.S. Forest Service, other state and federal funds, other grants and the tax credit to be confident that a full industrial scale pellet plant can be supported by Grant County forests. If U.S. Forest Service funding at an increased level can be anticipated, a plant scale of 140,000 tons would be supported. With no increase in U.S. Forest Service funding a smaller industrial scale plant of approximately 120,000 tons could be supported.

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## CHARACTERISTICS OF A PELLET PLANT AND THE MARKETS IT SERVES

A wood pellet fuel plant of the 120,000 to 140,000 ton output range considered in this study would involve an initial capital investment of around \$10 million. It would take up to two years to construct and would require a site of 10 to 15 acres. Most of the site would be taken up by raw material storage and processing. The plant would need a water supply to meet fire regulation codes and personal use of plant employees. There is no process water need. A 440/480 3-phase electricity supply of 3000 kVa would be required.

In the case of a plant of the type envisaged, most of the raw material would arrive at the plant as whole tree chips or grounds in 25 ton chip trucks. This implies arrival and departure of 56 chip trucks per day during the logging operations year in addition to the 20 to 25 finished pellet truck loads leaving the plant per day throughout the year.

The chip material can come from fir, pine, juniper as well as other tree species and will likely be blended before being finely ground to sawdust sized material to go in to the pellet making process.

Received raw material must be *clean* and will typically be between 20% mc and green, or 50% mc. This material in finely ground form is dried to approximately 10% mc in a tumble drier, from which it is conveyed to a screening station.

The dried screened material goes through a ring die pellet extrusion process, during which, under the heat and pressure of extrusion, the natural resins of the wood fiber bond the pellet into a hot “pliable” form. No additives are required to enable this bonding. The finished pellet contains only the original wood fiber less some of the water in the raw material.

During the cool down phase the “pliable” pellets harden into the familiar dry wood pellets. Wood pellets are clean and dust free to handle, are uniform and flow easily in hoppers and screw feed augers. In this final form they either go into bulk storage hoppers prior to bulk shipping to commercial customers, or through a packaging operation, mostly into 40 lb bags for distribution to retail outlets for purchase by residential users.

Wood pellets are used in about 1 million homes in the USA. Increasingly, heating with wood pellets is becoming common on larger scale municipal, state and federal buildings, educational facilities, housing complexes, office buildings and other small to medium sized businesses. Wood pellet usage is very well established in Europe with Finland, Sweden and Austria the leading users at 8% to 20% of total primary energy coming from wood, compared with the USA at barely 2%. Large quantities are exported from the USA to Europe, especially for industrial use including fueling electrical power stations.

Reliable industry wide information is not readily available, making it difficult to establish accurate production volumes and growth rates for wood pellet use. However according to the Pellet Fuels Institute there was 2.8 million tons of wood pellets manufactured last year in the USA. This level displaces 8 million barrels of oil per year. Figures from the Hearth, Patio and Barbecue Association show that installation of wood pellet appliances in the five years from 2003 to 2007 were 2 1/2 times the installation rate of the previous 5 years. The economic slow down of the past year has impacted growth. Nonetheless wood pellets currently have a very small penetration into the overall energy market, but have enormous potential in the residential/commercial heat energy segment that represents approximately one third of the total USA energy consumption.

At the current retail price of \$250 per ton, pellet pricing compares to \$2.25 per gallon for heating oil and \$1.80 per gallon for propane. Substantial savings accrue to energy users that change over from oil, gas or electricity to wood pellets.

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## THE BENEFITS OF A WOOD PELLET FUEL PLANT TO GRANT COUNTY

For more than 100 years Grant County's economy has been based on the forest industry and agriculture. Unfortunately these industries have been in a downward spiral for many years. While the recent economic downturn has led the nation into an economic crisis, the conditions recently being faced by much of the nation are characteristic of the state of affairs in Grant County for many years.

In the past two years, Grant County has seen an increased interest in questions of wood fiber availability from wood pellet manufacturers and from site locators who represent wood pellet manufacturers. However we have not been well prepared to answer questions such as:

- 1) How much wood fiber supply can Grant County support?
- 2) Do we have an infrastructure to support a wood pellet manufacturing facility?

The County's inability to answer these questions for potential investors and manufacturers led The County Court to set up a project team to address these and related questions.

A pellet plant of the size considered in this assessment, 120,000 to 140,000 output tons per year, would cost approximately \$10 million to construct over a two year period. This would be the largest capital investment program in Grant County since the establishment of the lumber mills.

Once in full operation the pellet plant would support 15 to 35 new jobs at the pellet plant dependent on the extent of finished product packaging. In addition to the direct employees at the pellet plant there would be employment opportunities for small to mid-sized entrepreneurs in the thinning, chipping and hauling operations; probably close to 50 more jobs during the forest operations year directly associated with supplying the pellet plant. These jobs are expected to command wage levels in the \$10 to \$25 per hour range.

Direct payroll \$s of close to \$200,000 per month would be added into our communities from these jobs. This does not include the enhanced indirect activities to support these new operations; from grocery store revenue, through service, utility and repair and maintenance support, to food service and property taxes. At a minimum a two times economic multiplier would apply; many economists would argue for a higher multiplier factor. Another measure of economic impact is the gross sales revenue expected of the pellet plant. 120,000 tons at \$180 per ton wholesale price is over \$20 million per year. A high proportion, probably as much as 60% or \$12 million would flow through our local economy in one way or another.

Grant County is an Enterprise Zone and as such can offer a pellet plant investor tax abatement, eliminating property tax liability for the initial three to five years.

While measurable economic indicators are important in assessing the potential benefit of establishing a pellet plant, another important perspective is the establishment in Grant County of an operation of the scale of a lumber mill that is based on a *growth* industry of the future, renewable energy.



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## RECOMMENDED FOLLOW UP AND FURTHER STUDY

This assessment has concluded that the wood fiber available from the forests of Grant County, Oregon can sustain an industrial scale pellet plant and that the processes of supply are economically viable.

However there are several follow up actions required to progress from this assessment to meaningful consideration of the set up of a pellet plant in Grant County. These include:

- Contacting wood pellet fuel manufacturers. There are candidate companies already established in Oregon and elsewhere in the western United States. We should also consider other North American and overseas based manufacturers.
- Visiting and presenting to wood pellet manufactures.
- Inviting wood pellet manufacturers to visit Grant County.

Once the County is in a meaningful dialogue with one or more potential manufacturers we will learn the further issues that they will want to address to support their decision making processes.

As stated elsewhere in this report the County needs to pursue discussions with U.S. Forest Service management to establish a greater level of confidence in long term levels of pre-commercial treatment execution.

Research relating to moisture content of wood fiber left in the forest to dry needs to be conducted. This should be done in the summer and fall of 2009.

A comprehensive research study of ash content contribution needs to be done.

This should address issues such as;

- tree species
- parts of the tree, e.g. foliage, bark, small branches, solid wood, etc.
- treatment process, e.g. pre-commercial thinning, logging slash, fire salvage, etc.
- handling conditions, e.g. degree of ground contact, weathering, chipping methods, etc.

This study should be completed during the summer of 2009.

The County Court needs to assign responsibility and resources to pursue the above topics that relate specifically to furthering consideration of the pellet plant opportunity.

Other areas identified by the assessment team as candidates for further consideration included:

- assessing the potential local and regional (eastern Oregon) usage of wood pellet fuel, beyond the Grant County survey conclusions
- develop public awareness and understanding of the pellet fuel option

The above topics are complementary to the pursuit of pellet plant considerations and should be done in parallel.

Further areas for future consideration included:

- evaluation of other wood fiber utilization options

These later topics may represent a considerable broadening of the assessment area and should not take precedence over a focused progression of the pellet plant consideration.

## APPENDIX A. INFORMATION SOURCES AND REFERENCES

*Much of the information used as the basis of this report was derived from personal knowledge of the team members and associates in their affiliated organizations.*

*In addition team members met and interviewed or otherwise personally communicated with local operators, experienced operators from elsewhere in Oregon, management of local forest industry companies, local U.S. Forest Service management, O.D.F. staff from elsewhere in the region, and representatives of pellet manufacturing companies.*

*The team also used internet web sites believed to be reliable information sources.*

*Several of these are referenced below:*

[www.biomass.forestguild.org/](http://www.biomass.forestguild.org/)

[www.eia.doe.gov/](http://www.eia.doe.gov/)

[www.fs.fed.us/woodybiomass](http://www.fs.fed.us/woodybiomass)

[www.eia.doe.gov/neic/experts/heatcalc.xls](http://www.eia.doe.gov/neic/experts/heatcalc.xls)

[www.fs.fed.us/pnw/pubs/pnw\\_rb249.pdf](http://www.fs.fed.us/pnw/pubs/pnw_rb249.pdf)

[www.pelletheat.org](http://www.pelletheat.org)

[www.pelletheat.org/3/industry/futureOfAmericanEnergy.pdf](http://www.pelletheat.org/3/industry/futureOfAmericanEnergy.pdf)

[www.mass.gov/Eoca/docs/doer/pub\\_info/doer\\_pellet\\_guidebook.pdf](http://www.mass.gov/Eoca/docs/doer/pub_info/doer_pellet_guidebook.pdf)

[www.fs.fed.us/rm/pubs/rmrs\\_p041/rmrs\\_p041\\_657\\_672.pdf](http://www.fs.fed.us/rm/pubs/rmrs_p041/rmrs_p041_657_672.pdf)

[juniper.oregonstate.edu/harvest01.pdf](http://juniper.oregonstate.edu/harvest01.pdf)

[juniper.oregonstate.edu/bibliography/documents/phpJ8GKSn\\_pellets.pdf](http://juniper.oregonstate.edu/bibliography/documents/phpJ8GKSn_pellets.pdf)

[juniper.oregonstate.edu/bibliography/article.php?article\\_id=103](http://juniper.oregonstate.edu/bibliography/article.php?article_id=103)

[lcrda.com/images/Pinyon-Juniper%20Biomass%20.doc](http://lcrda.com/images/Pinyon-Juniper%20Biomass%20.doc)

[juniper.oregonstate.edu/bibliography/documents/phpRgrDtU\\_harney.pdf](http://juniper.oregonstate.edu/bibliography/documents/phpRgrDtU_harney.pdf)

[fia.fs.fed.us/](http://fia.fs.fed.us/)