PERCEPTION TO INCEPTION:
ASSESSING CONTRACTOR CAPACITY TO UTILIZE WOODY BIOMASS FOR ENERGY PRODUCTION IN THE SOUTHERN WILLAMETTE VALLEY, OREGON

By

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TERMINAL PROJECT

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ABSTRACT

Global warming, peak oil, and severe wildfires are leading government officials, community members, conservation organizations, timber industry officials, and other stakeholders to explore sustainable long-term solutions to create healthy and vibrant communities. The use of woody biomass provides a solution because of its ability to not only reduce the effects of these events, but also meet economic development, renewable energy, and ecological objectives. Timber companies are important to making the woody biomass industry successful because they are a key link between accessing and delivering the supply and meeting consumer demand. Though they stand to benefit economically, there are challenges they face before fully committing to utilizing woody biomass.

This study had two objectives to better understand the opportunities and challenges the timber industry faces in the southern Willamette Valley. The first was to understand the capacity of firms either engaged in or with the potential to engage in woody biomass collecting, processing, and transportation. The second was to determine the willingness and interest of firms to participate in biomass utilization and what barriers prevent them from engaging in or supporting woody biomass utilization.

As part of the study, we interviewed key individuals involved in the collection, transportation, or utilization of timber in the southern Willamette Valley. The results of the study provide an understanding of the competition for the region's existing supply of woody biomass and the perceived challenges and limitations of increasing woody biomass opportunities for energy production. Findings suggest that the timber industry is interested in pursuing woody biomass for energy production if they can make a profit and have access to a new source of woody biomass.

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CHAPTER 1

INTRODUCTION

Wood for energy is anything but new. From Neanderthals burning wood to stay warm and cook food to, in more recent decades, saw mills burning wood chips to create steam for drying wood and electricity for power. Historical applications of the technology were born out of necessity and an economical climate based on an abundance of inexpensive wood chips. Currently, the utilization of wood to meet small and large scale energy demands throughout parts of the United States is seriously considered. However, reasons to use woody biomass go beyond energy needs and include meeting ecological and economic objectives. These objectives include improving and restoring forest health, stimulating economic growth, reducing fossil fuel dependency, and minimizing severe wildland fires through the reduction of ladder fuels.

In 2007, Senate Bill 828 established the Renewable Portfolio Standard (RPS) for Oregon. This legislation required the State of Oregon to increase its role in advocating for research and the use of renewable energy by requiring major electrical utility companies to provide 25% of its energy through renewable sources. Sources of renewable energy include biofuels, biogas, biomass, fuel cells, geothermal, solar, wind, ocean energy, and hydroelectric generation. The RPS allows for incremental progress toward renewable energy of 15% by 2015, 20% by 2020, and 25% by 2025 (Oregon Legislative Assembly 2007b). With almost 50% of the land covered by trees, Oregon has the potential to meet a portion of renewable energy needs with the use of woody biomass (Rooney 2006).

Statement of the Problem

For the past century, Western Culture's connection with the natural environment has served to benefit ourselves at the expense of the environment. These anthropogenic activities have released atmospheric gases that contribute to climate change (Intergovernmental Panel on Climate Change 2007). Of importance to this paper is the increase in the emission of CO_2. Anthropogenic activities include, but are not limited to, transportation, manufacturing, and energy supply. In addition, forest and agriculture activities such as wildland and prescribed fires, field burning and deforestation have contributed CO_2 emissions. Identifying the causes of climate change may help citizens, communities, and governments develop appropriate actions to mitigate its effects.

Some of the challenges with the U.S. energy supply are its dependency on fossil fuels and overseas supply sources. Most of the energy consumed in the U.S. is derived from fossil fuels, a nonrenewable fuel source and major contributor of atmospheric CO_2. Secondly, the U.S. oil supply peaked in the 1970s and currently imports a majority of its oil from international reserves (Energy Information Administration 2008). This contributes to dependence on other countries to meet our demands and sends jobs overseas. This is particularly difficult at a time when the U.S. economy needs to add jobs, not lose them. Also, as oil reserves become more difficult to access, it contributes to higher costs for energy.

One main action to address the U.S. energy problem is identifying sources of domestic renewable energy sources including wind, solar, geothermal, wave, and biomass. Each of these options alone will not have significant influence in replacing current energy demands, but if considered as whole, and coupled with improving energy efficiency and reducing consumption, renewable energy stands a chance to replace a considerable portion of fossil fuels.

When communities consider what types of renewable energy to invest in, they should consider its local resources, including weather. Communities that are located near sources of wood may consider meeting a portion or all energy demand through the utilization of woody biomass. The *Rural Voices for Conservation Coalition* encourage the "utilization of locally-derived energy" for communities due its cost effectiveness and to keep money in local economies (Rural Voices for Conservation 2008).

The price of various fuels will have a significant impact on the availability and demand for energy. Today, the rising cost of oil and other nonrenewable sources of energy allow different types of woody biomass to be competitive in today's energy market. Woody biomass products such as wood pellets and wood chips are not as competitive as coal, the cheapest and heavily subsidized fuel source available, but it can compete against other fuel types. Table 1 shows the prices for different fuels. The information shows 2005-2006 prices, but the range of prices is still applicable to today's prices.

Table 1. Comparison of Cost and Energy Content of Common Fuels (2005-2006)

Fuel	Energy Content		Cost/unit		Cost per MMBtu[1]
Electricity	3,413 BTU[2]	Per kWh	$0.05 to $0.15	Per kWh	$14 to $44
Propane	91,000 BTU	Per gallon	$2.00 to $2.90	Per gallon	$22 to $32
Gasoline	124,000 BTU	Per Gallon	$2.25 to $2.50	Per gallon	$16 to $24
Heating Oil	139,000 BTU	Per gallon	$2.00 to $2.60	Per gallon	$14 to $19
Wood Pellets	8,000 BTU	Per pound	$140 to $250	Per ton	$8 to $15
Wood Chips	About 8,000 BTU	Per bone-dry pound	$0 to $100	Per bone-dry ton	$0 to $6.40
Coal	8,800 – 13,000 BTU	Per Pound	$12.00 to $70.00	Per delivered ton	$0.70 to $2.40

Source: Flexible Energy Communities Initiative document, U.S. Department of Energy 2005-2006 ("Where wood works: Strategies for heating with woody biomass" 2007)
[1] BTU – British Thermal Unit (measurement of heat energy in the United States)
[2] MMBtu – 1 Million BTUs

Purpose of Study

Oregon has taken a number of necessary steps to develop a woody biomass industry. Among them are the adoptions of the Renewable Energy Action in 2005, establishing the State of Oregon Forest Biomass Working Group[1], creating Oregon's Renewable Energy Action Plan, and passing the Renewable Portfolio Standard (Oregon Department of Energy & Oregon Department of Forestry 2007b; State of Oregon 2007c). With these actions coupled with future legislative action, Oregon is setting itself to be a leader in woody biomass energy, as well as renewable energy options.

According to a report by the State of Oregon Forest Biomass Working Group, key actions to consider before further developing the woody biomass industry in Oregon include administering a logging survey to timber representatives to understand equipment needs, training needs, and interest level in restoration work; and learning about the experiences from people currently involved in biomass extraction and production (Oregon Department of Energy & Oregon Department of Forestry 2007b). The report reveals the interest level in developing the biomass industry and the experiences of biomass users from the timber industry workforce and companies in the southern Willamette Valley.

Understanding the perceived challenges and limitations that businesses face is necessary for any industry to be successful. My study opens the discussion with timber industry firms in the southern Willamette Valley to better understand what it will take to develop a regional woody biomass industry.

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[1] The Forest Biomass Working Group was created in 2005 to meet the goals of Senate Bill 1072 and the Renewable Portfolio Standard. The group consists of 36 members from forest and energy industries, resource agencies, environmental organizations, public officials, labor representatives, and local communities.

Research Question

This paper provides a better understanding of the challenges and opportunities of further developing a biomass industry in the southern Willamette Valley. For the purpose of this paper, the southern Willamette Valley includes Lane, Linn, and Douglas counties. The findings will assist government officials, community members, planners, and energy and timber industry professionals in making a more informed decision when developing policies and programs that emphasize utilizing woody biomass to meet the growing energy needs of communities in the region. Specifically, this paper answers the following questions:

- Who is interested in promoting the utilization of woody biomass and at what level of involvement do they want to participate?

- What challenges and opportunities exist in developing a regionally based woody biomass industry in the southern Willamette Valley?

Methodology

Telephone interviews were conducted between October 2007 – April 2008 with timber industry company owners, managers, and workforce individuals located in the southern Willamette Valley. The study instrument, an interview guide composed of 27 questions, was informed through a review of existing studies of the woody biomass industry. The purpose of the interviews were (1) to understand the range of perceived challenges in utilizing or increasing utilization of woody biomass, (2) to reveal the opportunities that exist for timber firms, and (3) to identify how these opportunities and challenges may differ across different firm types.

Importance and Limitations of Study

This study increases the knowledge base of a regional approach to rural economic development by increasing the understanding of opportunities to develop the woody biomass industry. A variety of stakeholders, including government officials, planners, community leaders, and energy and timber industry professionals will all benefit from this knowledge as they consider creating employment opportunities for local businesses. Studies have shown that there needs to be a regional approach to the utilization of woody biomass (Nazzaro 2006; Sample 2007). A regional approach looks at a specific geographic area and considers the long-term availability of the woody biomass supply, the capacity and interest of timber firms to engage in utilization of woody biomass, and the demand and interest from local communities to promote and financially support the utilization of woody biomass for energy. Regional approaches to the development of the woody biomass industry also allow the local communities to make informed decisions on the size and scale that are appropriate to local circumstances. Using a regional approach to develop woody biomass utilization opportunities in the southern Willamette Valley will help ensure the long-term success and viability of the industry.

This study faced several limitations. Since I used qualitative recruitment methods, interviewed participants are not a statistically representative sample of the woody industry. The findings can only speak to the firms that were interviewed for the study due to the difficulty in obtaining a representative sample. In addition, the study does not estimate the amount of woody biomass material in the region. In all studies on woody biomass, the availability and the duration of the available supply is an essential factor to consider when pursuing the utilization of woody biomass for long-term economic growth. The specific costs involved in harvesting, collecting, and

transporting were not considered for this study but would be valuable to consider in future research efforts.

Outline of the Remainder of the Project

The remainder of this study will consist of four chapters: the story; methodology; findings; and recommendations. *The Story* provides an overview of why the woody biomass is a viable option to meet domestic energy demands and summarizes select research on woody biomass utilization. The *Methodology* section discusses how we created the participant sample and the methods used to collect data from the timber industry professionals. The *Findings* section provides the results of the interviews conducted with timber industry firms and discusses the significant themes that emerged through the analysis. The *Recommendations* section suggests next steps to take based on the findings.

CHAPTER 2

THE STORY

In the wood products industry, woody biomass may be referred to as firewood, clean chips, dirty chips (e.g. hog fuel, slash piles), municipal waste, or densified fuels (e.g. low and high quality pellets, fuel cubes, Duraflame™ Logs) (Flexible Energy Communities Initiative 2007; Lane Forest Products 2004). Its importance has increased due to the growing market for renewable energy sources and changing fire management and forest management practices. In this chapter we will first discuss the reasons for the emerging market and the potential role of woody biomass. Then I will examine changes in fire management and forest management that has increased woody biomass availability.

Woody Biomass Definition

Understanding how woody biomass is defined is important to ensure that companies understand if they are currently utilizing woody biomass or to understand how they can become involved in the woody biomass industry. Federal and state governments offer tax credits and subsidies to stimulate the utilization of woody biomass, but these tax credits and subsidies are available to companies depending on where the woody biomass came from or what it will be used for.

At different levels of governments, agencies have provided definitions of woody biomass when developing policy that promotes its use. In a 2003 memorandum of understanding between the United States Department of Agriculture, Department of Energy, and Department of Interior stated that woody biomass is defined as:

> "the trees and woody plants, including limbs, tops, needles, leaves, and other woody parts, grown in a forest, woodland, or rangeland environment, that are the

> by-products of restoration and hazardous fuel reduction treatments" (U.S. Department of Agriculture, Department of Energy, & Department of the Interior 2003).

This definition was adopted by some conservation organizations, including the Rural Voices for Conservation Coalition[2] (Rural Voices for Conservation 2008).

In an almost identical definition, Oregon Senate Bill 1072, legislation that provided the direction for policymakers to promote the utilization of woody biomass, defined woody biomass as

> "the trees and woody plants, including limbs, tops, needles, leaves, and other woody parts, grown in a forest, woodland, rangeland or wildland-urban interface environment that is the by-products of forest management, ecosystem restoration or hazardous fuel reduction treatment" (Nelson 2005).

Although the federal and state governments have defined woody biomass in almost identical terms, it is important to recognize how the timber industry defines woody biomass.

According to a report by Oregon Forests Resource Institute (OFRI), woody biomass is defined as "the sum total of all organic material in trees, agricultural crops and other living plant material" (Lord et al. 2006). The OFRI study specifically looks at forest biomass and residual wood waste. Forest biomass includes waste generated from the harvesting of small diameter timber, debris from limbed timber, and/or timber understory. Residual wood waste includes waste generated at saw mills and other factories that use wood products, as well as woody debris from construction sites and landscaping projects.

There are similarities and differences between the previously stated definitions. The key difference is that wood residuals from mills or municipal waste are not included in Oregon Senate Bill 1072 and the 2003 memorandum of understanding. It's important that businesses and

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[2] The Rural Voices for Conservation Coalition is comprised of 45 western rural and local, regional, and national organizations that have joined together to promote balanced conservation based approaches to the ecological and economic problems facing the West.

organizations recognize the similarities and differences between the previously stated definitions, as well as any that they may have about woody biomass. Having this understanding may help distinguish the type of wood products and businesses that can promote the development of the woody biomass industry.

Forest Production Industry

The Pacific Northwest timber industry suffered a decline in the 1980s and 1990s (Andrews & Kutara 2005; Rooney 2006). After a successful and profitable era in the 1960s and 1970s, changes in government policies, timber practices, and the housing market contributed to decreased timber activities. The revision of the US Forest Service forest management policy to protect the spotted owl and conserve its associated habitat in the Pacific Northwest through the adoption of the Northwest Forest Plan resulted in a 38% decrease in the total number of board feet harvested from 1990 to 2000 (Rooney 2006). Also, an increase in mechanization in the mills and through the use of helicopters and heavy machinery for harvesting contributed to the loss of jobs. Inflation and an increase in interest rates coupled with the slowing of home construction and competition from Canada were also factors to the decline in annual timber harvest and timber industry job loss in the Pacific Northwest (Andrews & Kutara 2005).

In Oregon, the highest annual timber harvested in the last 50 years occurred in the years 1968 and 1972. The total timber harvested for these years was 9,743 million board feet (mmbf) (Andrews & Kutara 2005). The 2001 total timber harvest was 3,440 mmbf, though this increased to 4,451mmbf in 2004. This timber harvest decline contributed to lost jobs and devastated resource dependent rural communities. From 1972 to 2004, the annual harvest rate declined 54% (Andrews & Kutara 2005) due to the changes in the national economy and adoption of the Northwest Forest Plan. Several logging corporations and small scale timber operations in Oregon

reduced staff or shut down their operations and communities such as Burns, Sweet Home, and Roseburg lost major sources of employment. This loss of jobs resulted in major economic hits to forest-resource communities in and around Lane County (Committee on Environmental Issues in Pacific Northwest Forest Management, Board on Biology, & National Research Council 2000).

The wood products industry is an important part of Lane County's economy. Until the early 1990s, the industry was a major factor in regional employment. Whereas the total timber production for Oregon decreased 54% between 1972 and 2004, the timber production in Lane County decreased 75% (Andrews & Kutara 2005). Despite the decrease, in 2004 Lane County was the top Oregon timber harvest county with 568,725 thousands of board feet (Rooney 2006). Since the early 1990s, the industry has slowly fluctuated in employment, but steadily increased (Lane Workforce Partnership 2005). The industry was able to add 200 jobs after the recession in 2000, but future job prospects are limited (Lane Workforce Partnership 2005). The industry is expected to decrease by 6.4% between 2004-2014, though opportunities for replacing employees will remain high due to 18% of the industry's workforce being between the ages 55-64 and ready to retire (Lane Workforce Partnership 2005).

Policy and Research

The realization of climate change and serious consideration for woody biomass as a renewable energy source has led to the development of energy policies and provided funding for research that encourages the growth of the woody biomass industry.

In 2005, the National Energy Policy Act became the first national energy plan in more than a decade. The stated goals of the bill were to improve energy efficiency while promoting renewable energy resources, and reduce America's dependence on foreign oil while increasing the domestic

production of oil supplies. The bill specifically promoted the use of biomass energy through the development of tax credit programs (White House Office of the Press Secretary 2005).

The United States Government Accountability Office produced two reports exploring current experiences of federal agencies and private businesses in utilizing woody biomass (Nazzaro 2006; Nazzaro & Bixler 2005). Some of the key conclusions of Nazzaro (2006) were that (1) design should be tailored to utilize all woody biomass, not just the cheapest source, (2) develop the timber industry's current infrastructure to promote the utilization of woody biomass, (3) stimulate the industry based on local users, and (4) take unintended ecological impacts into consideration. Nazzaro and Bixler (2005) concluded that (1) the Departments of Agriculture, Energy, and Interior are primarily implementing most woody biomass projects, (2) obstacles to using woody biomass include a reliable source of supply and ability to utilize woody biomass cost-effectively, and (3) federal agencies are limited in their ability to promote the utilization of woody biomass. In addressing the federal government's role to promote the woody biomass industry through tax credits and subsidies, respondents provided mixed messages. Some respondents thought that tax credits and subsidies should be made available to offset costs, whereas others thought they should not be made available and "that such incentives could have adverse, unintended consequences on the ecological health of the national forests" (Nazzaro & Bixler 2005). The conclusions from both of these reports show that the woody biomass industry is still young, needs considerable research as to availability of supply, there is still a lack of agreement on how to promote the feasibility of the industry, and the impacts to the forest health need to be a priority.

At the state level, Oregon is playing a leading role in the promotion of woody biomass as a renewable energy resource. In 2003, biomass, including agriculture, accounted for 10% of non-transportation and 9% of industrial energy resources in Oregon (State of Oregon 2007a). This is

significant when nationally the amount of biomass used for energy production in 2002 was 3% (State of Oregon 2007a). Oregon has displayed leadership in the promotion of utilizing woody biomass by its recent actions of adopting the Renewable Energy Action in 2005, establishing the State of Oregon Forest Biomass Working Group, creating Oregon's Renewable Energy Action Plan, and passing the Renewable Portfolio Standard. All of these help develop the woody biomass industry.

In recent years, three actions by the state government have contributed to the promotion of the utilization of woody biomass. In 2005, Senate Bill 1072 and Oregon's Renewable Energy Action Plan were created, and the Renewable Portfolio Standard in 2007 provided directives for state government agencies to explore options in harvesting woody biomass for the purposes of reducing catastrophic fires, improving forest health, and creating jobs.

Senate Bill 1072 provides guidance for the Oregon Department of Forestry to "engage and provide direction to federal land managers regarding forest stewardship needs in Oregon" (Oregon Department of Energy & Oregon Department of Forestry 2007a). It directs state foresters to be involved in federal land management decisions so that Oregon needs are considered, initiate assessments to better understand the opportunities that exist in utilizing woody biomass and educating the public about the woody biomass (State of Oregon 2007b).

Oregon's Renewable Energy Action Plan (REAP) provides a comprehensive blueprint to the development of renewable energy sources to meet Oregon's energy needs, and strive to meet Oregon's energy needs in the year 2025 with 25% from renewable energy resources. The plan highlights the lack of a "market-pull mechanism" to contribute to the increase in ethanol, a renewable fuel from primarily corn and, to a lesser extent, wood fiber (Oregon Department of Energy 2005). A couple key actions that stakeholders need to consider in the development of

markets to utilize woody biomass are fostering the development of private-public partnerships and educate the public about the benefits of utilizing biomass for energy.

In May 2007, the Oregon State Legislature implemented part of REAP and passed the Renewable Portfolio Standard (RPS). RPS states that large utilities will need to provide 25% of their electricity in the form of renewable energy resources by 2025 (State of Oregon 2007c). Qualifying renewable energy resources in the category of biomass and biomass byproducts are organic waste, pulping liquor, woody debris or hardwoods, energy crops, organic matter, wastewater, or municipal solid waste. It should be noted that chemically treated wood is not considered a source of renewable energy. This can affect woody biomass sources from construction sites and landfills where contaminated wood and other products are mixed with clean sources of woody biomass.

Most policies focusing on renewable energy encourage the development of large scale 20-megawatt electrical generation facilities through tax credits (Rural Voices for Conservation 2008). There is minimal policy developed to promote the development of small scale facilities that produce electricity and/or heat through the use of renewable energy sources.

The State of Oregon Forest Biomass Working Group provided recommendations to "remove existing barriers to the sustainable use of forest biomass in Oregon" (Oregon Department of Energy & Oregon Department of Forestry 2007a). Their report details barriers and recommendations to overcome these barriers within six subgroups: Shared Vision and Public Support, Predictable Supply, Harvesting and Transportation Infrastructure, Biofuels, Research and Development, and Supportive Regulatory Environment.

One barrier mentioned by in the Predictable Supply Subgroup lists capacity of local contractors to take advantage of restoration projects. This may be due to lack of education and training opportunities, or lack of interest or equipment. In the Harvesting and Transportation Infrastructure Subgroup, one action to overcome barriers to developing the biomass industry is to complete a logging industry survey of the Associated Oregon Loggers (AOL). A survey of timber industry professionals provides an understanding of the ability of contractors to engage in the woody biomass industry, interest level, and workforce education/training needs.

Another significant action recommended by the Harvesting and Transportation Infrastructure Subgroup is to allow contractors already engaged in woody biomass utilization to discuss their experiences. The recommended forums include workshops and the distribution of case study results. This type of information has been presented, such as the report from the United States Government Accountability Office (Nazzaro 2006), but they provide accounts from a variety of states rather than focusing within a specific geographic location, such as Oregon.

Carbon Neutral?

Some industry professionals have termed woody biomass energy as “carbon neutral” (Atkins 2008; Maker 2004). Their reasoning is that as timber is cut and burned for energy, the carbon being released in the burning process can be absorbed by the new growth of trees. Overtime, some speculate there will be no net increase in carbon dioxide (Maker 2004). Others argue that this is an incomplete picture (Palosuo, Wihersaari, & Liski 2000). Their argument is these studies do not consider the negative effects that collecting and transporting timber has on soil carbon storage. They also say that the CO_2 emissions released from vehicles and facilities involved in the harvesting, transportation and chipping of the material are not taken into account. One study, after taking in all considerations for the removal of woody biomass from the forests, concluded that

80% of greenhouse gases could be removed if woody biomass was utilized from the forest and used to replace fossil fuels (Palosuo et al. 2000). The U.S. Forest Service stated that about 5% of net CO_2 would be produced when considering transportation emissions (Bergman & Zerbe 2008). The picture is not clear about carbon neutrality, but the reduction in CO_2 needs to be considered when examining all renewable energy sources.

Fire Management

The utilization of woody biomass industry to meet energy needs is not only a viable option to mitigate climate change, but it may also be used to meet reduce severe wildfires and meet ecological objectives. Decades of fire suppression and poor logging practices had contributed to an increase in forest fuel loading. These fuels contributed to the 2000 fire season being the worst on record at that time and influenced policymakers to take a more proactive approach to fire suppression. This resulting policy was the National Fire Plan (NFP).

The goals of the NFP were to (1) provide a highly-trained firefighting workforce, (2) reduce hazardous fuels, (3) conduct rehabilitation projects in post-fire areas, (4) improve community assistance, and (5) provide oversight of standards for firefighting on public lands (U.S. Department of Agriculture & U. S. Department of Interior 2007). The goal of reducing hazardous fuels on public lands was further met with the 2002 President's Healthy Forests Initiative (HFI) and the Healthy Forests Restoration Act of 2003 (HFRA). The HFI and HFRA were designed to reduce hazardous fuels through thinning activities around communities threatened by wildfires. This may create an opportunity to utilize the removed timber for energy production.

Some scholars say that the goals of the NFP "signifies a critical shift from reactionary policy that focused on wildfire suppression toward a more proactive policy that focused on long-term

ecosystem and community health" (Steelman & Burke 2007). This collaborative approach to wildfire management with communities and government officials developing strategies was a new approach that sought to develop long-term solutions. The collaborative approach was not only being implemented in wildfire management, but was also being tried in forest management practices.

Community Forestry

The decline of timber jobs in rural communities and poor management of national forests contributed to a paradigm shift in the management of public lands in the 1990s. This shift in managing forests sought a collaborative approach and public participatory process that involved stakeholders from a variety of backgrounds. Community involvement allowed local issues to be considered in the management of resources while creating a sustainable economy. An overall goal to this approach was the increase in higher quality jobs (Hibbard & Karle 2002). By creating a higher demand and diversifying the utilization of timber, the economic value would increase and help create higher paying jobs.

This collaborative approach has many names, such as grass roots ecosystem management, community forestry, ecosystem management, and ecological forest restoration (Brodsky & Hallock 1998; Hibbard & Karle 2002; Weber 2000). Despite the many names, the common goal is to create a sustainable local economy that values the natural environment. This holistic approach looks at economic, social, and ecological impacts when forest management decisions are made. I use the term community forestry to describe this new approach to forest management.

The Forest Service made community forestry policy in the early 1990s to provide stability to rural communities that depended on timber industry jobs (Frentz, Burns, & Sperry 2000). Communities

without a stable economic base may suffer from high rates of unemployment and crime, lower education scores, and an exodus of residents seeking employment opportunities in other regions. Community forestry works with the residents of these communities to increase their capacity to create a sustainable livelihood. The Aspen Institute (Aspen Institute 1996) defines community capacity as a combination of commitment, resources, and skills[3].

- **Commitment** refers to the communitywide will to act, based on a shared awareness of problems, opportunities and workable solutions. It refers also to heightened support in key sectors of the community to address opportunities, solve problems and strengthen community responses.

- **Resources** refers to financial, natural and human assets and the means to deploy them intelligently and fairly. It also includes having the information or guidelines that will ensure the best use of these resources.

- **Skills** includes all the talents and expertise of individuals and organizations that can be marshaled to address problems, seize opportunities, and to add strength to existing and emerging institutions.

When communities understand their strengths, weaknesses, opportunities, and barriers, then they are more prepared to address local problems by working together towards common community goals.

In addition to the input from local residents, community forestry seeks the input of outside interest groups. These interest groups include environmental and conservation organizations, trade organizations and interested citizens. One motivation for this inclusive approach is for the federal government to reduce future lawsuits (Frentz et al. 2000). When all stakeholders are included early in the planning stages of policy development, there is less of chance of surprises at the end of the process. Also, bringing in outside interest groups allows the local communities to

[3] The definitions for commitment, resources and skills are taken directly from the Aspen Institute. See bibliography.

understand how the management decisions made on adjacent public lands could affect a wide-range of citizens.

Community forestry provides the framework for stewardship contracting. Stewardship contracting is designed "to achieve land management goals for National Forest System lands while meeting local and rural community needs"(U.S. Department of Agriculture, Forest Service 2005). It provides a collaborative approach in the development of long-term Forest Service contracts that meets ecological objectives and allows communities a process to ensure their needs are being met. In terms of developing the woody biomass industry, long-term sustainable supplies of material from public lands should be explored through stewardship contracting (Rural Voices for Conservation 2005; Williamson 2007).

Community forestry can provide positive benefits for communities considering woody biomass to meet economic and energy needs. These benefits include increased community capacity to utilize woody biomass, and community-scaled energy and wood product facilities to "adapt to changes in volume and type of material being supplied, to accommodate limitations in transportation distances and inefficiencies,…and to efficiently produce a variety of products to reflect these variations over time" (Rural Voices for Conservation 2008).

Perspectives on Woody Biomass

Other research has been conducted on stakeholder perspectives of utilizing woody biomass in Oregon (Almquist 2006; Williamson 2007). Almquist interviewed environmental organizations in the Pacific Northwest to understand how they felt about utilizing woody biomass to reduce hazardous fuels. Key findings that are important to this paper include environmental organizations have a varying level of awareness of what utilizing woody biomass means;

economic and not ecological objectives will drive the woody biomass industry; subsidies may be encouraged for companies to utilize woody biomass, but organizations caution as to their use; and guaranteeing a supply of woody biomass from federal lands is not an agreed upon approach.

Part of Williamson's study was to interview landowners, and representatives of the forestry and pulp and paper industry representatives to understand technology gaps and challenges to utilizing woody biomass. Key findings relevant to this paper are "raw material supplies are constrained", though a market for slash should be encouraged since it is piled and burned; economics are the main factor for a landowner to harvest woody biomass for energy production; and mixed reviews of the use of subsidies exist. Some respondents felt that subsidies should be used to "spur investment" and others said it was an "unfair advantage".

These stakeholder perspectives provide insight as to how woody biomass is perceived and the challenges that lie ahead for developing this industry in Oregon. They provide a reference point for stakeholders to begin to work together and encourage the promotion of woody biomass.

CHAPTER 3

METHODOLOGY

Objectives

This was an exploratory study of woody biomass utilization opportunities in the southern Willamette Valley. I wanted input from firms in the timber industry that are or had an interest in utilizing woody biomass. There were two objectives that I accomplished through the interviews. The first was to understand the capacity of firms either engaged in or have the potential to engage in woody biomass collecting, processing and transportation. The second was to determine the willingness and interest of firms to participate in biomass utilization efforts and what barriers would prevent them from engaging or further promoting the utilization of woody biomass.

Sample Identification

I employed a snowball sampling methodology to recruit study participants (Miles & Huberman 1994). Snowball sampling uses a qualitative approach to participant recruitment and creates a sample born out of interview participant recommendations. I identified initial participants based on their connections and experiences with the woody biomass experiences within the industry. In addition, I identified a list of timber industry businesses in the southern Willamette Valley through the phone book. At the end of each interview, I asked participants to recommend others in the woody biomass industry that should be included in the study. I made efforts to ensure a diversity of participants were recruited for the study. However, the pool of individuals currently engaged in the regional biomass industry is small, which limited the number of participants I was able to include in the study. Although my sample size was limited I am confident theoretical

saturation (Miles & Huberman 1994) was reached because many of same themes were repeated across interview participants. All information collected remains confidential and the information provided will not be linked to individual respondents.

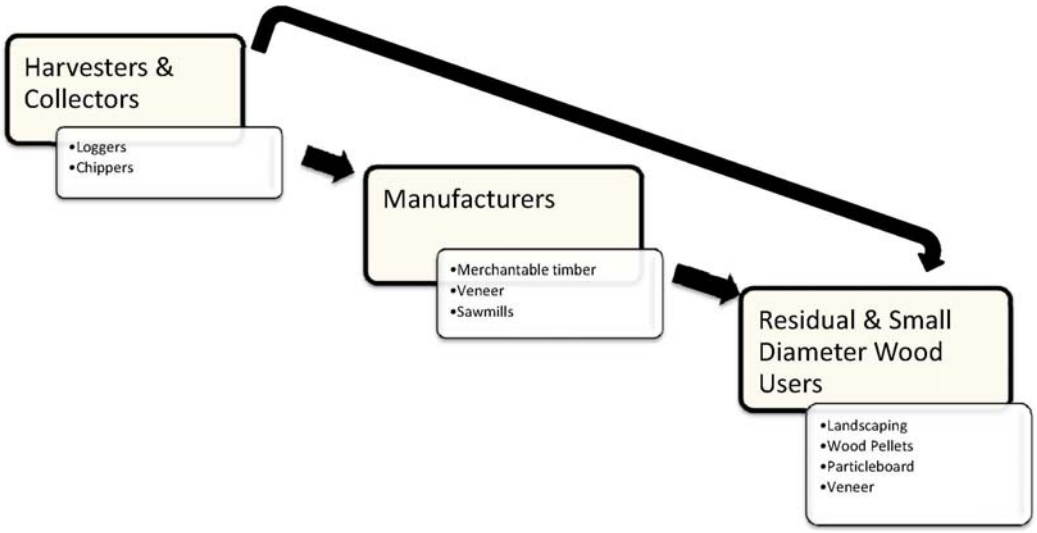
A total of seventy individuals from sixty-seven firms were contacted for this study. From these seventy individuals, eighteen participants living and/or working in the southern Willamette Valley agreed to participate in this study. Individuals were contacted one to three times to be part of the study. The reason that individuals did not participate in the study were because they did not answer the phone, did not return phone calls, did not have the time, or did not have an interest in participating.

The primary objective of the study was to learn about experiences with the woody biomass industry from a range of professionals working in the wood industry. Therefore the selection criteria included factors such as: length of time spent working in the industry; location of business; size of operation; and experience with woody biomass. I selected a diverse group of participants in an effort to reveal the range of perceptions regarding woody biomass and to better understand the suite of experiences, opportunities and challenges forestry professionals face in the southern Willamette Valley when considering the woody biomass industry.

The firms contacted included a diversity of business ranging in size from multi-national corporations to small businesses. Their area of business include wholesale and manufactured wood products, sawmills, plywood, utility poles, logging, particleboard, veneer, and chipping. The firms have a place of business in Lane, Douglas, or Linn County and some conduct business solely in Lane County while others engage in biomass utilization efforts in eastern Oregon, and as far south to California and north to British Columbia. One participant conducted business in North Carolina. I spoke with either firm managers or firm owners who were willing to participate

in the study. I conducted interviews until theoretical saturation was reached (Miles & Huberman 1994). This means I continued to interview firms until no new concepts were introduced into the study and a range of potential interview participants were recruited. All information collected remains confidential and the information provided will not be linked to individual respondents. Figure 1 shows the activities that participants engaged in and how the activities relate to each other in terms of the wood supply.

Figure 1. Interview Participant Activities



The respondents generally had a lot of experience in the forestry industry. Six had 30 or more years, six had 20-29 years, three had 11-20 years, and three had 10 or less years of experience in the forestry industry. The respondents generally started their careers in the forestry industry and switched companies within the industry or, in a couple instances, stayed with the same company their entire career.

Procedures

Initial contacts were made in January 2008. All firms that were recommended through timber industry professionals were contacted first. The list of firms identified from the phone book was contacted beginning in February. The data was collected through phone and face-to-face interviews. At the end of each interview, the interviewee was asked to recommend another individual or firm for this study. The interviews concluded at the end of March 2008.

Firms were contacted and asked to participate in the survey. An initial phone call allowed me an opportunity to explain the study and, if they were willing to participate, set up a time to conduct the interview. For those interested in participating, a follow up phone call was made and a 20-45 minute interview was conducted.

Interview Instrument

A guide composed of twenty-seven questions was used in the interview. The questions were to acquire background and demographic data, assess awareness/education level of biomass utilization efforts, determine interest and willingness of participants to learn more about and/or engage in woody biomass utilization efforts in the southern Willamette Valley, and offer an opportunity for questions from the interviewees. The interview guide was informed by a review of woody biomass studies by federal and state government agencies and affiliates. The interview guide is found in Appendix I.

Analysis

Interview responses were analyzed for common themes. Themes were identified based on specific keywords that we recognized as relevant to this study. The themes were categorized

under either the first objective (to understand the capacity of firms either engaged in or have the potential to engage in woody biomass collecting, processing and transportation services) or the second objective (determine the willingness and interest of firms to participate in biomass utilization efforts and what barriers would prevent them from engaging or further promoting the utilization of woody biomass). The accumulation of these responses allowed them to be grouped.

Due to the qualitative nature of this study, in general, it was not appropriate to quantify the specific number of responses to any theme. Though, when appropriate, the specific number of responses was presented. Themes relevant to participant types were determined based on the demographic and background data provided by respondents. For example, responses were identified based on the number of years of experience, size of the business, or geographic location.

CHAPTER 4

PERSPECTIVES FROM THE TIMBER INDUSTRY

This chapter presents the results from the eighteen interviews. The first goal was to understand the capacity of firms and contractors either engaged in or having the potential to engage in woody biomass collecting, processing and transportation services. The second goal was to determine willingness and interest of firms and contractors to participate in biomass utilization efforts.

Goal 1: Understand the capacity of firms and contractors either engaged in or have the potential to engage in woody biomass collecting, processing and transportation services.

What is woody biomass?

When asked what they think of when they hear the term "woody biomass", participants provided a variety of responses. The responses reflected the work that the businesses were engaged in. Definitions included byproducts of merchantable timber, hog fuel, municipal wood waste, and slash piles in the forest.

Most of the participants that were strictly engaged in cutting timber or collecting slash piles thought of woody biomass as slash piles or debris littered on the forest floor. Many participants that milled timber referenced bark, hog fuel, and tree tops in addition to slash piles. Hog fuel is wood fiber and bark ground up in a piece of equipment called a "hog" and may be used for ground cover, animal bedding, and erosion control (Lane Forest Products 2004).

A couple participants said that woody biomass was the "recovery of wood materials for energy" and "anything that you can use to produce heat out of it". A few participants included municipal wood waste from construction sites and yard debris as woody biomass.

Almost half of participants mentioned woody biomass as a form of energy production and attributed it to an opportunity for business tax credits if they engaged in energy production. Of these respondents, they mentioned electricity, fuel, and steam production as part of utilizing woody biomass for energy production. The variety of examples provided show the diverse ways interview participants describe and define woody biomass in the Lane County region.

Where are woody biomass efforts occurring?

All but one participant's business location was in or adjacent to Lane County. Eleven participants were based out of Lane County proper, four were located in Douglas County, two were housed in Linn County, and one in Marion County. However, of those participants with businesses in Lane County, only half did most of their work in Lane County. Three participants worked along the I-5 corridor from southern Oregon into Canada. A few participants extended their efforts east to the central Oregon area where the flatter terrain increased the accessibility of a supply. The primary reason that participants did not do a majority of their work in Lane County was that they perceived the existing supply of woody biomass in the County to be saturated. Therefore, they felt they needed to go elsewhere to find a sustainable biomass supply. Most participants who received their supply from the forest get it from private lands. Very few participants operated on public lands due to the difficulty of accessing public timber. One stated "it is cheaper for me to get wood out of a landfill in Tacoma, then go down the street (to the Willamette National Forest) and access forest slash." The labor costs and high fuel costs involved in transporting materials long distances from public lands, coupled with the numerous regulations that govern public lands has made it difficult or uninviting for businesses to consider woody biomass from public lands.

Current efforts of woody biomass utilization

Almost all the participants in our study were engaged in woody biomass efforts. Four said they were not currently utilizing woody biomass. Interestingly though, when these four participants were asked what the nature of their work was, elements of their work clearly involved using woody biomass. The degree of engagement in woody biomass utilization efforts varied between businesses.

Participants engaged in woody biomass were almost all involved in chipping or grinding slash piles or wood waste. One participant said, “I chip up pre-commercial trees at the farm. Instead of spreading it around the ground, I blow it into a trailer and use it for ground cover.” Some participants have brought their equipment to landing piles in the forest, chip the wood debris, and haul it to a buyer. Others brought in commercial timber to their plant and chip the wood residuals. Although only one participant was involved in wood pellet production, several mentioned they would like to get involved in pellet production. Two participants were actively engaged in chipping wood products from municipal wood waste. One respondent explained, “We have been grinding urban wood waste for pulp, particleboard, and fuel since 1993”. Two participants produced wood chips to produce steam onsite in a cogeneration process. Overall, participants engaged in woody biomass chip wood residuals as a result of the demand in the marketplace.

Sources of Woody Biomass Information

Most participants attributed their knowledge of woody biomass from their experiences in the timber industry. Some participants felt their knowledge of the industry has been gained through years of daily interactions with others engaged in similar activities. From these participants, many mentioned how the term woody biomass was a new term for hog fuel. The term hog fuel had been

in the timber industry for decades, whereas woody biomass had been a term being used only in the last decade or so.

Specific sources of information from within the industry included trade shows and trade journals or magazines. Few participants mentioned the Internet as a vehicle for learning about woody biomass. One participant mentioned National Public Radio as a primary source of woody biomass information.

Interestingly, a few participants specifically mentioned current practices in European countries as their source of knowledge of woody biomass. One participant visited websites based out of Europe, one had a friend who visited Germany and talked to him about Germany's woody biomass efforts, and one participant visited European countries to learn more.

To summarize responses for Goal 1, participants had a variety of ideas of what woody biomass is and how it could be utilized. Generally participants provided responses based on their line of work in the timber industry. Users of woody biomass often obtained their supply from residuals at mills and from private land, and expressed that the availability of a supply in the southern Willamette Valley was not adequate due to the saturation from existing markets. Most participants also felt the supply of woody biomass is limited to private lands. Chipping and grinding, and potentially hog fuel, were the primary sources of woody biomass in the Lane County region. Participants have learned about woody biomass through daily interactions, trade shows, journals, and European contacts. Despite the availability of woody biomass information on the Internet, very few participants have used the Internet as a primary source of information.

Goal 2: Determine willingness and interest of firms and contractors to participate in biomass utilization efforts

Concerns in Woody Biomass Utilization

Participants' willingness and interest to participate in regional biomass utilization efforts varied based on the costs to collect and transport the supply, and the identification of a sustainable, long-term supply source. Some participants thought that their ability to participate in woody biomass utilization efforts hinged on economic benefits. Specific economic concerns included the costs to access woody biomass on public lands and the threat to the existing supply of woody biomass. One specific concern regarding supply of biomass on public lands was that participants involved in the hauling of slash piles had not been included in the negotiation of initial timber contracts. They wanted to be included in the early stages of contract development between federal agencies and timber companies. Participants felt that their suggestions of creating better road access to slash piles and where to specifically place slash piles could greatly increase access to woody biomass on public lands if incorporated into the contracts. A participant from a small logging firm stated "there needs to be more of a discussion of biomass utilization efforts when the sales are laid out and access to the landings are determined…we are trying to get in with the companies to help lay out the sale." In the past, these participants had not removed forest slash piles due to poor road access to the supply and the specific slash pile locations. The type of equipment used to access slash was the primary reason participants could not collect all the piles. Participants used trucks and chippers to collect and haul slash from road and/or landing sites. The chipping equipment was wide and long, and not easily maneuvered on logging roads and off roads. A participant mentioned that "the chip trucks are large and many of the logging roads are made for logging trucks. Our trailers don't pivot well on the choppy (logging) roads."

Another economic concern that participants raised included the cost to access low-value small diameter timber on public lands for energy production, when no large-scale demand exists, was not cost-effective. Transportation costs were the main concern to some businesses. Due to the low economic value of woody biomass, the supply of woody biomass has needed to be within a certain distance from their facilities. Participants did not provide a specific number of miles, though one participant said "transportation costs a lot to haul a chip van 60 miles."

Some participants felt that if the supply of woody biomass materials were not expanded to include material from private and public forestlands, then the development of the woody biomass industry would only displace another sector of the timber industry. According to interview participants, the current availability of woody biomass was already saturated within Lane County. Participants felt the total available supply was already being used for landscaping, particleboard, pellets, hog fuel, and briquettes. One participant stated "there will be (an increase in) competition (of the existing supply) if the supply doesn't expand". Other respondents echoed this concern by saying "that you could be doing away with one market to feed (the woody biomass market)", and "do we want to put at risk a bunch of existing industry?". The existing industry included sectors of the wood industry that relied on hog fuel and clean chips such as pulp, paper, and landscaping materials. Another respondent speculated that increased competition for supply may affect his buyers.

> "I guess that we might take some diversity out of the market. We have a landscaping market, and if it all becomes an energy market, then instead of five hundred customers, we now have three or four customers. It would consolidate and the few customers that exist would be large consumers."

A few participants were also concerned that the woody biomass industry may grow too fast too soon. These participants would like to see the industry grow more gradually, based on science and funding and "not politized and driven by politics." Another concern raised includes potential

damage biomass extraction practices could cause to the forest ecosystem. Specifically, concerns that woody biomass removal efforts would cause too much organic matter to be removed and excessive compaction of the soil by heavy equipment. Another participant cited the concern that the utilization of woody biomass for energy production would increase burning and contribute more CO_2 to the atmosphere. And although most participants did express some level of concern regarding woody biomass utilization efforts in the Lane County area, two respondents cited no concerns to utilizing woody biomass.

Impacts of creating a woody biomass industry in Lane County

The majority of participants were positive about increasing a woody biomass industry in the Lane County area. However, some participants feared growing the industry too quickly or without enough guidance would have a negative impact on the region. The primary positive impact expressed included increasing job opportunities and allowing companies to diversify their uses of timber. Participants expressed the need to continue to diversify the timber industry to adapt to fluctuations in the economy. One participant in Douglas County said "most guys who do the job will be from the logging industry. They don't care what they are doing as long as they get paid."

A few participants currently utilizing woody biomass suggested that their businesses would experience economic growth if the industry were to develop in Lane County. These respondents felt they were prepared to take advantage of the industry through their current knowledge of the woody biomass industry and/or the equipment they currently owned that provided a competitive edge. One small business owner in western Lane County explained how he would benefit.

> "I have a chipper that is Scandinavian design and is designed to feed itself. If you take my kind of machine, once the tree is off the stump, you can reach out, grab the tree and put it in the chipper. If there is a biomass (energy) generating facility and it needed small diameter wood cut, then I can get involved."

Two participants said there would be no impact to their work since they were not able to get involved. The main reasons expressed were the high cost of transportation and an insufficient amount of government subsidies available that would allow them to break into the market.

Some of the negative impacts were around the availability of supply if the market increased. A participant specializing in the utilization of woody biomass from municipal wood waste explained that when consideration for the existing supply of woody biomass in Lane County is for energy, then a shortage exists. “Currently, the supply side is a byproduct from lumber production. You can’t just go out and grind it up. It doesn’t economically make sense. There needs to be another financial incentive.” Competition for the existing supply, without identifying a new supply, would affect some businesses. One participant mentioned his issue with the current woody biomass supply. “I purchase fiber logs. If (the woody biomass industry) uses fiber logs for biomass utilization, then I am affected.” Another participant, a log buyer with 20 years of experience, felt that his company would be negatively impacted if an increase in the utilization of softwoods was identified for the woody biomass market. “If you focus on hardwoods and underutilized materials, then it shouldn’t have a huge impact on us.” The identification of a new supply outside of what is currently being used was important to minimize the negative impacts of developing the woody biomass industry.

Increase participation in woody biomass efforts

When asked what it would take to either participate or increase participation in utilizing woody biomass, the majority of participants stated their participation in the industry hinges on their ability to make a profit. This was the bottom line for any company to succeed. The two factors were increasing the number of available subsidies to underwrite the initial investment in utilizing woody biomass and diversifying the supply. One specific incentive was increasing the feasibility

of selling green tags. Businesses that generate renewable energy are able to accumulate renewable energy certificates known as green tags and sell them on the market to utility companies trying to meet state renewable energy standards (Nazzaro 2006). Oregon House Bill 2210 provided this incentive (Oregon Legislative Assembly 2007a). One respondent working for a major timber business said, "We need more incentives. The current incentives are not effective. They are bureaucratically stifling. The federal energy bill treats some energy types differently. If we want renewable energy, we can do it. We can easily do it, but the incentives are not correct." In speaking of diversifying the woody biomass supply, a participant said, "I think there is a lot of supply, but it can't all come from forestry. It needs to come from straw, Christmas trees, and pruning."

Two participants thought incentives were not a good idea to increasing participation. They felt that they could be confusing and, ultimately, lead to failure if the company cannot pay its own way to participating in the industry. A company should be able to show that it could make a return on its investment over a length of time based upon the demand from the market. They believed incentives such as subsidies and tax credits may increase profit, but should not be the reason a project was determined to be feasible.

Two participants with small businesses and currently involved in chip production mentioned that limited access to supply on public lands was their limiting factor to increasing participation. The woody biomass supply located on most public land was not located near a receiving facility. This distance to travel to collect and transport the supply was usually the most expensive part of utilizing woody biomass. In addition, the supply is not always located near a road, but required a vehicle to go off road to access the slash piles. One participant stated "the (timber companies) just

need to pile the slash closer to the road and then we can collect the slash piles. For the (timber companies) that do, we can get 90% of the slash."

Economic and Quality of Life Benefits to developing the woody biomass industry

In understanding what may motivate participants to participate in the woody biomass industry, they were asked what economic and quality of life benefits they want woody biomass utilization to provide. The main economic benefit for a majority of businesses was that the woody biomass industry needs to create profitable margins. If businesses cannot obtain a profit then they won't participate in the industry. But if it provides forestry professional with greater economic opportunities then they are likely to support biomass expansion efforts. As one interview participant put it, "my personal feeling is that the loggers won't mind having it. They want to be paid for getting the materials to the landing and the company will enjoy seeing the landing piles removed."

The majority of participants also felt that pursuing woody biomass as an energy source was another benefit. Some of potential benefits cited included diversifying the U.S.'s source of energy and reducing the country's dependency on fossil fuels. One respondent said, "I think generating power using biomass makes a ton of sense, it will reduce the needs for fossil fuels and increase the efficiency of power generation." Another shared "I guess personally, terrestrial carbon is better than fossil fuel carbon."

Some participants mentioned that developing the woody biomass industry could improve forest health. One respondent said that "we are aware that the use of biomass is carbon neutral and (that the utilization of woody biomass) will provide lumber, clean water and air." A couple of participants felt that using beetle kill timber for energy would be more beneficial than letting it

burn in a wildfire. A few suggested that collecting slash would result in reduced burning and help create less CO_2 in the atmosphere. Wood from these slash piles would be taken to a facility to be utilized for an energy purpose resulting in reduced wildfire hazards.

Opportunities in woody biomass efforts

Some participants discussed opportunities that should be investigated to help promote biomass utilization within the greater Lane County region. The suggestions provided were diverse with little overlap. One participant said the development of partnerships with countries who signed the Kyoto Protocol could help promote the utilization of woody biomass and secure a number of users within the context of an international market. Another suggestion was to utilize forest land that does not produce healthy Douglas Fir or areas that include a lot of alder or poplar. In conjunction with supply, another participant said that the focus of fuel reductions should be in southern Oregon where a woody biomass market already exists for energy production. Most likely this was from the establishment of Biomass One, a 25 megawatt wood waste fired cogeneration plant located in White City, Oregon (Biomass One 2006). A respondent with a small business in western Lane County thought that multiple smaller (cellulosic ethanol) plants should be developed rather than one large one. He felt that since transportation costs would be the deciding factor in accessing supply, then multiple plants would increase the radius to access a supply. Interview participants offered a range of opportunities for growing regional biomass utilization efforts and provided insight regarding potential concerns and limitations regarding the industry's growth.

CHAPTER 5

DISCUSSION

Climate change, rising fuel costs, changes in forest management, and economic growth opportunities are all potential contributing factors to the development of the woody biomass industry. The future of the industry may be in large scale production of electricity and fuels, but it is currently starting with small-scale woody biomass utilization projects at schools and hospitals. The demand for the woody biomass supply will increase as the small-scale projects increase and as more large-scale projects are developed.

This study aimed to increase our understanding of the opportunities and challenges that forest contractors and companies have in the development of a woody biomass industry. Furthermore, the study tried to understand the interest level in participating in the woody biomass industry. Most participants for this study were excited about increasing their participation in the woody biomass industry. The bottom line was that if they could make a profit, then they were willing to participate. Others expressed that increasing the woody biomass industry could contribute to achieving carbon neutrality and help mitigate the effects of climate change.

Summary

Economics. Participants perceive the demand for forestland small diameter wood to be low. They mentioned that the costs to collect and transport the material exceed the material's market value. By contrast, the woody biomass that came from mills and other municipal wood waste has been in demand and valued for products such as landscaping material, particleboard, and medium density fiberboard. Woody biomass derived from mill residuals and municipal wood waste has

been cost-competitive because the trees from which they originated from were either merchantable timber from the forest or urban trees and debris. Participants mentioned that if the utilization of woody biomass for energy purposes increases, then it may be cost-competitive to collect low-value small diameter trees.

Supply and Competition. When discussing new sources of woody biomass supply, respondents often said that, without increasing the supply in the southern Willamette Valley, the development of the woody biomass industry would displace existing jobs, not create new ones. Most respondents were concerned that the current supply in the area was saturated with uses in various other sectors of the wood manufacturing industry. This included the manufacturing of veneer, particleboard, and landscaping materials. If the identification of a new supply for woody biomass was not pursued, then as jobs increased in the woody biomass industry due to consumer demand, jobs in other sectors of the timber industry might be lost. Some respondents said that to alleviate this problem of displacing jobs, the supply could be increased by harvesting low-value small diameter on public lands, where access to timber has been limited. This would not only create economic opportunities through the addition of new jobs, but could decrease the number of severe wildfires that threaten communities.

Awareness. Timber industry professional's awareness about what woody biomass is and how it may be used was not consistent. Respondents mentioned many of the same sources of woody biomass and the different uses for woody biomass, but it was not consistent with all respondents. Though four respondents mentioned that they did not utilize woody biomass, when they discussed the work that their businesses were engaged in, they actually were engaged in the utilization of woody biomass. The term hog fuel was used often to describe what woody biomass use to be

called in the timber industry. Respondents clearly show that they have varying levels of awareness of what woody biomass is and how it can be utilized.

Federal Government. The USDA Forest Service should include all contractors and subcontractors in the initial set up of a timber sale. Some participants with businesses that subcontract with timber companies fulfilling the Forest Service contract expressed interest in being part of the initial timber sale contract negotiations between the contracted timber company and Forest Service. Subcontractors wanted to provide details on where to locate slash piles so that their equipment was able to access the material. Participants said that they have had difficulty accessing material that was not located at landings or within close proximity to roads. This was because some of the equipment used was not designed to go off the main logging roads. Taking the time to access slash piles hundreds of yards from roads take a lot of time and increases costs.

Incentives. Many participants favored incentives such as tax credits and subsidies. Some were aware of specific incentives such as those offered in Oregon House Bill 2210 and from the federal government. In contrast, a couple respondents did not favor incentives as a promotional tool for developing the woody biomass industry. They discussed that a woody biomass project should be proven feasible without the use of incentives.

Recommendations

This study's findings generally support the findings from the two GAO reports (Nazzaro 2006; Nazzaro & Bixler 2005). This includes securing a reliable supply, considering the forest health as an objective, and, due to the infancy of this industry, differing ideas exist on how to promote and develop the industry.

The identification of a sustainable long-term woody biomass supply is critical for this industry to develop. Detailed research as to the feasibility of accessing the supply needs to be conducted and promoted locally. These studies should detail the availability of a supply located in forestland in conditions Class 2 or 3[4], sawmill residuals, and municipal wood waste. A government report on the availability of biomass fuels determined that only about 2% of wood residuals at sawmills are available for energy production (Oak Ridge National Laboratory 2006). This was based on the following other uses of wood residuals at mills:

- Bark: 80% used as fuel and 13% used in products
- Coarse residuals: 85% used in products and 13% used as fuel
- Fine residuals: 55% used as fuel and 42% used in products

This supports the fact that communities seeking woody biomass for energy need to look for a reliable sustainable source of supply. Long-term contracts on federal land should be explored as an option. Stewardship contracting is recommended to encourage community support, solicit input from a variety of stakeholders, and meet the ecological, social, and economic needs of a project.

Though some respondents discussed the importance of removing woody biomass to prevent severe wildfires and decrease CO_2 emissions, it's important to recognize ecological impacts that may be created from an increase in the removal of the material. Accompanying studies as to the ecological impacts of removing woody biomass from forests need to be conducted so that all the costs of utilizing woody biomass are known. When considering a long-term supply, all benefits and consequences need to be considered. This recommendation is shared by others involved in collaborative forest management (Rural Voices for Conservation 2005; Sample 2007). Woody

[4] Forestland in Condition Class 2: At moderate risk of uncharacteristically intense fire.
Forestland in Condition in Class 3: At high risk of uncharacteristically intense fire

material from designated wilderness and roadless areas and old growth stands cannot be considered as a long-term supply for obvious ecological benefits to the forests.

If the development of the woody biomass industry relies on the timber industry professionals to collect, harvest and transport the material, then all contractors and subcontractors working in the timber industry should understand that there are multiple sources of supply and that the uses of woody biomass are varied. This may help ensure buy-in from timber professionals as they understand what various roles they can fill in the development of the woody biomass industry.

As stated earlier, organizations and government agencies have varying levels of awareness of what woody biomass is and its uses. A consistent definition as to what woody biomass is and the various uses of woody biomass needs to be agreed upon and promoted to all individuals in the timber industry and those associated with the development of the woody biomass industry. The Rural Voices for Conservation Coalition and Oregon Forests Resource Institute have taken initial steps by publicizing their definitions, but discussions between these and other stakeholders including government officials, utility companies and community members needs to take place. A universally understood definition by all decision makers and participants in the woody biomass industry may help promote opportunities to access tax credits and subsidies, as well as seek new markets. Regional workshops for all stakeholders will help provide consistency in what woody biomass is and how it can be utilized.

Further Research

This study was limited in scope but the findings reveal additional research questions to consider regarding the utilization of woody biomass as a source of energy for communities in the southern Willamette Valley. Potential future research questions include:

- What will the long-term ecological impact be to the forests that are harvested for woody biomass utilization?

- If the current supply of woody biomass is saturated in the southern Willamette Valley, does forested public lands offer long-term sustainable economic opportunities?

- If wood is burned for energy production, then how will air quality change as woody biomass utilization increases to meet energy needs?

Conclusion

The utilization of woody biomass to meet multiple community objectives is in its infancy, but positive steps are being taken to understand its potential and develop this industry into a sustainable economic and energy solution for communities. Some of the benefits include climate change mitigation, economic development, fuels reductions, and community wildfire reduction. The intended and unintended ecological impacts and the identification of a long-term supply are uncertainties that the timber industry will need to grapple with for the woody biomass industry to succeed. With a collaborative approach that includes voices from multiple stakeholders and consideration for the appropriate scale based on the communities to be served by these projects, woody biomass may play a role in creating jobs in rural and urban communities to meet community energy demands while creating healthy forests.

APPENDIX I

SURVEY INSTRUMENT

Hello, is _____ available? This is _____ calling from Resource Innovations to conduct our interview about biomass activities in Lane County. Thank you so much for taking the time to speak with me. Before we get started I want to remind you that interviews generally take between 30 and 45 minutes. Also, please remember that your participation in the interview is voluntary. Are you willing to participate in this study? Y/N

Everything you tell me today will be kept confidential and the only people who will know your identity are those involved in the research team. However, no one outside of the research team will have access to your individual answers. If at any time you have questions for me, please feel free to ask them.

Thanks again for participating. Let's get started.

Interview Questions

Background data and demographics.

1) Where do you live?
2) What is the name of the organization you work for (or own)?
3) Where is your organization located?
4) Where do you do most of your work?
5) How long have you been working in the forestry industry?
6) What other types of companies have you worked for? What has been your role there?

Assess awareness/education level of biomass utilization efforts.

7) What do you think of when you hear the term "biomass utilization"?
8) Can you describe how you are familiar with the term "biomass"?
9) Where have you gotten most of your information about biomass?
10) Are you currently, or have you previously been involved with woody biomass utilization efforts? *
11) If yes, what types of biomass activities are you doing or have you done?

Determine interest and willingness of participants to learn more about and/or engage in woody biomass utilization efforts in and around Lane County.

12) How do you think biomass utilization efforts in Lane County (or surrounding counties) might impact your livelihood?
13) What economic and quality of life benefits or incentives do you want biomass utilization efforts to provide?
14) Do you have any concerns regarding biomass utilization efforts?
15) What would it take for you to participate (or to increase your participation) in biomass efforts?
16) Are you interested in learning more about the woody biomass industry?

Follow-up Interview*(complete this section if participant said yes to question 10

17) We are going to conduct follow-up interviews with individuals that are currently engaged in woody biomass activities or have participated in these types of activities in the past. The purpose of this follow-up interview is to learn more about your experiences, successes and challenges in the biomass industry. The follow-up interview will be in-person and I can meet you at the time and location or your choice. Would you be willing to participate in a follow-up interview? *If yes, then go to question 18. If no go to question 20.*
18) Follow-up interviews will take approximately 45 minutes. When would be a good time to meet?
19) Great. I look forward to getting together. Where would you like to meet?

Other Questions

20) At the end of the interview process we will be compiling our results and sharing them with decision makers and other stakeholders in the Lane County. Are you interested in finding out more about the study?
21) Would you like to be contacted with more information about regional biomass utilization efforts?
22) Is there anything else you would like to discuss?
23) Do you have any additional questions for me?
24) Can you please confirm your complete contact information (e-mail, phone, address)?
25) At the beginning of the interview I explained to you that your interview responses will be kept confidential. But in an effort to follow-up with you after the completion of the project we hope to share the names of organizations that participated in the study. Is that alright with you? Y/N
27) We are hoping to talk to other forest industry professionals that are either currently or have been previously involved in biomass activities or who are considering expanding their existing forest practices to include biomass utilization activities. One last question I have for you is, can you think of anyone else that I should include in the this study.

I want to thank you for your time and feedback. Your input will be a crucial aspect of our project and will assist us in understanding the capacity for woody biomass utilization efforts in the region. I'll send you an email with my contact information in case you have any further questions. As we analyze the data, we may be in touch with you if we have any clarifying questions about what you have said. Once we are done with the final report we will send you a copy. *(If applicable: I look forward to meeting with you in-person on _____).*

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