Commercial Potential for Ethanol Production

From Wood Residue in Montana and Idaho

Submitted to

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March 16, 1999

TABLE OF CONTENTS

EXECUTIVE SUMMARY

This report evaluates and seeks to develop a commercial opportunity for ethanol production from wood residue in Montana and Idaho. The basic opportunity stems from low current prices and an abundance of wood residue between Missoula, Montana and Coeur d'Alene, Idaho, as well as a healthy demand for ethanol in the Western U.S.

- There are 1.8 million dry tons of sawdust, planer shavings, and bark produced annually within 100 miles of this specific region.
- The current delivered price for these feedstocks is about $15 per bone dry ton.
- An ethanol plant with a capacity of 12 to 17 million gallons per year could generate returns on investment in the range of 20% to 30% using a portion of these feedstocks.
- This assumes that 14% of the current supply could be marketed for ethanol production without creating a drastic price increase.
- A rule of thumb for price sensitivity: for every additional dollar of delivered feedstock costs, the internal rate of return is reduced by 1%.

Although this opportunity appears attractive from a feedstocks perspective, finding the right combination of *all* factors favorable to ethanol production will not be easy. Ethanol production requires investors capable of raising significant debt capital (+$30 million), able to adopt new technologies (hydrolysis and fermentation), and having a goal of creating an opportunity in the transportation fuels market. Moreover, this potential opportunity favors an investor who could control or predict wood residue supply. Wood residue supply is expected to decline as a result of forest access issues and improved milling technology that produces less wood waste.

Demand for ethanol in the Rocky Mountain and Pacific Coast region is fairly robust, with most states being net importers. This, in combination with attractive production and blending incentives in Montana, Idaho, and Wyoming creates opportunities for local production and sales. Additional incentives are available from the federal government. However, margins on ethanol production are generally low at this time due to depressed prices for fossil fuel-derived gasoline and additives.

Ultimately, market demand for ethanol and potential profits from the production and sale of ethanol *together* must draw the investor into this opportunity. Therefore, cheaper feedstocks, improved ethanol production technology, more favorable legislation, and rising prices for competing products of ethanol (such as gasoline and MTBE), would all improve the outlook for ethanol production in the region.

Parties interested in developing this potential opportunity are encouraged to contact the author or the sponsors of this study (see the cover of this document). A companion document on technologies and economic considerations for ethanol production is available from the same sources. It is entitled "Fuels from Farms and Forests: A Technical Bulletin for Biomass Conversion to Ethanol." It also provides a list of private sector contacts that can furnish further information.

INTRODUCTION

Project background

The U.S. faces an uncertain energy future requiring the development of new fuels and fuel-efficient transportation systems. Although current oil supplies appear plentiful, their depletion is inevitable, with estimates of peak oil production expected as early as the year 2010.[1] The aftermath of this could include fuel shortages and price shocks. Total depletion of oil reserves can be projected to occur by the year 2100.[2] In the mean time, fossil fuels and fossil-fuel additives threaten the environment in ways that were previously little understood.[3]

Fortunately, the U.S. has a vast supply of renewable resources that can be converted into cleaner fuels. Recent estimates put the annual recoverable energy potential of these resources, known collectively as biomass, equal to 15 EJ (10^{18} Joules), or nearly half of the oil-based energy consumed annually in the U.S.[4] Many of these resources are currently underutilized or treated as waste products, creating potential economic opportunities in new uses.

One such opportunity is the production of ethanol from biomass. Ethanol is a domestically produced alternative transportation fuel that raises fuel octane and oxygen content, resulting in reduced air pollution problems such as smog and carbon monoxide.[5] Ethanol also has relatively low toxicity, is water soluble, and is biodegradable, making the consequences of large fuel spills less environmentally threatening.

Although ethanol in the U.S. is produced primarily from corn, lignocellulosic feedstocks like grasses, straw, stover, and sawdust from farms and forests, and municipal solid waste, offer enormous potential and additional advantages for ethanol production:

- A virtually inexhaustible domestic resource
- No net carbon dioxide to the atmosphere
- Can generate revenues rather than disposal costs
- Can stimulate rural economies

In recognition of our nation's future energy needs and the advantages of converting biomass to cleaner-burning fuels like ethanol, more than two decades ago governments and private stakeholders launched a national effort to develop these resources. Eventually, most states and regions conducted feedstocks studies, which have led to new technologies and opportunities being realized. The first large-scale biomass-to-ethanol plants in the U.S. are expected to break ground in 1999.[6]

Montana and Idaho, the two states of primary interest in this report, are also exploring their potential in developing new energy resources. The Montana State Energy Office and the Idaho Energy Division conducted biomass feedstock studies in 1991[7] and 1987,[8] respectively, and Montana State University (MSU) with support from the National Renewable Energy Laboratory completed in 1996-1997 an assessment of potential feedstocks for ethanol production in Montana.[9]

The MSU study examined the availability and cost of sugar crops and grain crops, as well as cellulosic feedstocks including straw, perennial grasses, poplar trees and residues from forests, wood products, and agriculture. The study concluded that although well-known feedstocks such as wheat and barley remain economically promising, fine wood residue such as sawdust from lumber milling might offer both an economic *and* environmental opportunity in the region.

According to that study, Montana produces some 650 thousand dry tons of fine wood residues annually, of which about 25 percent are land filled, given away, or utilized internally for hogfuel. The remainder is sold cheaply, at prices ranging from $2 to $7 per dry ton. Transportation costs are low, averaging $4 per dry ton in a 100-mile radius. At these prices, using one-fifth of the state's available feedstock, an ethanol plant could be feasibly located in Montana.[10]

Based on these results, it was recognized that further research and collaboration with the wood products industry would be necessary to further develop this potential opportunity. The need was also recognized to expand the analysis to Idaho and to scrutinize the initial results more closely vis-a-vis competing uses of the feedstocks.

Objectives and activities

The *principal objective* of the present study is to further analyze and develop the opportunity to commercially produce ethanol from wood residues in Montana and Idaho. This requires:

- Identifying demand and incentives for ethanol production in the region
- Estimating current and future availability and prices of wood residues
- Identifying compatible infrastructure and concentrations of feedstocks
- Educating collaborators on the technology and economics of production
- Building partnerships with the private sector and others to identify potential market opportunities, technical and financial solutions, and a potential plan for the development of this technology.

Key activities of the project fall into the broad categories of (1) research and (2) outreach. Research activities include:

- Update price and quantity data on the supply of wood residues in Montana and gather new data for Idaho.
- Analyze data by geographic units to determine concentration
- Interview firms to identify current uses of wood residues and available infrastructure
- Identify available technologies for conversion of biomass to ethanol

Outreach activities include:

- Contact and establish relationships with companies having (1) access to feedstocks, (2) compatable infrastructure, and (3) ethanol conversion technologies.
- Explore economic opportunities with individual companies as well as industry groups
- Prepare and distribute a technical bulletin for potential investors in ethanol conversion technology
- Prepare and distribute a final report containing improved data on the potential business opportunity for converting wood residues to ethanol in the region.
- Find partners to undertake a technical and economic feasibility study at a specific site

Acknowledgments

The author would like to acknowledge the following extremely helpful people. Rick Veeh of Montana State University's Center for Biofilm Engineering made the technology more accessible and took the travail out of travel. Chuck Keegan and Dan Wichman of the University of Montana's Bureau for Business and Economic Research provided the data and carefully considered its use. Peter Perna of NASA-MSU TechLink supported the project from the outset. Sharon Williams made the nice maps. Dozens of people in the wood products and ethanol industries accepted our calls and visits, and shared their knowledge unselfishly. Paul Mann of Simplot and Kent Thornton of Boise Cascade explored a potential market opportunity. James Glancey of Wyoming Ethanol provided detailed information on the ethanol business. Gerald Fleischman of the Idaho Energy Division provided helpful comments on the final draft of this report. Special thanks to NREL's Mark Yancey and Rafael Nieves, who saw the value in this project and who helped to keep it on track.

FEEDSTOCK AVAILABILITY AND USES

Traditional feedstocks

Ethanol production is not new to the region. *Montana* has a history of producing ethanol from barley and wheat. Although there are no ethanol plants currently operating in the state, a new $165 million dollar ethanol plant is fully financed and is expected to break ground in 1999. The plant has a minimum production capacity of 30 million gallons of ethanol per year, and is configured to earn about half of its revenues from the sale of ethanol, and half from the sale of other products, notably wheat gluten and animal feed.[11] A large plant with similar business objectives is about to go on line in Alberta, Canada.

Idaho has two ethanol plants in operation, with a production capacity of about 3 million annual gallons each. These plants, owned by Simplot, utilize undersized potatoes and potato waste as a feedstock. Simplot adopted ethanol production as an alternative to cattle rearing for processing potato waste streams. The ethanol plants came on line in 1985-86 when the economics of cattle production changed for the worse.[12]

Washington State has America's only long-standing ethanol plant using wood and paper processing wastes for ethanol production. Owned by Georgia-Pacific at

Bellingham, WA, the plant ferments sugars found in spent sulfite pulping liquor. A similar approach to ethanol production is used at a mill in Tembec, Quebec Canada.

Wyoming has one plant producing ethanol primarily from milo, a variety of corn, in Torrington.

Availability of fine mill residues

An economic opportunity in ethanol production from biomass currently requires the large-scale availability of low cost feedstocks in a concentrated area, such as can be found in the woods products industry of Montana and Idaho. The availability of fine wood residues (sawdust and planer shavings) and bark, is addressed below.

The quantity of fine residue produced annually in *Idaho* from sawmills and plywood plants is 683 thousand bone dry tons, with 55% being sawdust and the remainder being planer shavings (Annex Table 1 and Figure 1). A full 83% of this residue is produced in the Northern half of the state, with the heaviest concentration in Bonner and Kootenai Counties. Kootenai county alone accounts for 173,000 bone dry tons, or 25% of the total produced statewide.

The quantity of fine residue produced annually in *Montana* from sawmills and plywood plants is 602 thousand bone dry tons, with 60% being sawdust and 40% being planer shavings (Annex Table 2 and Figure 2). A full 86% of this residue is produced in the northwestern part of the state, with the heaviest concentration in Lincoln and Flathead Counties. Flathead county alone accounts for 184,000 bone dry tons, or 31% of the total produced statewide.

Wood residue in Idaho and Montana is mostly produced at sawmills and plywood plants as a byproduct of lumber and sheathing production. Virtually of it is softwood, mainly Douglas fir, lodgepole pine and pondersosa pine. These three species constituted about 75% of all timber products harvested in the Montana in 1993. In Idaho, just over half of the wood residues come from Douglas fir and True fir, followed by Ponderosa Pine (17%) and Western redcedar (9%). Other species account for less than 6% each.[13] Neither state harvests a significant amount of hardwood.

Bark and other materials

The total amount of bark generated by sawmills in Idaho and Montana is 441 thousand and 420 thousand bone dry tons, respectively (Annex Tables 1 and 2). This is the amount of bark produced through de-barking; it does not include log yard waste and other heavily contaminated sources of fiber.

Total availability and concentration

Together, the quantity of fine residues and bark produced at sawmills and plywood plants in Montana and Idaho is about 2.1 million dry tons annually. Of this, 84% or roughly 1.8 million bone-dry tons are produced within 100 mile radius of Superior,

Box 1. Future Residue Availability in Idaho and Montana
Charles E. Keegan III, BBER, The University of Montana

Lower Production of Lumber and Plywood
Lumber production in Montana and Idaho has fallen by over fifteen percent and plywood production by nearly 10 percent in the last decade. The declines in production were due to a more than 60 percent decline in National Forest harvest.

The outlook for timber availability is very uncertain. In both states the timber harvest from non-National Forest sources is approximately equal to growth and large increases from current levels would likely not be sustainable.

National forests, which currently supply 20 to 25 percent of the timber processed, have a net growth exceeding harvest by several-fold. However, many of the factors, which caused the past decline in National Forest harvest, still exist. Conditions such as threatened and endangered species classification, and a cumbersome appeals process continue to make it difficult for the National Forests to sell timber and there is a real possibility the National Forest timber program in the two states will fall substantially from current relatively low levels. Declines in harvest would likely cause commensurate declines in the size of the lumber and plywood industry and in residue production.

Greater Production Efficiencies
Since 1969 there has been an approximate 30 percent reduction in the volume of residue produced per thousand board feet (MSF) of lumber and a 20 percent reduction per thousand square feet (MSF) of plywood produced by Idaho mills. Montana's sawmills and plywood plants saw a 16 and 11 percent decline, respectively. The largest changes among the various components of mill residue were decreases in sawdust, planer shavings, and bark. Much smaller changes were observed in the volume of chips or coarse residue generated, and the volume of coarse residue generated per unit of lumber and plywood produced increased slightly over the past 25 years in Montana.

Future Changes: A simple linear extrapolation indicates that in the next decade, the volume of mill residue per unit of lumber produced will decline 9 to 25 percent; for plywood the decline is expected to be 10 to 14 percent. While new technology such as "curve sawing" which greatly improves lumber recovery in small log sawmills has yet to be widely adopted by mills in Idaho and Montana, one has to question how much further mill residue factors can decline in the future. Further, one could easily argue that further reductions in the size and quality of logs entering the mills in the future will result in a modest reversal of long term trends. However, recent data for the more efficient mills in Idaho and Montana show residue production per unit volume of lumber produced substantially below the projected average for the region.

Outlook for Surplus Mill Residue
The combination of potential reductions in timber availability and in the quantity of residue generated per unit volume of lumber and plywood produced would indicate a 10 to 30 percent reduction in the total volume of mill residue generated by sawmills and plywood plants. Somewhat offsetting the impacts of reduced mill residue availability is the fact that major users have and will continue to turn to alternative fiber sources such as recycled paper, low quality timber or short rotation, plantation grown timber. Even with an increase in the use of other fiber sources competition for mill residue is expected to increase in the next decade.

PRODUCTION COSTS AND FEASIBILITY

Prices in Montana and Idaho

With current technology, feedstocks account for between 20% and 40% of ethanol production costs. Including handling and transportation, feedstock costs are therefore a key determinant in evaluating a potential opportunity.

According to data from Montana, about 75% of fine mill residue and 52% of bark is sold. The remainder is burned or given away. Prices are affected by the availability of long term contracts, multiple fiber agreements, external sales and transfer pricing, broker arbitrage, and quality differences.

Fine residue in *Idaho* has a weighted average price in 1995 of $9.70 per bone dry ton, ranging from a high of $18 for sawdust in Boundary County to a low of $2.70 for planer shavings in Clearwater and Idaho Counties (Annex Table 3 and Figure 5). The high price for residue in Boundary might be explained by Western redcedar, which fetches a high price in niche markets. Bark in Idaho has an average price in 1995 of $2.70 per dry ton. Because 1995 was a year of high prices for chips as shown in Annex Figure 6, some adjustments are in order. Adjusting the 1995 data for the 6-year average price, Idaho fine residue price estimates can be lowered to $7.60 per dry ton, while bark can be left unadjusted because large portions are not sold.

Fine residue in *Montana* has a weighted average price in 1993 of $5 per bone dry ton, ranging from a high of $7 for planer shavings in Lincoln and Gallatin Counties, to a low of $2 for sawdust in Missoula County (Figure 7). Bark in MT had an average price in 1993 of $3 per dry ton. Because 1993 prices are similar to the 6 year average, no adjustments to the data were made. In a limited survey of Montana firms, 1997 prices do not appear to differ significantly from prices in 1993.

Thus, the weighted average price for fine residue during recent years in Montana and Idaho is about $6.50 per bone dry ton. Bark is just under $3 per bone dry ton. Differences in residue prices between MT and Idaho can be explained by survey years and in certain counties by species.

Price effects of competition and shortage

What would a new user of wood residue do to the prices in the region? Suffice it to say that views on price sensitivity are mixed, and that a supply curve for residues was not estimated as part of this study. However, according to a limited survey of residue producers, two views dominated. The first view is that ten to twenty percent more fiber in the region could be marketed without significantly affecting price (from the 1.8 million dry tons within 100 miles of Superior, MT, that's about 270 thousand dry tons, enough to supply an ethanol plant). The second view is that the region holds NO surplus fiber so a new user would simply drive up prices, causing businesses to fail, particularly those dependent on this single input.

The real difficulty for any new user of residue in the region would be the lack of market influence. Like some co-generation facilities and pellet producers, an ethanol producer would likely have to compete for residue fiber with full service partners of sawmills, such as Potlatch Corporation and Stone Container, which offer long term, multi-fiber contracts. This is particularly important because the prized residue sales are the coarse residues for pulping. The market for coarse residues is dominated by these two companies.

Finally, expected declines in residue production (Box 1.) could put significant upward pressure on the price of residues in the long-term. Over the *very* long term, this pattern does not necessarily hold. Shifts in consumer preferences toward alternative products (synthetic paper, oriented strand board from crops, natural gas) could again depress the demand for residues by traditional users, and offset any increased use by new industries or declines in residue production.

Transportation costs

The cost of this potential feedstock must take into account transportation costs, as these in cases are higher than the cost of the basic input. According to a major trucking interest, transportation costs for wood residue can be calculated at 5.9 cents per ton per mile for a 100 -mile roundtrip haul.[15] Other distances can be calculated according to a formula that is expressed graphically in Annex Figure 8.

To express transportation costs on a dry-weight basis requires weighted averages. With just under half of fine residue in the region being planer shavings which are hauled dry, and just over half being sawdust which is hauled green, the dry weight hauling cost of these is about 9 cents per mile. Bark on the other hand is always hauled green, and so the dry-weight hauling cost of bark is about 12 cents per mile (50% moisture by weight).

Total costs and production feasibility

Total cost for feedstock on a dry-weight basis within a 100 mile radius of Superior MT, can thus be estimated at $15.50 for fine mill residues ($6.50 for the raw material plus $9 for trucking) and $15 for bark ($3.00 for the raw material plus $12 for trucking), based on current prices.

Returns on ethanol production at these prices can be calculated according to an economic model developed by ProForma Systems (Golden, CO). According to this model, key variables are (1) the type of technology used for breaking down the wood into simple sugars, (2) whether the ethanol plant is co-located with a co-generation facility, (3) the delivered cost of the feedstock, (4) the percentage of owner equity versus debt equity, and (5) the ethanol plant size.

Under one scenario (dilute acid hydrolyis, co-location with a cogeneration facility, $15 per bone dry ton delivered, scale of 250,000 BDTs per year, and 25% owner equity), ethanol production would be feasible and generate an internal rate of return on the order 20 to 25% per year.

If the same amount of feedstock could be obtained within a smaller radius (50 miles) of the ethanol plant, the total cost of feedstocks (including transportation) would fall to $12 per ton for fine mill residues and $10.40 for bark, at existing prices. Under that scenario, ethanol production would be feasible and generate an internal rate of return between 25% to 30% per year.

A sensitivity analysis on a full range of variables has been completed for a potential wood residue to ethanol plant in Chester, California that would apply to Montana and Idaho.[16]

In principal, an investment opportunity can be found in Montana or Idaho that is feasible for ethanol production, offering annual rates of return on investment in the range of 20 to 30%. For example, it is likely that if 1.8 million dry tons of fine residues and bark are produced within 100 miles of Superior MT, that 250,000 dry tons (or 14%) of the total could be marketed for ethanol production without creating a drastic price increase. A rule of thumb for price sensitivity is: for every additional dollar of delivered feedstock costs, the internal rate of return is reduced by 1%.

On the other hand, finding the right combination of all factors favorable for ethanol production will not be easy. Ethanol production requires a large company capable of raising significant debt capital ($30 to $60 million), able to adopt new technologies (hydrolysis and fermentation), and having a goal of creating an opportunity in the transportation fuels market. It will also require one of the following in the long term: (1) some control over the inventory of feedstocks, (2) long term contracts for feedstocks, or (3) a reliable means of predicting and ensuring future feedstock prices.

Ultimately, market demand for ethanol and potential profits from the production and sale of ethanol together must draw the investor into this opportunity as compared to other opportunities. In this regard, improved ethanol production technology, more favorable legislation, and rising prices for competing products (such as gasoline), would improve the market outlook.

Technology and infrastructure considerations

This report will not go into any detail about the diverse technologies for producing ethanol from biomass, but a companion bulletin does just that. The bulletin, entitled "Fuels from Farms and Forests" explores technical and economic considerations for producing ethanol from biomass. It was designed to answer basic questions of technical decisionmakers and investors in a biomass to ethanol plant.[17]

The presence of certain types of infrastructure, such as biomass boilers or a complete co-generation facility is complementary to the feasibility of an ethanol plant. Certain conversion technologies produce significant quantities of cellulosic bi-products (primarily lignin) that require disposal or further conversion. Obviously, generating steam or electricity from these bioproducts is an efficient end use. Moreover, these biproducts have a higher BTU value than the initial feedstock, on the order of 11,000 BTUs as compared to 9,000 BTUs per pound. NREL has calculated the returns of a cogeneration facility with and without ethanol production, and the returns are more favorable with.

There are presently 6 biomass-fed cogeneration facilities in Idaho and none in Montana. These would be potential sites for producing ethanol, offering a particular infrastructure advantage.

REGIONAL MARKETS FOR ETHANOL

The regional market for ethanol would include states in and west of the Rocky Mountains, which are mostly net importers of ethanol. The actual states targeted for market development would depend on incentives provided by the individual states (discussed below) and other strategic considerations.

According to recent estimates, the total demand for ethanol in the Rocky Mountain and Pacific Coast states is 302 million gallons per year (see Annex Table 4). These data reflect the amount of pure ethanol mixed in gasoline, not the amount of blended gasoline. The normal mixing ratio is 10% ethanol to 90% gasoline, although E-85 cars are now capable of running on 85% ethanol.

Use of ethanol ranges widely from 95 million gallons per year in California to less than 1 million gallons per year in Montana and Wyoming. Ethanol use in Montana accounts for some 520,000 gallons per year, mostly in Missoula, which is mandated by amendments to the Clean Air Act to have a 10% ethanol mix in winter gasoline in all light duty vehicles. For the same reason, motorists in Spokane consume roughly 8 million gallons of ethanol annually during a 6-month season.[18] Outside of Spokane, Washington motorists use ethanol as an octane enhancer. Motorists in Idaho consume about 8 million gallons of ethanol per year, mostly around Boise, without federal mandates.

Demand for ethanol and other biofuels in the region is not only for light duty vehicles, but also from recreational operators who need to employ clean, safe fuels in environmentally sensitive areas, such as Yellowstone Park, and around water and snow sports. In Europe, for example, ski areas use biodiesel for operation of equipment including trucks, tractors, groomers, and ski lifts. Yellowstone Park, with the State of Montana, is launching pilot bus and snowmobile projects to demonstrate and encourage the use of cleaner fuels.[19]

The ethanol business

The ethanol business fills a small niche within the transportation fuels industry. Ethanol competes for market share with both gasoline and with fuel oxygenates, like MTBE. The relationship is one of synergy, but it is not always viewed this way. Direct subsidies provided to the ethanol industry by most states and the federal government as a means of internalizing the benefits of using cleaner fuel, are sometimes misunderstood.

Ethanol accounts for only about 1% of the automotive fuel used in the country. Therefore, ethanol producers are price takers. That is, they do not set the price in the market. The price they receive is set by (1) the price of gasoline, the price of other oxygenates, and of course, the policy environment.

Marketing Ethanol
By James Glancey, Wyoming Ethanol

Large ethanol producers like those found in Nebraska seek to sell ethanol by railcar or truckload to the major oil companies on the coasts. Small producers like those found in Wyoming, Montana and Idaho tend to distribute and market their ethanol through "bulk plants" which they may also own, and which are co-located at pipeline terminals. Blending occurs at the bulk plant: a 9000-gallon fuel truck may load 8100 gallons of gasoline at the pipeline terminal which is generally owned by a major oil company and drive across the street to "top up" or splash blend the 900 gallons of ethanol at the bulk plant.

There are two major fuel pipelines cutting through Montana and Idaho. The Northern pipeline originates in Billings and has terminals in Bozeman, Missoula and Spokane (with a short interruption at Thompson Falls). The Southern pipeline originates in Salt Lake City and has terminals in Burley, Boise, Clarkston, the tri-cities and Spokane.

Successful distribution of ethanol in the region has been done through independent dealers, some of which own their own fuel trucks, and through individual station owners or "jobbers." These agents have been more receptive to buying ethanol than the major oil companies, because in many instances the financial rewards accrue directly to the retailer. The major independent stations in Idaho selling ethanol-blended fuel are the Stinker stations. Some major oil companies, like Cenex, also sell ethanol-blended fuel.

Ethanol producers use a number of strategies to motivate retail sales of their products, depending on market conditions. These include the following:

- Higher margin: the difference between the cost of ethanol (after subsidies) and gasoline, can be shared with the retailer, increasing the retailer's margin from 7-10 cents per gallon to 9-12 cents per gallon.
- Higher octane: adding 10% ethanol to gasoline adds 3 octane numbers to the fuel, raising the pump price and the margin for the retailer.
- Cleaner environment: ethanol is required seasonally in many cities that do not comply with the CAA amendments. Ethanol is also a year-round clean-burning (oxygenated) fuel which raises octane and which is safer for underground storage than competing products. Ethanol raises the volatility of blended fuels slightly.

Competing products

As a fuel oxygenate, ethanol competes with MTBE. MTBE is an ether which has several commercial advantages, but is increasingly under fire as an environmental risk.

- MTBE is fungible and can be shipped through fuel pipelines.
- Ethanol blended fuel is transported by truck or rail to the retail site.
- MTBE outsells ethanol by more than 2 to 1
- MTBE is about one-third the price of ethanol
- Ethanol has a higher oxygen content, has a lower vapor pressure, results in fewer regional health complaints, and is of far less environmental and health concern in terms of its overall impact from underground storage tank releases.

The policy environment

The policy environment is shaped by two instruments: (1) mandates requiring motorists in noncompliance zones to burn oxygenated fuels, and (2) incentives that promote production, blending, and sale of ethanol. With regard to the latter, Idaho offers a 22.5 cents per gallon excise tax credit to blenders on the sale of each gallon of ethanol (no sunset date), Montana offers a 30 cents per gallon producer's credit (through 2005), and Wyoming offers a 40 cents per gallon producer's credit. Apparently, these incentives can benefit ethanol production in one state and sales in another.

In addition, the Federal tax code contains five tax incentives that benefit alcohol fuels: the 5.4 cents excise tax exemption, the 54 cents per gallon blender's tax credits, the 10 cents per gallon small ethanol producers' credit, the income tax deduction for alcohol-fueled vehicles, and the alternative fuels production tax credit.[20]

Is this corporate welfare? No, not really. The subsidies to ethanol production are simply a means of internalizing the benefits of producing and using a cleaner automotive fuel. It is the socially acceptable alternative to the government's levying a "carbon tax," which is being done in some parts of the world. These policy instruments also support new products that could eventually become main stream in the oil and gas industry.

Even with subsidies, however, margins from ethanol production and sales are generally small. The ethanol producer in 1998 must be able produce fuel for sale at about $1 per gallon f.o.b. after incentives to make a profit and cover handling. The price parity of gasoline is about $1.14. Ethanol thus requires a significant marketing effort, particularly in states without mandates (see Box 2.).

In conclusion, demand for ethanol in the region is fairly robust, with most states being net importers. This, in combination with attractive production and blending incentives in Montana and Idaho, creates opportunities for local production. Additional incentives are available from the federal government. However, margins on ethanol production are historically low at this time, due to depressed prices for fossil fuel-derived gasoline and additives.

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[18] James Kursteder, Energy Extension Officer, Washington State University, personal communication, February 11, 1997. Spokane's ethanol consumption is calculated on the basis of state population with Spokane accounting for 10%. State gasoline consumption is 2.5 billion gallons annually, making Spokane's share roughly 250 million gallons. One-third of Spokane's consumption—approximately 80 million gallons—is winter ethanol formulation, of which one-tenth, or 8 million gallons, is ethanol.
[19] Howard Haines and Ms. Larson, Montana Department of Environmental Quality, personal communications at a meeting in Helena, April 22, 1996.
[20] Salvatore Lazzari, , *Alcohol Fuel Tax Incentives and EPA ' s Renewable Oxygenate Requriement*, CRS Report to Congress, The Library of Congress, October 7, 1994

Table 1.
Wood Residues Generated by Sawmills and Plywood Plants by Major Producing Counties and County Groups, Idaho, 1995 (thousand bone dry tons)

	Boundary	Bonner	Kootenai	Benewah	Latah Lewis Nez Perce	Clearwater Idaho	South Idaho Counties	Total
Mll Residues								
Coarse	43	176	180	178	128	133	224	1,062
Fine								
Planer Shavings	12	58	83	37	41	35	44	310
Sawdust	10	70	90	46	44	41	72	373
Total Fine Residues	22	128	173	93	85	76	116	683
Bark	18	73	104	64	50	59	73	441
Total	83	377	457	325	263	268	413	2,186

Source: Bureau of Business and Economic Research, University of Montana, 1998.

Table 2.
Estimated Wood Residues Generated by Major Producing Counties and County Groups, Montana, 1997 (thousands of bone dry tons)

	Lincoln	Flathead	Lake Mineral Sanders	Missoula	Granite Powell Ravalli	Broadwater Gallatin Park	Fergus Musselshell Rosebud Wheatland	Other Counties	Total
Mill Residues									
Coarse	145	271	106	153	96	102	26	4	903
Fine									
Planer shavings	33	72	33	30	30	36	8	0	242
Sawdust	60	112	50	45	39	44	8	2	360
Total Fine	93	184	83	75	69	80	16	2	602
Bark	54	119	51	83	40	58	14	1	420
Other residues	2	1	1	2	12	3	0	1	22
Total	294	575	241	213	217	243	56	8	1947

Source: Bureau of Business and Economic Research, University of Montana, 1998.

Table 3.
Average Prices of Sold Wood Residues from Sawmills and Plywood Plants by Major Producing Counties and County Groups, Idaho 1995 (dollars per bone dry ton)

	Boundary	Bonner	Kootenai	Benewah	Latah Lewis Nez Perce	Clearwater Idaho	South Idaho Counties	Total
Mill Residues								
Coarse	91.1	97.7	102.1	98.8	87.0	99.7	82.2	93.6
Fine								
Planer Shavings	2.6	9.4	12.0	8.5	14.2	2.7	6.8	8.9
Sawdust	18.4	8.3	12.0	8.9	15.1	5.3	13.8	10.6
Bark	2.2	0.8	2.3	4.2	11.2	1.5	0.9	2.7

Source: Bureau of Business and Economic Research, University of Montana, 1998.

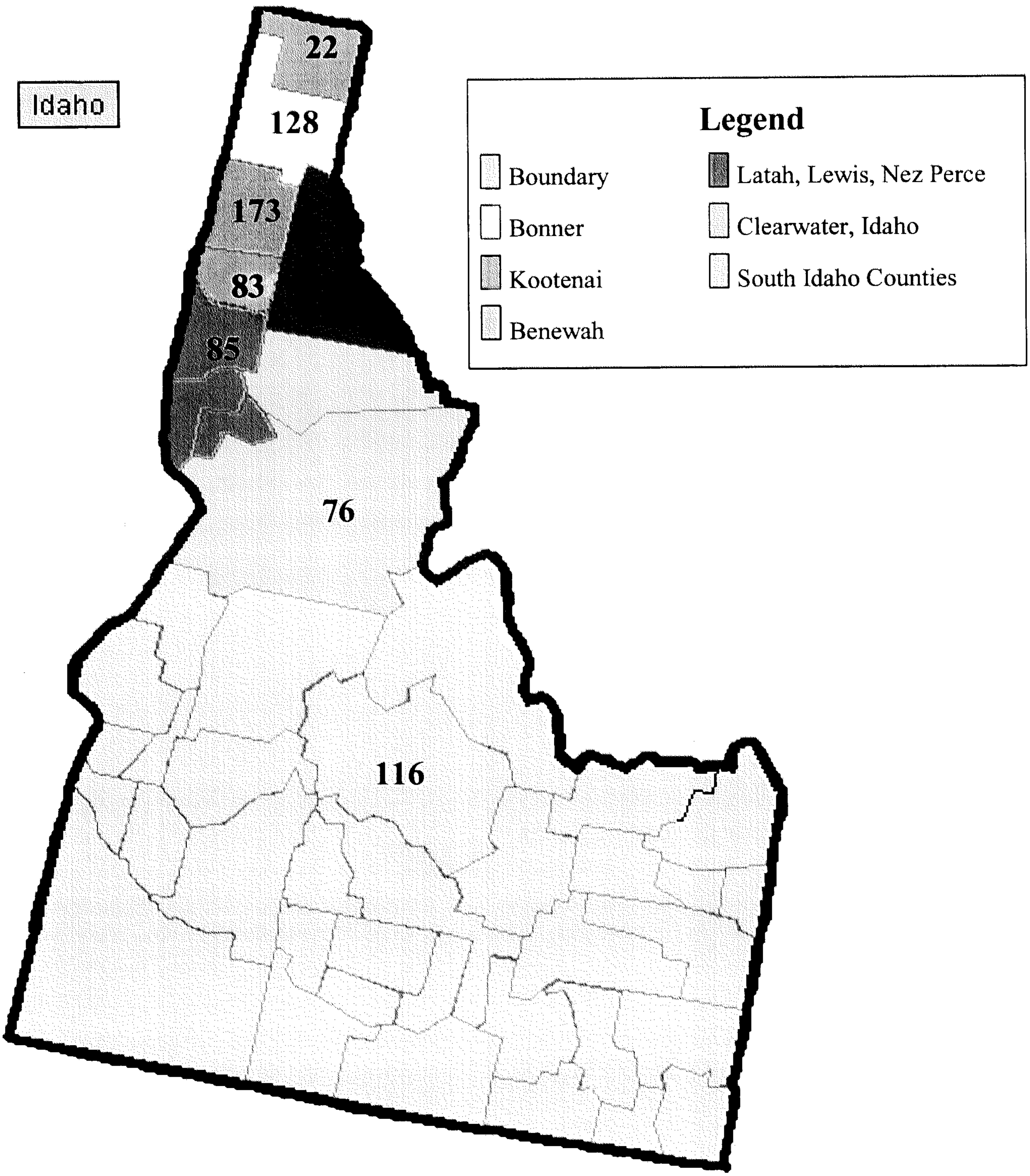
TABLE 4.
Regional Demand for Ethanol (total gallons of ethanol per year in gasohol)

Alaska	7.6 mil	GPY	1997 IRS estimates as reported by FHA
Arizona	24.4 mil	GPY	1997 IRS estimates as reported by FHA
Colorado	67.6 mil	GPY	1997 IRS estimates as reported by FHA
California	94.9 mil	GPY	1997 IRS estimates as reported by FHA
Idaho	8.0 mil	GPY	Jim Clancey, Paul Mann
Montana	0.5 mil	GPY	Howard Haines, MT DEQ
Nevada	29.0 mil	GPY	NREL presentation
New Mexico	17.7 mil	GPY	1997 IRS estimates as reported by FHA
Oregon	25.0 mil	GPY	NREL presentation
Utah	N.A.		
Washington	27.6 mil	GPY	NREL presentation
Wyoming	0.1 mil	GPY	1997 IRS estimates as reported by the FHA
TOTAL	302.4 mil	GPY	

FHA is the Federal Highway Administration
NREL is the National Renewable Energy Laboratory

FIGURE 1.

Fine Mill Residues* by County and County Group, 1995 (thousands of bone dry tons)



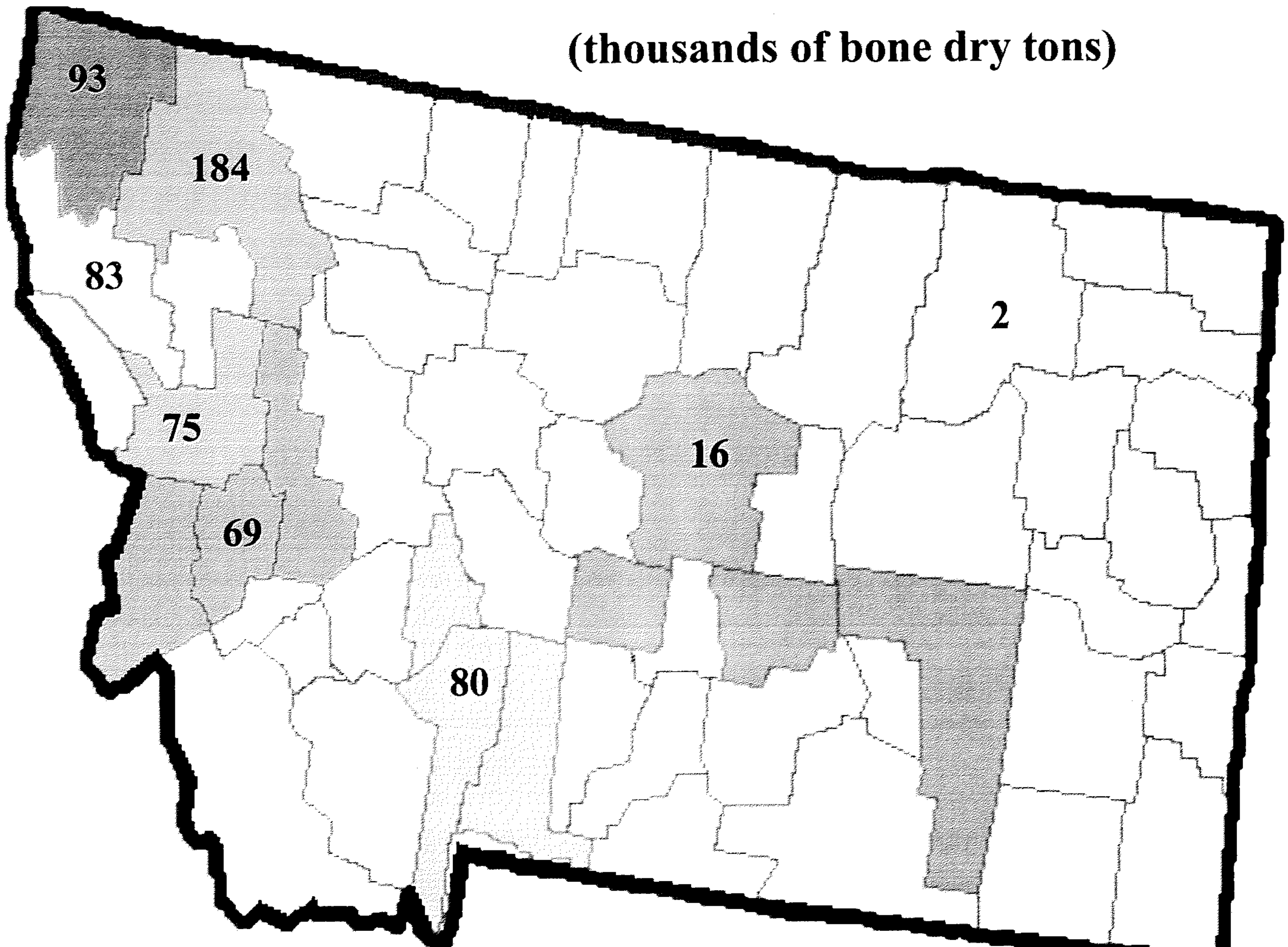
Source: BBER, University of Montana

*Planer shavings, sawdust and sander dust

FIGURE 2.

Fine Mill Residues* by County and County Group, 1997

(thousands of bone dry tons)



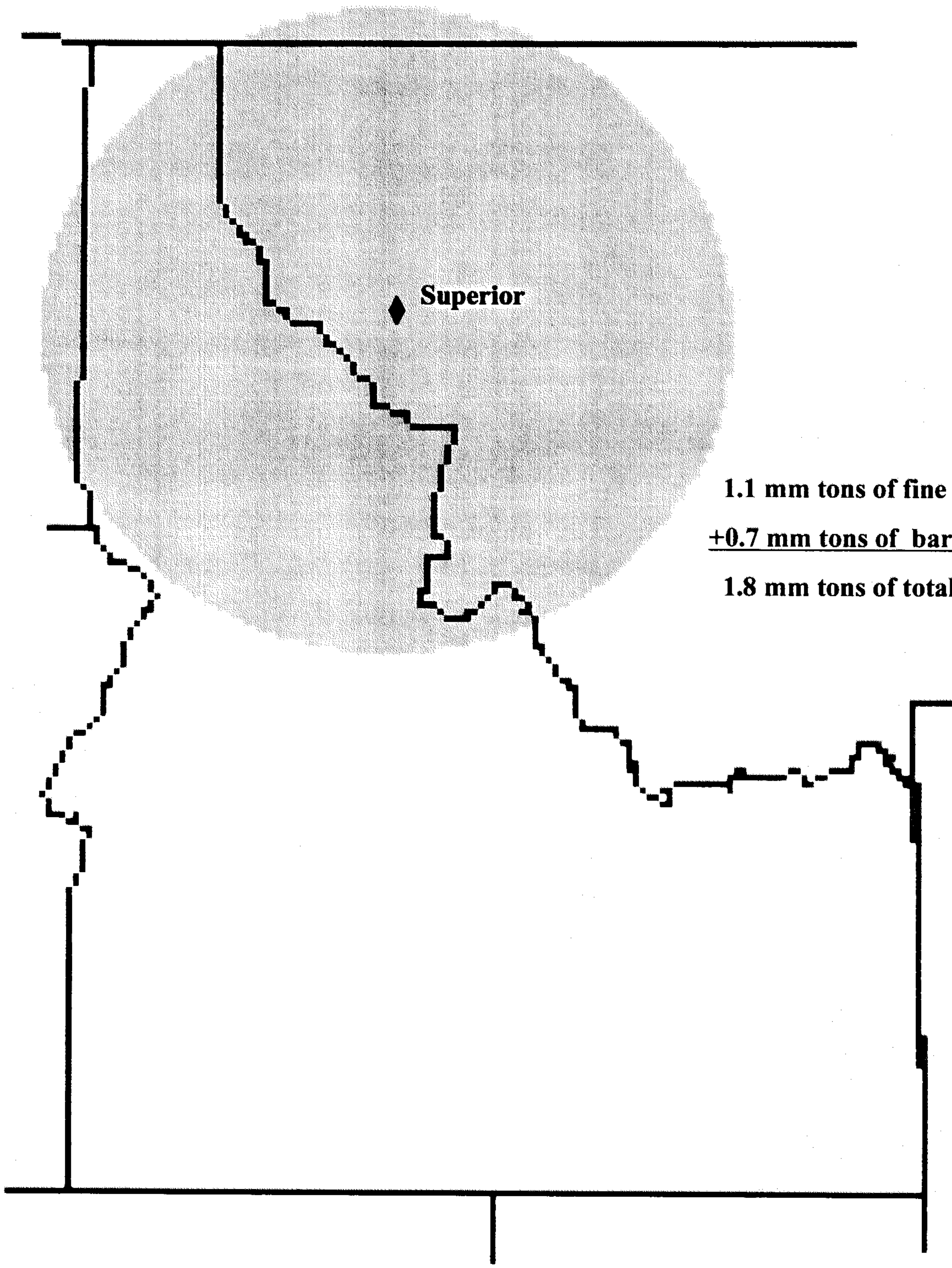
Source: BBER, University of Montana

*Sawdust, sander dust and planer shavings

Legend

Lincoln	**Lake, Mineral, Sanders**	**Granite, Powell, Ravalli**	**Rosebud, Fergus, Musselshell, Wheatland**
Flathead	**Missoula**	**Broadwater, Park, Gallatin**	**Other Counties**

Fine Mill Residues and Bark in 100 Mile Radius of Superior, MT (bone dry tons)



1.1 mm tons of fine residues

+0.7 mm tons of bark

1.8 mm tons of total residues

Major Users of Fine Residues and Bark

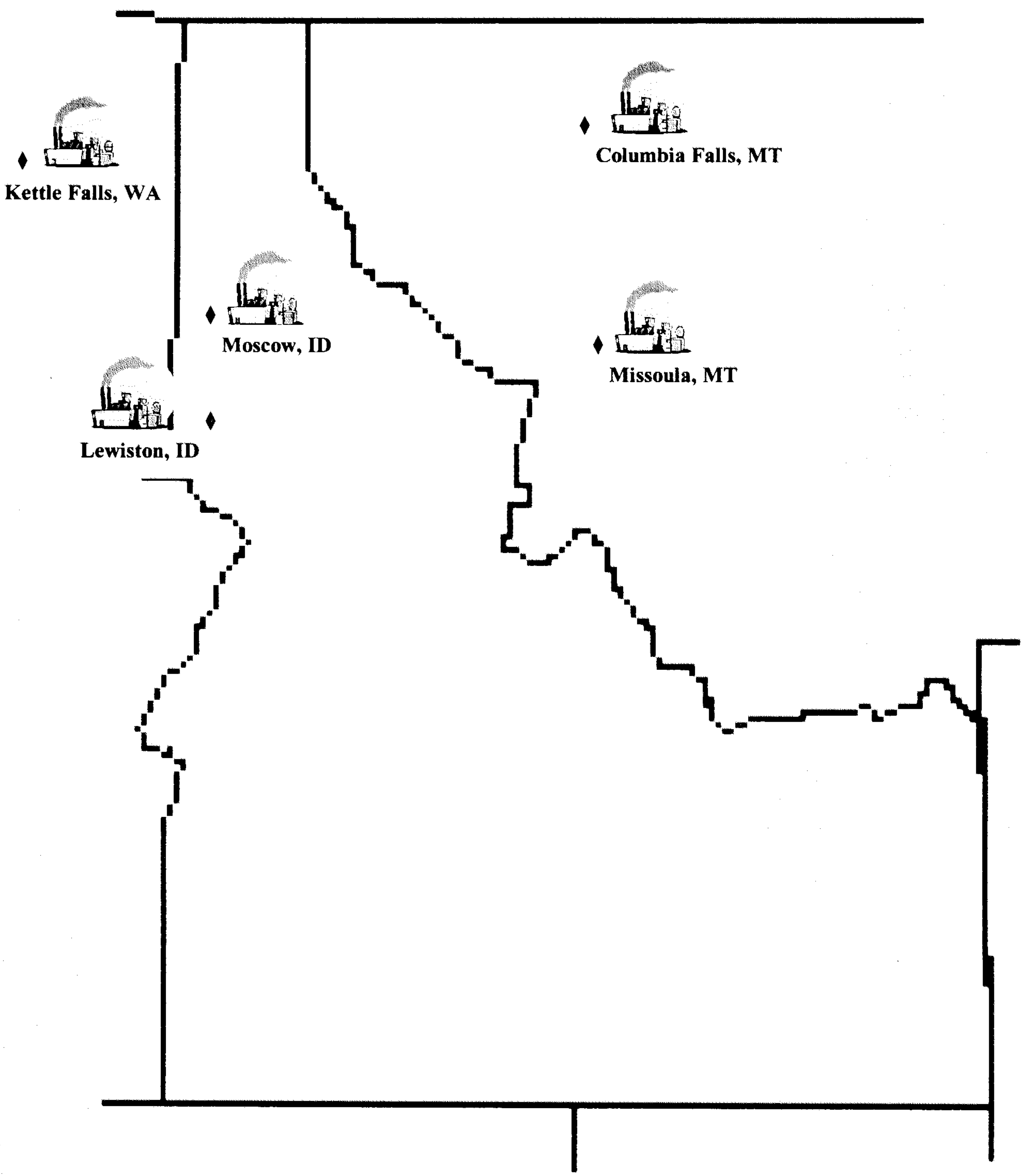
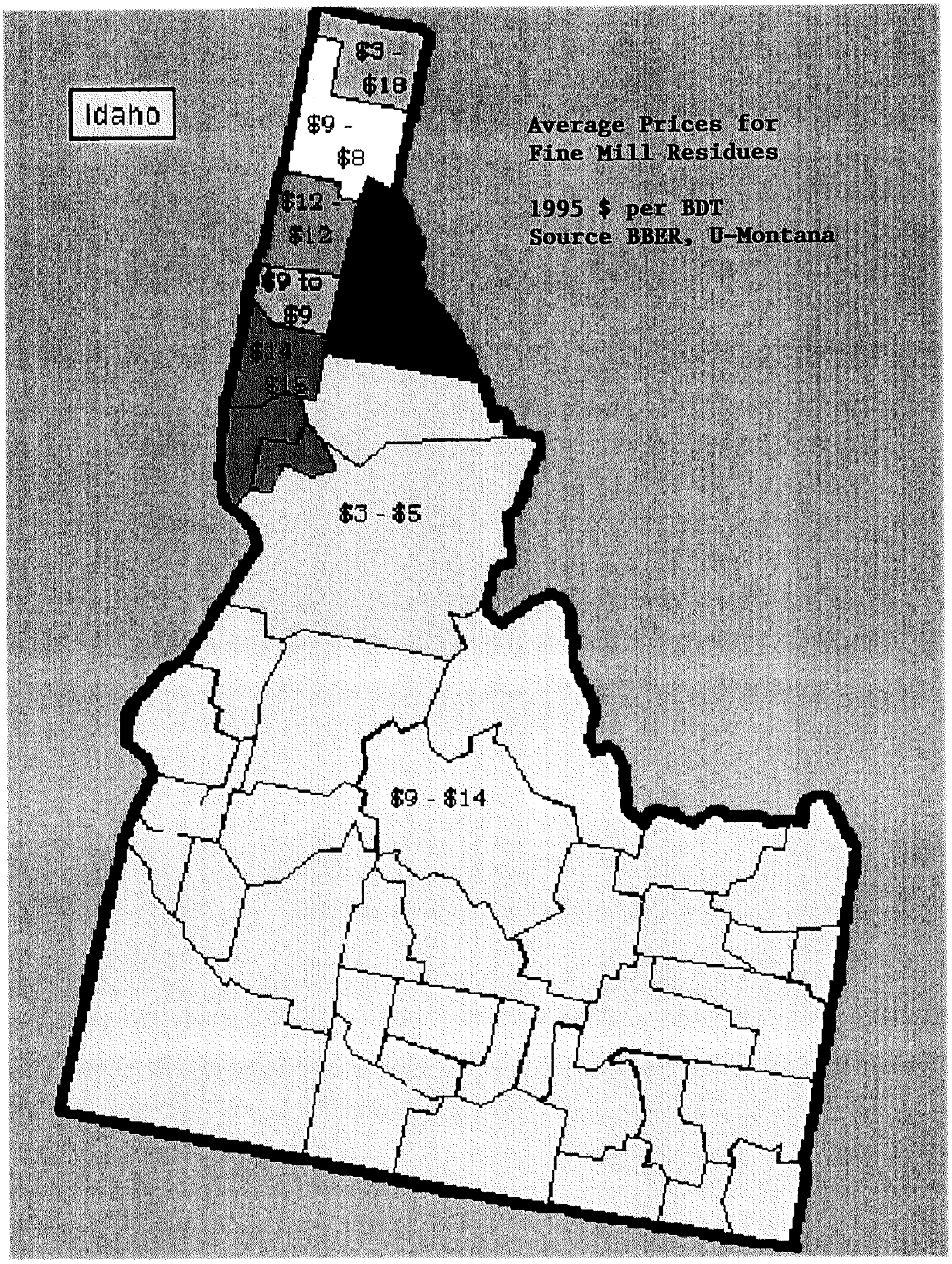
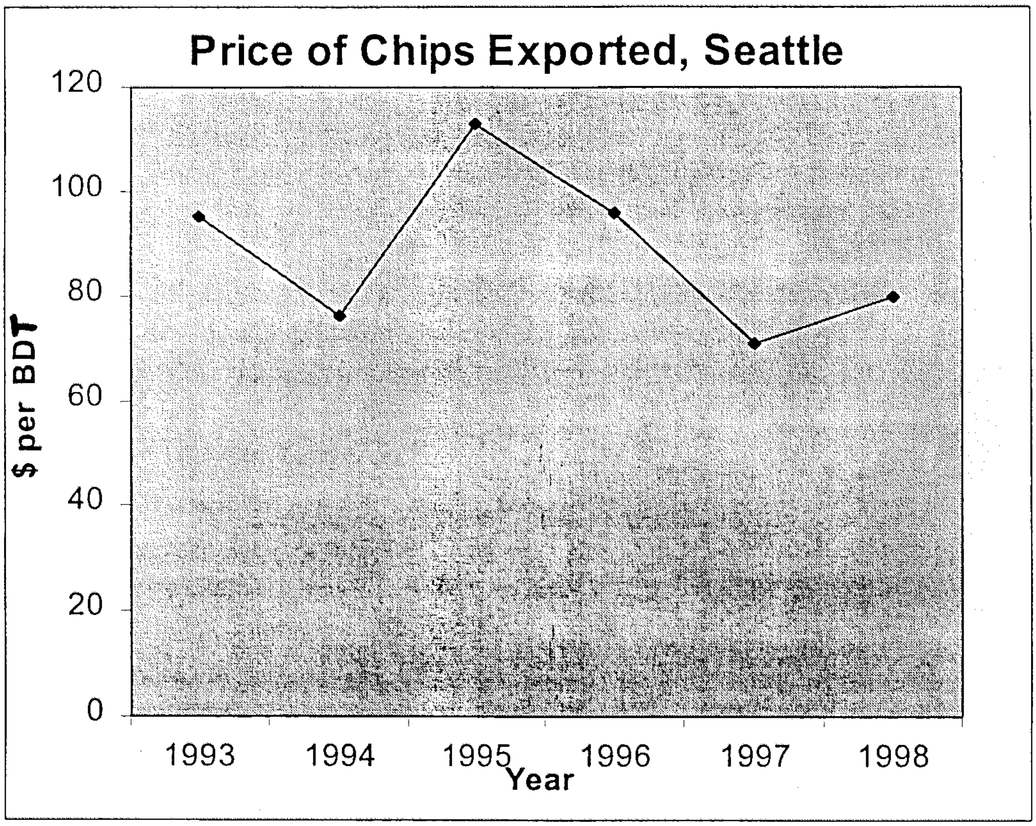


FIGURE 5.



Idaho
Average Prices for
Fine Mill Residues
1995 $ per BDT
Source BBER, U-Montana
$3 -
$18
$9 -
$8
$12 -
$12
$9 to
$9
$14 -
$15
$3 - $5
$9 - $14

FIGURE 6.

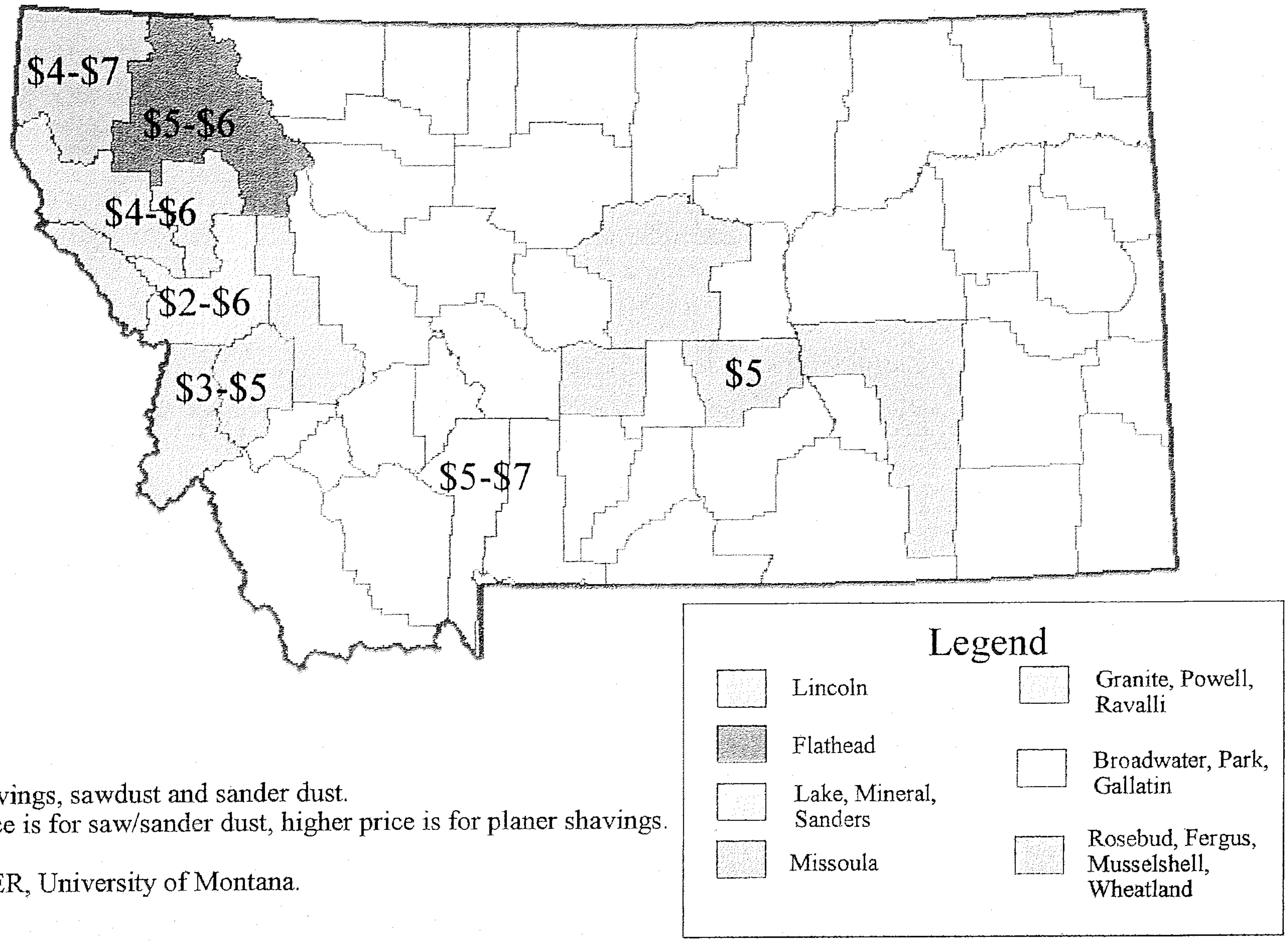


Source: Warren, USDA, 1997

Note: 1997 is half year only, 1998 is projected.

FIGURE 7.

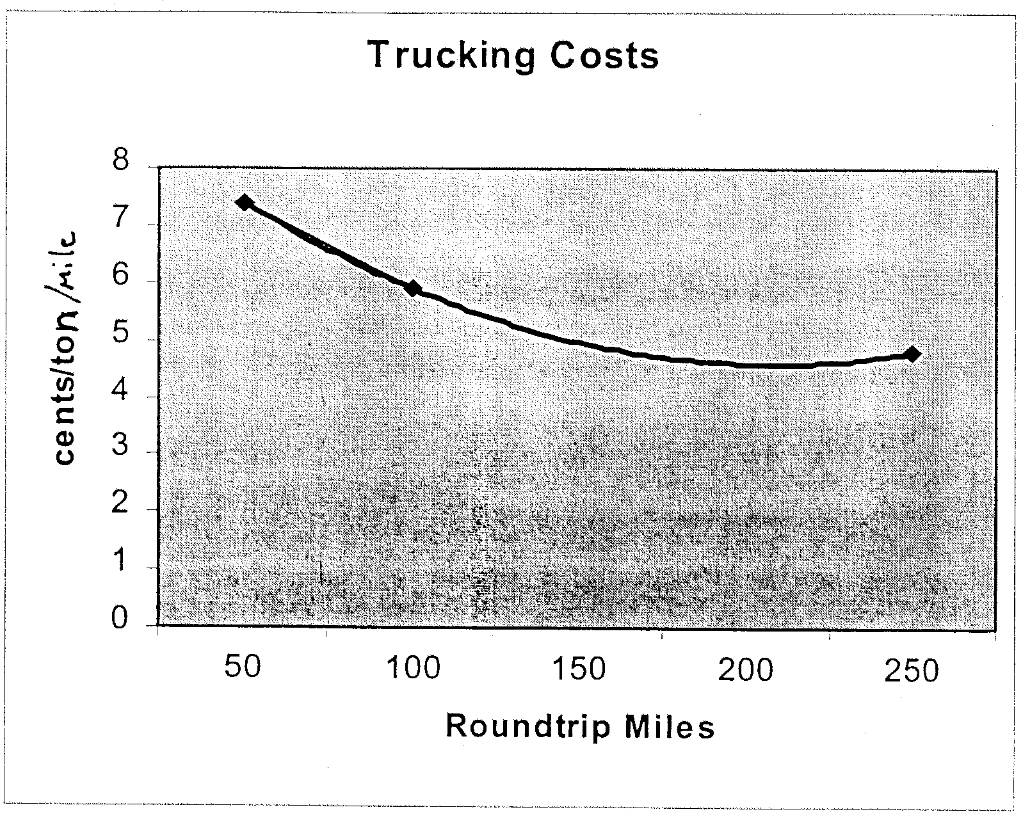
Average Prices for Fine Mill Residues* by County and County Cluster, 1993
($/ bone dry tons**)



Notes:
*Planer shavings, sawdust and sander dust.
**Lower price is for saw/sander dust, higher price is for planer shavings.

Source: BBER, University of Montana.

FIGURE 8.



Source: Pat Richardson, Richardson's Trucking, Lewiston, ID