NARA

Northwest Advanced Renewables Alliance

University of Idaho

CLEARWATER BASIN BIOMASS ATLAS

2011

UNIVERSITY OF IDAHO
BIOREGIONAL PLANNING
AND COMMUNITY DESIGN
PROGRAM

Nez Perce
Clearwater
Idaho
Lewis
Latah

CLEARWATER BASIN BIOMASS ATLAS

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PREFACE

The Clearwater Basin Biomass Atlas was prepared by University of Idaho graduate students in the Bioregional Planning and Community Design program. A key component of the Bioregional Planning program is partnering students and faculty with Idaho communities through "Learning and Practice Collaboratives (LPCs)" to create healthy and attractive places to live through sustainable land use, economic development and transportation planning. The LPCs give students hands-on planning experience, while providing communities with a team of people to address community planning issues. During the first semester in the program, students are introduced to the LPC community they will be working with during their time in the program. In addition to exploring the history of the community, visiting the region, and meeting with key community leaders, students develop a bioregional atlas, which gives them a comprehensive picture of the communities and region where they will be working.

A bioregional planning perspective examines regions from a geographic boundary, such as a watershed, rather than from political jurisdictions, and incorporates political, historical, economic, and cultural knowledge to arrive at solutions that respond more effectively to the limits and potentials of a region.

For this atlas, the bioregion was defined by the Clearwater Basin watershed, which encompasses all or a portion of Nez Perce, Clearwater, Idaho, Lewis and Latah counties. This atlas, unlike atlases we have completed in previous years, does not provide a wide range of information about the bioregion; this atlas focuses specifically on the woody biomass resources of the Clearwater Basin, and how those resources may be best utilized to promote healthy forests and economically viable communities.

The field of converting woody biomass to biofuels production is growing rapidly. Exploring the opportunities for a commercially viable biojet fuel from woody biomass received a boost in 2011 when the U.S. Department of Agriculture granted $40 million to the Northwest Advanced Renewables Alliance (NARA), a consortium of universities in Washington, Idaho, Oregon and Montana, along with other private and public entities. NARA's mission is to address the national need for a domestic biofuel alternative for U.S. commercial and military air fleets from wood and wood waste in the Pacific Northwest where forests cover almost half of the region.

NARA is working with communities throughout the Pacific Northwest to identify where they fit on the biomass to biofuels supply and production chain. During fall 2011, students in the Bioreginal Planning and Community Design Program (BIOP) at the University of Idaho and in the Integrated Design Experience (IDeX) at Washington State University teamed up to look at biomass supply and production opportunities in the Clearwater Basin.

[1]Brunckhorst D.J., 2000. Bioregional planning: resource management beyond the new millennium. Amsterdam: Harwood Academic.

The Clearwater Basin was selected for the fall 2011 Biomass Atlas because of the interest in the region for biomass utilization; the tremendous infrastructure in place for biomass harvesting and processing (e.g., former mill sites, highways, railroads, port of Lewiston); and the region is rich in woody biomass resources. Furthermore, the region is looking for a sustainable economic development opportunity to employ its assets.

In this atlas, we examine the woody biomass resources in the Clearwater Basin to see how feasible it would be for the region to participate in the emerging biomass economy. To understand the region's assets, we adopted an asset mapping approach to explore the region's various assets. Asset mapping is used extensively in the community economic development field to identify a community's existing and potential assets that could enable it to take advantage of economic development opportunities. We categorized the assets using a community capitals framework, looking at five categories of assets: natu-ral capital, physical capital, human capital, economic capital and policy/incentives capital.

- Natural Capital: Natural resources and amenities
- Physical Capital: Infrastructure, buildings, technology and other material goods
- Human Capital: The knowledge, skills, and abilities of the workforce; education programs (primary and secondary); organizations
- Economic Capital: Existing financial resources; potential resources, markets, revenue
- Policy Incentives Capital: Existing or Pending policies, incentives and regulations.

To learn more about the Bioregional Planning and Community Design Program at the University of Idaho, please visit our website at: www.bioregionalplanning.uidaho.edu. There you can view previous atlases as well as other projects students and faculty have been involved with around the state of Idaho.

[2]Council on Competitiveness. Illuminate, Asset Mapping Roadmap. http://www.compete.org/publications/detail/33/asset-mapping-roadmap-a-guide-to-assessing-regional-development-resources/. Accessed August 2011.

[3]Forum for the Future. Not Dated. The Five Capitals Model – a Framework for Sustainability. http://www.forumforthefuture.org/sites/default/files/project/downloads/five-capitals-model.pdf. Accessed August 2011.

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INTRODUCTION

By Jillian Marotz, Benjamin Ledford, Sinora Shrestha, Michele Vachon, and Tammi Laninga

This atlas looks at the Clearwater Basin as a single bioregion, and examines the biomass resources by describing and mapping it from various angles, including its natural, physical and human capitals. Furthermore, we look at the economic feasibility of biomass harvesting and utilization, and biomass policy incentives at the local, state and federal levels.

In this section:

http://biomasshub.com/usda-announces-grants-woody-biomass/

THE BIOREGIONAL APPROACH

The Bioregional Planning and Community Design program at the University of Idaho addresses planning and design issues from a bioregional perspective. Robert Thayer, in his book Life Place describes a bioregion as "a unique region definable by natural (rather than political) boundaries … by the geography of watersheds, similar plant and animal ecosystems, and related, identifiable landforms (e.g., particular mountain ranges, prairies, or coastal zones) and by the unique human cultures that grow from natural limits and potentials of a region."[1] Bioregional planning, by extension, examines the biophysical, historic, cultural, economic, and political elements of regions to arrive at solutions that respond more effectively to its limits and potentials.[2] (Brunckhorst 2000). Each bioregion is defined by the people who live there.

Bioregionalism is similar in many ways to ecosystem management. Both are predicated on the desire to maintain viable populations of all native species and to ensure that all native ecosystem types are protected across their natural range of variation. Bioregionalisms is distinguished from other forms of ecosystem management because it requires a fundamental change in beliefs, attitudes, and values concerning the interaction of humans with their natural environment and it provides the theoretical basis for managing resources as an interrelated system. Bioregionalism examines not only the interrelationships between species and ecosystems, but also of policymaking processes and the values that underlie policies. In contrast to most regional planning, bioregionalism also puts its focus on the development of self-reliant economic, social and political systems.[3] The bioregional approach is holistic in that it focuses on ecology, economics, equity, empowerment and education in the development of a region.

We use the bioregional approach to help us define the regions where we work and what we examine. For fall 2011, we focused on the Clearwater Basin bioregion in North Central Idaho, looking at the region's woody biomass assets ranging from natural resources to human capital.

BIOMASS TO BIO-JET FUEL

The business of converting woody biomass to biofuels production is growing rapidly. Exploring the opportunities for a commercially viable bio-jet fuel from woody biomass received a boost in 2011 when the U.S. Department of Agriculture granted $40 million to the Northwest Advanced Renewables Alliance (NARA), a consortium of universities in Idaho, Montana, Oregon and Washington, along with private and public entities. NARA's mission is to address the national need for a domestic biofuel alternative for U.S. commercial and military air fleets from wood and wood waste in the Pacific Northwest where forests cover almost half of the region.

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http://www.brighterenergy.org/4745/news/bioenergy/alliance-formed-to-source-biomass-power-fuel-in-washington/

identify where they fit on the biomass to biofuels supply and production chains. During fall 2011, students in the Bioregional Planning and Community Design Program (BIOP) at the University of Idaho and in the Integrated Design Experience (IDeX) at Washington State University teamed up to look at biomass supply and production opportunities in the Clearwater Basin.

We are examining the woody biomass resources in the Clearwater Basin to see how feasible it would be for the region to participate in the emerging biomass economy. To understand the region's assets, we adopted an asset mapping approach to explore the region's various assets. Asset mapping is used extensively in the community economic development field to identify a community's existing and potential assets that could enable it to take advantage of economic development opportunities.[4] We categorized the assets using a community capitals framework, looking at five categories of assets: natural capital, physical capital, human capital, economic capital, and policy/incentives capital.[5]

- Natural Capital: Natural resources and amenities
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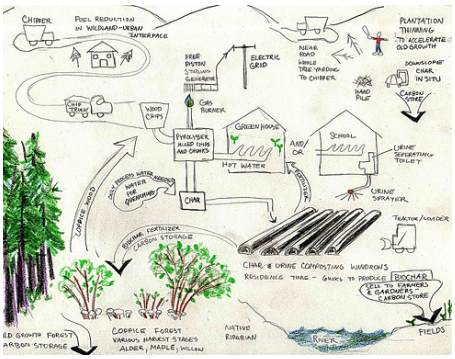
WOODY BIOMASS DEFINED



The Woody Biomass for Energy Debate-Manomet Study. http://ncfp.wordpress.com/2010/06/23/the-woody-biomass-for-energy-debate-manomet-study/

Biomass is any organic matter that can be used as fuel. The source of woody biomass, as the name implies, is wood. Feedstock includes by-products from lumber mills (e.g., sawdust), and forest residues which come from routine thinning, as well as the leftover slash (limbs and tree tops) from logging industries which cannot be utilized for particle board or wood pulp. Generally speaking, woody biomass is a byproduct of the lumber industry, forestry management and restoration processes, which normally is not utilized in any other way.[6]

Potential sources of woody biomass within the Clearwater Basin are from fire hazard thinning on both public and private land, private land thinning, logging residues on both public and private land, and unused mill residues.[7] Municipal waste from construction and demolition are also feasible sources.

Currently, woody biomass can be used as feedstock for steam heating generators in buildings of all sizes as well as electricity, liquid fuels, and biochar[0] as a soil enhancer.[8] Research is currently being done to advance the use of liquid fuel from woody biomass that can be used to produce jet

fuel as well as additives in other specialty products including rubbers, fragrances, solvents, and plastics.[9] The current research looking at alternative uses of wood as a fuel is likely to expand the market for woody biomass in the future.

There are numerous environmental woody biomass:
• In many cases, prescribed burnings and slash pile burnings can negatively impact air quality. Woody biomass utilization provides a useful alternative to simply burning fuels which build up in forests, and with clean burning designs and the right operating and maintenance, woody biomass can be burned quite cleanly for heat and energy.[10]
• Using woody biomass as a fuel source improves forest health and enhances fire management by providing a market for insect and disease killed trees.[11]
• Scrap wood from construction and demolition can be used as feedstock. This diverts wood from landfills and adds value to something currently considered a waste product.
• Woody biomass is a renewable and sustainable resource which can be grown and harvested on a local level.
• Managing forests through woody biomass harvests reduce wildfire hazard by removing excess fuel and is a popular method of fire mitigation
• Harvesting, processing and transporting woody biomass products can create economic opportunities in resource dependent communities.

To examine the potential biomass resources and assets in the Clearwater Basin, or in any other community, we use a bioregional approach.

• OVERVIEW OF THE CLEARWATER BASIN

The Clearwater Basin was selected for the fall 2011 Biomass Atlas because of the interest in the region for biomass utilization; the tremendous infrastructure in place for biomass harvesting and processing (e.g., former mill sites, highways, railroads, Port of Lewiston); and the region is rich in woody biomass resources. Furthermore, the region is looking for a sustainable economic development opportunity to employ its assets.

The Clearwater Basin is a vast and beautiful region spanning the full width of North Central Idaho. It is bounded on the east by the Bitterroot Mountains and the Montana border, and in the west it narrows to where the Clearwater River joins the Snake River at the City of Lewiston. This region includes parts of Clearwater, Idaho, Latah, Lewis, and Nez Perce counties. The region contains a wide variety of ecosystems and land use patterns, including Idaho's only seaport in Lewiston, extensive protected areas in the east (e.g.,

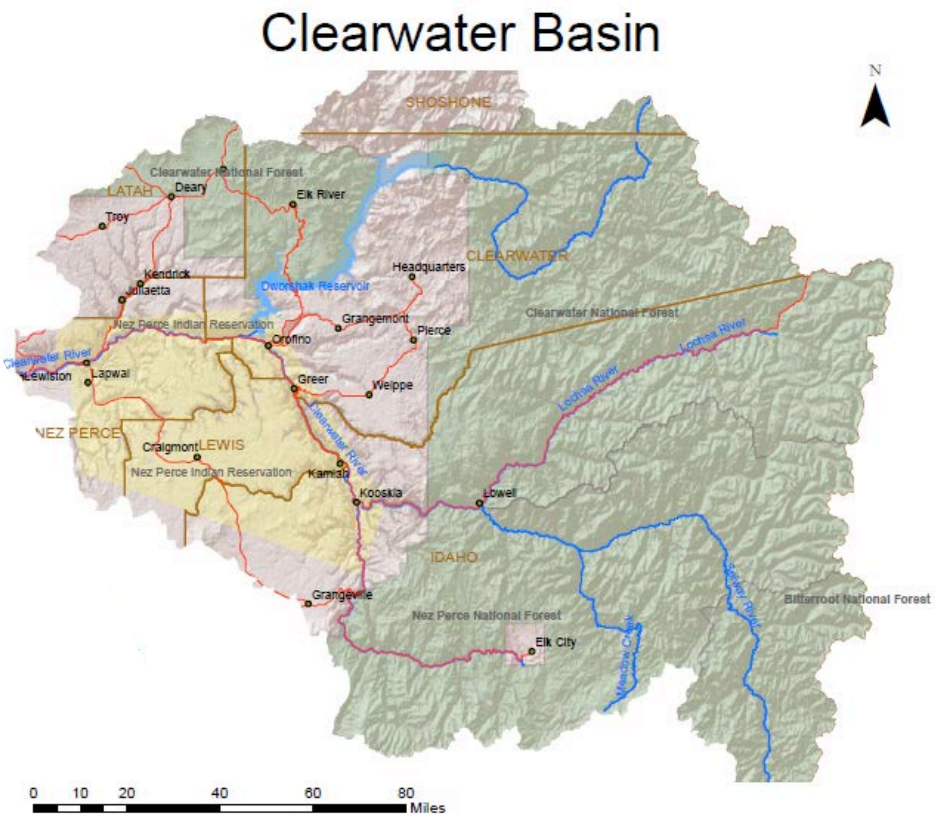
http://www.clearwaterbasincollaborative.org/

[0] Biochar is a solid material obtained from the carbonisation of biomass. Biochar may be added to soils with the intention to improve soil functions and to reduce emissions from biomass that would otherwise naturally degrade to greenhouse gases. Biochar also has appreciable carbon sequestration value (http://www.biochar-international.org/biochar)

National Forests, wilderness areas), and unique, highly diverse natural habitats.

Figure 1: Clearwater Basin in the State of Idaho

Source: Jason Boal and Dan Callister with data obtained from Inside Idaho, http://cloud.insideidaho.org.



Legend

- Cities_Towns
- Highways
- County_Boundary
- Rivers
- Reservoir
- Nez_Perce_Tribe
- National_Forest

Approximately 102,100 people live in the Clearwater Basin, and the City of Lewiston is the region's largest community and retail hub with a population of 31,764. All other communities range between 100 and 3,200 in population. The Nez Perce Tribe's reservation is home to most of the region's Native American residents, which is the largest minority group in the region.

The region suffers from both slow population and economic growth, due in part to the sluggish economy and the fact that many young people move out of the region after high school. However, at the same time, the region still contains vast natural resources and amenities, and is home to many collaborative organizations, including the Clearwater Basin Collaborative, looking for ways to protect and enhance the basin and to encourage its economic development. One promising economic development opportunity is utilizing the woody biomass found throughout the basin for a number of different markets. These markets range from combined power/heat generating facilities to pellet manufacturing and beyond.

ATLAS SECTION SUMMARIES

Section 1: Natural Capital

The NATURAL CAPITAL section of the Clearwater Basin Biomass Atlas addresses the physical environment and natural amenities enjoyed by a community. It includes resources such as water, soil and biomass. Unlike the other forms of capital, natural capital is finite. Together, with the other categories of capital, natural capital has a major impact on economic viability and community resilience and influences the range of possible development strategies possible in a rural region. The focus of this section is on the total amount of biomass available in the Clearwater Basin that could be utilized for the biofuels industry. In addition, the Natural Amenity Rank as prepared by the United States Department of Agriculture (USDA) Economic Research Service, is used an indicator of the natural capital present in each county featured in the Clearwater Basin region. This scale takes into account regional features that people tend to use to determine the appeal of a place, such as climate, water, and topographic variation.

Section 2: Physical Capital

The PHYSICAL CAPITAL section of the Clearwater Basin Biomass Atlas addresses several aspects of existing physical infrastructure within the five counties of the Clearwater Basin including Clearwater, Idaho, Latah, Lewis, and Nez Perce. This section includes the identification and cataloging of all major physical assets (infrastructure) relevant to regional development and processing of woody biomass. This physical capital section can aid in understanding current uses and development patterns and is a key in identifying future opportunities and possibilities in the region.

Section 3: Human Capital

The HUMAN CAPITAL section of the Clearwater Biomass Atlas looks at the social assets within the region—grouped into human capital and cultural assets. Each county is evaluated in terms of education, workforce, and general attitudes toward biomass, which might help or hinder the development of biomass projects in the region. These categories are further broken down into K-12 education, community colleges as well as vocational schools, four year universities, retraining and certification programs, existing workforce and skills, and an assessment of the general community attitude towards biomass utilization and projects. A strong emphasis is placed on evaluating these assets in terms of their relationship to the woody biomass industry.

Section 4: Economic Capital

The ECONOMIC CAPITAL section of the Clearwater Basin Biomass Atlas addresses the economic viability and benefits of biomass utilization, particularly a biomass energy plant and associated woody biomass markets in the Clearwater Basin. This section focuses on the economics of

a biomass plant because there is little information available on bio-fuels plants. It is no secret that economics will play a large role in any project requiring large financial investment. This section analyzes the Basin's economic climate, details the benefits and costs of opening a biomass plant, and offers recommendations on the feasibility of a biomass plant. Concrete numbers are provided where available and relevant information and sources are included that could be useful as plans for a biomass project may develop. The purpose of this section is to provide information for prospective biomass developers and the community rather than to speculate whether any hypothetical biomass project is likely to succeed.

Section 5: Policy and Incentives Capital

The POLICIES AND INCENTIVES CAPITAL section of the Clearwater Basin Biomass Atlas reviews policies and incentives relevant to Clearwater, Idaho, Latah, Lewis, and Nez Perce counties in North-Central Idaho, as well as on the Nez Perce Reservation. This section explores and identifies existing or pending policies or incentives at the local, state, and federal levels, as well as at the broader regional level within the states of Idaho, Montana, Oregon and Washington to support woody biomass utilization. In addition, this section includes resources pertaining to research and development in the area of woody biomass utilization in the Northwest.

[1] Thayer, R. L. 2003. Life Place: Bioregional Thought and Practice. Berkeley: University of California Press. Pg 3.
[2] Brunckhorst, D. J. 2000. Bioregional Planning: Resource Management Beyond the New Mellennium. London: Routledge.
[3] Bioregionalism: A comparative study of the Adirondacks and the Sierra Nevada. By: Diffenderfer, Mark; Birch, Dean. Society & Natural Resources, Jan/Feb97, Vol. 10 Issue 1.
[4] Council on Competitiveness. Illuminate, Asset Mapping Roadmap. http://www.compete.org/publications/detail/33/asset-mapping-roadmap-a-guide-to-assessing-regional-development-resources/. Accessed August 2011.
[5] Forum for the Future. Not Dated. The Five Capitals Model – a Framework for Sustainability. http://www.forumforthefuture.org/sites/default/files/project/downloads/five-capitals-model.pdf. Accessed August 2011.
[6] Becker, Dennis, et al. Conventional Wisdom of Woody Biomass Utilization. 2009.
[7] Cook, Philip S. and Jay O'Laughlin. Idaho Forest Biomass Supply Estimate by County. University of Idaho. 2011.
[8] Colorado State Forest Service. Where Wood Works: Harnessing the Power of Woody Biomass in Colorado.
[9] NARA
[10] The Forest Task Force. Wood Bioenergy: Homegrown Baseload Energy for Idaho. Idaho Strategic Energy Alliance, 2009. And Colorado State Forest Service
[11] http://www.forestsandrangelands.gov/Woody_Biomass/benefits.shtml
[12] Clearwater Economic Development District, Comprehensive Development Strategy (CEDS), 2009 – 2014. http://www.bioregionalplanning.uidaho.edu/files/CEDS/Region-2CEDS.pdf page 50. (Assessed December 2010)
[13] Ibid.
[14] ibid.

NATURAL CAPITAL

By Kevin Lewis, Jonathan Staldine and Michele Vachon

The natural capital section addresses the physical environment and natural amenities enjoyed by a community. It includes resources such as water, soil and biomass. Unlike the other forms of capital, natural capital is finite. Together, with the other categories of capital, natural capital has a major impact on economic viability and community resilience and influence the range of possible development strategies feasible in a rural city. The focus of this section is on the total amount of biomass available in the Clearwater Basin region that could be utilized for the biofuels industry. In addition, the Natural Amenity Rank as prepared by the United States Department of Agriculture (USDA) Economic Research Service, is used an indicator of the natural capital present in each county featured in the Clearwater Basin region. This scale takes into account regional features that people tend to use to determine the appeal of a place, such as climate, water, and topographic variation.

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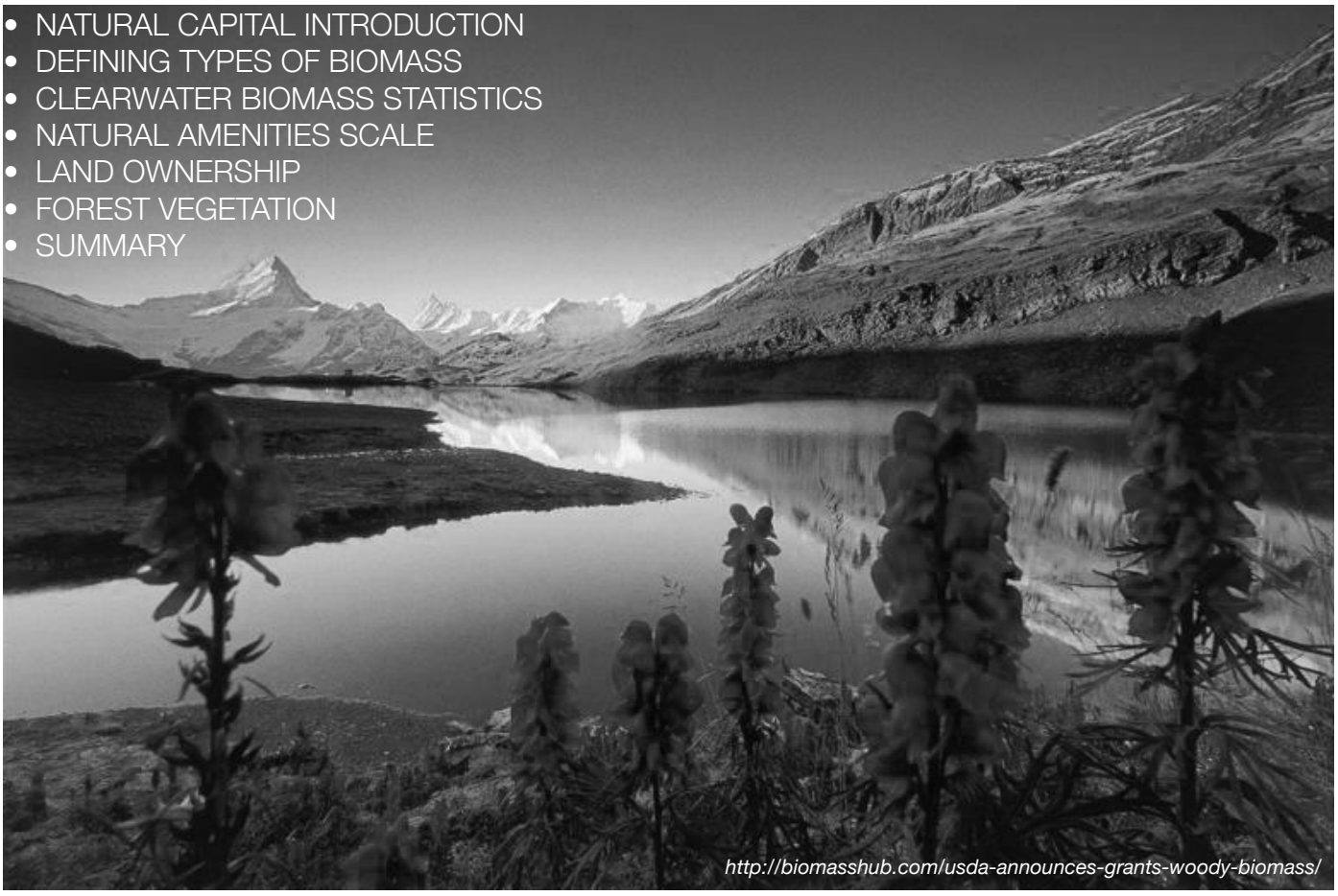


http://biomasshub.com/usda-announces-grants-woody-biomass/

STATE OF IDAHO BIOMASS BACKGROUND

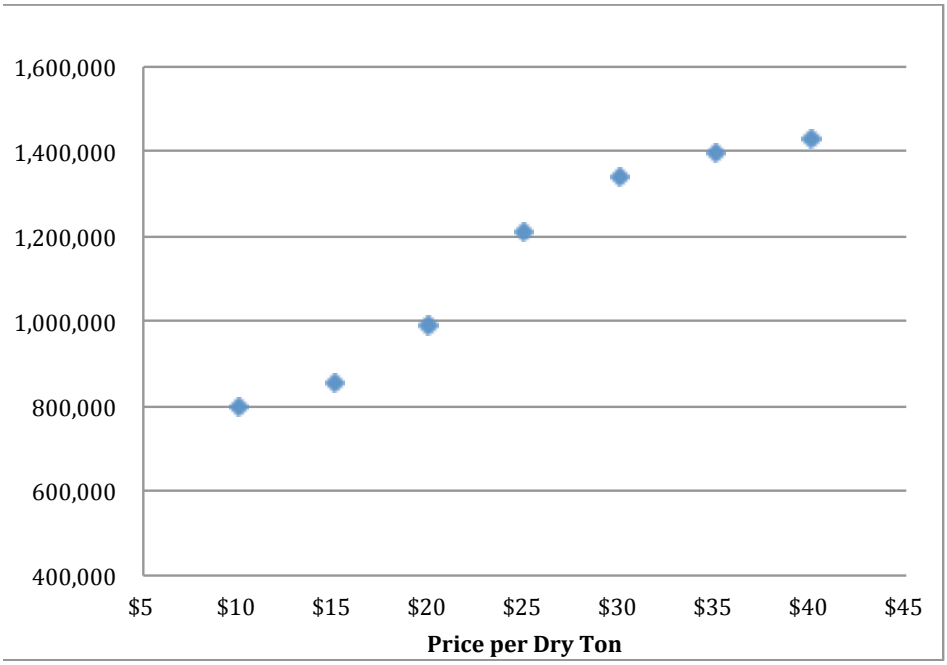
Idaho has a vast supply of woody biomass. In general, biomass is categorized into one of five general types:

- Slash -residue left over from logging large diameter trees, this includes tree tops, limbs and stems[1]
- Small diameter trees -a tree between 5 and 12 inches in diameter[2]
- Large diameter trees - a tree greater than 12 inches in diameter[3]
- Woodchips – "a medium-sized solid material made by cutting, or chipping, larger pieces of wood"[4]
- Hog fuel – "ground up or powdered wood used for fuel"[5]

Statewide estimates of biomass range from approximately 800,000 to 1,400,000 tons per year based on price. Figure 1.1 shows the relationship between estimated annual woody biomass and price per dry ton. The estimated biomass is the sum of forest thinning, logging residue and unused mill residues. The forest thinning includes private forest thinning, and both private and public fire hazard thinning.

Figure 1.1: Estimated Annual Available Woody Biomass vs. Price[6]

Source: Idaho Forest Biomass Supply Estimate by County*



CLEARWATER BASIN BIOMASS SUPPLY

The Clearwater Basin covers a total of five counties; Clearwater, Idaho, Latah, Lewis and Nez Perce. Figure 1.2 shows the annual dry woody biomass supply, in tons, by county assuming a price of $25 per ton. Clearwater, Idaho and Latah counties have the largest supply of woody biomass but these values are artificially high because the three counties are larger than Nez Perce and Lewis counties.

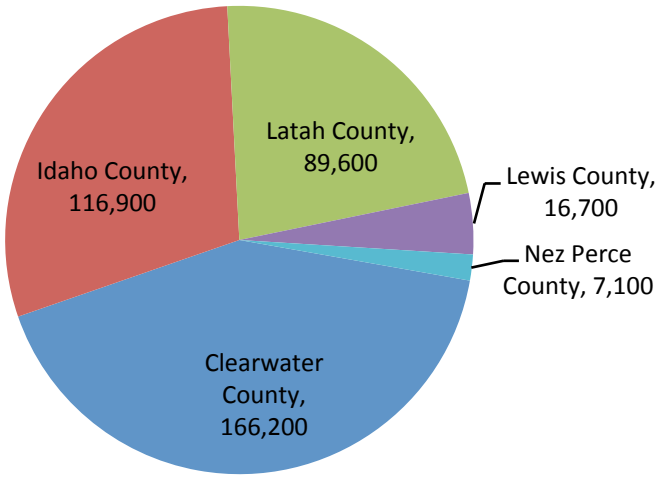


Figure 1.2: Annual Dry Woody Biomass, in tons, by County, at a Price of $25 per Ton[7]

Source: Idaho Forest Biomass Supply Estimate by County*

Figure 1.3 shows how the sources, in the Clearwater Basin, of woody biomass measured in dry tons assuming a price of $25 per ton. The majority of the biomass is located in fire hazard thinning and logging residue and very little is located in private thinning and unused mill residue. Currently the fire hazard thinning residue has little purpose, creating a large biomass market would help landowner maintain their land. Maintaining the forest in the Clearwater Basin could become profitable with the creation of the woody biomass market.

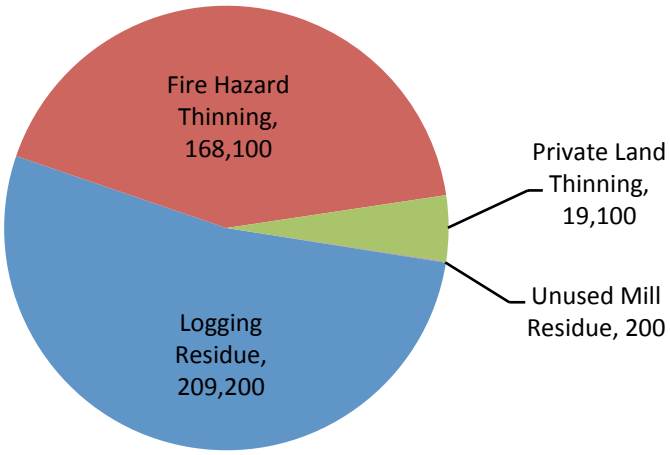


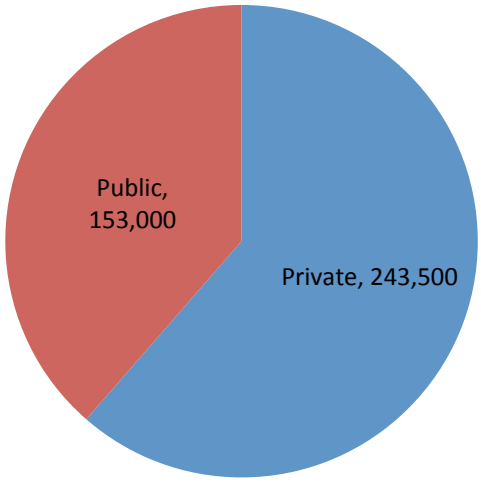
Figure 1.3: Annual Dry Woody Biomass Sources, in tons, in Clearwater Basin, at a Price of $25 per Ton[8]

Source: Idaho Forest Biomass Supply Estimate by County*

Figure 1.4 shows how the woody biomass is divided up in terms of property ownership. Approximately 40 percent of the biomass is located on public land while the rest of the 60% is on private land.

Figure 1.4: Annual Dry Woody Biomass Land Owners at a Price of $25 per Ton (tons)[9]

Source: Idaho Forest Biomass Supply Estimate by County*



• LEWISTON REGION

Once the biomass is removed from the surrounding forests, the biomass must be exported and the Port of Lewiston is seen as the logical location. Long haul distances would lead to increased costs, which will lead to some biomass locations not being fiscally viable. Travel distances of 25, 50, 75 and 100 miles are seen as major haul distance benchmarks. Table 1.1 shows harvested biomass in the Clearwater Basin for the year 2010 with respect to the mileage benchmarks. If a larger biomass market was created it is expected that the harvest values would increase.

Table 1.1: Harvested Biomass in Clearwater Basin, in the year 2010, with Respect to Radius Distance from Lewiston[10]

Source: www.crop-usa.com/Interactive_Haul_Distance_map_all_offerings.php

Radius Distance from Lewiston (miles)	Biomass (million board feet)
25	0.8
50	11.5
75	78.7
100	121.0

• NATURAL AMENITIES INDEX SCALE

The Natural Amenities Scale is a measurement tool for identifying areas with conditions preferable to population growth. The scale uses six variables that influence perceived livability provided by an area to forecast the correlation of growth to areas rich in these favored environmental qualities. The variables are represented by:

WARM WINTERS -

People are attracted to areas that experience warm to mild winter temperatures. Mean January temperatures were analyzed from the same thirty year period.

- TEMPERATE SUMMERS

Large variances in mean winter temperatures to mean summer temperatures are less comfortable to people. Data from the same thirty year period used in calculating mean January temperatures was also to find mean July temperatures.

- SUNNY JANUARY WEATHER

Greater amounts of sunny hours in the coldest part of the year reduces the gloominess of the season. Areas with sunny winters are more appealing to people.

- TEMPERED SUMMER HUMIDITY

Hot humid weather is miserable for enjoying natural amenities. People prefer areas with lower humidity levels during the hot parts of the year. Data was collected during the same range used for the winter and summer mean temperatures to calculate mean relative humidity for the month of July, which is typically the hottest month of the year for the US.

- TOPOGRAPHICAL VARIATION

People tend to favor areas with terrain that have character and variability to the landscape. Rolling hills and rugged mountains are more favorable than areas with flat, homogenous plains that leave little to the imagination. Landscape character was divided into 21 types, with type 1 being the most homogenous topography and type 21 being the most varied.

- WATER COVERAGE

People are naturally attracted to water, it possesses a variety of qualities many people find soothing and rejuvenating so it is no surprise that areas with substantial water area are attractive to population growth. Data for this category is expressed as a percentage of total land area of each county covered by water.

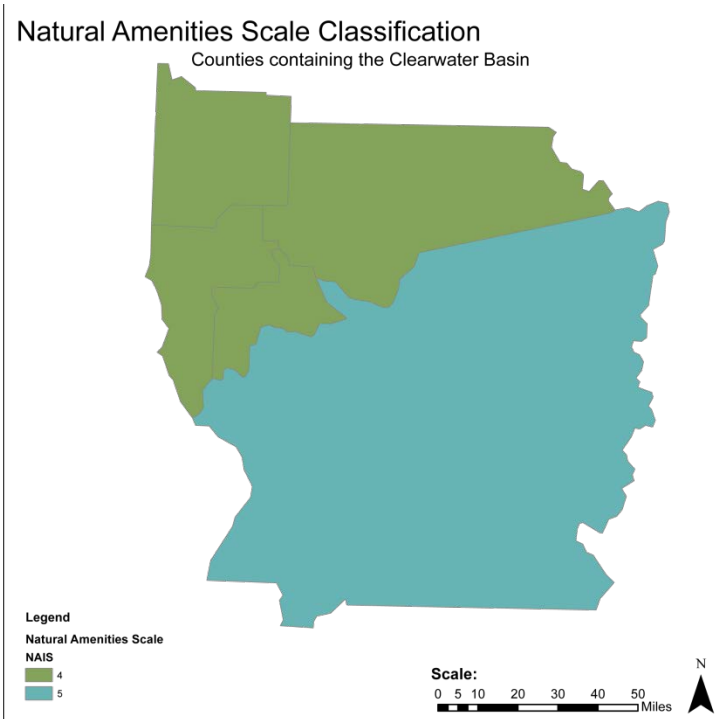


Figure 1.5: Scores from the Natural Amenities Scale index are shown in a color coded image.

Source USDA Economics Research Service, Measures of natural amenities.

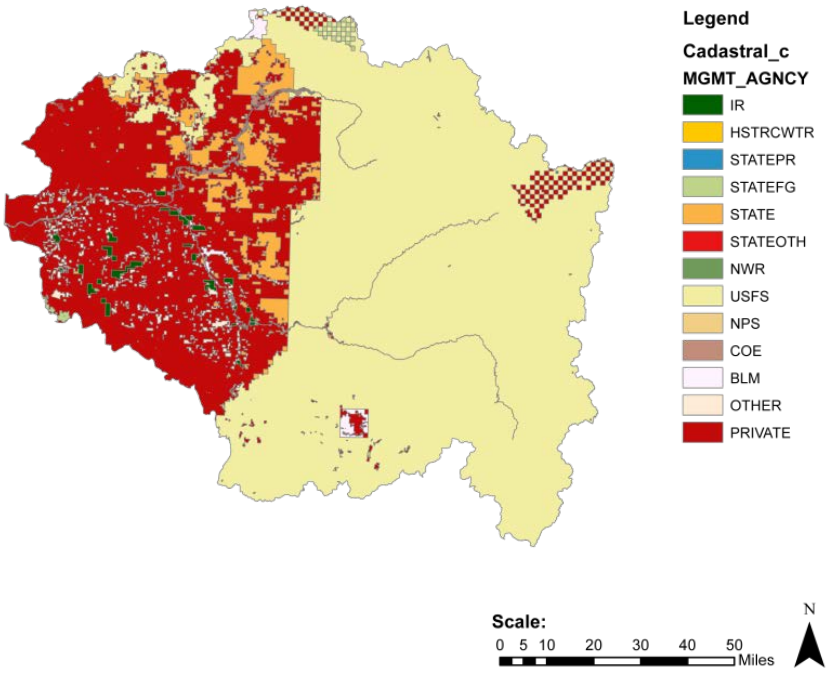
The result is the Natural Amenities Scale, a number formed by the composite of the six variables weighted evenly. The scale is expressed from 1 to 7 based on prevalence of natural amenities found to be preferable to population and economic growth. Figure 1.5 shows the ranking for the Clearwater Basin; Idaho County ranked highest of the selected counties, with a rank of 5[11] .

LAND OWNERSHIP CLASSIFICATION

The majority of the land in the Clearwater Basin is publically managed by the United State Forest Service (USFS), and other federal and state agencies. The private land in the basin is managed timber harvest, agriculture, commercial or residential use. How landscape ownership is expressed spatially can influence management interests and goals as they related to woody biomass resource utilization. Figure 1.6 shows the land ownership classification for the Clearwater Basin; the area is divided into 13 ownership classifications, codified by representative colors for reference.

Figure 1.6: Clearwater Basin Land Ownership Classification Map

Source BLM Surface management agency GIS file.[12]



Private ownership is comprised primarily of corporations and individuals. Within the Clearwater Basin a large amount of land is held by the Potlatch Corporation and used for timber harvest. Another important type of private land ownership in the Clearwater Basin is for agricultural use.The Nez Perce Indian Reservation lies within the Clearwater Basin, much of the land area within the designated reservation is privately owned. The Nez Perce tribe does own a number of properties that are used for a variety of resources, some of which consists of timber harvest and agriculture.

The State of Idaho controls a significant amount of land within the Clearwater Basin in several capacities including lands controlled by Idaho Fish and Game and Idaho Parks and Recreation used by area residents and visitors alike. Similarly, much of the land within the Clearwater Basin is controlled by the United States federal government. Federal public lands are controlled by a number of agencies including the United States Forest Service, National Park Service, Bureau of Land Management, and the Army Corps of Engineers. Of this land, a substantial amount belongs to the Clearwater National Forest.

FOREST VEGETATION COMMUNITY TYPES

The Clearwater Basin is home to a diverse set of vegetation communities that influence how the land is utilized. Some forest communities are difficult to access given high elevations or rugged terrain that could limit successful harvest of woody biomass. The rate of re-growth cycle varies by dominant tree species as well. Trees that have faster re-growth cycles can be harvested in fewer years. Thirty vegetation community types cover the Clearwater Basin. Vegetation cover influences the availability of biomass resources through renewal rates, potential energy and risk of biomass supply through natural processes

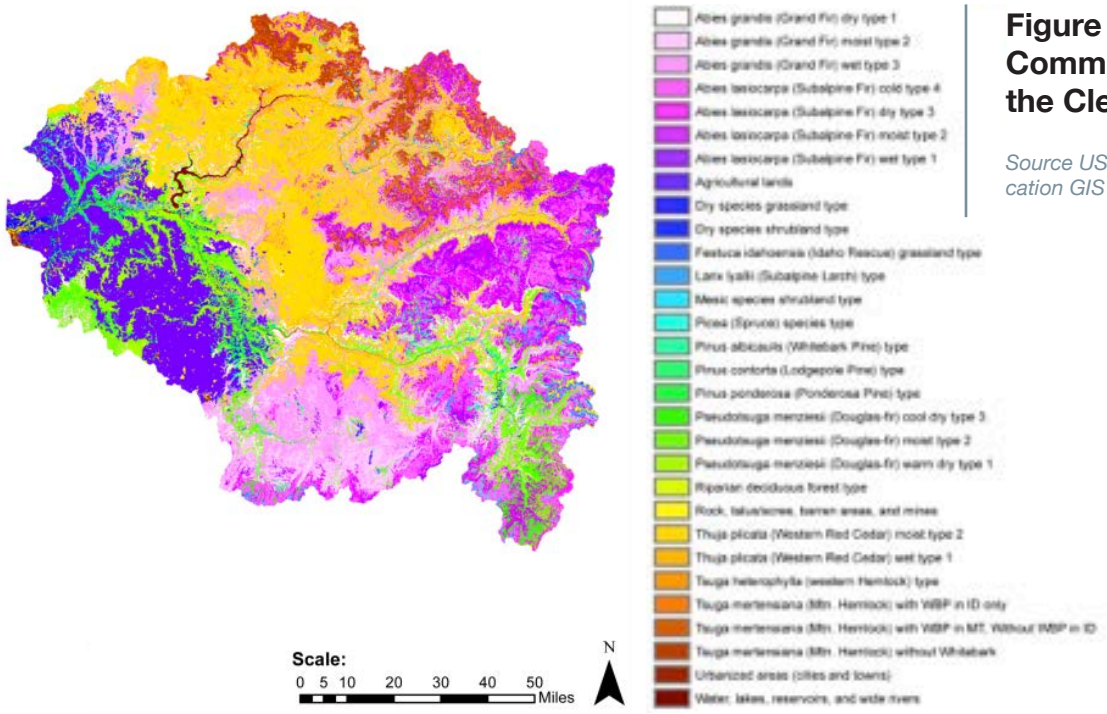


Figure 1.7: Vegetation Community Classification in the Clearwater Basin

Source USFS Northern Region PVT classification GIS file .[13]

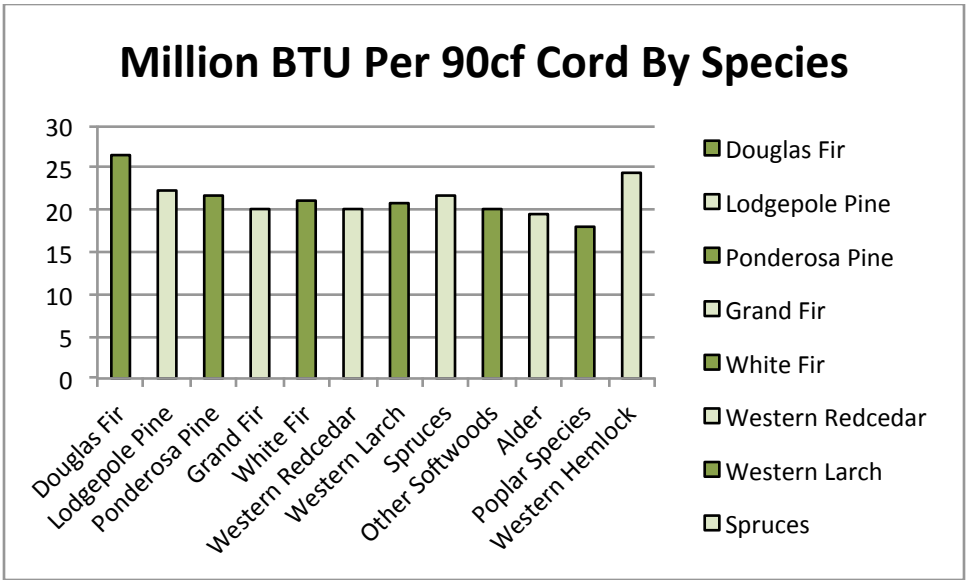
TREE SPECIES BIOMASS QUALITY

All wood is not created equal. Although the same basic components are found in the cellular structure of woody species, the factors of growth rate and density affect suitability for biomass consumption. In the Clearwater Basin twelve dominant species produce the bulk of the regional woody biomass. Some species carry much more thermal energy potential (expressed in mmBTU) per cord of biomass than others. The table and chart below illustrate that the difference between Douglas Fir and Cottonwood or Aspen (at the upper limit of the range for poplar species) biomass was as great as 47%.[14]

This indicates that biomass coming from natural forests requires less material to fulfill the same requirement than poplar species commonly grown in woody biomass farming operations.

Graph 1.8: BTU values among tree species common to the Clearwater Basin.

Source: California energy commission.



Tree Species	mmBTU
Douglas Fir	26.5
Lodgepole Pine	22.3
Ponderosa Pine	21.7
Grand Fir	20.1
White Fir	21.1
Western Red Cedar	20.1
Western Larch	20.8
Spruces	21.7
Other Softwoods	20.1
Alder	19.5
Poplar Species	18
Western Hemlock	24.4

Table 1.2: BTU values among tree species common to the Clearwater Basin.

Source California Energy Commission.

• SUSTAINABLE FOREST PRODUCTS

Forest product sustainability is a product of biomass availability and proximity to transportation avenues. Dark areas in Figure 1.9 represent areas with a strong correlation of these functions, areas where sustainable markets are likely to occur. Areas with a strong potential for sustainable forest product markets will be the most successful locations for biomass based economics; the higher the value, the more sustainable the market. [15]

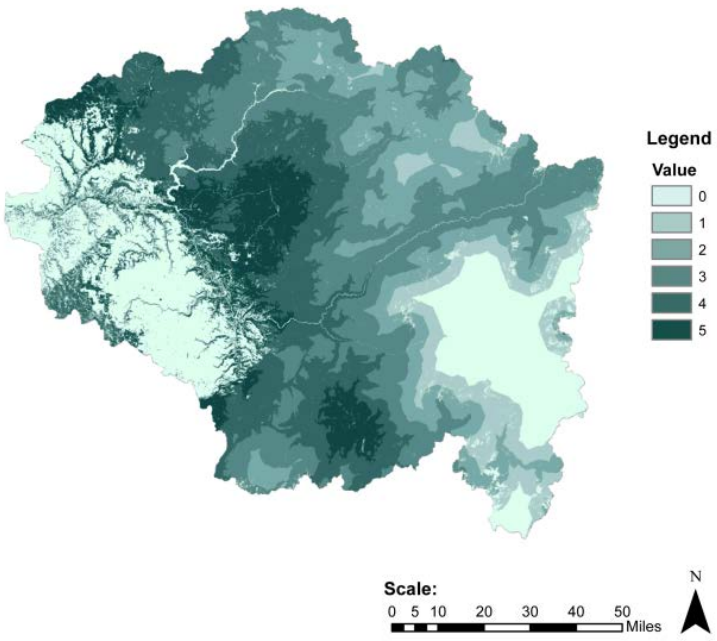


Figure 1.9: Sustainable Forest Product Market Index Map
within the Clearwater Basin

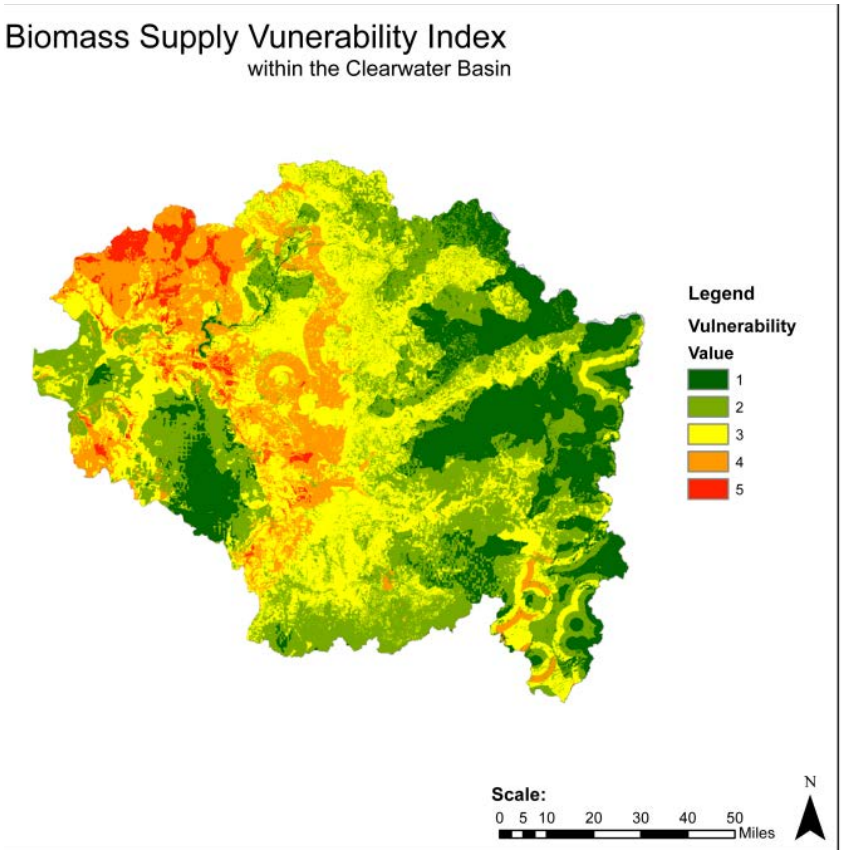
Source: IDL Sustainable forest markets GIS file.

BIOMASS SUPPLY VULNERABILITY

As biomass is a renewable resource it is necessary to assess the vulnerabilities of the resource to understand the supply cycle. Figure 1.10 below illustrates a an index of this vulnerability due to the overall ecological health and diversity of forests, susceptibility to uncharacteristic wildfire, and potential canopy losses due to development or recreation. Each of these issues is a potential risk to biomass supply and areas with less risk make greater potential sources for forest residual biomass supply.[16] Areas depicted in green have lower risk to biomass production while red areas have a high degree of associated risk to uncharacteristic fire, canopy loss, and forest decline.

Figure 1.10: Biomass Supply Vulnerability Index Map

Source: IDL, Threats to forest resources.



SUMMARY

The Clearwater Basin is rich in Natural Capital, with an average natural amenity index of 4.2 across all five counties. Individually, Idaho County scored the highest on the natural amenity index of five, on a score of 7 to 1 (from high to low). The majority of the land and biomass in the basin is privately held, containing 60% of biomass. The remaining 40% of biomass supply is in either state or federally owned forests.

The private landowners interviewed as part of this study conveyed interest in harvesting biomass for energy sustainability. A challenge that residents, landowners and public agency managers in Clearwater Basin must examine in greater depth is the accessibility of the biomass, especially from the state, tribal, and federally-owned lands. In addition, although, the supply of biomass is well documented at the private, state and federal level, consensus as to which types of biomass and how accessible it is remains a question across many stakeholders. We recommend that this issue be examined in greater depth.

[1] Han-Sup Han, Harry W. Lee, Leonard R. Johnson, Richard L. Folk, Thomas M. Gordan. Economic Feasibility of Small Wood Harvesting and Utilization of the Boise National Forest Cascade, Idaho City, Emmett Ranger Districts. Report, Moscow: Department of Forest Products, 2002.
[2] Ibid
[3] Ibid
[4] Wikipedia. n.d. http://en.wikipedia.org/wiki/Woodchips. Accessed December 4, 2011.
[5] Merriam-Webster. December 4, 2011. http://www.merriam-webster.com/dictionary/hog%20fuel.
[6] O'Laughlin, Philip S. Cook and Jay. Idaho* Forest Biomass Supply Estimate by County. Report, Moscow: Western
Governors' Association, 2011.
[7] Ibid
[8] Ibid
[9] Ibid
[10] CROP (Coordinated Resource Offering Protocol). 2011. http://www.cropusa.com/Interactive_Haul_Distance_map_all_offerings.php. Accessed November 25, 2011.
[11] USDA Economic Research Service. Measures of natural amenities. http://www.ers.usda.gov/publications/aer781/aer781b.pdf. Accessed November, 2011.
[12] BLM. Surface Management Agency. GIS. ftp://ftp.blm.gov/pub/ID/gis/realty/SMA_PUB_24K_POLY.shp.xml. Accessed November, 2011.
[13] USFS Northern Region. Potential vegetation type classification (PVT). GIS. http://www.fs.usda.gov/wps/portal/fsinternet/!ut/p/c5/04_SB8K8xLLM9MSSzPy8xBz9CP0os3gDfxMDT8MwRydLA1cj72DTUE8TAwgAykeaxRtBeY4WBv4eHmF-YT4GMHn8usNB9uHXDzYBB3A00PfzyM9N1S_IjTDIMnFUBADW0rdA/dl3/d3/L2dJQSEvUUt3QS9ZQnZ3LzZfMjAwMDAwMDBBODBPSEhWTjJNMDAwMDAwMDA!/?navtype=&cid=fsp5_030918&navid=160130000000000&pnavid=160000000000000&ss=1101&position=Not%20Yet%20Determined.Html&ttype=detail&pname=Region%201-%20Geospatial%20Data#top. Accessed November, 2011.
[14] California Energy Commission. Heating: Firewood values. http://www.consumerenergycenter.org/home/heating_cooling/firewood.html. Accessed November, 2011.
[15] IDL. Sustainable Forest Market Index. GIS. http://cloud.insideidaho.org/webApps/metadataViewer/default.aspx?path=G%3a%5cdata%5canonymous%5cidl%5csafr%5cissues%5cI4_Sust_Forest_based_markets%5ci4_sfm_092109%5cmetadata.xml. Accessed November 2011.
[16] IDL. Threats to Forest Resources. GIS. http://cloud.insideidaho.org/webApps/metadataViewer/default.aspx?path=G%3a%5cdata%5canonymous%5cidl%5csafr%5cfinalLayers%5cF3_Threats%5cf3_at_092109%5cmetadata.xml. Accessed November, 2011.

PHYSICAL CAPITAL

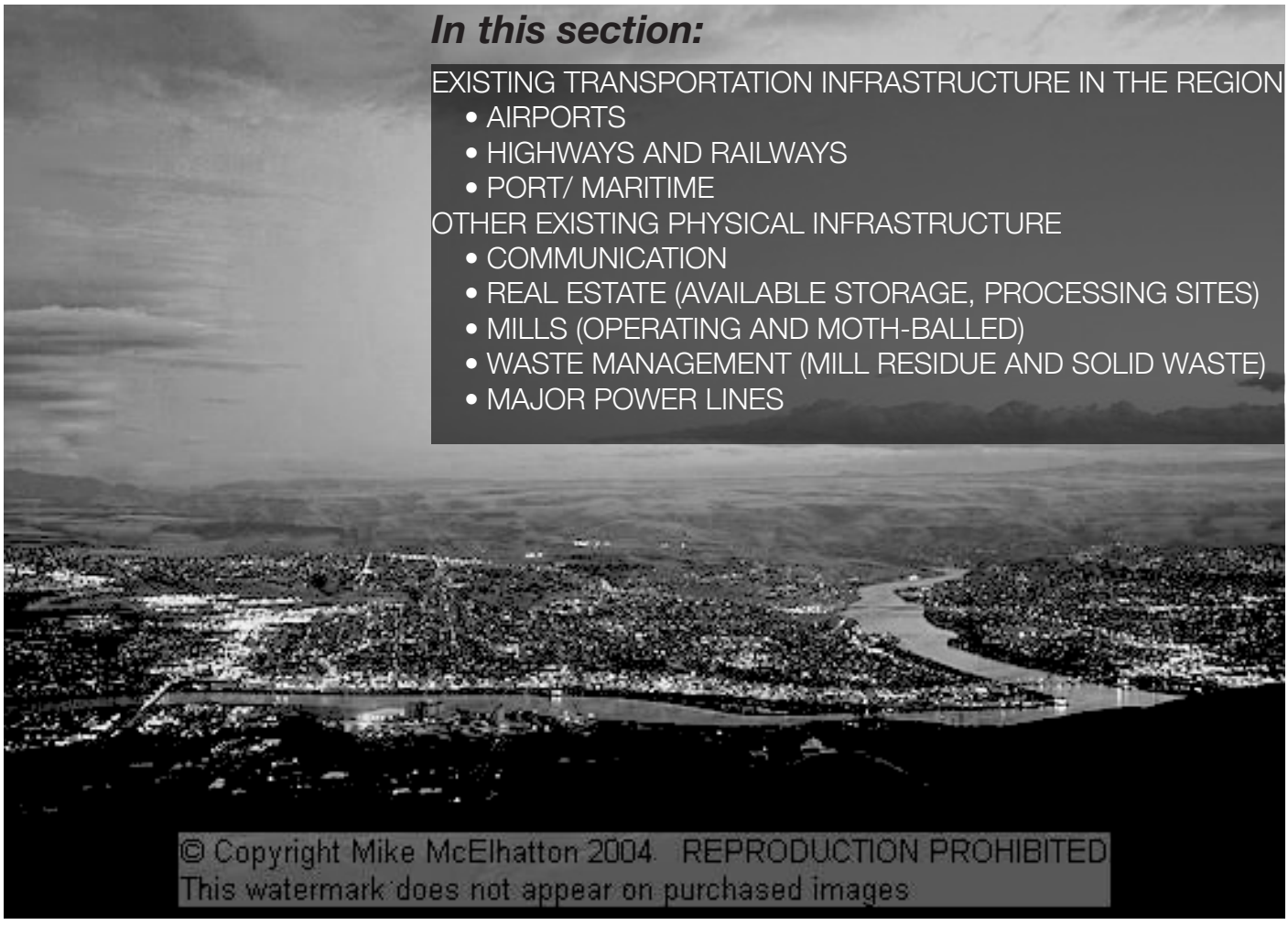
By Navin Risal, Matt Ricks, JJ Petersen, and Michelle Volkema

The physical capital section of the Clearwater Basin Biomass Atlas addresses several aspects of existing physical infrastructure within the five counties of the Clearwater Basin including Latah, Nez Perce, Lewis, Clearwater, and Idaho. This section includes the identification and cataloging of all major physical assets (infrastructure) relevant to regional development and processing of woody biomass. This physical capital section can aid in understanding current uses and development patterns and is a key in identifying future opportunities and possibilities in the region.

In this section:

EXISTING TRANSPORTATION INFRASTRUCTURE IN THE REGION
- AIRPORTS
- HIGHWAYS AND RAILWAYS
- PORT/ MARITIME

OTHER EXISTING PHYSICAL INFRASTRUCTURE
- COMMUNICATION
- REAL ESTATE (AVAILABLE STORAGE, PROCESSING SITES)
- MILLS (OPERATING AND MOTH-BALLED)
- WASTE MANAGEMENT (MILL RESIDUE AND SOLID WASTE)
- MAJOR POWER LINES



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AIRPORTS

According to the Federal Aviation Administration (FAA) there are 20 public airports in the five counties that make up the Clearwater Basin. The airports in the Clearwater Basin are part of the Northwest Mountain FAA region and are administered by the Seattle Airports District Office (Seattle ADO).[1] A list of all of the airports in the Clearwater Basin is shown in Table 2.1. Locations of each airport can be seen in Figure 2.1

Table 2.1: List of all the airports in the five counties of the Clearwater Basin Bioregion

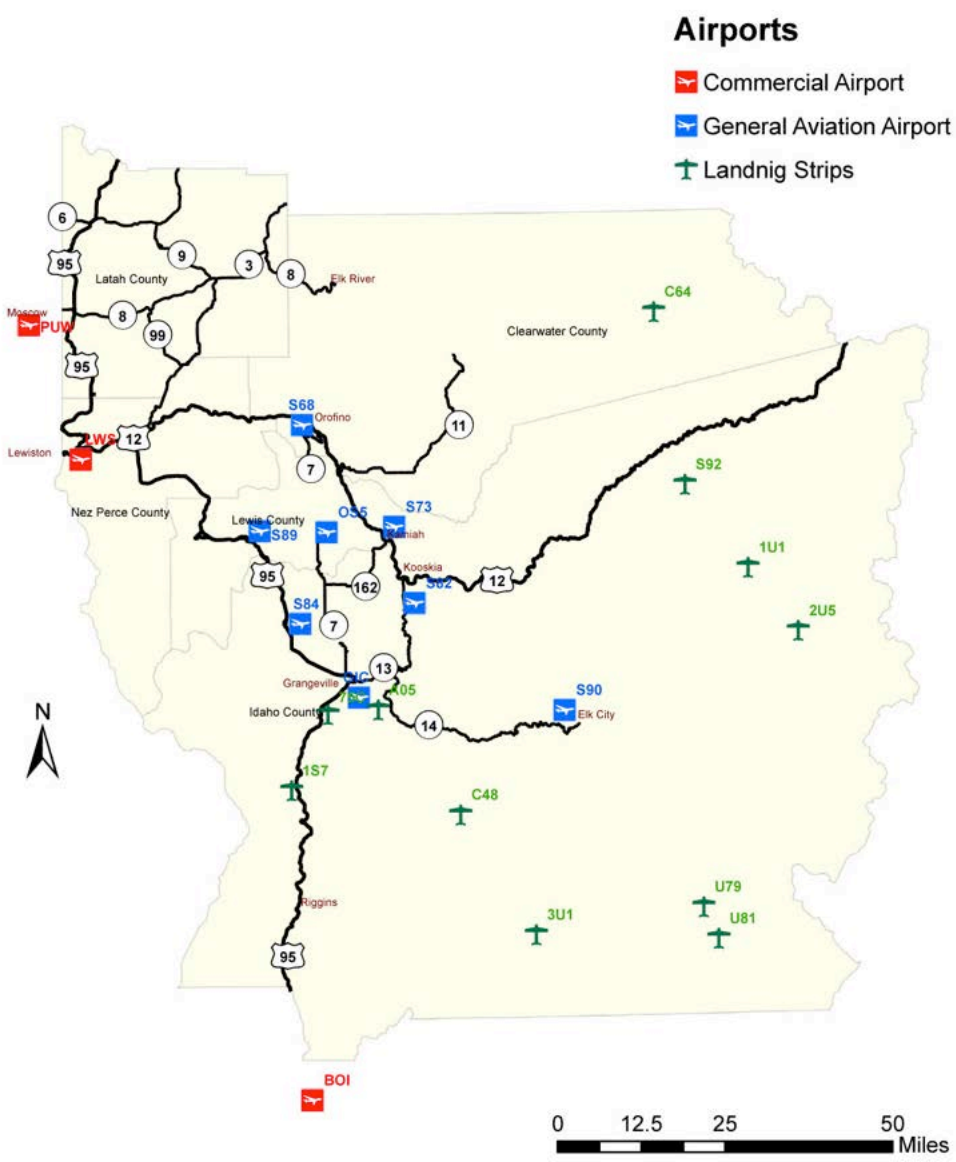
Source: Federal Aviation Administration, www.faa.gov

County	FAA Code	City	Owner
IDAHO	1U1	MOOSE CREEK RANGER STATION	US FOREST SERVICE
	75C	OROGRANDE	US FOREST SERVICE
	2U5	SHEARER	US FOREST SERVICE
	U79	CHAMBERLAIN GUARD STATION	U S FOREST SERVICE
	U81	COLD MEADOWS GUARD STATION	U S FOREST SERVICE
	A05	DIXIE	U S FOREST SERVICE
	S92	FISH LAKE	U S FOREST SERVICE
	3U1	WARREN	U S FOREST SERVICE
	1S7	SLATE CREEK	STATE OF ID ITD, DIV AERO
	C48	DIXIE	NEZ PERCE NATL FOREST
	GIC	GRANGEVILLE	IDAHO COUNTY
	S90	ELK CITY	ELK CITY AREA ALLIANCE
	S82	KOOSKIA	CITY OF KOOSKIA
	S73	KAMIAH	CITY OF KAMIAH
	S84	COTTONWOOD	CITY OF COTTONWOOD
NEZ PERCE	LWS	LEWISTON	CITY OF LEWISTON/NEZ PERCE COUNTY
LEWIS	S89	CRAIGMONT	CITY OF CRAIGMONT
	0S5	NEZ PERCE	CITY OF NEZ PERCE
CLEARWATER	C64	CAYUSE CREEK	US FOREST SERVICE
	S68	OROFINO	CITY OF OROFINO

The airports in Clearwater Basin can be divided into three categories:
- Commercial Airport
- General Aviation Airport (County, Municipal)
- Landing Strip (US Forest Service, Idaho Department of Transportation)

Figure 2.1: Public Airport Locations in five counties Clearwater Basin Bioregion

Source: Navin Risal



COMMERCIAL AIRPORTS -

Lewiston-Nez Perce County Regional Airport, which can be seen in Figure 2.2, is the only public commercial airport in the five counties Clearwater Basin region. It is located in the city of Lewiston, in Nez Perce County, Idaho. However, the Pullman-Moscow Regional Airport is located just four miles away from the city of Moscow, Idaho in Whitman County, Washington, and approximately 40 miles away from Lewiston-Nez Perce County Regional Airport. Outside of the Clearwater Basin Bioregion, the largest nearby public commercial airports are Spokane International Airport and Boise Air Terminal. Spokane International Airport is located approximately ten miles west of downtown Spokane in Spokane County, Washington, approximately 115 miles north of Lewiston-Nez Perce County Regional Airport and 75 miles north of Pullman-Moscow Regional Airport. The Boise Air Terminal, located in Boise, Idaho is approximately 275 miles south of Lewiston-Nez Perce County Airport.

Some of the general information of these four commercial airports can be seen in table 2.2.

Airports	Lewiston–Nez Perce County	Moscow Pullman Regional	Spokane International	Boise (Boise Air Terminal)
Location	Lewiston, ID	Pullman, WA	Spokane, WA	Boise, ID
Operator	City of Lewiston & Nez-Perce County	Pullman Moscow Regional Airport Board	City of Spokane & Spokane County	City of Boise & Dept. of Aviation
FAA Code	LWS	PUW	GEG	BOI
Enplanements (2010)	61,737	35,248	1,545,115	1,406,750
Operating Airlines	2	1	12	11
Destination Cities	4	2	11	18

Table 2.2: General information of the four common commercial airports in Clearwater Basin

Source: Federal Aviation Administration, www.faa.gov

Fig2.2: Lewiston-Nez Perce County Airport, Lewiston ID

Source: Kathy Parsells, www.pictureyourselflivinghere.com

GENERAL AVIATION AIRPORTS -

General aviation refers to all flights other than military, scheduled airlines, and regular cargo flights. General aviation airports cover a large range of activities, depending upon its capacity and features, both commercial and non-commercial which may include private flying, flight training, air ambulance, police aircraft, aerial firefighting, air charter, bush flying, gliding, skydiving, and many others. There are eight general aviation airports listed in the five counties of the Clearwater Basin: [2]

1. Idaho county Airport, Grangeville, Idaho County. FAA Code - GIC
2. Cottonwood Municipal airport, Cottonwood, Idaho County. FAA Code - S84
3. Kooskia Municipal Airport, Kooskia, Idaho County. FAA Code - S82
4. Kamiah Municipal Airport, Kamiah, Idaho County. FAA Code - S73.
5. Elk City Airport, Elk City, Idaho County. FAA Code - S90.
6. Nez-Perce Municipal Airport, Nez-Perce, Lewis County. FAA Code – 0S5
7. Craigmont Municipal Airport at Craigmont, Lewis County. FAA Code - S89.
8. Orofino Municipal Airport at Orofino, Clearwater County. FAA Code - S68.

LANDING STRIPS -

There are 11 landing strips in Clearwater Basin. Among them 10 belong to US Forest Service and 1 belongs to the Idaho Transportation Department.[3]

1. USFS Airport, Dixie, Idaho County. FAA Code - C48.
2. USFS Airport, Dixie, Idaho County. FAA Code - A05.
3. USFS Airport, Warren, Idaho County. FAA Code - 3U1
4. USFS Airport, Fish Lake, Idaho County. FAA Code -S92
5. USFS Airport, Orogrande, Idaho County. FAA Code -75C
6. USFS Airport, Shearer, Idaho County. FAA Code – 2U5
7. USFS Airport, Moose Creek Ranger Station, Idaho County. FAA Code - 1U1
8. USFS Airport, Chamberlin Guard Station, Idaho County. FAA Code – U79
9. USFS Airport, Cold Meadows Guard Station, Idaho County. FAA Code – U81
10. USFS Airport, Cayuse Creek, Clearwater County. FAA Code – C64
11. State of Idaho Department of Transportation Division Aero, Slate Creek, Idaho County.
FAA Code – 1S7

• STATE HIGHWAYS, FEDERAL HIGHWAYS, AND RAILROADS

A map showing the state highways, federal highways, and railroads within the Clearwater Basin is shown in the Figure 2.3 below. There are two U.S. Highways in the basin; U.S. 95, which runs north to south and U.S. 12, which runs east to west.

Figure 2.3: Highways and Railroads in North Central Idaho

Source: (Frazier, Thompson and Vachon 2011)

- HIGHWAY OVERHEAD CLEARANCE

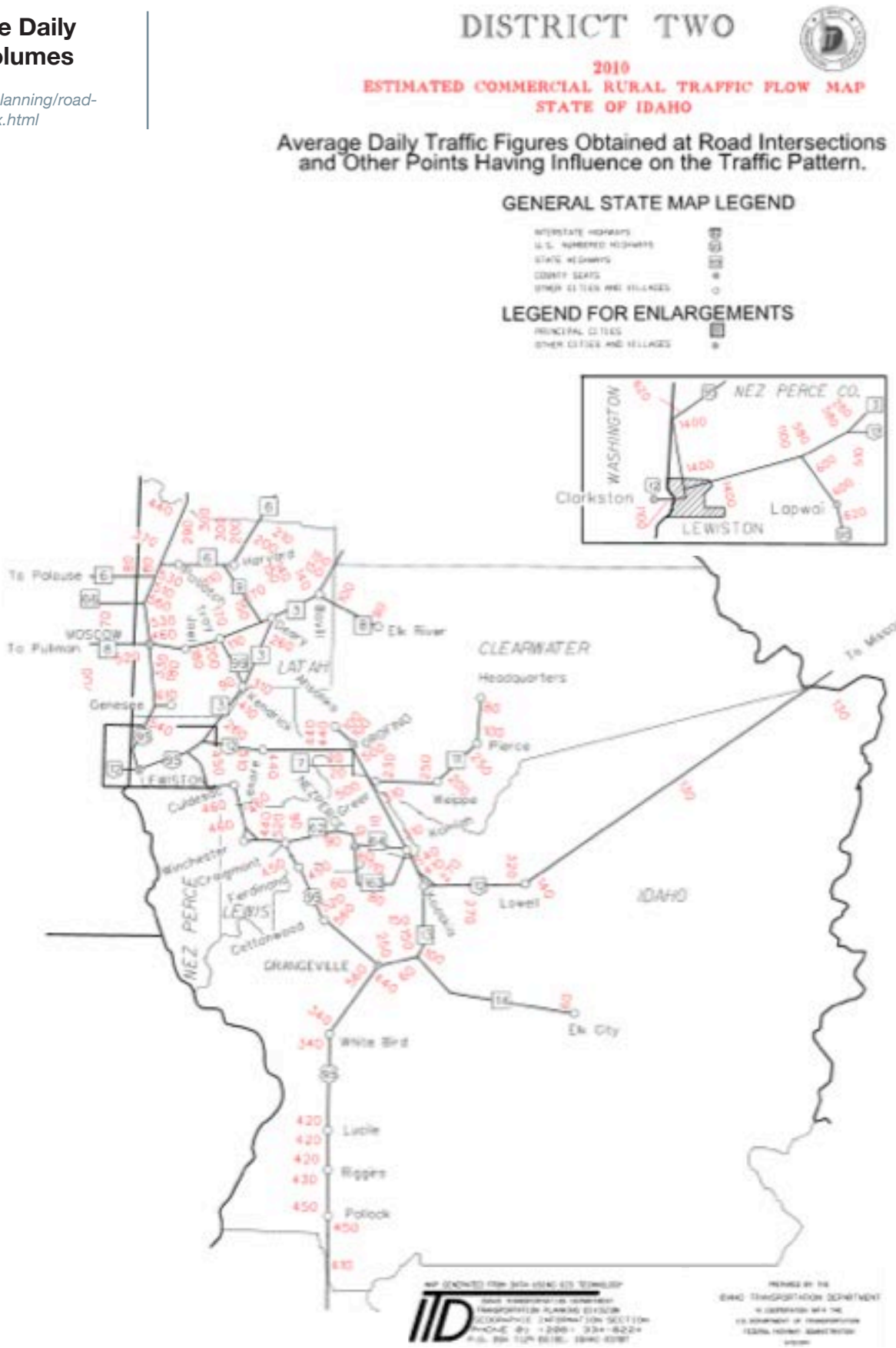
In accordance with the American Association of State Highway Transportation Officials (AASHTO) Geometric Design of Highways and Streets, Idaho has designated a minimum overhead clearance of fourteen feet.[5]

- HIGHWAY LENGTHS AND TRAFFIC VOLUMES

In the five counties that make up the Clearwater Basin, there are approximately 310 miles of state highways and 290 miles of US Highways totaling 600 miles. Figure 2.4 shows daily traffic volumes for the five counties of the Clearwater Basin. In general, the highest volumes occur on US 95, near Lewiston, and near Moscow.

Figure 2.4: Average Daily Traffic Vehicular Volumes

Source: http://itd.idaho.gov/planning/road-waydata/RTFmaps/2010/index.html



- PROPOSED ROADWAY IMPROVEMENTS

The Idaho Transportation Department (ITD) currently has projects planned on twelve state highways within the Clearwater Basin. According to the goals and objectives statement of ITD District 2's Low Volume and Narrow Roadways Corridor Plan, the recommended improvements will focus on improving highway safety, roadway geometry, operations and maintenance, congestion and transit, and bridges and structures.[8] In addition to the roadway improvements planned on the low volume and narrow state highways, ITD also has planned improvements on State Highway (SH) 12 from Lewiston to the Forest Service Boundary. According to ITD District 2's U.S. 12, Lewiston to Forest Service Boundary Corridor Plan, the goal of the improvements along SH12 is to address the following needs:

- Motorist and pedestrian safety along the corridor, considering roadway width, intersections and access, passing lanes and sight distance
- Year-round regional connectivity between U.S. 12 and other transportation corridors in north-central Idaho
- Increased capacity and decreased delays in response to area growth
- Practical solutions in light of highway funding limitations [9]

The projects include work on SH3 in Latah and Nez Perce Counties, SH7 in Clearwater County, SH8 in Latah County, SH9 in Latah County, SH 11 in Clearwater County, SH13 in Idaho County, SH14 in Idaho County, SH62 in Lewis County, SH64 in Lewis County, SH128 in Nez Perce County, SH128 in Nez Perce and Idaho Counties, SH162 in Lewis and Idaho Counties, and U.S. 12 from Lewiston to the Forest Service Boundary. The primary work that is proposed to be completed will focus on adding turn or passing lanes and controlling falling rock.

The figures and tables that list proposed improvements, descriptions of their locations, and their estimated costs for numerous roadways in the Clearwater Basin are included in the Appendix 1.

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MARITIME/PORTS

The Clearwater River, which has an annual discharge of approximately 15,300 cubic feet per second (CFS) near Spalding, Idaho, is the main waterway and defining feature of the Clearwater Basin.[10]The Clearwater River flows west from the Bitterroot Mountains in the east, to Lewiston, Idaho, where it joins the Snake River. The Clearwater River has three main tributaries. The first tributary, The Middle Fork, is the confluence of the Selway and Lochsa Rivers, joins with the second tributary, The South Fork at Kooskia, Idaho to form the main Clearwater stem. The third tributary, The North Fork, joins the Clearwater River near Orofino, below Dworshak Dam. From there, the Clearwater flows west to the Port of Lewiston at the confluence of the Snake River. The Clearwater River comprises approximately one-third of the Snake River flow and 10 percent of the Columbia River flow annually.[11]

Dworshak Dam, shown in Figure 2.5, is located on the North Fork of the Clearwater at Ahsahka, Idaho. The dam creates Dworshak Reservoir and is primarily used for flood control, power, and navigation.[12]Inflow at the dam in 2011 has ranged from 1,000 to 26,000 CFS, and outflow ranges from 1,600 to 24,000 CFS.[13]There is no throughway for commercial or recreational vessels at Dworshak.

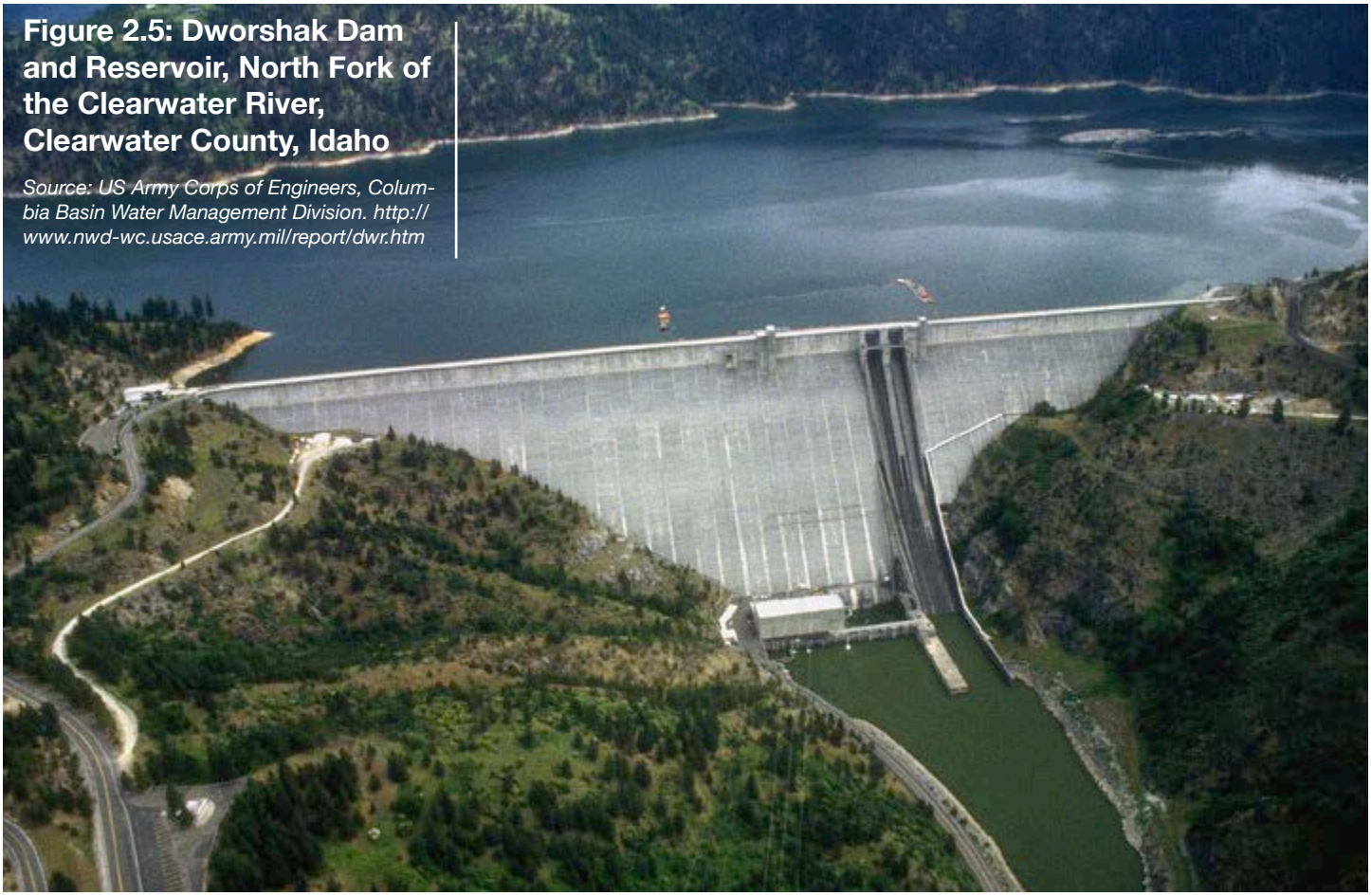


Figure 2.5: Dworshak Dam and Reservoir, North Fork of the Clearwater River, Clearwater County, Idaho

Source: US Army Corps of Engineers, Columbia Basin Water Management Division. http://www.nwd-wc.usace.army.mil/report/dwr.htm

Where the Clearwater joins the Snake River near Lewiston, it becomes a part of one of the largest and busiest inland river systems in the nation, the Columbia Snake River System. The inland portion of this river system, from Lewiston, Idaho to Portland, Oregon is 465 river miles.[15]This portion of the Snake and Columbia Rivers transports 10 million tons of commercial cargo each year with an average value of $3 billion.[16]Furthermore, this river system, which averages a 14-foot depth, accesses a deep draft channel from Portland to the Pacific that is 105 miles long and 43 feet deep, trading 42 million tons of international trade in 2010 valued at $20 billion.[17]

The most significant maritime features in the Clearwater Basin, aside from the river systems themselves, are the Ports of Lewiston, Idaho and Clarkston, Washington. The Port of Lewiston, shown in Figures 2.6, 2.8,

and 2.9, was formed in 1958 "in accordance with Idaho Code 70-1101, the Port oversees harbor operations, terminal facilities, international trade, and industrial and economic development."[18]The Port is an 85-acre complex of light and heavy industrial components and has the largest crane, warehouse facility and grain storage facilities on the inland river system including a business incubator program and business and technology park. [19]

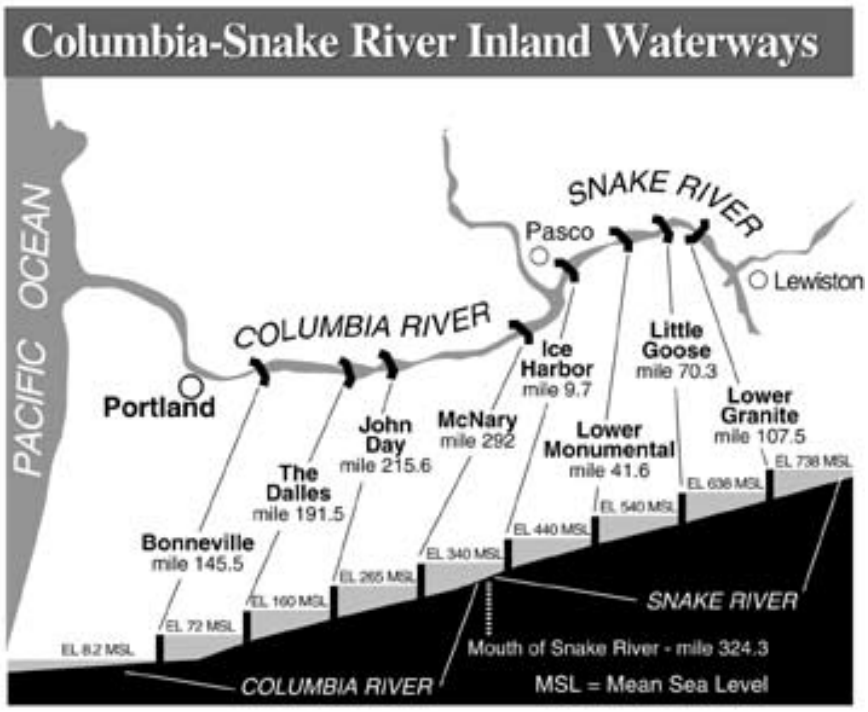
Figure 2.6: Port of Lewiston and Storage Facilities, Nez Perce County, Idaho

Source: Port of Lewiston. http://www.portofewiston.com

The Port of Lewiston began shipping containers by barge in 1978 and ships on average over 500 TEUs (twenty-foot equivalent unit) per year of bulk commodities and containerized cargo via multiple steamship lines.[20] Tugs move four-to-five barges together down the Snake River for a short distance and through the locks and dams along the Columbia River to the Port of Portland. Each barge typically holds 80-160 TEUs.[21]The Corps of Engineers estimates that the average barge operating in US waters is the approximate equivalent of 58 large semi-trucks, or 1,500 tons, 52,500 bushels, or 453,000 gallons.[22]Meanwhile, the average barge operating on the Columbia Snake River System moves the equivalent of 134, 26-ton semi-trucks, and the average tow along this river system is four barges. [23]Barging time to Portland from Lewiston is approximately 50 hours.[24] Figure 2.7 shows a map of the Columbia-Snake River waterways from Portland, Oregon to Lewiston, Idaho.

Figure 2.7: Columbia-Snake River Inland Waterways, Idaho, Washington, and Oregon

Source: Port of Lewiston. http://www.portofewiston.com



At 125 feet long with a carrying capacity of 31-tons per axel, the Port of Lewiston's dock and facilities are capable of handling oversized cargo. The dock and container yard are serviced by one 240-ton mobile crane with a 120-foot boom, three 35-ton diesel container top-lift trucks, and three four-ton and one 15-ton forklift trucks.[25]

Figure 2.8: The Port of Lewiston Riverside, Lewiston, Nez Perce County, Idaho

Source: Port of Lewiston. http://www.portofewiston.com

Contact:
Port of Lewiston Container Yard
1224 6th Avenue North
Lewiston, ID 83501
Phone: 208-743-3209; Toll Free: 877-777-8099

Additionally, the Port has secure storage facilities, warehousing, land for leasing, and a business park. For storage, there are approximately 20 acres available for outdoor, oversized storage adjacent to the Port's dock facilities.[26]For indoor, short-term storage or cross-docking needs, the Port has available 20,000 square-feet of dockside warehouse space. Finally, the Port also runs a business incubator program in North Lewiston and offers land for lease and purchase at the Harry Wall Industrial Park and the Business and Technology Park.[27]

Contact:
David Doeringsfeld, Port Manager
Port of Lewiston
1626 6th Ave. North
Lewiston, ID 83501
208-743-5531
portinfo@portoflewiston.com

In addition to the Port's storage and warehouse facilities, there is a full-service 150,000 square-foot secure warehouse and distribution facility adjacent to the Port of Lewiston's container yard.[28]This facility includes ten truck bays, five rail bays, and indoor and outdoor forest and paper products storage. This warehouse facility's services include controlled temperature indoor storage, container and lumber loading/unloading, freight brokerage, and invoice consolidation with local delivery available.[29]

Figure 2.9: Inland 465 Storage Facilities, Port of Lewiston, Nez Perce County, Idaho
Source: Port of Lewiston. http://www.portofewiston.com

Contact
Inland 465
PO Box 465
1730 3rd Ave North
Lewiston, ID 83501
208-743-6505 or 1-800-551-WARE
w.rismon1730@inland465.com

The Port of Clarkston, Asotin County, in southeastern Washington State, was created in 1958, and is located at river mile 137.8 of the Snake River, approximately 460 miles from the Pacific Ocean.[32] The Port of Clarkston, shown in Figures 2.10 and 2.11, is smaller than the Port of Lewiston, and is primarily involved in "marine commerce, property development (industrial and commercial) and recreation/tourism facilities."[33] The Port comprises 120 acres of fully developed and utilized land, and is therefore planning for the development of an additional 120 acres near the existing facilities. Clarkston is an "operating" port running its own facilities, equipment, and terminal functions and in doing so, does not contract to third parties for those services.[34] The Port transports large cargo, has a cruise-boat dock, marina facilities, and warehouse and office space.

Figure 2.10: Hells Canyon Marina, Port of Clarkston, Asotin County, Washington

Source: Port of Clarkston. http://portof-clarkston.com/

The Port operates a 140-ton crane for large cargo movement of up to 78 feet in length and over 90,000 pounds. Typically, the port crane moves logs and timber, wood products, cargo containers, and specialized cargo such as boats and yachts.[35]

In addition to the shipment and transportation roles at the Port of Clarkston, there are also three cruise line tour boats that dock at the Port's 580-foot "Gateway Dock."[36] These lines work to bring several thousand tourists to the area and service the Columbia, Snake, and Clearwater Rivers. Cruise ships operate and dock here from April through October. When not occupied by these cruise ships, the "Gateway Dock" is available for short-stay private boaters and day trip jet boats to dock. Also at the Port of Clarkston are two RV parks and Hells Canyon Marina providing mooring accommodating personal watercraft, boats, and yachts.[37]

Figure 2.11: Gateway Dock, Port of Clarkston, Asotin County, Washington

Source: Port of Clarkston. http://portofclarkston.com/

As an "operating" port, Clarkston land is for lease and not for sale, but the Port will "build-to-suit" or tenants may construct their own facilities.[38] The Port currently has approximately 40 tenants ranging from "large agribusiness and forest products firms to a 50-unit antique mall and small entrepreneurial enterprises in manufacturing, retail, and service sectors."[39] The Port of Clarkston currently has available for lease over six acres of land zoned industrial and over seven acres zoned port commercial. The Port also has developed property including over 3,100 square feet of warehouse and office space available to rent, and one large 12,880 square-foot steel building zoned industrial with full public utilities. For the future,

the Port of Clarkston is planning infrastructure development for a large "Sustainable Business Park."[40]

Contact:
849 Port Way
Clarkston, WA 99403
(509) 758-5272
info@portofclarkston.com

• COMMUNICATION

Frontier Communications and Qwest are the two local exchange carriers that provide telecommunication services in the five county Clearwater Basin also known as North Central Idaho. In 2010, Frontier Communications purchased Verizon and now serves Latah and Clearwater Counties as well as the southern region of Idaho County (Elk City, White Bird, and Riggins). Qwest serves Lewis, and Nez Perce counties, and the majority of Idaho County. The City of Moscow and the City of Lewiston have significantly better broadband capacity than the other outlying communities. In a 2006 telecommunication study that was conducted by Clearwater Economic Development Association (CEDA), an assessment was completed for sixteen rural communities in Idaho, Lewis, Nez Perce, and Clearwater County. The study identified substantial gaps in intra and inter-community networks. Less than 50% of the communities are served by fiber optic cable. Communities are served with digital radio systems or with buried copper cabling extended from digital radio communities with limited or no bandwidth available for broadband applications. Although satellite internet service is available, it is subject to a clear view of the southern sky. The most significant deficiency in infrastructure was the absolute lack of connectivity between Grangeville and White Bird, Idaho, over the White Bird Hill.[41]

USDA Rural Development funding has been utilized to develop the North Central Idaho Telecom Assessment and Implementation Plan (2006) and North Central Idaho Schematic Wide Area Network Design (2008). As a result of these planning efforts, projects have leveraged resources from federal, state, Tribal and local governments as well as private sector to expand telecommunications capacity to most of the regions incorporated communities. The State of Idaho Broadband Initiative (2006) was a competitive, one time funding source for broadband infrastructure upgrade, and was used to make the following upgrades:[42]

- Qwest upgraded switches in the communities of: Grangeville, Cottonwood, Nez Perce, Craig Mont, Culdesac, Kamiah, Kooskia
- First Step Internet expanded wireless broadband to Weippe

USDA Rural Utilities Service Community Connect Grant program awards:
• First Step Internet: Bovill (2002), Deary & Potlatch (2003), Ferdinand (2008)
• Elk River Free Library District (2007)

The USDA Rural Business Enterprise Grant & ID Gem Community Grant was used to make the following upgrades:
• Nez Perce Tribe Broadband Enterprise Feasibility Analysis & Network Expansion in Orofino in partnership with First Step Internet
• Verizon fiber optic extension to serve Orofino – Weippe (2009); and Frontier switch upgrades to add service capacity in those communities (2010)

The American Recovery & Restoration Act –Broadband Technologies Opportunity Program grant (2010) was used to make the following upgrades:[43]
• First Step Internet – expand middle mile broadband infrastructure across North Central Idaho
• Nez Perce Tribe – expand middle and last mile service, and voice coverage across the Nez Perce Reservation, serving communities of Ahsahka/ Orofino, Kamiah, Kooskia, Greer/Fraser, Peck, and Culdesac.

• REAL ESTATE

While it can sometimes be difficult to gather real estate information because of its ever-changing nature, over the last few years new online technologies have made this task easier and it is apparent that the Clearwater Basin has more office, commercial, retail, industrial, and warehouse properties than what was previously thought.[44] The Idaho Department of Commerce has established a statewide database website to make searching for real estate in Idaho easier. The "Gem State Prospector" allows the user to search by property type, size, and by location, either city or county.[45]

To briefly summarize the real estate available and desirable for this project, it is evident that Nez Perce is again the most prolific county in our study area, while Lewis County had the least available properties for sale or lease.[46] At the time of publication, Clearwater County had only a few office/industrial/retail spaces available from 1,600 square feet to 53 acres, primarily in Orofino, Pierce, and Weippe. However, there were no warehouse properties available. Idaho County had several mixed use properties available combining office, retail, and warehouse functions together primarily located in either Grangeville or Cottonwood and ranging from 1,000 to 30,000 square feet. In addition, there is a 3,700 square foot in

dustrial property available in Cottonwood. Latah County had surprisingly few samples of properties available, especially in industrial and warehouse space, but did post several office/retail properties available from 1,000 to 25,000 square feet. As noted above, Nez Perce County had multiple properties available in each real estate category, in a wide variety of square footage.[47]

In addition to the individual or scattered commercial and industrial properties that can be found through the statewide database or through local real estate agents, there is also space available to lease in the region's business and industrial parks. For instance, as discussed as part of the Port of Lewiston facilities, the Port operates and has available thousands of square feet of storage, warehousing, and distribution facilities.[48] The Port of Lewiston has also developed a Business Incubator Program in North Lewiston, which makes available commercial space to businesses, as well as offering land for lease and purchase at the Harry Wall Industrial Park and the Business and Technology Park.[49]

The Port of Clarkston in Washington has available over ten acres of land to lease that is either zoned port commercial or industrial.[50] The Port of Clarkston also has developed property including over 3,100 square-feet of warehouse and office space available to rent, and one large 12,880 square-foot steel building zoned industrial with full public utilities. Currently, the Port of Clarkston is planning and implementing doubling the land available for lease to commercial and industrial tenants.[51]

There is also real estate available at the Lewiston-Nez Perce County Regional Airport, where the City of Lewiston and Nez Perce County are currently developing a 60-acre airpark.[52] In Moscow and Latah County, leases are available through the City of Moscow's Urban Renewal District, which provides commercial space for high tech companies in Alturas Technology Park and the City and Latah County are planning for an industrial site located just outside the Moscow city limits.[53] The University of Idaho also operates a business incubator for start-up companies in Moscow that come from the University. Similar facilities are also available in Orofino, at the Business Development Center, and in the City of Kamiah's new industrial site.[54]

• MILL LOCATIONS

There are several sawmills located in the Clearwater Basin. Figure 2.12 shows existing sawmills as well as several mills that have been closed. The green pointers represent mills that are currently open, while the red pointers represent sawmills that have been closed. As seen in Figure 2.12, there are nine operating mills in the Clearwater Basin and six that have been closed in the past 22 years.[55] The closed mill near Pierce,

Idaho is the Jaype site, now owned by Idaho Forest Group. The other closed mill names and locations can be seen in Figure 2.13, which shows a statewide map of mill closures from 1989 to 2001.[56]

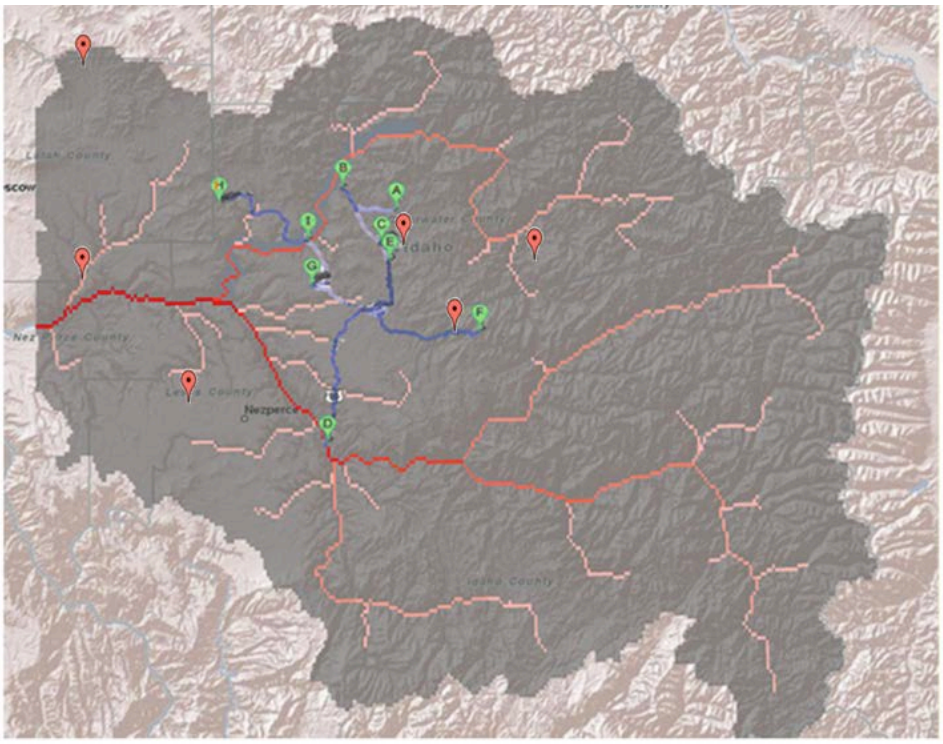


Figure 2.12: Sawmill Locations

Source: http://www.idexstudio.org/idex-team

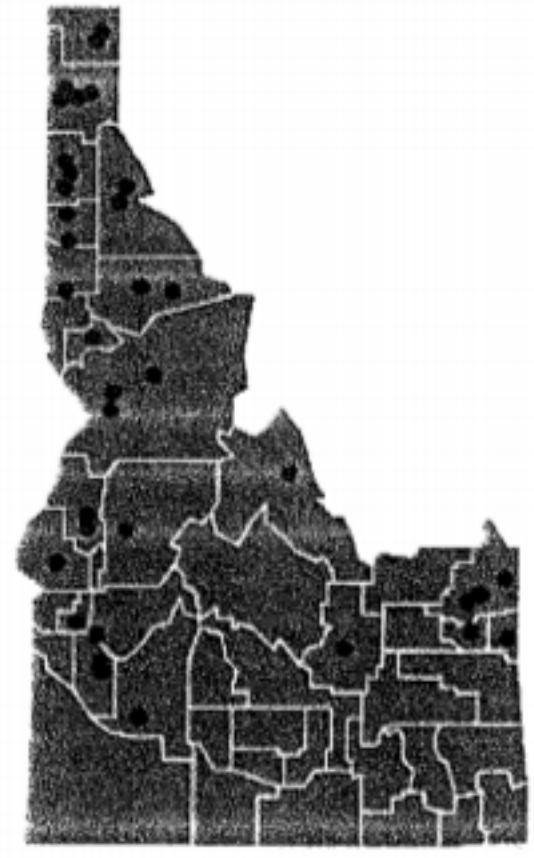


Figure 2.13: Mill Closure from 1989 till 2001

Source: Munis, Betty J., interview by Matt Ricks. Director, Idaho Forest Products Commision (November 21, 2011).

	Employees
1989	
Sawtooth Forest Products	45
1990	
W.I Forest Products,LP	129
Davies Sawmill and Logging	6
Christenson Mill	3
1991	
Good Deal Hardware & Lumber Co.	7
Edwards Industries	100
1992	
Fairchild Lumber Co.	12
Syringa Land & Timber	5
Idaho Forest Industries	80
Eldridge Wood Products	9
Balderson Lumber	3
1993	
Rhoades Enterprises	10
North Bench Lumber	8
1994	
Mine Timber Co.	30
Idapine Mill Inc./Kooskia	150
Louisiana-Pacific	60

1995	
Louisiana-Pacific	65
Salmon Intermountain Inc.	40
Louisiana-Pacific	115
Boise Cascade	75
1996	
Green Cosmos/Kellogg	40
Crown Pacific	130
1997	
Victor Sawmill	3
Channel Lumber Co., Inc.	30
Louisiana-Pacific	100
C&B Timber Products	10
Geaudreau Lumber Co., Inc.	8
Producers Lumber Co.	40
1998	
Gem State Lumber Co.	40
Crown Pacific	80
Rayonier	125
Boise Cascade	75
1999	
Croman Corp.	60
2000	
Potlatch Corp.	215
2001	
Boise Cascade	100
Boise Cascade	275

Source: Intermountain Forest Association, Statesman I

Sawmill capacity was also found for mill sites throughout Idaho and Montana. Figure 2.14 shows the plant capacity of mill sites and timber densities. Figure 2.15 details mill types and their respective capacities.[57]

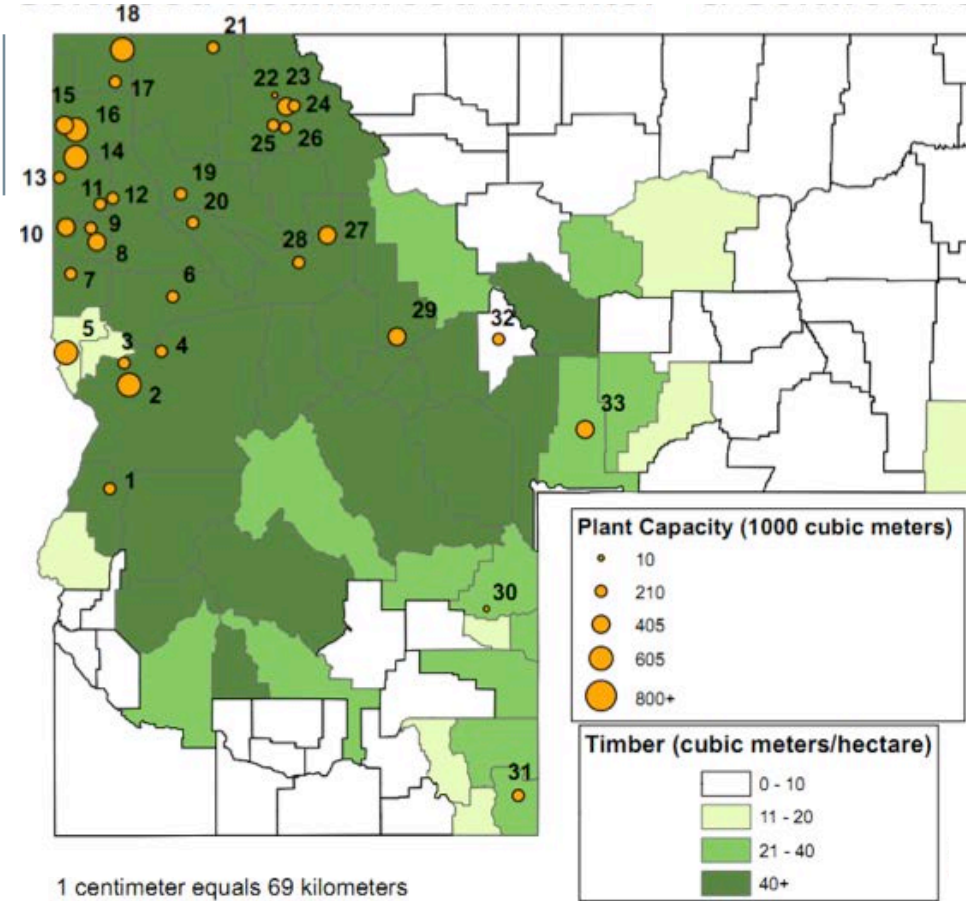


Figure 2.14: Plant Capacity and Timber Density in Idaho and Montana

Source: Munis, Betty J., interview by Matt Ricks. Director, Idaho Forest Products Commision (November 21, 2011).

Idaho/Montana

Mill I.D.	Name	Former name or DBA	Location	Capacity / Production (1,000 m³) 2004	2005	2006	2007	2008	2009
				Closed Mills					
	Cascade Tim		Laurel	30	0				
	Bennett For Ind	Shearer Lum Prod	Elk City	153	102				
	Stimson Lum	Idaho For Ind Inc	Coeur d'Alen	94	83				
	Owens and Hurst		Eureka	189	94				
	Blackfoot River Lum		Victor	30	30				
	D & G Lum		Three Forks	59	59				
	Stillwater For Prod		Kalispell	94	94	94			
	North End Tim Prod		Olney	59	59	59	59		
	Stimson Lum	Idaho For Ind	Coeur d'Alen	321	321	321	321	134	
	Idaho Forest Group	JD Lumber	Priest River	319	319	319	319	239	
	Three Rivers Tim		Kamiah	137	137	165	212	212	
	Stimson Lum		Bonner	142	142	142	142	71	
	Plum Creek Tim		Fortine	234	248	248	248	248	59
	Plum Creek Tim		Pablo	212	230	177	177	177	87
				Timber Mills					
25	Klinger Lum		Kalispell	21	21	21	21	21	21
				Stud Mills					
28	Eagle Stud Mill		Missoula	54	54	54	54	54	54
18	Idaho Forest Group	Riley Creek Lum	Moyie Spring	484	389	453	453	453	453
13	Idaho Veneer	Ceda-Pine Veneer	Post Falls	59	59	59	59	59	59
26	Plum Creek Tim		Kalispell/Eve	248	271	208	264	182	182
32	R Y Tim		Townsend	189	189	189	189	177	177
33	R Y Tim		Livingston	212	212	212	212	212	212
10	Stimson Lum	Plummer FP	Plummer	224	224	224	224	224	224
15	Stimson Lum	Merritt Bros	Priest River	319	319	319	319	319	319
9	Stimson Lum	Regulus Stud Mill	St Maries	177	177	177	177	177	177
	Softwood lumber (1,000 m³)			2004	2005	2006	2007	2008	2009
	Estimated capacity			7975	7811	7755	7808	7353	6426
	Reported output (WWPA)			6960	7144	6521	5230	3696	
	Implied capacity utilization			87%	91%	84%	67%	50%	

Mill I.D.	Name	Former name or DBA	Location	Capacity / Production (1,000 m³) 2004	2005	2006	2007	2008	2009
29	Sun Mountain Lum	Louisiana-Pacific	Deer Lodge	319	319	260	260	201	201
				Dimension Mills					
20	Tricon Timber		Saint Regis	165	165	150	159	165	165
4	Clearwater For Ind		Kooskia	201	201	189	142	142	142
5	Clearwater Lum	Potlatch rp	Lewiston	413	425	472	496	484	484
3	Empire Lum	Kamiah Mills	Kamiah	118	118	118	118	118	118
24	F H Stoltze Land&Lu		Columbia Falls	142	142	165	165	170	177
16	Idaho Forest Group	Riley Creek Lum	Laclede	543	566	590	590	590	590
14	Idaho Forest Group	Riley Creek Lum	Chilco (Athol)	566	566	566	566	566	566
21	Lone Pine Tim Ind		Eureka	90	90	90	90	90	90
8	Potlatch rp		St Maries	271	271	283	295	295	295
1	Tamarack Mill LLC	Evergreen For Prod	New Meadows	123	123	123	123	142	142
19	Thompson River Lum		Thompson Falls	94	94	94	94	94	94
				Board Mills					
2	Idaho Forest Group	Riley Creek Lum	Grangeville			307	425	472	472
7	Idaho Forest Group	Bennett Lum	Princeton	224	224	236	203	205	205
12	Malloy Lum		Kingston	59	59	59	21	21	21
23	Plum Creek Tim		Columbia Falls	189	212	217	217	212	212
27	Pyramid Mountain Lu		Seely Lake	177	177	177	177	212	212
6	Tri Pro	Konkolville Lum	Orofino	68	71	71	71	71	71
				Specialty or Unknown					
31	Jensen Lum		Ovid	19	19	19	19	19	19
22	RBM Lum		Columbia Falls	4	4	5	5	5	5
17	Wel Lum		Naples	106	106	106	106	106	106
11	Whiteman Lum		Cataldo	14	14	14	14	12	12
30	Willmore Lum	Stoddard Lum	St Anthony	12	12	5	3	3	3
				2004	2005	2006	2007	2008	2009
	Number of sawmills			45	45	41	40	39	35
	Number employed ('000)			4.2	4.1	3.9	3.8	3.0	
	Output per employee (m³)			1660	1760	1690	1370	1230	

Figure 2.15: Mill Types and Capacities

Source: Munis, Betty J., interview by Matt Ricks. Director, Idaho Forest Products Commision (November 21, 2011).

If mills are reopened for the biofuels project, significant amounts of solid and liquid waste will be produced. The following provides information on several waste treatment facilities within the Clearwater Basin Bioregion which could process this waste: Sunshine Disposal Recycling in Lewiston, Latah Sanitation Inc. in Moscow, Lewiston Waste Management Inc. in Lewiston, Simmons Sanitation and Recycling in Kamiah, Clearwater City, Clearwater County Solid Waste Station in Orofino, Four Feathers Disposal LLC in Lewiston, Moscow Wastewater Treatment Plant in Moscow, and the Lewiston Wastewater Treatment Plant in Lewiston. Figure 2.16 shows the locations of the eight major waste treatment facilities in the Clearwater Basin Bioregion. Figure 2.16 does not include sanitary lagoons, which are present in several of the small towns within the Clearwater Basin Bioregion.[58]

• WASTE TREATMENT FACILITIES

Figure 2.16: Waste Treatment Locations

Source: maps.google.com

MAJOR POWER LINES

Power lines which carry more than 69 kilovolts of power, substations, and power plants are shown in Figure 2.17. In addition to the four power plants shown, Avista Utilities is the sole power provider in the Clearwater Basin Bioregion.[59] Power is a concern for two reasons. First, reopened mills will need to be powered, and this will be easier to do when the mill is located near a major power line. Secondly, if the power lines are lower than expected, logging trucks may have to find alternative routes to transport the woody biomass. However, as stated in the Highway Overhead Clearance section, Idaho requires at least fourteen feet of vertical clearance, which should be adequate for a logging truck to pass under.[60]

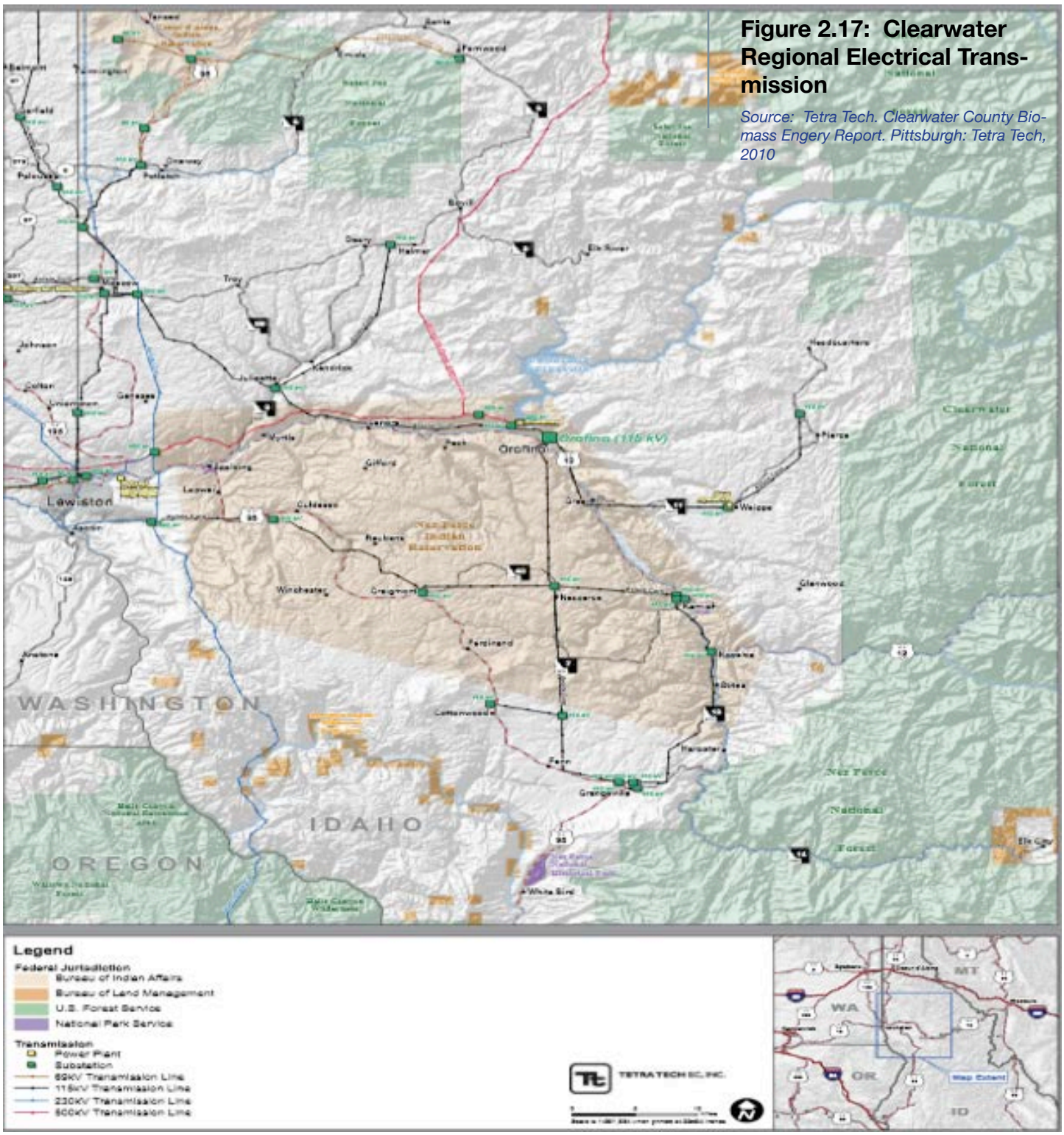


Figure 2.17: Clearwater Regional Electrical Transmission

Source: Tetra Tech. Clearwater County Biomass Engery Report. Pittsburgh: Tetra Tech, 2010

SUMMARY

Physical infrastructure is essential in order for the region to facilitate the establishment, operation, storage and transportation of woody biomass production and distribution. From our study, we found the Clearwater Basin moderately suitable for regional development and processing of woody biomass from a physical infrastructure point of view.

Despite the geographic and topographic variation, ranging from 710 feet above sea level at the Port of Lewiston to 7835 feet in the Selway Crags, the Clearwater Basin has access to all four major transportation means including highways, railroads, air and waterways. Lewiston is a major transportation hub in the region, with the only public commercial airport and maritime port facility in the Clearwater Basin.

The availability of sawmills (both operating and mothballed) and the storage facilities in the region are also important existing infrastructure in the region for the initial establishment of woody biomass development and processing. Similarly, available waste management facilities will help manage the waste produced by such facilities and could possibly provide a small stream of woody biomass from construction wastes.

As mentioned in the communication section, several current upgrading plans and projects will definitely help the regional woody biomass development project to be successfully implemented.

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http://www.bioregionalplanning.uidaho.edu/files/CEDS/Region2CEDS.pdf
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HUMAN CAPITAL

By Aaron Buckly, Daniel Johnson, Elaheh Kerachian, and Jillian Marotz Moroney

The Human Capital section of the Clearwater Biomass Atlas looks at the social assets within the region—grouped into human capital and cultural metrics. Each county is evaluated in terms of education, workforce, and general attitudes toward biomass, which might help or hinder the development of biomass projects in the region. These categories are further broken down into K-12 education, community colleges as well as vocational schools, four year universities, retraining and certification programs, existing workforce and skills, and an assessment of the general community attitude towards biomass utilization and projects. A strong emphasis is placed on evaluating these assets in terms of their relationship to woody biomass.

In this section:

- DEFINITION OF HUMAN CAPITAL
- PRIMARY EDUCATION
- SECONDARY EDUCATION
- WORKFORCE
- DEFINITION OF CULTURAL METRICS
- REGIONAL NORMS AND ATTITUDES
- LITERARY REVIEW OF BIOMASS PROJECTS IN OTHER AREAS
- SUMMARY

http://biomasshub.com/usda-announces-grants-woody-biomass/

DEFINITION OF HUMAN CAPITAL

The knowledge, skills, and abilities which an employee attains through education, training, and job experience make up human capital.[1] In this case, human capital is centered on the knowledge and skills which are advantageous in the biomass industry.

PRIMARY EDUCATION:

There are eight school districts located in the Clearwater Basin providing education for students from kindergarten through 12th grade.

Clearwater County
Orofino Joint District (171)
1015 Michigan Ave.
PO Box 2259
Orofino, ID 83854
208-476-5593
http://www.sd171.k12.id.us/

Idaho County
Salmon River Joint District (243)
133 North Main
PO Box 50
Riggins, ID 83549
208-628-3143
www.jsd243.org

Mountain View School District (244)
714 Jefferson St.
Granfeville, ID 83530
208-983-0990
www.sd244.org

Cottonwood Joint District (242)
PO Box 158
Cottonwood, ID 83522
208-962-3971
http://www.sd242.k12.id.us/

Kamiah Joint District (304)
1102 Hill Street
Kamiah, ID 83536
208-935-2991
http://www2.kamiah.org/

Latah County
Genesee Joint District (282)
330 W. Ash St.
PO Box 98
Genesee, ID 83832
208-285-1161
http://www.sd282.org/

Lewis County
Highland Joint District (305)
112 Boulevard Ave.
PO Box 130
Craigmont, ID 83523
208-924-5211
http://www.sd305.k12.id.us/

Nezperce County
Nezperce Joint District (302)
614 Second St.
PO Box 279
Nezperce, ID 83543
208-937-2136
http://www.nezpercesd.us/

- STANDARDIZED TESTING

Several different standardized tests measuring students' proficiency in various subjects are administered throughout a student's education. Scores from these tests can be compared to national averages to help Idaho gauge subjects which its schools are excelling at and subjects with which school struggle.[2]

The Direct Math Assessment (DMA) and Direct Writing Assessment (DWA) are proficiency exams administered to all school districts in Idaho. They are scored by Idaho teachers and aim to evaluate if school districts are meeting the achievement standards set by the state of Idaho. The DMA is administered state wide to students in fourth, sixth, and eighth grade; these scores are shown in Table 3.1. The DWA is administered state wide to students when they are in fifth, seventh, and ninth grade; scores are shown in Table 3.2 below.[3]

Table 3.1 Direct Math Assessment Scores by School District

**To ensure the privacy of individual student information, only scores for groups of ten or more students are reported.*
Source:http://www.sde.idaho.gov/DataCollection/dmwa09/default.asp.

County	School District	Grade Level/Average Score		
		4	6	8
Clearwater County	171	2.55	2.70	2.57
Idaho County	242	2.87	3.05	3.00
	243	2.32	*	*
	244	2.81	2.46	2.55
	304	2.78	2.64	2.70
Latah County	282	2.96	3.43	3.17
Lewis County	305	3.03	3.14	3.14
Nezperce County	302	*	2.36	2.40
Overall Average for Clearwater Basin		2.42	2.48	2.44
State Average for Idaho		2.73	2.59	2.57

The overall average scores on the Direct Math Assessment of the Clearwater Basin students are slightly below the average seen at state level. Scores missing as a result of too little information can partially account for the lower averages and upon examination for the table one can see that several school districts' averages are above the statewide average.

Table 3.2 Direct Writing Assessment Scores by School District

**To ensure the privacy of individual student information, only scores for groups of 10 or more students are reported. Information not displayed is included in state, district and school totals.*
Source: http://www.sde.idaho.gov/DataCollection/dmwa09/default.asp.

County	School District	Grade Level/Average Score		
		5	7	9
Clearwater County	171	2.77	2.65	2.82
Idaho County	242	2.93	2.87	3.00
	243	*	*	*
	244	2.77	2.63	2.86
	304	2.61	2.63	2.93
Latah County	282	3.00	3.00	3.03
Lewis County	305	2.86	*	2.71
Nezperce County	302	3.15	2.91	2.80
Overall Average for Clearwater Basin		2.51	2.08	2.52
State Average for Idaho		2.91	2.71	2.79

Similar to the Direct Math Assessment scores, Clearwater Basin's scores on the Direct Writing Assessment are also slightly below the statewide average. Missing scores may partially account for the lower averages and some districts did score higher than the statewide average.

The National Assessment of Educational Progress (NAEP) is a test administered nationwide and aims to measure students' skills and abilities in several subjects. The test is administered to fourth and eighth grade students and serves as a measurement of where Idaho stands compared to the rest of the U.S. [4]

NAPE 2011	Average Scale Score				Percentile Rank			
	Grade 4		Grade 8		Grade 4		Grade 8	
	Idaho	Nation	Idaho	Nation	Idaho	Nation	Idaho	Nation
Mathematics Total	240	240	287	283*	50	50	54	50
Properties/Operations	238	239	286	279*	48	50	57	50
Measurement	242	238*	285	278*	54	50	55	50
Geometry	240	241	285	281*	49	50	54	50
Data Analysis	242	242	287	285*	49	50	52	50
Algebra	243	244	289	288	48	50	51	50

Table 3.3 Idaho National Assessment of Educational Progress

** Difference between Idaho and national average scores is statistically different (p<.05). Source: http://www.sde.idaho.gov/site/naep/naep2012/naep2012.htm*

In 2011, 83 percent of Idaho fourth graders scored at or above NAEP Basic in mathematics. This was greater than their counterparts in the nation's public schools (82 percent). Seventy-seven percent of Idaho eighth graders scored at or above NAEP Basic in mathematics. This was greater than their counterparts in the nation's public schools (72 percent).[5] Idaho's schools are doing comparatively well with regards to the rest of the nation.

- SAT/ACT SCORES

The ACT is a voluntary curriculum-based test which measures college readiness. It tests high school aged student's proficiencies in English, math (algebra), reading (social science), and science (biology).[6] Many colleges and universities consider ACT scores during their application and admissions process.

The Table 3.4 indicates that Idaho students who have taken the ACT score, on average, slightly higher than the national average. Here the table shows a trend where Idaho scores have been fairly consistent over the last five years in every category. Table 3.5 also illustrated that Idaho students are reaching the benchmark scores in English and reading, but on average do not reach the benchmark scores in math and science. For more information on Idaho's ACT scores, visit: http://www.act.org/newsroom/data/2011/pdf/profile/Idaho.pdf .

Table 3.4 Idaho ACT Scores Five Year Trend

**A benchmark score is the minimum score needed on an ACT subject-area test to indicate a 50% chance of obtaining a B or higher or about a 75% chance of obtaining a C or higher in the corresponding credit-bearing college courses, which include English Composition, Algebra, Social Science, and Biology.*
Source: http://www.act.org/newsroom/data/2011/pdf/profile/Idaho.pdf

	English		Math		Reading		Science		Composite	
	State	National	State	National	State	National	State	National	State	National
	20.7	20.7	21.2	21	22.1	21.5	21.3	21	21.4	21.2
	20.7	20.6	21.4	21	22.2	21.4	21.3	20.8	21.5	21.1
	20.9	20.6	21.3	21	22.3	21.4	21.4	20.9	21.6	21.1
	21.2	20.5	21.4	21	22.4	21.3	21.6	20.9	21.8	21
	21.1	20.6	21.3	21.1	22.2	21.3	21.5	20.9	21.7	21.1
ımark Scores*	18		22		21		24			

The SAT is a test of student's reasoning based on the skills and knowledge developed during their educational coursework. Similar to the ACT, the SAT is a voluntary test taken during high school and is used during the college admissions process. The SAT tests critical reading, mathematics, and writing abilities. Table 3.5 shows SAT scrores.

Table 3.5 Idaho SAT Scores Five Year Trend

Source: State Profile Report: Idaho.[9]

Year	Writing		Math		Reading	
	State	National	State	National	State	National
2006	525	497	545	518	543	503
2007	519	494	539	515	541	502
2008	517	494	540	515	540	502
2009	520	493	540	515	541	501
2010	517	492	541	516	543	501

Trends in Idaho's SAT scores over the past five years show fairly consistent scores, with the writing score varying the most. An explanation for this could be the fact that the first time the writing section was offered as part of the SAT was in 2006, so the process is still being perfected. Overall, Idaho scores quite high when compared to the national average in every category. For more information on Idaho's SAT scores, visit: http://professionals.collegeboard.com/data-reports-research/sat/cb-seniors-2010 .

BIOMASS RELATED PROGRAMS AND CLUBS -

Within the Clearwater Basin there are several programs aimed to educate school age children about natural resources within the area, logging related activities, and biomass. One such program is a forestry tour for the eighth graders in Orofino which has one station, among many natural resource related stations, where students weigh green slash and then extrapolate tons per acre per year with a corresponding financial exercise.[10] There is a similar farm and forestry fair held for fifth grade students in Orofino.[11] A forestry and natural resource tour, in the form of a three day two night camp, educates Orofino sixth grade students about sustainable logging practices, soils, and tree identification.

Imagine tomorrow is a high school problem solving competition centered on alternative energy sources and solution. Students from Idaho schools will be competing starting in 2012. This program will be a way for students to get involved in researching biomass, and also expose them to biomass related information. Topics can range from project design, community mobilization, technologies and beyond. More information can be found at: http://imagine.wsu.edu/

• SECONDARY EDUCATION:

The Clearwater Basin District's workforce is, "better educated than the state's and the nation's workforces." The post-secondary education is higher in the District than the state or nation. Also, males under the age of 64 years are above the national average for bachelor's degrees and higher education with the female population just under the national average.[13]

Table 3.6 Educational Attainment of Clearwater Basin Population 25 Years and Older

Source: CEDA CEDS.

	CEDA District		State of Idaho		United States	
	Female	Male	Female	Male	Female	Male
25 to 34 years						
High school graduates	91.1%	90.8%	87.7%	85.1%	85.9%	81.9%
Some college incl. assoc. deg.	39.5%	36.3%	39.3%	36.3%	32.3%	28.7%
Bachelors degree or higher	28.4%	28.3%	22.8%	21.3%	29.4%	25.7%
35 to 44 years						
High school graduates	91.8%	91.3%	88.7%	86.2%	86.6%	83.4%
Some college incl. assoc. deg.	35.5%	33.4%	39.3%	34.7%	33.0%	28.3%
Bachelors degree or higher	25.2%	23.8%	21.2%	22.8%	26.0%	25.8%
45 to 64 years						
High school graduates	89.6%	89.4%	88.3%	88.2%	83.4%	82.9%
Some college incl. assoc. deg.	33.7%	31.5%	38.3%	35.1%	28.9%	27.3%
Bachelors degree or higher	24.6%	29.4%	21.0%	29.0%	23.7%	29.3%
65 years and over						
High school graduates	73.1%	68.8%	73.0%	71.7%	64.9%	66.4%
Some college incl. assoc. deg.	21.6%	18.5%	24.3%	22.7%	18.0%	18.4%
Bachelors degree or higher	13.1%	18.9%	11.1%	18.6%	11.8%	20.5%

Clearwater County in the 2000 Census, "had the lowest percentage of college graduates" but overall the District "has significantly increased the educational level of its adult population in the last three decades.[15]" . Also, there has been a rise in the number of technical certificates and associate degrees from colleges.[16]

Table 3.7 Educational Attainment of Clearwater Basin by County

Source: Educational Attainment of Clearwater Basin by County. Clearwater Economic Development Association. 2011. Comprehensive Economic Development Strategy (CEDS) 2009-2014. Appendix A, pg 10.

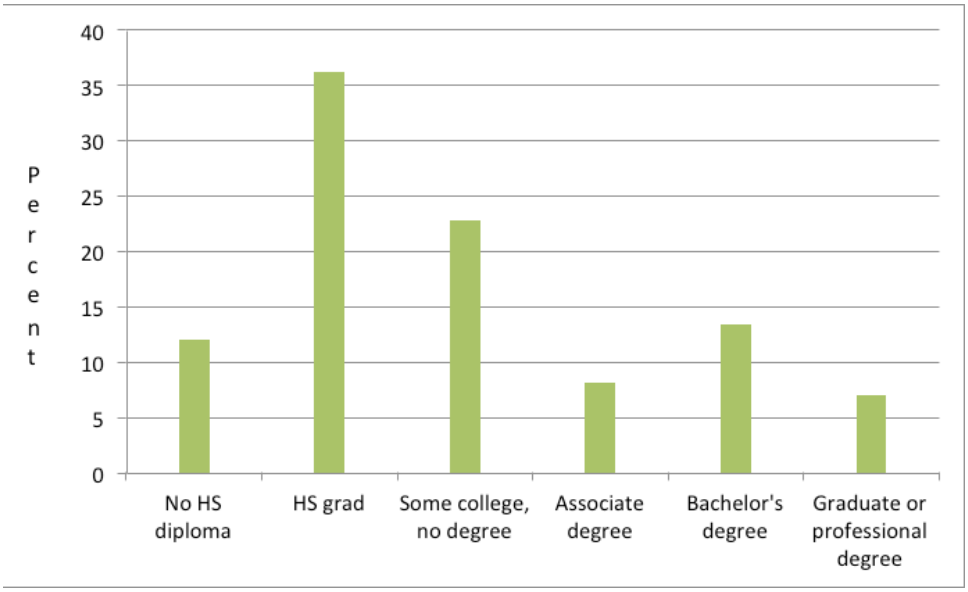
Education Profile	Clearwater County	Idaho County	Latah County	Lewis County	Nez Perce County
Education attain 2005-2009					
Population 25years and over	6,240	10,859	19,409	2,615	26,587
No High school diploma	15%	17%	7%	9%	12%
Some College, No Degree	20%	22%	21%	26%	25%
Associate Degree	8%	6%	6%	11%	10%
Bachelor's Degree	10%	10%	23%	11%	13%
Grad or Professional Degree	5%	3%	19%	3%	5%

Tables 3.6 and 3.7 show the educational attainment in Clearwater Basin and the state of Idaho. Considering the data in these tables, it can be concluded that, on average, the education attainment in Clearwater Basin is higher than the average attainment in the state of Idaho. According to the data in table-1 and table-2, Latah County has the highest education rank of the five counties in Clearwater Basin.

Figure 3.1 shows the percentage of educational attainment, which refers to the highest level of school completed in the Clearwater Basin. As it can be seen at least 80 percent of the population has a high school degree or higher.

Figure 3.1 Educational Attainment of the Population of the Clearwater Basin

Source: 2005-2009: U.S. Bureau of the Census, American Community Survey, American Factfinder,(http://factfinder.census.gov)



COLLEGES & UNIVERSITIES IN THE STATE OF IDAHO

Idaho has a number of public and private colleges and universities, which are listed below; those in bold are located in the Clearwater Basin. [17]

- STATE COLLEGES:

College of Southern Idaho: Twin falls, Twin falls County.
College of Western Idaho: Boise, Boise County.
Eastern Idaho Technical College: Idaho Falls, Bonneville County.
Lewis-Clark State College: Lewiston, Nez Perce County.
North Idaho College: Coeur d'Alene, Kootenai County.

- STATE UNIVERSITIES:

Boise State University: Boise, Boise County.
Idaho State University: Pocatello, Bannock County.
University of Idaho: Moscow, Latah County.

- PRIVATE COLLEGES:

Apollo College
Brown Mackie College: Boise, Boise County.
College of Idaho: Caldwell, Canyon County
ITT Technical Institute, Idaho College: Boise, Boise County.
New Saint Andrews College: Moscow, Latah County.
Stevens - Henager College: Boise, Boise County.
Wesley Center for Applied Theology: Nampa, Canyon County.

- PRIVATE UNIVERSITIES:

BYU-Idaho University: Rexburg, Madison County.
George Fox University: Boise, Boise County.
Northwest Nazarene University: Nampa, Canyon County.
University of Phoenix, Idaho Campus: Meridian, Ada County.

- ONLINE EDUCATIONAL TOOLS:

Idaho Electronic Campus

COLLEGES & UNIVERSITIES IN THE CLEARWATER BASIN:

Figure 3.2 shows the colleges and universities in the Clearwater Basin area. There are several programs offered at the institutions of higher education in the Clearwater Basin that could be useful in training a workforce in skills relevant to the woody biomass industry. These programs are listed under each school.

- STATE COLLEGES:

Lewis-Clark State College: Lewiston, Nez Perce County.
Programs offered at this school which can strengthen skillsets related to biomass include:

- The Agriculture and Natural Resources articulated program
- Bachelor of applied science Welding Technology
- Advanced technical certificate Welding Technology

- STATE UNIVERSITIES:

University of Idaho: Moscow, Latah County.

• The College of Natural Resources and the College of Agriculture and Life Sciences have many programs and courses that trained students in this context.

PRIVATE COLLEGES: -

Private Colleges:
New Saint Andrews College: Moscow, Latah County.

Idaho Electronic Campus

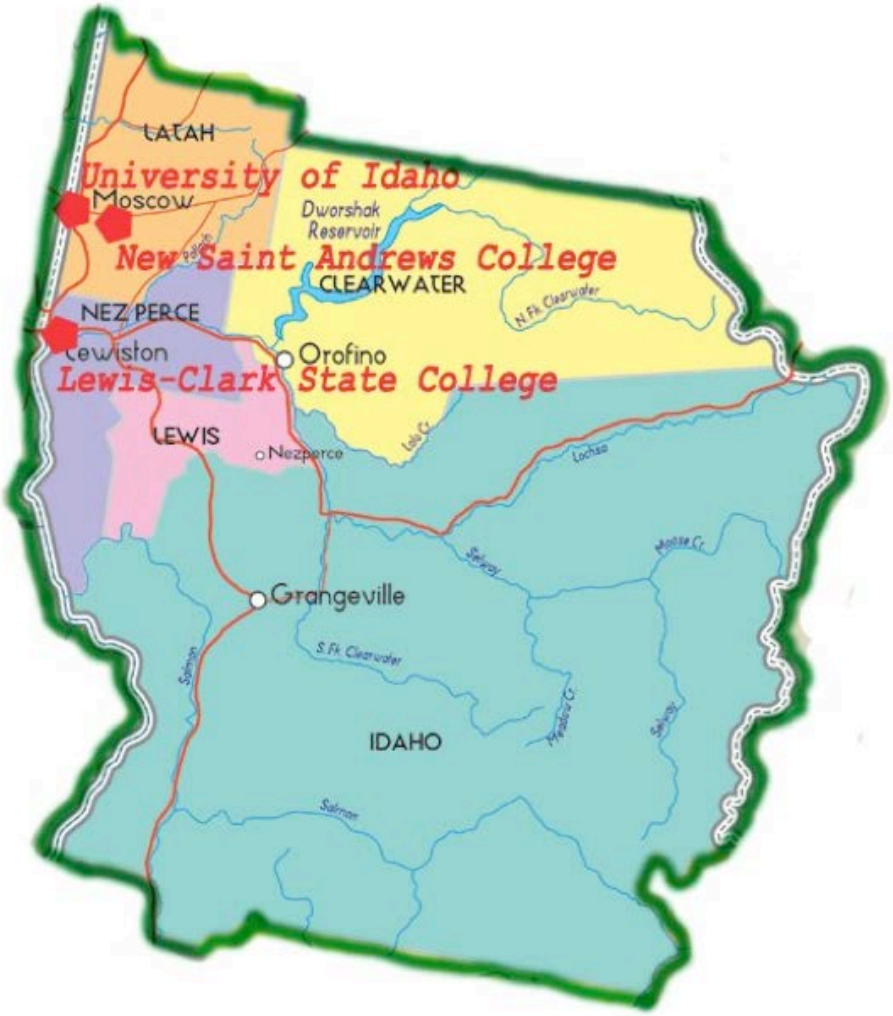


Figure 3.2 Colleges and Universities within the Clearwater Basin
Source: Idaho Map - Counties and Road Map of Idaho. 2009. http://www.ezilon.com/maps/united-states/idaho-counties-and-road-maps.html. Accessed December 1, 2011.

•

WORKFORCE

According to the Clearwater Economic Development Association (CEDA) report from 2009, "approximately 102,099 people live in the 29 incorporated communities and in the unincorporated areas of the District's 13,500 square miles."[18] These people and communities are spread across five counties: Clearwater, Idaho, Lewis, Latah, and Nez Perce. We believe that these communities may have the potential to contribute significantly to a new biofuels industry through feedstock supply, production, and distribution. With much of the land area either forested or under some form of agriculture the biological waste from crop production, logging, or other

natural resource based economic actions could be used in the bio-fuels process.
The formation of a new biofuels market will take place in two realms: the foundation of a business model and the training necessary to meet that demand. The production of biofuels will involve people on the ground collecting the biomass and processing it into a functioning product. Then a distribution chain will need to be established to bring the finished product to markets across the Northwest. Each of these three steps: supply, production, and distribution will allow the biofuels to be successful in the market place.

AVAILABLE WORKFORCE

The largest community and retail hub is the City of Lewiston with a population of 31,764. The second largest is the City of Moscow with a population of 22,798. All other communities outside of these two have between 100 and 3,200 inhabitants.[19]

- CLEARWATER COUNTY

Clearwater County consists of approximately 8,167 people living in Orofino, Weippe, Elk River, and Pierce. The City of Orofino has the largest population of 3,045 and is the county seat.[20] There are 384 different 'establishments' of employment with a total of 2943 employees. The four largest employers include: services with 39.4% of total employees, retail trade with 14.7%, public administration with 14.5% and agricultural, forestry, and fishing with 12.1%. [21]

- IDAHO COUNTY

Idaho County borders both Oregon and Montana while being the southernmost county in the Clearwater Basin. 15,448 people occupy the county living primarily in the communities of Cottonwood, Ferdinand, Grangeville, Riggins, Kooskia, Kamiah, Stites, and Whitebird. Additionally, Elk City, Fenn, Harpster, and Mount Idaho are unincorporated communities in the county with small, but recognizable populations. Grangeville with a population of 3,110 is the county seat.[22] In total there are 762 employment establishments with a total of 4,940 employees. Of those employees the majority, 72.6%, are working in locations that have only one to four employees total. The three largest categories of employers are services with 36.1% of the workforce, retail trade at 15.7%, and manufacturing at 15.0%.[23]

- LEWIS COUNTY

Lewis County contains 3,594 people a portion of the Clearwater River Basin and the Camas and Nezperce Prairies. The City of Nezperce with its 486 residents is the county seat, but the City of Kamiah is the largest in the county with a population of 1,088 residents. There are also the incorporated cities of Craigmont, Reubens, and Winchester.[24]Overall, there are 207 employment establishments with 1,047 employees. Again like Idaho County, Lewis County has 74.4% of the workforce in establishments with

only one to four employees. This county also has two primary employment designations with 45.5% of the work force in services and 19.6% in public administration. [25]

LATAH COUNTY -

Latah County, home to a vibrant agriculture and timber industry, is also home to the University of Idaho. Within Latah County there are 35,906 people living in the cities of Bovill, Deary, Genesee, Juliaetta, Kendrick, Moscow, Onaway, Potlatch, Troy, and rural areas. In addition, there are the unincorporated communities of Avon, Cedar Creek, Farmington, Harvard, Helmer, Howell, Joel, Princeton, and Viola. The City of Moscow is the county seat and home to the University of Idaho with its approximately 10,000 students.[26]Latah County has the second largest number of employment establishments at 1,366 with its accompanying 12,340 employees. It also has a larger percentage of five to nine and 10 to 19 employee establishments with one to four being 59.0% and with 18.8% and 11.5% respectively for those mentioned previously. The county also has 44.6% of the employment in services due to the University of Idaho. The second largest employer is retail trade with 25.9% of the employment market.[27]

NEZ PERCE COUNTY -

Nez Perce County contains the City of Lewiston the largest in the Clearwater Basin. The county is home to 38,975 residents spread across the cities of Culdesac, Lapwai, Lewiston, and Peck. This County also contains the only seaport in the state of Idaho, and a large paper and wood products industry both located in Lewiston. Additionally, Lewiston is home to Lewis-Clark State College.[28] Nez Perce County has the highest number of employment establishments at 1,867 with 20,983 employees. Similar to Latah County the percentage of employees at establishments with five to nine and 10 to 19 is higher than less populated counties. Establishments with one to four employees makes up 58.9% of the market, five to nine 18.6%, and 10 to 19 11.0%.2 The top three employers are in services with 38.7% of the employment market, retail trade with 20.3%, and manufacturing at 10.8%.[29]

Figure 3.3 shows the unemployment rate by county in the state of Idaho for 2011. For the 5 counties located in the Clearwater Basin, unemployment rates ranged from 15-18.9% for Clearwater, 9-11% for Idaho, 4.9-7% for Lewis, 7-9% for Latah, and 7-9% for Nez Perce.[30] This provides a recent picture of unemployment rates in the Basin, a clearer understanding about the rest of the counties in the State of Idaho, and it gives some size reference for Clearwater and Idaho Counties.

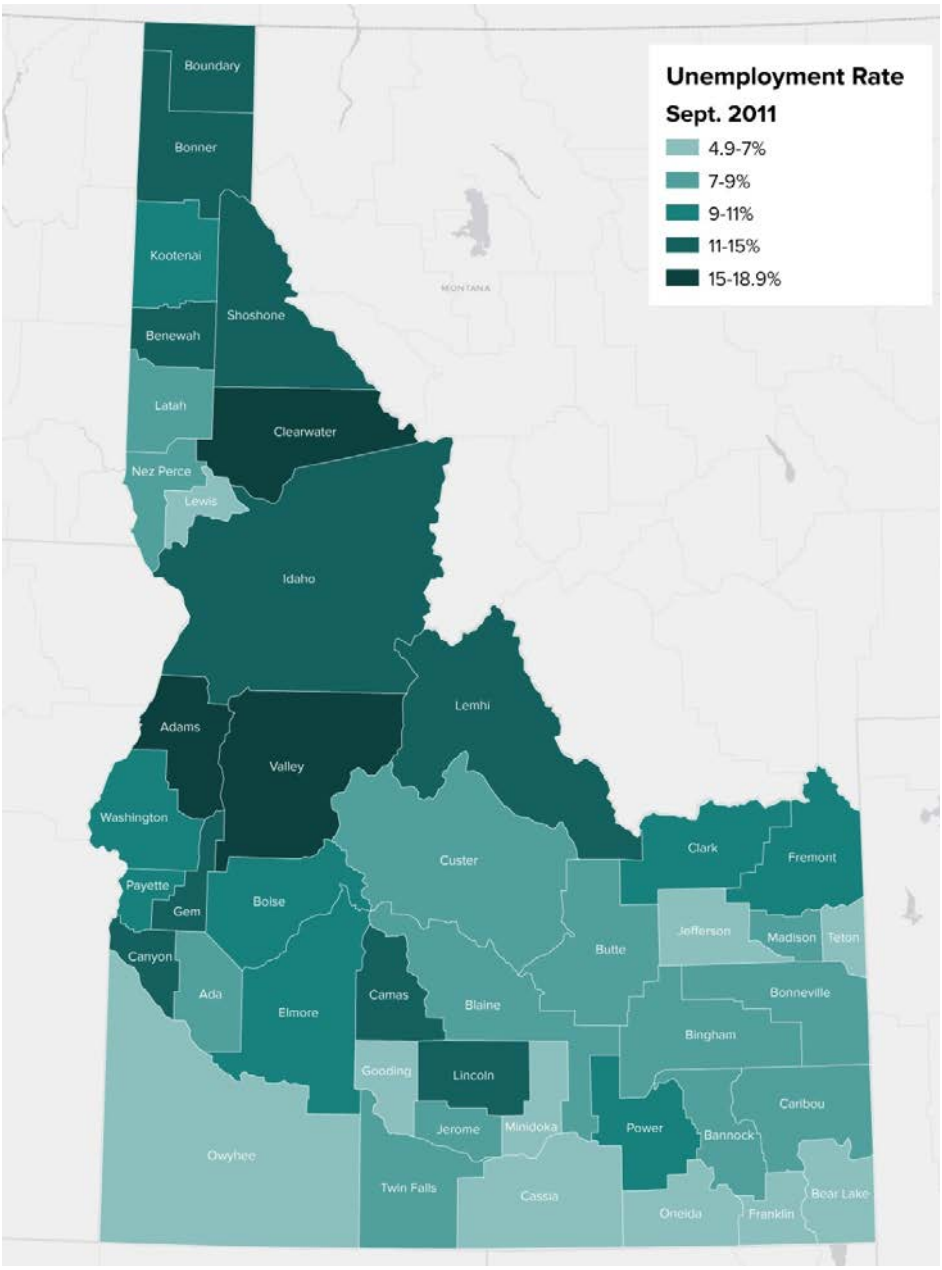


Figure 3.3 Idaho Unemployment Rate 2011 by County

Source: State Impact. Mapping Idaho's Unemployment Rate, County-by-County. Figure 1. October 21, 2011. http://stateimpact.npr.org/idaho/2011/10/21/idahos-unemployment-rate-ticks-down-thousands-still-without-work/Accessed November 7, 2011.

According to the Illuminate Report, "available workforce, specialized or skilled workforce, and quality of educational institutions" must be analyzed to see what the capacity for innovation is in a given region.[31]The average workforce age is between 25 and 65 years of age. The Clearwater Basin currently has approximately 88.6% of the population which fits into this age bracket and the majority of this group has at least a high school diploma/GED or higher. This suggests that residents in the region should be trainable on new biofuel techniques. [32] Furthermore, based on the different steps of production it would seem that the diverse level of education present in the region would allow a wide array of employment opportunities.

DEFINITION OF CULTURAL METRICS

The social attitudes and beliefs of a region can either help or hinder economic development advancements within that region. [33] For this atlas, cultural metrics will specifically pertain to the local ideas and attitudes towards the biomass industry.

REGIONAL NORMS AND ATTITUDES

Community support is an essential element in a successful project. An attempt to gauge the support of the utilization of woody biomass in the Clearwater Basin at a community level was tackled on several different levels. Community leaders provided input through surveys, several face to face informal interviews were conducted, and literature and news articles about community response to biomass in other regions were reviewed and evaluated for trends relating to advantages or obstacles which could arise from communities.

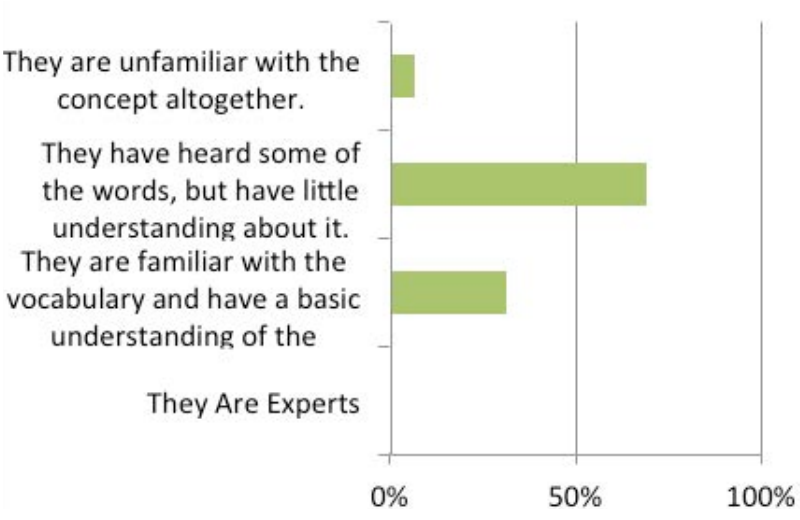
SURVEY -

To gather information about the regional norms and attitudes of the Clearwater Basin, a survey aimed to gauge the knowledge and attitudes of the different communities towards biomass was sent to 43 city, county and regional leaders. The community leaders were asked to fill out an online survey using their knowledge and perspective on their own communities. Questions focused on the amount of knowledge community members possess regarding woody biomass, benefits a community hopes to gain from the utilization of woody biomass, disadvantages or potential obstacles which could stunt a biomass project, and the demographics of the people being surveyed. Answer formats included both write in and multiple choice. There was a 37% response rate to the survey. A brief summary of what was found through the survey follows.

The first question addressed how much the general community knows about biomass. The answers showed that about 69% of the community had at least some exposure to biomass terminology.

Figure 3.4 Citizen Knowledge of Biomass Utilization

Overall, how much do the citizens in your community understand about utilizing woody biomass as a renewable energy source?



The next few questions of the survey evaluated what the communities saw as potential drawbacks and benefits of utilizing biomass in their areas. For this portion of the survey people were allowed to select multiple answers, and asked to provide an example when answering questions with "other."

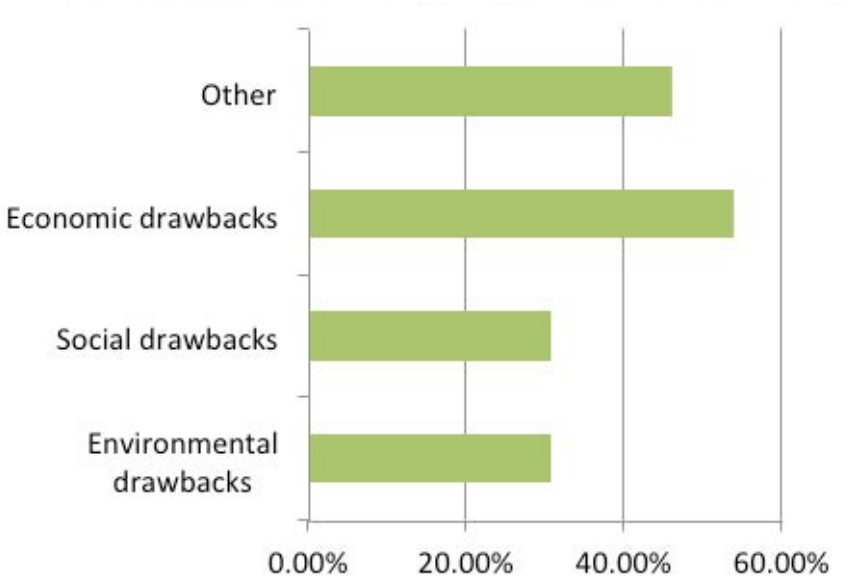


Figure 3.5 Drawbacks of Biomass Utilization

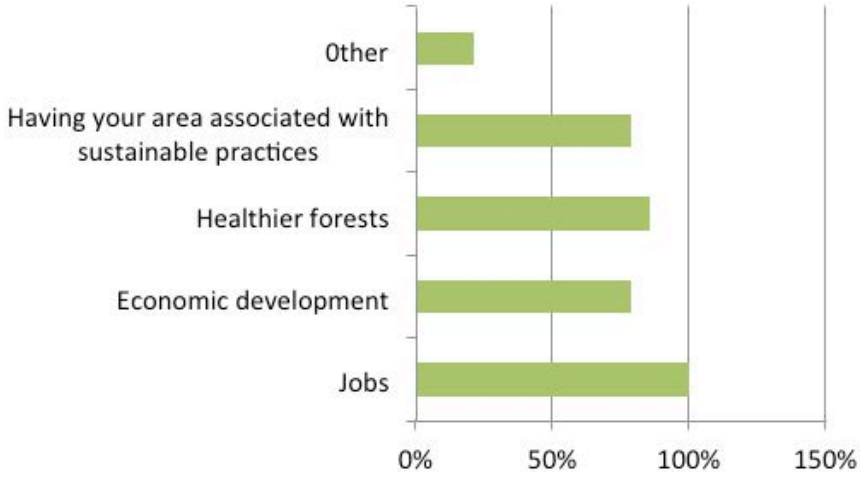
Do you see any potential drawbacks to utilizing woody biomass to produce energy in your town or community?

When asked about the potential drawbacks of woody biomass, the majority of people answered that they were concerned about economic drawbacks including the startup and investment costs. Other concerns raised were the odor a biomass facility might give off, and unreliable feedstock sources.

When discussing the benefits of a biomass as an energy source, 100% of those surveyed who chose to answer the question thought that jobs would be one of the benefits of the biomass industry to their community. Eighty-six percent said that healthier forests would be a benefit, while 79% said both economic development as well as a sustainable image would be benefits. Others thought that no benefits would be seen, and one person thought that the growth of the economy would attract more families to the school system and the school would get more funding.

Figure 3.6 Benefits from Woody Biomass

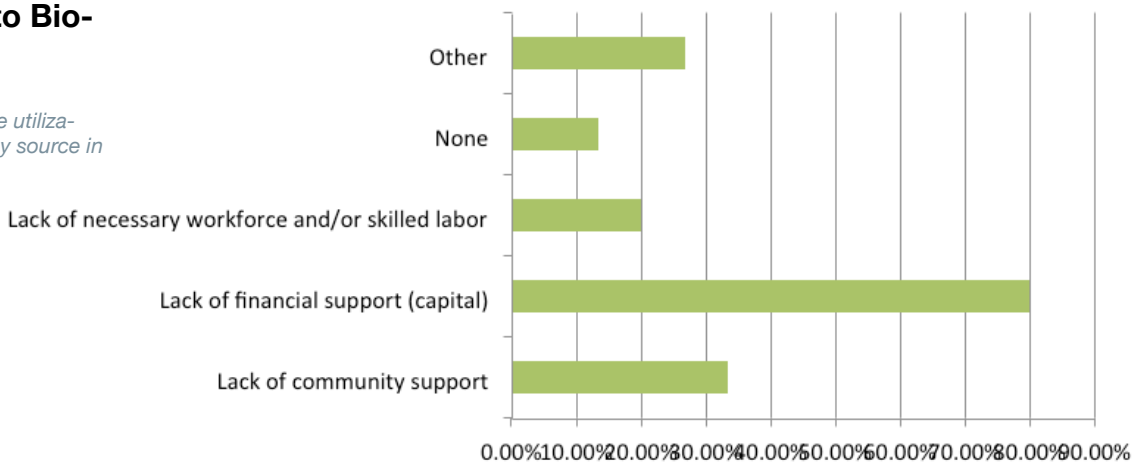
What benefits might your community hope to see from utilizing woody biomass as an energy source?



Those taking the survey saw the main obstacle to woody biomass utilization in their community as lack of financial support for projects. Fewer people thought that community support and labor would act as barriers. One person expressed concern about the cost of extraction of the feedstock, and one person expressed their concern about the amount of education and training a community might need.

Figure 3.7 Obstacles to Biomass Utilization

What obstacles do you see with the utilization of woody biomass as an energy source in your community?



Seventy-five percent of those surveyed thought that their community might benefit from some sort of informational session or presentation about woody biomass, although several people were concerned that there may not be a large turnout for such an event.

Sixty-nine percent of the people surveyed have lived in the Clearwater Basin for more than 25 years, and 67% of people were at least the second, if not third or fourth, generation of their family to live in the Clearwater

Basin. This demographic information shows that many of the people surveyed have deep roots in the community, not only as leaders but also as members.

Overall, the findings from the survey showed that community leaders in the Clearwater Basin are interested in the prospect of biomass being used in their area, and they predicted that community members would be as well.

• LITERARY REVIEW OF BIOMASS PROJECTS IN OTHER AREAS

It is important to carefully assess regional norms and values that could have an impact on community responses to the development of woody biomass as an energy source. There is growing evidence of significant resistance to using biomass as an energy source centering on the environmental impacts of biomass burning facilities. In the Pacific Northwest, where people enjoy abundant natural amenities and want to preserve them, including good air quality and healthy forests, there are several biomass opposition groups are active in the region. Even though the majority of environmentally conscious groups are located primarily on the west coast of the Pacific Northwest region, there is considerable impact these groups can potentially have on the values of the greater region, including Idaho. However, at this point, there has not been an indication that there would be a significant opposition of this nature in the Clearwater region, where economic development is a primary felt-need.

In the state of Washington alone there were two significant occasions in 2011 where community opposition to biomass burning plants blocked the implementation or construction of proposed biomass energy plants.

In the community of Vancouver, there was a land use planning and zoning dispute across jurisdictional boundaries, between Clark County and the City of Vancouver. Also, several community citizen groups began raising objections ranging from home value declines to air and water pollution.[34]

There are a diversity of stakeholders and interest groups representing varying opinions, beliefs and interests in the greater Pacific Northwest region which make the harvesting, transportation, processing, and burning of woody biomass a potentially multifaceted conflict between competing ethical values. For example, websites like http://nobiomassburn.org are an example of grass roots networking among environmental groups concerned about air and water pollution associated with biomass burning facilities. This growing network of grassroots environmental community groups has recently helped to organize protests at biomass facility projects in Olympia and Shelton, WA, resulting in those projects either being delayed or cancelled altogether.

Some other concerns that restrict the utilization of woody biomass from being harvested on public lands revolve around compliance with the National Environmental Protection Act (NEPA) of 1971. NEPA mandates all federal agencies to comply with the Council on Environmental Quality (CEQ), a committee within the Executive branch.[35] The compliance requirements are set by this committee, which can vary from agency to agency and are stringent. In addition, sometimes the process of insuring that public lands and the governing agency are complying with NEPA leaves open the possibility of being challenged by environmental groups.[36] Partially, this is due to the fact that each federal agency is responsible for creating their own internal procedures for implementing the guidelines required by the CEQ, further confusing an already ambiguous and inherently difficult interpretation process for determining NEPA requirements.

It should be noted that it is possible the cases mentioned above in Washington state involving the environmental and land use objections may not be an issue in the Clearwater Basin, which has seen recent declines in economic development and work force population.

Many of the positive aspects of biomass energy plants are realized in the potential for economic development within a region where the facilities are located. An example of a biomass energy plant that was initiated, funded, and went through the permit process and construction phases relatively smoothly is the Avista biomass plant in Kettle Falls, WA. This plant was the first biomass plant constructed in the U.S. for the sole purpose of burning biomass to produce electric energy. A study of a variety of biomass energy producing plants across the nation, and the lessons learned from their construction, was conducted by Appel Consultants and the National Renewable Energy Laboratory in 2000.[37] Avista Corporation, previously known as the Washington Water Power Company (WWP), has operated a 46-MWe (net) wood-fired steam turbine power plant at Kettle Falls since 1983. Avista is an investor-owned utility company located in Spokane, Washington. The plant site is 86 miles north of Spokane next to the Columbia River. Fuel consists primarily of lumber mill wastes from mills in northeastern
Washington, and some in Canada.

There needs to be more research regarding the cultural norms, ethical values, community acceptance, and environmental concerns in the Clearwater Basin to assess the cultural and human capital, and to ascertain the viability of biomass as an economic development option.

SUMMARY

The Clearwater Basin is a dynamic mix of people. The standardized testing scores as well as the ACT and SAT scores of the children living in the Clearwater Basin show that academically they are competitive with the rest of the nation. Test scores specifically focusing on the schools within the region fall slightly lower than the average scores seen in Idaho as a whole. The programs regarding aspects of biomass available to students are somewhat limited to the one school district in Clearwater County. The region would benefit as a whole if these programs could be expanded to other school districts within the region. Overall, the primary education system seems adequate, but would ultimately benefit from teaching students stronger math and science skills and giving them more exposure to biomass related topics and operations.

The secondary education system shows that there are numerous colleges and universities within the state, and three within the region. These institutes of secondary education provide a wide array of programs which could be applicable to biomass operations on multiple levels from harvesting and managing feedstock to scientific engineering of the materials.

There is an adequate workforce within the area which already possesses a skillset that can be applicable to biomass harvesting. The unemployment rate and diverse level of education of the region indicate that the area would be willing to fill a variety of positions. Overall, what would benefit the community most, is if willing members of the workforce had access to biofuel focused retraining to help them adapt to this new, but similar, field. Their experience with equipment, knowledge of the area, and educational backgrounds suggest that they would be adaptive to new technologies.

In terms of regional norms and attitudes, the region seems overall to be interested in the prospect of the biomass industry coming to the area. There are concerns about the feedstock harvesting process, the availability and reliability of feedstock sources, and the operational concerns (stench and smoke of a biofuel plant). This area would benefit greatly from an information session addressing issues, and a question answer session where their concerns could be answered, or at least considered.

After reviewing community responses to the biomass industry in locations within some proximity to the Clearwater Basin, it is suggested that further studies be done on cultural norms, ethical values, community acceptance, and environmental concerns which may exist in the region to adequately assess the cultural and human capital, and to ascertain the viability of biomass as an economic development option. But at the present time, based on the results of the above survey, there does not seem to be significant opposition to utilizing woody biomass as an energy source in the Clearwa

ter region. Rather, there does appear to be at least a positive starting point and a need for more community education, assessment, and interaction regarding the topic.

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ECONOMIC CAPITAL

By Abbos Akhadov, Kyle Merslich and Ross Phillips

The Economic Capital section addresses the economic viability and benefits of biomass utilization, particularly a biomass energy plant and associated markets in the Clearwater Basin. It is no secret that economics will play a large role in any project requiring large financial investments. This section analyzes the Basin's economic climate, details the benefits and costs of opening a biomass plant, and offers recommendations on the feasibility of a biomass plant. There is currently no cost information pertaining to sustainable aviation jet fuels. The biomass gasification industry business model is the most similar to that of bio-jet fuels and evaluation sheds light on the potential bio-fuel industry of Central Idaho. Concrete numbers are provided where available and relevant information and sources are included that could be useful as plans for a biomass project may develop. The purpose of this section is to provide information for prospective biomass developers and the community rather than to speculate whether any hypothetical biomass project is likely to succeed.

In this section:

ECONOMIC CLIMATE

The economic climate of the Clearwater Basin is important to understand how receptive Basin communities may be to biomass development. Basin communities, like many other communities, are struggling economically. Essentially for biomass development, this means that dependable job creation could greatly benefit Basin individuals and communities.

While numbers cannot fully portray the economic climate of a region, they are useful as indicators. The economic indicators chosen and given in the table below were population, poverty, per capita income, median household income, jobs unemployment, and wage per job. These indicators are given for the five-county Basin as a whole and for each individual county.

Table 4.1: Clearwater Basin Economic Climate

Source: http://www.indicatorsnorthwest.org/.

Category	Basin	Clearwater Co.	Idaho Co.	Latah Co.	Lewis Co.	Nez Perce Co.
2010 Population	105,358	8,761	16,267	37,244	3,821	39,265
2009 Poverty Rate (%)	17	17	21	18	15	14
2009 Per Capita Income (2010 $s)	32,150	32,076	27,956	30,423	39,668	34,775
2009 Median Household Income (2010 $s)	39,664	40,453	35,348	39,454	39,372	43,694
2010 Jobs	62,721	4,805	8,135	21,431	2,194	26,156
2010 Unemployment Rate (%)	8.7	15.5	11.6	7.9	6.3	7.3
2009 Wage Per Job (2010 $s)	32,258	31,135	30,713	29,643	25,485	35,155

CLEARWATER BASIN, IDAHO, AND U.S. UNEMPLOYMENT RATES

Although Basin unemployment follows statewide and nationwide trends, it was lower than the state and national levels in 2009. However, it remains clear that unemployment is of concern in the Basin.

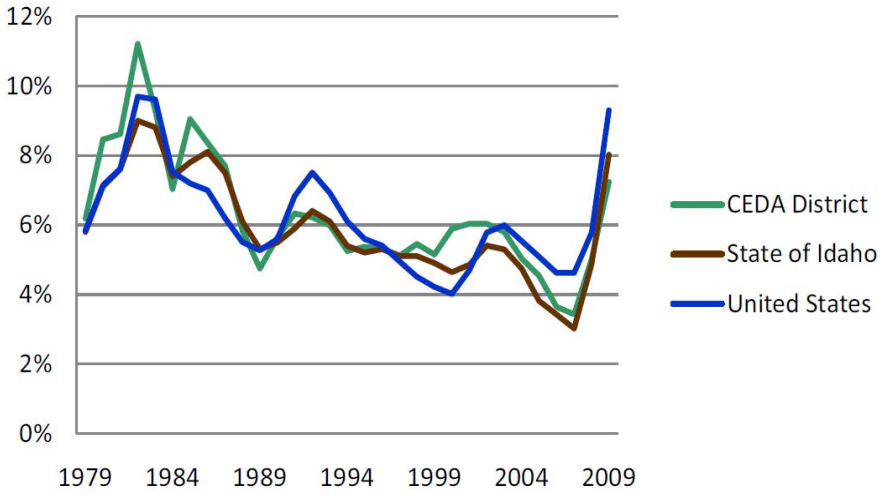

Table 4.2: Clearwater Basin, Idaho, and U.S. Unemployment Rates

Source: CEDS p. 59

TAX BASE -

In addition to providing needed jobs, biomass development could increase local county tax bases. Tax rates are highly site-specific because they are the sum of overlapping tax levy areas for services such as ambulance, cemetery, and school. For example, there are roughly 120 tax code areas in Clearwater County alone. The annual tax rates range from a low of around 0.009315087 (0.932%) to a high of 0.017559766 (1.76%). Statewide, the average urban property tax rate is 1.275% and the average rural property tax is 0.832%. To calculate the property tax of a given property, the county assessor would appraise the property based on the value of the land and improvements on the land. The appraised value would then be multiplied by the applicable tax rate. Because the tax rates are so site-specific, a potential biomass developer would need to contact the county in which a potential site is located to find the exact tax rate for that site. An online property tax estimator should be available in June of 2012 at: http://tax.idaho.gov/i-1072.cfm.

Clearwater County collected a total of $7,516,486.62. A biomass facility appraised at $25 million would bring in $232.877 in annual taxes even in Clearwater County's lowest tax rate area assuming it did not receive any special tax exemptions. While such a potential contribution may seem relatively small, they are non-trivial. Furthermore, economic boosts from biomass development could increase property values and buying ability, in turn indirectly increasing the tax base.

INFRASTRUCTURE -

Infrastructure is essential to a biomass plant. Adequate roads are necessary to allow the transport of feedstock to processing facilities. Processing facilities themselves may be necessary to condense feedstock or convert it to a usable form. Existing facilities also provide experienced workers and established feedstock generation patterns. Power line infrastructure is necessary to make any electricity generated by a biomass plant available to its surrounding area and the "grid." Again, this information provides the big picture and resources that would need to be examined more closely in the context of an actual biomass plant plan.

The town of Orofino in Clearwater County is centrally located within surrounding timberland. It lies on a rail line with access to the port town of Lewiston, is home to logging infrastructure, has a high voltage line at the Dworshak Dam that would greatly reduce connection costs for access to the grid for sale and distribution of power. It provides an ideal location for potential biomass industry.

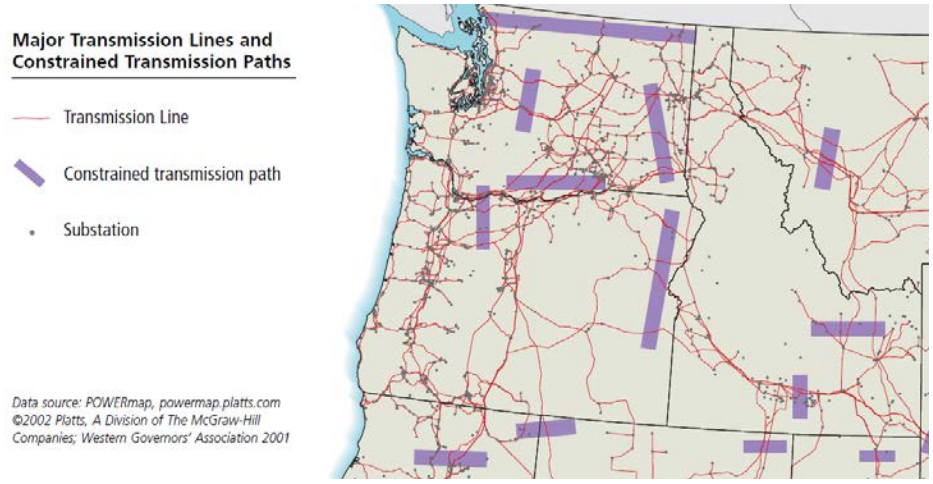

Image 4.1: Pacific Northwest Utility Lines

Source: Renewable Energy Atlas of the West, The Washington State Edition p. 4.

While this figure is not detailed enough to be useful to site an actual facility, it provides a sense of the Basin's connectivity to the surrounding region.

- LOCAL BUSINESS

The timber industry has been essential to the Clearwater Basin. Lumber and wood products jobs account for 28% of the employment in the area. In 2009, there were 18 logging companies and 5 mills in Clearwater County. The Clearwater Paper mill in Lewiston, which produces paper products and lumber, employs over 1,700 people. The average lumber and wood products worker in the basin earns $41,645 a year compared to the average annual income of $29,073 for all other workers in the Basin. Each lumber and wood products job also creates 1.77 other jobs. In 2009, there were 18 logging companies and 5 mills in Clearwater County.

	1979	1984	1989	1994	1999	2004	2009
Clearwater County	99.5%	96.1%	95.2%	92.4%	87.3%	78.3%	54.3%
Idaho County	93.7%	88.8%	88.0%	79.5%	77.7%	71.8%	43.3%
Latah County	86.1%	74.7%	68.9%	65.2%	59.7%	60.4%	60.4%
Lewis County	80.3%	96.3%	97.3%	97.6%	83.8%	69.1%	69.1%
Nez Perce County	45.1%	36.5%	26.7%	18.8%	17.8%	16.2%	12.9%

Table 4.3: Importance of Timber Industry to Basin

Source: CEDS p. 64.

This table shows the percentage of manufacturing jobs in each county that were lumber and wood products jobs.

In effect, the timber industry is a foundation of the Basin's cultural identity and economy. Its gradual decline has been a product of years of consolidation, declining profits, improved technology and poor demand both domestic and abroad. Finding new uses for timber could allow Basin residents to retain their identity while allowing them to build upon their expertise and evolve to meet modern product demands.

ELECTRICITY COSTS -

To properly evaluate the feasibility of a biomass plant, the electricity costs from existing sources must be considered. In a sense, the difference between the per unit electricity rates from a biomass plant and existing sources is a "cost" of a biomass plant that may or may not be outweighed by benefits such as job creation.

Avista Corp. provides 80% of the Basin's electricity. Other power providers include Clearwater Power Company, Idaho County Light and Power, and Idaho Power. Avista uses mostly hydroelectric power, which is very cheap relative to other sources (www.avistacorp.com). Because Avista is a public utility, its rates are set by the government.

Table 4.4: Electricity Costs per Kilowatt Hour by Region

Source: http://www.electricchoice.com/electricity-prices-by-state.php.

	Idaho	Washington	Montana	Mountain Region	Pacific Region	United States
Residential	8.04	7.97	8.99	10.61	12.55	11.53
Commercial	6.78	7.32	8.31	8.88	12.15	10.22
Industrial	5.24	3.96	5.68	6.2	7.91	6.81
All Sectors	6.6	6.61	7.58	8.72	11.37	9.91

This table shows the utility rates in Idaho, by sector, given in cents per kilowatt-hour in 2010 and compared to the rates of nearby states, regions, and nationwide. The "Mountain Region" consists of Arizona, Colorado, Idaho, Montana, Nevada, New Mexico, Utah, and Wyoming. The "Pacific Region" consists of California, Oregon, and Washington. Utility rates in Idaho are competitive within the surrounding area and nationwide.

A biomass plant would have to compete with the "status quo" or "do nothing" alternative provided by hydroelectric power. Because the producers of this established electricity source have already paid the startup costs of building the dams and because hydroelectric power is not labor intensive, it is unlikely a biomass plant can produce cheaper electricity than existing sources. However, this does not rule out the possibility that the overall benefit of a biomass plant may outweigh this difference in price. Either way, the difference between electricity costs must be known before a decision can be made.

• BIOMASS INVESTMENT- ECONOMIC BENEFITS FOR COMMUNITY

BACKGROUND -

Biomass is defined generally as "any organic matter that is available on a renewable or recurring basis, including agricultural crops and trees, wood and wood wastes and residues, plants (including aquatic plants), grasses, residues, fibers, and animal wastes, municipal wastes and other waste materials." In general, biomass is biologically derived renewable material. Although much of fossil fuel is biologically derived from ancient plants, the rate of current consumption does not classify it as a renewable resource.[4]

For example, cellulose and hemicellulose are two of the three main structural components of the great bulk of biomass resources. They are polymers of sugars and can be broken down to component sugars for fermentation to ethanol and other valuable fuels and chemicals. Lignin is the third main component of biomass; it can be extracted and used to generate heat and electricity or converted to other chemicals and products. Cellulose, hemicellulose, lignin, and other biomass components can also be processed to fuels and chemicals through thermochemical means, and both biological and thermal processing can be combined in advanced refining processes to produce value-added products and energy. [5]

- LOCAL JOB CREATION- PLANT EMPLOYMENT, FUEL DELIVERY, INCREASED LOGGING JOBS

The Biomass industry is a great producer of jobs. It is labor intensive and requires a high number of skilled workers. An estimated six jobs are created for each megawatt (MW) of biomass power capacity that is installed. These jobs include positions at the plant and also in the fuel processing and delivery sectors.

A 5-MW biomass power plant would use an estimated 123,000 green tons of fuel per year and would create an estimated 16 new jobs at the plant with payroll and benefits equal to $600,000 as well as employ approximately 18 people in fuel procurement. So, overall, a 5-MW plant would support 34 new jobs, including plant operations and fuel procurement. A 25-MW biomass power plant would use an estimated 430,000 green tons of biomass per year, but would only require one additional employee at the plant, for a total of 17 employees, and payroll and benefits for the 25-MW biomass power plant would equal $641,250. So, overall, a 25-MW plant would support 71 new jobs.[6]

- BIOMASS PLANT: CASE STUDIES

In the following section we review existing and potential biomass generating plants, providing information on how they operate, the number of employees they retain and the amount of power they generate.

Avista's Kettle Falls Generating Station, in Washington

The plant described below is a 53-MW plant. Avista's Kettle Falls Generating Station is a biomass fuel generating plant in Kettle Falls, Washington. According to the Avista website, the biomass plant began operating in October 1983 and celebrated its 25th year of operations in October 2008. The plant burns wood waste to produce steam, which runs a turbine and generator that can produce a maximum output of 53 megawatts of electricity. The plant also operates a natural gas-fired combined-cycle combustion turbine that produces 8 MW, bringing the electricity output of

the entire plant (including biomass and natural gas-fired operations) to 61 MW; enough electricity to power nearly 46,000 homes.

The plant was the first electric generating station of its kind constructed within the United States for the sole purpose of producing electricity from wood waste.

HOW THE PLANT AND BIOMASS WORKS -

• Wood waste – called "hog fuel" – is fed into a seven-story furnace/boiler and burned, creating heat. The walls of the furnace/boiler consist of pipes filled with water that are heated by the burning hog fuel. The optimal burning temperature is 2,000 degrees, resulting in a steam temperature of 950 degrees. The heated water generates stream and pressure that drives a turbine, which turns a generator, creating electricity.
• The term "biomass energy" refers to the organic matter in trees, agricultural crops and other living plant material burned to create energy. Avista's focus has centered on wood waste of various types.
• The plant burns 70 tons (140,000 pounds) of wood per hour during full operations. That amount of fuel would fill two fully loaded semi trucks. The plant removes 99.9 percent of particulates from flue gas prior to leaving the stack. (.052 pounds of particulate is released per ton of fuel burned.)

Figure 4.2: Kettle Falls Generating Station

Massachusetts-based firm, Beaver Wood Energy

MASSACHUSETTS-BASED FIRM, BEAVER WOOD ENERGY -

A Beaver Wood Energy, a Massachusetts-based firm is proposing a $150-million plant to the local officials in Fair Haven, Vermont. It would create 50 well-paying permanent jobs, 140 jobs in forestry and in the short term, 1,000 construction and other jobs during the two years it will take to build. The plant would also provide tax revenues to Vermont of $2.5 million a year and pay $1.1 million in property taxes, 70 percent of Fair Haven's yearly tax receipts, according to Beaver Wood Energy. And unlike solar and wind, the biomass plant would provide needed baseload power that is always available, which will be especially valuable if Vermont Yankee

shuts down in 2012 and the state's utilities lose the 200 megawatts Yankee currently sells to them.[9]

- ALTAVISTA, VIRGINIA AND SOUTH BOSTON STATES' BIOMASS PLANTS COMPANIES

Here is the example of employment opportunities the biomass markets are creating in Altavista and South Boston. Local landowners, foresters and loggers welcome two proposed wood-fired power plants in Altavista and South Boston. "The biomass plants that are being proposed would help the whole industry here," said Ken Scruggs, owner of ForLanCo Forestry & Land Management Company, LLC.

Depending on the market, the costs range from $15 to $25 for a ton of wood chips. Dominion Power estimates converting the Altavista plant to biomass would create about 100 new jobs in the regional forestry and trucking industries at a value of $4.2 million a year. On a separate project, the Northern Virginia Electric Cooperative is partnering with NOVI Energy to build a proposed biomass plant in South Boston. That plant would use about 360,000 tons of wood chips a year. The cooperative expects the plant to use 100 suppliers.[10]

- SUPPLY OF RAW MATERIALS

The California Energy Commission's report Roadmap for the Development of Biomass in California discusses the importance of stable supplies of biomass. The report states:
Stable supplies of biomass are critical to the long-term success of biomass conversion facilities. A common concern of industries seeking to invest in new or expanded capacity is the state of feedstock markets and the readiness of suppliers to enter into long-term contracts for particular feedstock types. Smaller scale, distributed, or portable conversion facilities may not require the same level of contracting, but they still require stable supplies with adequate storage. Fuel costs will remain a primary economic barrier to increasing use of agricultural, forestry, and dedicated crop biomass. Urban biomass, for which tipping fees can currently be charged by a separation and processing facility, may in the long-term experience greater competition as resource, leading to higher prices to the end user.

Mobilizing the necessary resources leading to the expanded production outlined above while ensuring sustainable production, harvesting, and handling practices could lead to increasing costs of supply, mitigated by continuing research to improve equipment and handling techniques and reduce costs. To encourage and support feedstock development, incentives can be applied that reward suppliers who demonstrate sustainable

practices. Such incentives could include state subsidies such as direct payments and tax credits to suppliers who can certify delivery of sustainably produced biomass. Such incentives have been applied occasionally in the past, but seldom for long enough to stimulate new plant investment. Developing a commodity market for biomass to allow broader access to feedstock by converters, and to conversion markets by suppliers, would also enhance stability of supply and potentially reduce price volatility as the market matures and expands.[11]

LOCAL TAX REVENUE -

Across the country, demand for biomass has been stimulated through tax credits, renewable energy credits, and direct subsidies. It can also be stimulated through cost penalties or taxes applied to other competing resources having undesirable environmental attributes, such as greenhouse-gas emissions. For example, fuel or carbon taxes applied to fossil fuel use or net emissions of greenhouse gases would increase fossil fuel prices and make renewable energy more competitive. Increased prices also send a direct signal to consumers: they encourage greater efficiency in use and stimulate demand for and development of more efficient vehicles, appliances, and other devices, critical to any successful economic transition.[12]

In the case of California, other approaches include carbon cap and trade systems and mandated efficiency standards, such as the corporate average fuel economy (CAFE) standard applied to vehicle sales in the United States and California's appliance efficiency standards. The effectiveness of these approaches varies depending on governmental policy. European policy, for example, that now combines cap and trade systems with previously applied fuel taxes and greenhouse gas emission reduction mandates (Kyoto protocol targets) has achieved a less energy-intensive energy and transportation system than has the US with its primary reliance on CAFE. More time will be needed to assess the recently introduced federal Renewable Fuel Standard (RFS) and the renewable portfolio standards applied by various states. In practice, a combination of approaches is likely to better achieve current policy objectives for reducing petroleum demand and greenhouse gas emissions. California has recently enacted legislation (AB 32, 2006) calling for the development of market mechanisms to reduce greenhouse gas emissions. Other legislation (AB 1012, 2006) calls for increasing the number of fuel flexible vehicles capable of using renewable fuels. Through these and other actions, California is clearly oriented toward a more sustainable energy future.[13]

TAX MECHANISMS -

Here is the excerpt from California State's tax mechanisms, loans, contracts and pricing structure. Mechanisms such as these would improve the feasibility and competitiveness of Idaho's Biomass industry.

Carbon taxes: Carbon emission caps, carbon trading systems, and carbon taxes are all mechanisms designed to help control the undesirable release of carbon dioxide and other greenhouse gases to the atmosphere. Caps are direct mandates that place limits on emissions. Carbon taxes are direct and publicly transparent. They are a way to influence public behavior to reduce fossil resource consumption and shift to other resources, improve efficiency, provide for carbon capture and storage if it can be shown to be sustainable, or most appropriately some combination of these.

Value-added taxes: Taxes on wood and selected agricultural products to finance the proper handling of these residuals can also provide incentives for reducing disposal and improving utilization. Specifically, funds collected from taxing the sales of such products would be directed to finance the sustainable collection and transportation of biomass residues from point of generation to a biomass facility. Funds collected through additional surcharges on garbage disposal could subsidize biomass users in proportion to the biomass consumed or biogas recovered for beneficial use.

Production tax credits: Providing the user of a biomass feedstock with a credit against taxes on earnings helps to offset costs of feedstock acquisition. At the federal level, the Production Tax Credit (PTC) available for residue or so-called 'open-loop' biomass lacks parity with credits available to wind and solar generators and users of dedicated energy crop or 'closed-loop' biomass both in value and duration of the credit. Parity among credits should be provided when sustainable use, even for open-loop biomass, can be demonstrated.

- ACCESS TO LOANS

The creation of a renewable-energy or green-product insurance fund, a loan loss reserve fund, or a subsidized loan program could lower the cost of borrowing for developers and reduce the risk to funding sources of making loans. Another option is to bundle projects into resource portfolios or packages. By pooling capital-intensive emerging technologies with more mature, less expensive technologies into a resource package, the overall blended risk may be more acceptable to lenders and investors.

Loan Guarantees: Government loan guarantees represent a commitment by the government to pay part or all of the loan principal and interest to a lender in the event the borrower defaults. A loan guarantee would enable a biomass business to obtain a term loan, line of credit, or letter of credit when it would not otherwise qualify for a loan. A state-backed program could provide the lender with the necessary security, in the form of a guarantee, to approve a conventional loan to a facility. Loan guarantees could be important for introducing into the market new technologies for which extensive production experience does not yet exist.

Long-term contracts: Demonstrating to bondholders an ability to repay debt service, such as through long-term contracts, is critical to the issuance of debt instruments. Long term contracts such as SO#4 established between utilities and qualifying facilities after PURPA (1978) were important in attracting investment capital. Providing new opportunities for long term contracting is one of the more important policy considerations for the state in increasing the supply of renewable energy.

Net metering: Net metering is not universally available to all biomass generating technologies. At present, net metering is available only for certain biogas facilities. Net metering policies should equitably treat all types of biomass facilities delivering equal service. Under biogas net metering, when a customer-generator is producing more power than it needs the excess is exported to the grid. That energy can then be imported without generation charges at times when the customer-generator′s usage exceeds its generation. The account is zeroed out annually and the customer generator receives no compensation for excess exports. Net metering should be revised to provide for compensation to the customer-generator for excess exports up to defined limits.

PRICING STRUCTURE -

Commodity Market: As noted under resource access, establishing a commodity market for biomass feedstock could bring stability to the sale of biomass feedstock and help reduce price volatility, especially during periods of rapid industry expansion. Similar measures have been taken with Iowa corn in the production of Ethanol with great success.

Greenhouse Gas Market: Establishing a market-system to allow trading of surplus reductions in green-house gas (GHG) emissions first requires enacting caps on the emission of GHG and establishing a baseline against which any reductions are to be measured. Potential categories for control of GHG are the electric generation sector, oil and gas extraction and refining, automobile and transportation sector, landfills, cement production, and others.

Direct Access: Direct access allows retail customers to purchase electricity directly from wholesale markets rather than from a distribution utility. Direct access could be important for increasing the market share of renewable biomass electricity by allowing companies to directly contract with generators for delivered energy.

Increase Government Procurement: Using the purchasing power of government to build demand for biomass products and technologies by requiring government purchases can also expand markets. Federal require

ments already exist, such as those under Title IX of the Farm Bill and the Federal Biobased Products Preferred Procurement Program. Similar programs at the state, county, and municipal levels would further expand the market.

Target prices and supplemental energy payments: The California Energy Commission, within the Existing Renewable Facilities Program provides production incentive payments to biomass generators for amounts above a target price for electricity. Funding for the program is collected from ratepayers of the state's invest or owned utilities and was collected from 1998 through 2001. Biomass is not clearly delineated as an eligible technology class within the emerging renewables category. Changes in the distribution and disbursement of funds under these support programs will influence the competitive pricing of biomass energy.[14]

- OREGON STATE'S BIOFUELS INCENTIVES.

Oregon continues to distinguish itself in the renewable energy sector as it breaks ground in the area of biofuels. On June 20, the Oregon legislature passed one of the most aggressive biofuels incentive packages in the United States. It sets renewable fuel standards and provides major tax and production incentives for fuel retailers and processors to produce and sell biofuels and biomass. When combined with Oregon's existing Business Energy Tax Credit, the new legislation will result in one of the most robust incentive packages in the nation for the development of ethanol and biodiesel. Governor Ted Kulongoski, an enthusiastic supporter of renewable fuels, is expected to sign the legislation shortly.

- INCOME TAX CREDITS AND PROPERTY TAX EXEMPTIONS

Oregon's biofuels legislation goes beyond just setting mandates; it also provides state income tax credits for producing or collecting biomass to produce biofuels, property tax exemptions in designated rural renewable energy development zones and income tax credits for consumers using biofuel blends or solid biofuels. Farmers and biomass collectors may claim their credit for the tax year in which they transfer the biomass to biofuel producers. The legislation provides a carry forward period of up to four years. Once the tax credit is claimed, the taxpayer may choose to use the credit or sell it to another taxpayer by a simple notice filed with the Department of Revenue. To be eligible for the tax credit, biomass must be produced or collected and used in Oregon as a feedstock for bioenergy or biofuel production. Biomass includes, but is not limited to, woody mass, canola, wheat, barley, triticale, straw, grass, camelina, flax, cooking oil or waste grease, yard debris, animal manure, and wastewater solids.

Producers of biofuels will receive state tax credits that can be used to finance up to 35 percent of a facility's capital costs through the recently amended Oregon Business Energy Tax Credit ("BETC") program. On June 25, the legislature passed HB 3201 that would increase the BETC to finance up to 50 percent of a facility's capital cost, up to a maximum BETC of $10 million. The producer eligible for a BETC may choose instead to sell the BETC to another taxpayer for cash. Senate Bill 819, which was passed by the Oregon legislature on June 23 and is expected to soon be signed by Governor Kulongoski, is intended to revive the market for the sale of these credits, helping producers that need to monetize the BETC.

The biofuels legislation also expands local property tax exemptions within a rural renewable energy development zone from $100 million to $250 million. Projects for the production of ethanol, biofuel or a verified fuel additive within the zone are eligible for the property tax exemption. No carryforward is allowed.

Individual consumers of biofuels are eligible for the Biofuel Consumer Income Tax Credit ("BCITC"), which allows an income tax credit of $0.50 per gallon of biodiesel (B99) or ethanol (E85) blended fuel up to a maximum of $200 per year for each Oregon registered vehicle owned or leased by the taxpayer. Individual taxpayers may also receive a BCITC of up to $200 per year for their purchase of biosolids prepared from forest, rangeland, or agriculture waste or residue. The BCITC is also available to consumers who purchase certain biodiesel blend fuels for home heating.

The legislation also sets technical standards for the composition of biodiesel and ethanol. In two years, the Oregon Department of Energy will conduct an impact study of the biofuels program, focusing on work force, environmental, and economic effects. [15]

Table 4.5: Federal Incentives and Policies for Renewable Energy and Efficiency

Incentive Type:	Corporate Tax Credit
Eligible Renewable/Other Technologies:	Landfill Gas, Wind, Biomass, Hydroelectric, Geothermal Electric, Municipal Solid Waste, Hydrokinetic Power (i.e., Flowing Water), Anaerobic Digestion, Small Hydroelectric, Tidal Energy, Wave Energy, Ocean Thermal
Applicable Sectors:	Commercial, Industrial
Amount:	2.2¢/kWh for wind, geothermal, closed-loop biomass; 1.1¢/kWh for other eligible technologies. Generally applies to first 10 years of operation.
Eligible System Size:	Marine and Hydrokinetic: Minimum capacity of 150 kW Agricultural Livestock Waste: Minimum capacity of 150 kW
Carryover Provisions:	Unused credits may be carried forward for up to 20 years following the year they were generated or carried back 1 year if the taxpayer files an amended return.
Website:	http://www.irs.gov/pub/irs-pdf/f8835.pdf
Authority 1:	26 USC § 45
Date Enacted:	1992 (subsequently amended)

Table 4.6: Federal Renewable Energy Tax Credits

Resource Type	In-Service Deadline	Credit Amount
Wind	December 31, 2012	2.2¢/kWh
Closed-Loop Biomass	December 31, 2013	2.2¢/kWh
Open-Loop Biomass	December 31, 2013	1.1¢/kWh
Geothermal Energy	December 31, 2013	2.2¢/kWh
Landfill Gas	December 31, 2013	1.1¢/kWh
Municipal Solid Waste	December 31, 2013	1.1¢/kWh
Qualified Hydroelectric	December 31, 2013	1.1¢/kWh
Marine and Hydrokinetic (150 kW or larger)**	December 31, 2013	1.1¢/kWh

The duration of the credit is generally 10 years after the date the facility is placed in service, but there are two exceptions:

- FEDERAL TAX INCENTIVES

Business Energy Investment Tax Credit (ITC)
· Renewable Electricity Production Tax Credit (PTC)
· U.S. Department of Treasury - Renewable Energy Grants
· USDA - High Energy Cost Grant Program (may have expired) check website
· USDA - Rural Energy for America Program (REAP) Grants
· Qualified Energy Conservation Bonds (QECBs)
· USDA - Rural Energy for America Program (REAP) Loan Guarantees
· Renewable Energy Production Incentive (REPI)

· U.S. Federal Government - Green Power Purchasing Goal
· Interconnection Standards for Small Generators (hooking up to infrastructure) [16]

EXPANDED MARKET FOR LOCAL BUSINESS -

There are many environmental, economic, and societal benefits to be realized from greater use of biomass. As a renewable resource, produced sustainably and with attention to life cycle impacts, substituting biomass for fossil resources can generate global ecological benefits. Net greenhouse gas emissions can be lowered and help to stabilize or reduce atmospheric carbon dioxide concentrations. Changes in the way biomass is produced and managed can also reduce greenhouse gas emissions.

Proper biomass use can reduce local pollutant emissions from agriculture, waste management and forestry, including air emissions from wildfires and open burning of residues; emissions from animal manure handling; methane emissions from landfills, and salt and nutrient contamination of ground and surface waters. Local, regional, and state economies benefit from biomass industry development through direct and indirect employment, tax revenues, and by enabling the expansion of other commercial, residential, and industrial development. Imports of biofuels and products can similarly benefit economies outside the state. Such development, however, needs to be accomplished with proper regard to sustainability and environmental justice on all fronts.

EXAMPLE OF EXPANDED MARKET FOR LOCAL BUSINESSES, CALIFORNIA -

The expansion of the biomass power industry after the enactment of the Public Utility Regulatory Policy Act (PURPA) in 1978 was due largely to its requirement for long-term contracts (most often Standard Offer #4) giving access to utility markets with favorable pricing based on the utility's avoided cost of production. In attempting to meet new targets for bioenergy, industry will similarly need appropriate investment opportunities. Electricity industry restructuring and the implementation of the existing California Renewable Portfolio Standard (RPS) have not yet provided the same incentives for bioenergy development. Higher costs of biomass power from stand-alone applications without CHP have so far limited access to utility markets through the RPS.

Increasing the mandated share of energy to come from renewables would likely increase access due to higher marginal prices to meet increased supply requirements. However, with additional development yet to come in wind and geothermal markets, biomass development may not occur to the extent desired to meet other environmental and resource management objectives. Implementing a renewable fuels standard would increase biomass use in the near term. Alcohols, diesel substitutes, methane, and other renewable fuels produced from biomass are not as readily produced from other renewable resources. Over the longer term, however, if hydrogen or

electricity emerge as larger energy carriers for transportation, competition from other renewables will increase.

Another approach is to impose fuel or carbon taxes reflective of the actual external costs associated with the use of fossil fuels, thereby establishing a more accurate market for biomass and renewables of all types. Like existing fuel taxes, proceeds should be used to support improvements within the sectors targeted, such as transportation. Increased investment in new and improved technologies and methodologies would result in both reduced reliance on imported petroleum and increased efficiency. Improved vehicle fuel use economy, in turn would reduce the amount of fuel used by the consumer to accomplish the same number of trips. Along with renewable energy credits, environmental credits and carbon cap and trade systems, these mechanisms can motivate change in consumer behavior leading to much greater use of renewable energy. Expanded state and local government procurement programs can also be used to provide more secure markets for biomass products.

The amount of biomass presently available for conversion could be used with existing technologies to generate electricity and heat. Permits for new facilities will be increasingly difficult to obtain unless pollutant emissions can be reduced due to the limited availability and high costs of emission offsets. Advanced generation systems with reduced emissions and increased efficiency still need demonstration. Additional biomass in the form of starch, sugars, and vegetable oils could be produced to immediately increase supplies of ethanol and biodiesel. Imported biomass is already beginning to contribute to such fuel supplies in the state. Manufacturing biofuels from most of the biomass available in California will also require demonstration of new technologies.

Working together with federal programs and through public-private partnerships, the state can encourage development of conversion capacity by helping to fund demonstrations of emerging technologies, including thermochemical and biochemical approaches. Major technologies to be demonstrated in-state include biomass-integrated combined cycles for power generation (BIGCC); biorefineries for fuels and chemicals including cellulosic fermentation to ethanol, butanol, and other fuels and gasification with Fischer-Tropsch or other synthesis techniques to produce direct substitutes for gasoline and diesel. Commercial project implementation and technology deployment will also require effective permitting and contracting processes, and coordinated regulatory assistance to expedite environmental review and ensure compliance. Deployment of standardized technologies may be accelerated by building on new or existing enterprise zones leading to region-wide environmental and other reviews and approvals. [18]

WILDFIRE PREVENTION FIRE COSTS -

The fire reports estimate 2010 suppression costs for IDL fires at $4,110,708. The expenses in this report are based on a Calendar Year (CY) fire season in order to accommodate most fire reporting systems. The ten most expensive fires of the year are shown in Table 2. These fires represent only 5 percent of the total fires, 65 percent of the total acreage, and 87 percent of the total cost.

Human activity started the most fires, but lightning fires cost the most. In the human-caused category, miscellaneous represented the most fires; however, debris burning was the most expensive. The average cost per fire was $22,463, with average lightning fire expenses being $43,286, and human-caused fires costing an average $4,001 (citation).

Human-caused and lightning fires burned almost the same area in 2010. Miscellaneous fires burned the most acres within the human-caused category. Human-caused fires cost a total of $388,071 (nine percent of the total). Of this amount, $27,460 (seven percent) of the costs was from fires attributable to negligence, and responsible parties have been billed. As of December 1, when the fire reports were completed, IDL had collected $881, or three percent, of the amount billed. IDL also collected $484,944 from prior year's billings. Table 2 describes in detail fire costs per acre.[19]

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EXAMPLE FROM IDAHO DEPARTMENT OF LANDS YEAR-END FINAL REPORT, 2010 -

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Table 4.7: Acres Burned by Cause with Costs

General Cause	Acres Burned	% of acreage	Total cost	Cost/Acre	Bill Amount	Amount Collected
Human Caused						
Miscellaneous	1,100	63%	$72,106	$66	$5,471	$0
Debris Burning	599	34%	$207,354	$346	$19,009	$0
Equipment Use	18	1%	$30,716	$1,688	$1,906	$881
Campfire	11	1%	$36,282	$3,277	$1,074	$0
Arson	7	0%	$35,857	$5,312	$0	$0
Smoking	0,7	0%	$3,255	$4,650	$0	$0
Children	0,5	0%	$2,502	$5,004	$0	$0
Railroad	0	0%	$0	$0	$0	$0
Total Human	1,736	100%	$388,071	$224	$27,460	$881
Human and Lightning						
Lightning	1,729	50%	$3,722,637	$2,153	$0	$0
Human	1,736	50%	$388,071	$224	$27,460	$881
Grand Total	3,465	100%	$4,110,708	$1,186	$27,460	$881
Collection from prior years negligent fires						$484,944
Total CY collections						$485,825

- TREATMENT COSTS

For each piece of equipment demonstrated hourly machine costs were calculated following the standard Cat Handbook Method (Caterpillar, 1997). This is clearly not an appropriate method for all of the equipment involved in these trials. However, it was used for all pieces of equipment in order to ensure comparability and standardization. For many of these equipment types, no standard for determining hourly owning and operating costs exists. Major assumptions have been made in order to arrive at hourly costs. The following assumptions were used for all equipment:

• Initial costs used were the mean of the ranges given in the system descriptions
• Machine life of five years
• Operating season of 1600 hours per year
• After five years the owner would expect to receive 20% of the purchase price for
the equipment (salvage value)
• Interest cost is 10% of the average annual investment
• Insurance cost is 2% of the average annual investment

- Property tax cost is 3.4% of the average annual investment
- Fuel cost is $1.25 per gallon
- Operator wages plus benefits is $20 per hour
- Profit and risk is 15% of owning and operating costs, excluding labor

DIVERSIFICATION AND REVITALIZATION OF LOCAL MARKETS AND INCOME -

All production costs ($/acre) are calculated based on 800 stems to treat per acre and assume a balanced system. For example, here the production cost for the Bandit wholetree-chipper assumes the system is composed of one feller-buncher, one rubber-tired grapple skidder, and one Bandit whole-tree chipper even through the production rates used here would indicate the skidder would be sitting idle at least half the time. Production rates are calculated based on the most limiting machine (the machine with the highest hours per acre estimate, in other words the slowest machine in the system) and assume an eight-hour operating day. [20]

Emerging wood bioenergy industries will provide new markets for forest resources, producing net benefits for forest health, local economies and the forest and wood products industries. Negative effects will vary by region, and they will be offset by good harvesting practices and more stable wood fiber supplies and markets over the long term.

- In 2007, nearly 8.68 million MWh of electricity were generated by electric utilities and independent power producers from wood and wood wastes.2 Federal and state standards and incentives will induce construction of additional capacity. Currently, 56% of states (plus D.C.) have mandatory Renewable Portfolio Standards (RPS), 12% have voluntary standards or goals, and 8% are currently considering an RPS.3 Federal incentives include production tax credits and loan guarantees.
- In 2007, combined heat and power (CHP) producers using wood wastes produced nearly 30.34 million MWh of electricity. Oak Ridge National Laboratory (ORNL) identifies CHP as “a proven and effective near-term energy option” to fossil fuels and has proposed a plan to increase CHP to 20% of electricity capacity by 2030. Generally, as energy prices rise, so does CHP capacity.
- The wood pellet market is growing and is expected to more than double its consumption level from 2007 to 2012. Based on announced U.S. capacity, Forest2Market estimates total wood pellet production will increase to 6-7 million tons annually by 2012.
- The Biomass Research and Development Initiative (BRDI) estimates that wood-based cellulosic ethanol production could grow from nearly zero to 4 billion gallons per year by 2022.

In addition to the environmental benefits of energy production from biomass fuels, biomass energy production provides important social and economic benefits to rural areas. These include high-quality jobs, the generation of local and regional tax revenues, and energy diversity and supply security for regional and national energy systems.

- EXAMPLE OF A JET-FUEL PROJECT

Moreover, Northwest Advanced Renewables Alliance (NARA) takes a holistic approach to building a supply chain for aviation biofuel, isobutanol, with the goal of increasing efficiency in everything from forestry operations to conversion processes. Using a large variety of feedstocks, from construction waste to forest residues, the project aims to create a sustainable industry to produce aviation biofuels and important co-products.

Isobutanol is a type of alcohol derived from cellulosic (woody) materials. Chemically it acts the same as conventional liquid fossil fuels and contains nearly 50 percent more energy than ethanol, according to project partner Gevo, a chemical research company. More than seven universities and other organizations are contributing to this project, which is divided into three research teams and two outreach and education teams. The technology for isobutanol creation already exists and is proven on a small scale. The main challenge is in scaling it up to provide realistic amounts of jet fuel, without incurring energy penalties in the production process. While significant advances could be made on improving efficiency within the current system, petroleum independence is important for three reasons — national security, reduction of emissions and the limited amount of oil available. Poplar is a plant that has been domesticated for millennia and can be grown from cuttings or planted branches, Coleman, associate professor of forestry resources, said. This allows identical plants ("clones") to be developed and bred without the need to produce seed.

The poplar is being experimented on a coppice growing system, whereby trees are planted very close together, grown for two to four years, then cut to within six inches of the ground. The trees grow back the next year and the cycle is repeated. To determine optimal growing conditions for biofuel feedstock, new plantations will be founded in eastern Washington and Idaho, western Washington, northern California and Oregon's Willamette Valley. These will be founded on "marginal farmland" and other areas not being used for food production. This lack of fuel versus food competition is a significant advantage for isobutanol. [22]

- VALUE ADDED PRODUCTS: BENEFITS OF MANUFACTURING WOOD PELLETS

Biomass also creates potential market for wood pellets. Wood pellet manufacturing secures a lot of support, due to the fact it addresses several important issues at the same time. For example, much of the wood residue used for wood pellet production is waste by-product. Producing wood pellets saves this material going to landfill, which is what used to happen, and it also cost heavily to do so. It therefore takes a costly waste material and transforms it into a valuable commodity. Wood pellets can also help to fill the gap in energy supply that that is needed due to the need to reduce our consumption and reliance on fossil fuels. No whether you personally believe in climate change or not is irrelevant. Demand for fossil fuels due to global population increase is making fossil fuels

unaffordable. Therefore the need for alternative energy sources is important purely on the basis of energy independence, never mind carbon emissions and climate change. Wood pellet manufacturing and other forms of fuel pellet production can help to form a new generation of energy, including wind, solar, geothermal and others.[23]

DIVERSIFICATION AND REVITALIZATION OF LOCAL MARKETS AND INCOME -

Research and technological innovation will lead to higher electrical conversion efficiencies and lower generation costs with biomass. After 2025, advances in plant biology and biotechnology will produce new energy products with substantial benefits.

Tipping fees, emission reduction credits, carbon credits or charges, environmental regulations, and other policies that charge the user for the environmental costs of energy will make biomass electricity economically competitive with other energy sources.

Open-field burning will be heavily restricted or no longer allowed. All appropriate agricultural and food-processing residues will either be processed on site or separated, collected and transported to be used as energy resources and other useful products. This will eliminate not only the need for open burning but also the need for landfilling.

If proper policies are enacted and markets permit, municipal solid waste will be source-separated
to maximize energy production and drastically reduce the material that will be landfilled. By 2050 most products will be designed to be reused and per-capita waste generation will decline. Recyclable elements will be collected and reused. Organic waste will be used through a variety of processes for energy or to produce valuable products such as fertilizers and organic soil amendments.

By 2050 all forms of transport will be much more fuel-efficient. Vehicles, ships, trains, and aircraft will be fueled by a variety of products using combustion engines, fuel cells, and other prime movers. Fuels will include gasoline, diesel, ethanol, biodiesel, Fischer Tropsch liquids, natural gas, biomethane, electricity, and hydrogen. A new distribution infrastructure and a network of fueling stations will be in place to dispense these new fuels. A much more extensive public transportation system, more efficient vehicles and transport-use patterns will all contribute to reductions in the transportation energy intensity (energy/ person-miles).

Biomass, including imported resources, will contribute increasing amounts of liquid transportation fuel. There is significant potential for use of biomass feedstocks if biofuels facilities are located near where the biomass is already gathered, such as in a landfill or a municipal recycling facility.

Forestry and agricultural residues are also large sources of cellulosic biomass. These include plant stalks, leaves, husks, and straw in addition to starch grains and oil seeds. In the longer term, the biomass industry could support dedicated energy crops specifically grown for energy use, such as switchgrass, poplars, willow, with research conducted over the near term to determine preferred crops. Sustainable yields will increase with improved and new varieties.

In 2025 cellulosic biofuels, including ethanol produced from biomass grown on marginal cropland, will be an important source and perhaps the largest source of renewable transportation fuel. Bioengineering advances will decrease production costs and increase energy yield. Biodiesel from purpose-grown crops and from food processing waste will be another major fuel, substituting for diesel. Biomethane from the anaerobic decomposition of organic wastes may be another fuel. After 2025 renewable hydrogen from biomass can make a major contribution to transportation fuel and might supplant ethanol as the largest contributor by 2050.

Technologically advanced biorefineries will produce valuable chemicals and polymers that were previously produced from petroleum, coal, and natural gas. Advances in bioengineering will revolutionize these processes.

Compost and soil amendments produced as byproducts of anaerobic digestion and other bioconversion processes, along with bioengineered products, will replace fertilizer produced from natural gas.

In rural communities near forests and wildlands there will be an increase in the number of wood marketing centers. Small trees harvested from fuel-hazard-reduction projects will be sent to these centers, sorted and used to produce the highest value-added products. If energy purchase commands a higher value, a greater percentage of this material will be used for the production of energy.

Residues from food and fiber production not used for energy generation will be used in other applications and products. Together, product and energy markets will provide stable, economic outlets for the great diversity of biomass produced in the state.

There is huge potential in Idaho's farming communities to utilize crop residues. Crop residue is defined by the Idaho Department of Environmental Quality as "any vegetative material remaining in the field after harvest, or vegetative material produced on conservation reserve program lands." The state of Idaho regulates all burning in Idaho except on the

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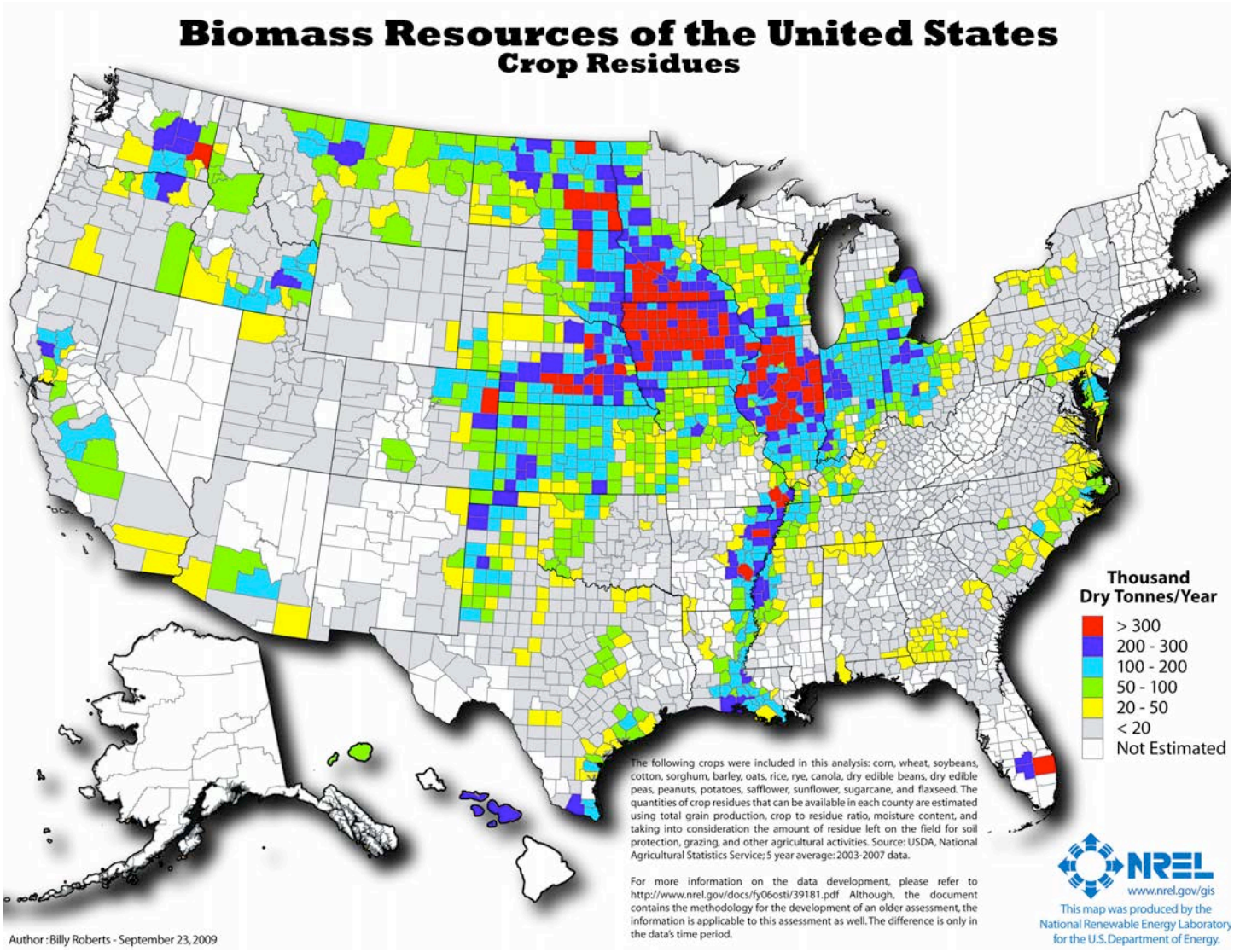
BIOMASS INDUSTRY

FUEL COSTS
- AGRICULTURE WASTES

five Indian Reservations. Idaho farmers most commonly remove crop residue through burning or on occasions bailing. The practice of burning adds nutrients back into the soil and burning residues is a way to control disease and weeds. This process occurs each year on designated burn days. The process is carefully managed, but crop residue burning like any other form of burning, creates smoke, which can endanger public health . Like any controlled burn, sometimes they can spread to other areas requiring time and money in attending to out of control burns.

Figure 4.3: Biomass Resources- Crop Residues

Source: http://www.nrel.gov/gis/images/map_biomass_crop_residues.jpg



- HARVESTING COSTS

The harvesting of agriculture residue for biomass can potentially bring added income each year to local farmers. Agriculture residues are measured in FDT (field dry tons) and contain 10% - 20% moisture content[27] . An agriculture biomass feasibility study was done for the Oregon Department of Energy in three Eastern Oregon counties (Baker, Union and Wallowa). The collection costs are broken down by swathing costs ($6/ton), bailing costs ($14 to $15/ton), and stacking costs ($5 to $7/ ton). These required a collection of at least one FDT per acre. Stacking in this instance was measured at a distance of travel no more than 5 miles. This provides an affordable business model for farmers in the region.

Other costs such as roadside storage must also be taken into account. Storage methods range from uncovered or tarp, to pole barn storage. Costs will obviously vary with each method depending on duration of storage, quantity, and location. These costs were estimated from $0 for uncovered to $7 to $25 per ton for field side stacks .[28] The value of crop residue has an estimated fertilizer value of $3 per ton or residue removed that must in some fashion be replaced. This would be paid as compensation to the landowner. As fertilizer costs vary, the monetary sum of $3 per ton of removed residue may not be sufficient as costs continue to trend upward. These totals do not include any additional payment to the landowner. It must be noted that a monetary sum must be established to compensate landowners for their goods. The ash waste from biomass plants can also be sold or given back to farm owners and re applied to soil after incineration at a biomass plant. The primary benefit of this would be a reduction in air pollution as the burning process is cleaner at an EPA regulated biomass facility as opposed to field burning.

Location			Residues	Transport	Costs ($)			
#	Latitude	Longitude	Tons	Miles	Total collection costs ($)	Total transport cost ($)	Marginal cost ($/ton)	Average ($/ton)
Union County								
1	N45 21.0	W118 2.0	11,245	0	305,684	0	27.18	27.18
2	N45 20.0	W117 53.7	22,490	8	611,367	139,526	33.39	31.32
3	N45 27.8	W117 57.5	25,449	9	691,810	160,124	33.48	32.25
Total/*average*			59,183	NA	1,608,861	299,650	NA	*32.25*
Baker County								
1	N44 47.7	W117 51.0	1,351	0	35,114	0	26.00	26.00
2	N44 52.1	W117 17.8	2,089	8	54,320	12,961	32.20	29.77
3	N44 53.1	W117 56.1	3,388	10	88,075	21,612	32.38	31.06
4	N44 59.3	W117 57.5	2,858	18	74,301	20,244	33.08	31.66
Total/*average*			9,685	NA	251,810	54,818	NA	*31.06*
Wallowa County								
1	N45 34.5	W117 31.9	811	0	21,095	0	26.00	26.00
2	N45 36.5	W117 23.9	1,210	8	31,468	7,509	32.20	29.71
3	N45 30.4	W117 23.4	1,487	12	38,659	9,748	32.56	30.92
4	N45 22.3	W117 8.4	1,538	26	39,983	11,976	33.79	31.79
5	N45 28.8	W117 4.2	1,281	31	33,313	10,542	34.23	32.29
6	N45 29.3	W117 12.1	1,458	25	37,914	11,228	33.70	32.55
7	N45 40.0	W117 1.8	1,240	44	32,228	11,617	35.37	32.94
9	N45 30.7	W117 17.8	723	18	18,809	5,125	33.08	33.21
8	N45 34.9	W117 3.9	1,391	40	36,171	12,548	35.02	33.22
Total/*average*			11,139		289,640	80,293		*33.22*

Table 4.8: Crop Residues- Resource Assessment Three Counties in Easter Oregon

Source: Biomass Resource Assessment and Utilization Options for Three Counties in Eastern Oregon. Oregon Department of Energy. http://www.oregon.gov/ENERGY/RENEW/Biomass/docs/EOBRA/FullText.pdf. 2003

AGRICULTURE TRANSPORTATION COSTS -

As is the case with all biomass, it is ideal that a power plant be centrally located- in this case choosing a supply physical center with a radius of 60 miles is ideal. The cost of transportation is measured in distance. Transportation costs gathered from a Rice Straw Feedstock Study in California found a fixed cost of $5.50/ton plus $0.088/mile. This produces a 50-mile haul that would cost about $10/ton. It should be noted that this study was done in 1999- accounting for current day gas prices to find a more accurate cost will be necessary. These numbers were very similar to those quoted by a local trucking firm. If access to railway is available, agricultural biomass transportation costs could be greatly reduced.

An Oregon Department of Energy study found the average cost to deliver 59,183 tons of residues to be $32.25/ton. Another study, this done by the USDA found the cost of wheat crop residue in two Kansas counties and one Minnesota county average $24.01 per ton and delivered at a cost of $2.28/ton per mile .

The USDA study also found that nationally, crop residues had the potential to displace 12.5 percent of petroleum imports and 5 percent of national electricity consumption. The harvesting of crop residues for biomass could force farmers to increase their use of fertilizers but the potential exists and with improved farming techniques and a declining livestock demands there is room for growth in this field.

Figure 4.4: Hog Fuel

Source: http://www.umt.edu/biomassplant/imx/bioboard3.jpg

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The USDA study also found that nationally, crop residues had the potential to displace 12.5 percent of petroleum imports and 5 percent of national electricity consumption. The harvesting of crop residues for biomass could force farmers to increase their use of fertilizers but the potential exists and with improved farming techniques and a declining livestock demands there is room for growth in this field.

- WOODY BIOMASS

The Clearwater Basin holds tremendous biomass potential. Its woody biomass is defined as forest slash, limbs, stumps, small diameter woods, agricultural trimmings, mill residue and urban wood waste. These wastes are chipped into hog fuel and have different grades based on dirt and bark content. The five counties have over 400,000 BDT (Bone Dry Tons) of wood wastes currently available. Much of the slash is burnt in the forest. The Idaho Department of Environmental Quality (DEQ) “recognizes that slash burning has its benefits, but improperly managed burns can create excessive smoke and adversely impact communities and public health ”.

- WOODY BIOMASS TRANSPORTATION COSTS

Transporting woody biomass in the Clearwater Basin is subject to a steeper terrain and at times challenging weather. Transportation data using a 60-mile or less radius is ideal for the region. As a whole, this will produce more affordable transportation costs. A 25-ton trailer would cost $3.75 per mile at 15 cents per ton/mile. On a 60-mile trip it would cost $225 per load. Transport of woods by railroad would reduce transportation by up to 35% on trips of over 80 miles (not including costs of railway operation and rental).

The savings for example on the 26-mile railway between the potential

Jaypee site and town of Orofino may not be that high (35%). If wood and wood products were shipped by rail to the port town of Lewiston, ground-shipping costs would be greatly reduced and provide access to larger markets. Due to fluctuating fuel prices it is difficult to forecast future transportation costs. However, the initial investment of repairs to the rail line in the long run if the upward trend of fuel prices continues, could provide a net savings to any potential investor.

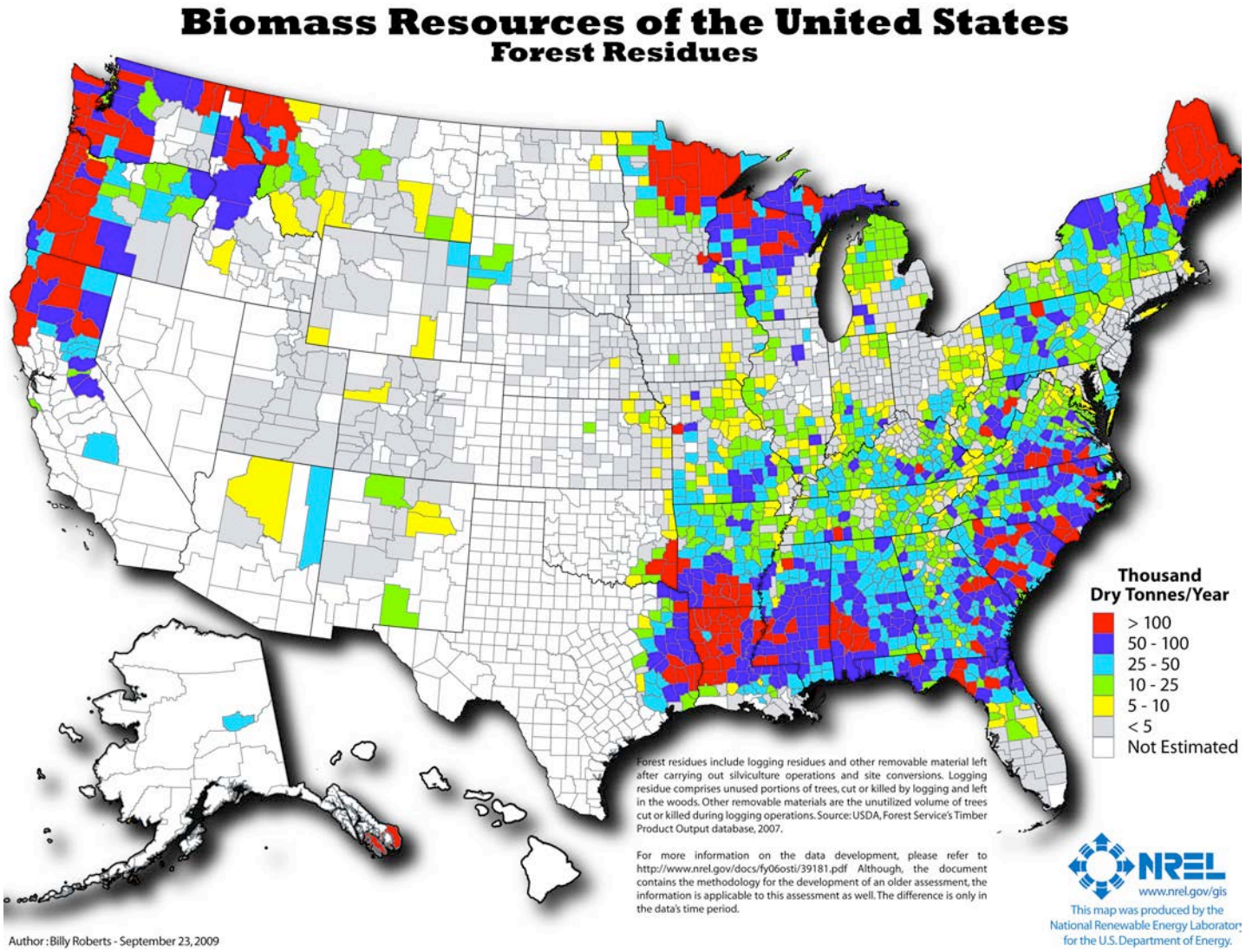
Image 4.5: Hauling Logs

Source: http://farm3.static.flickr.com/2429/3972984698_c047c85a63.jpg

FOREST RESIDUES -

The most common form of biomass available in the Clearwater Basin are woody forest wastes (below). These wastes include logging residues such as limbs, stumps, and tops of trees. Currently, these wastes are either burned on site or at wood processing plants. In some areas, these wastes can even be thrown away into landfills when air quality becomes an issue

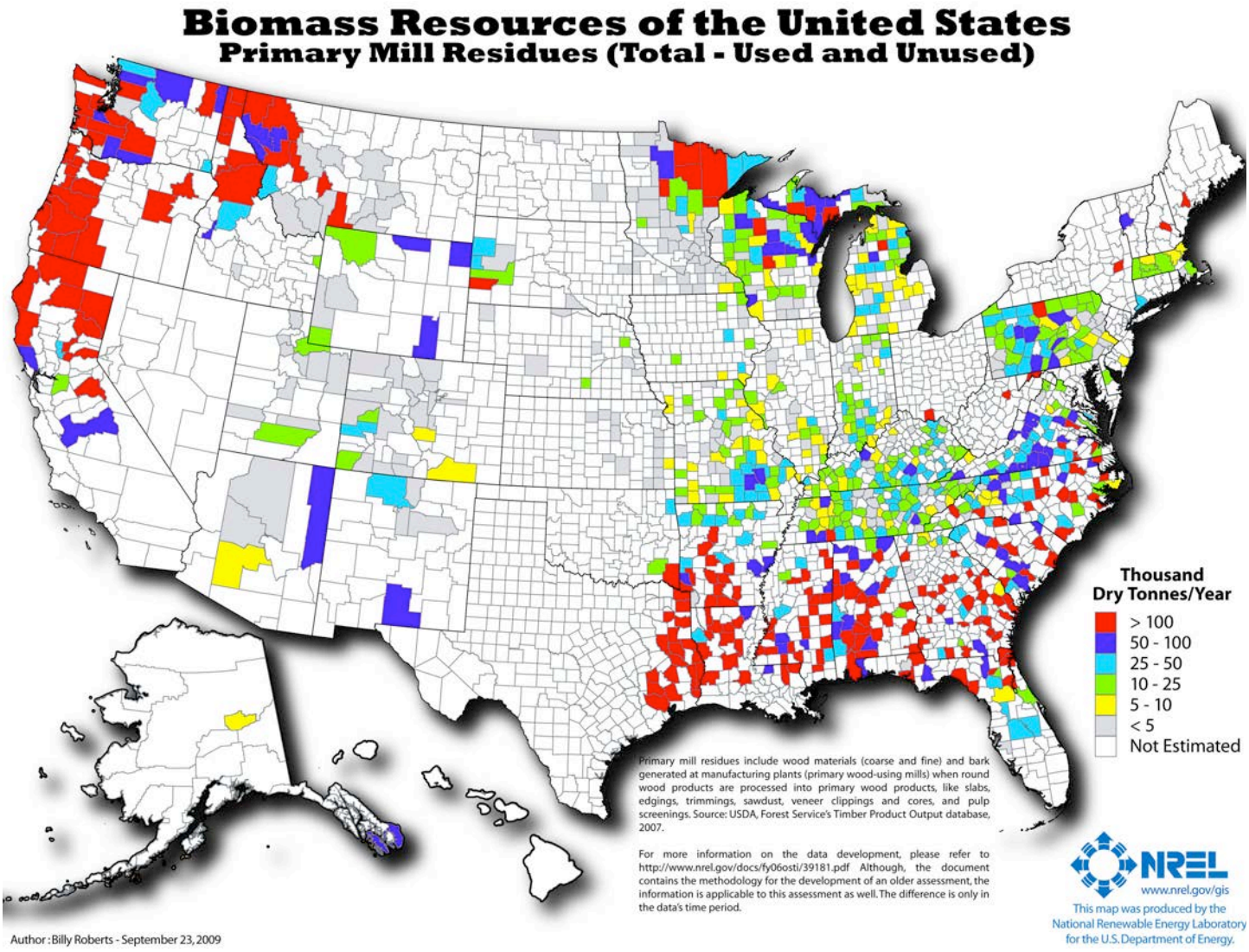
The Clearwater Basin has extraordinary natural potential in the biomass market. According to University of Idaho Professor Jay O'laughlin it contains over 400,000 bone-dry tons of sustainable woody biomass. Only a fraction of the country has the combination of both infrastructure and natural resources and they hold great growth potential for the local economy.



Source: http://www.nrel.gov/gis/images/map_biomass_forest_residues.jpg

- PRIMARY MILL RESIDUES

These residues are generated at lumber mills in which trees are processed into higher-grade wood products such as trim and plywood. The remaining residues are then frequently burned as a means to either kiln dry wood onsite or in energy production when running a manufacturing plant.
Primary mill residues are not a very common and reliable source of wood in most parts of the country (see map above). However, the Pacific Northwest and the Clearwater Basin have a particularly large amount of residues available.



Sources: http://www.nrel.gov/gis/images/map_biomass_primary_mill_residues.jpg

BIOMASS COSTS -

For this atlas, we will focus only on woody forest residues and their costs. Primary mill residues while significant are nearly completely utilized by manufacturing companies for the production of energy in plant operations. As a result, forest residues will be the main focus and supply of fuel throughout the basin.

Price of fuel is the primary factor in establishing a price per kilowatt-hour for electricity sales. The quality of fuel plays a large role in the efficiency of production. General prices listed in bone dry tons do not account for quality of chips. Frequently, these listed prices are expected to include a certain allowable amount of bark and other such lower quality hog fuel. The use of clean paper grade wood chips provides a cleaner and more efficient burn but will also cost around $60 per BDT. The University of Moscow for example currently uses higher quality chips at just over $60

per BDT and continues to save the university up to 5,000 dollars per day and 5 million dollars per year. [34]

Figure 4.8: Chipped Woody Biomass

Source: http://www.timberexchange.com/img/wood-chips.jpg

It should be noted that the below listed biomass estimates account for sustainable forest health, fire hazard thinning and logging residues. It should also be noted that Idaho's timber harvests on federal lands have been dropping for decades now. They are currently at their lowest levels since 1952. [35] There lies huge potential in the federally held lands in the Clearwater Basin when federal lands are again opened.

According to the findings of Jay O'Laughlin of the University of Idaho, the Clearwater Basin has the potential to sustain biomass gasification as a power source in the region. A 25 MW (megawatt) biomass plant will burn an estimated 200,000 BDT (Bone Dry Tons) of wood per year. [36] To put this is perspective, the total tonnage of the Clearwater Basin would provide enough wood for nearly 50 MW of electricity production per year.

Fire Hazard Thinning				Logging Residue			
County	Public	Private	Private Land Thinning	Public	Private	Unused Mill Residues	Total
Clearwater	43,459	20,010	0	26,046	76,664	42	166,221
Idaho	64,578	8,538	4,394	3,971	35,331	122	116,935
Latah	9,663	20,842	8,189	5,288	45,621	0	89,603
Lewis	0	988	2,575	0	13,136	0	16,700
Nez Perce	0	0	3,928	0	3,148	0	7,076
Totals	117,700	50,384	19,086	35,305	173,900	164	396,535

Source: Idaho Forest Supply Estimate by County. Phillip S. Cooke, Jay O'Laughlin. Jan. 24, 2011.

Table 4.9: Forest Biomass Supply at $25 per Bone Dry Ton (BDT)

Source: Idaho Forest Supply Estimate by County. Phillip S. Cooke, Jay O'Laughlin. Jan. 24, 2011.

Table 4.9: Forest Biomass Supply at $25 per Bone Dry Ton (BDT)

Source: Idaho Forest Supply Estimate by County. Phillip S. Cooke, Jay O'Laughlin. Jan. 24, 2011.

	Fire Hazard Thinning			Logging Residue			
County	Public	Private	Private Land Thinning	Public	Private	Unused Mill Residues	Total
Clearwater	60,010	26,869	0	21,908	74,950	42	183,779
Idaho	64,578	9,262	4,394	3,971	35,150	122	117,477
Latah	9,663	22,968	8,189	5,288	45,089	0	91,198
Lewis	0	4,092	2,575	0	12,361	0	19,028
Nez Perce	0	0	3,928	0	3,148	0	7,076
Totals	134,251	63,191	19,086	31,167	170,698	164	418,558

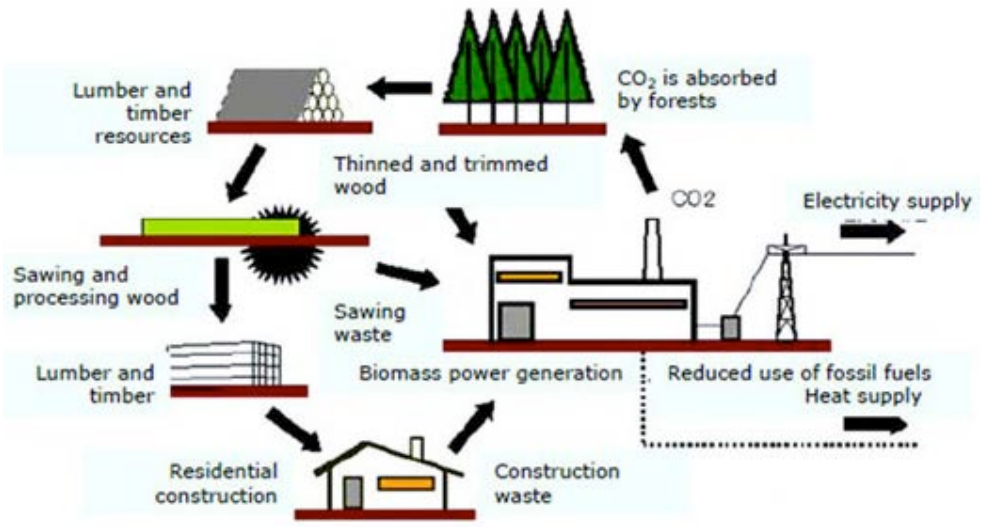
BIOMASS PLANT -

The most common form of biomass gasification plant used is a direct combustion system. This technology is widely used in Europe, Asia and here in the United States. Gasification technology has been used for well over 100 years beginning with coal and peat as fuel sources. Biomass gasification looks to hold a promising future in this age of unstable fuel prices and sources, providing communities with increased financial opportunity and energy flexibility.

Combustion systems convert woody biomass such as chips, pellets, and cordwood into thermal energy by burning fuels (wood) in the presence of oxygen. The thermal energy is used in the production of steam that is able to produce electricity. After the steam is passed through the generator, the hot water is circulated back into the system or sold to the surrounding community in the form of heat for homes, commercial buildings and campuses.

Figure 4.9: Woody Biomass Process

Source: http://i234.photobucket.com/albums/ee274/biopact3/biopact_woodybiomass.jpg?t=1223291454



- COSTS

Costs

The initial capital investment in a biomass plant can be substantial. Many small communities express interest in a small 1 or 2 MW (megawatt) facility with the intent of heating a small industrial campus or school. A 1 MW biomass plant in Orofino, ID has been quoted at just over 8 million dollars and a 2 MW project will start at nearly 12 million dollars for plant, land, instillation, site preparation, etc.

The Clearwater County Biomass Feasibility Study done for the Clearwater county to assess the feasibility of a small biomass plant in Orofino, ID found, both the 1 and 2 MW biomass plants the community was interested in came up in the red as an investment. In terms of cost, the larger the plant the more efficient it is to run and the less cost per MW of power produced. The ideal size biomass plant for a commercial investor is roughly 25-50 MW. At this point, the capital to megawatt of power ratio becomes economically feasible where at 2 MW it wasn't.

Figure 4.10: Biomass Plant

Source:http://www.renewableenergymagazine.com/ficheroenergias/fotos/biomasa/ampliada/b/biomass_plant_5.jpg

Biomass Power Plant Facilities Production (in megawatts)	Annual feedstock use (Bone Dry Tons)	Plant costs (US dollars)
10	80,000	
151	120,000	40,000,0002
203	160,000	45,000,000
254	200,000	58,000,000
505	400,000	128,000,000

Table 4.11: Biomass Plant Financial and Resource requirements

Depending on the grade of fuel burned, a typical biomass plant will burn 8,000 BDT of wood per megawatt per year. The larger the biomass plant, the greater supply needed to sustain the generation of energy and jobs. Generally a 15 MW plant is the smallest commercially feasible plant. Below that, at 10 megawatts electricity can still be produced and sold to local residents and residual hot water can be sold to surrounding buildings as heat. A 10 MW plant or less would be ideal for a small community, tribe or campus looking for sustainability and energy independence.

Infrastructure: Facilities

The biomass market brings with it not only biomass power plants but also other potential industries. A chip and drying facility is a vital part of the biomass gasification process. Chips must be dried to appropriate levels for efficient energy production. The production of high quality pellets and logs for burning in homes and commercial business provides another market for local biomass and job growth for local communities. This increases the value of woody biomass for sale in both foreign and domestic markets.

Site identification and suitability combines many different variables, however physical and natural capital, are two of the primary determinates this section will address. In rural logging communities such as the in the Clearwater Basin mothballed and current mill sites are frequently ideal for biomass plants, chip storage and pellet production. They provide these basic infrastructures:

- Transportation- roads and railways to deliver woody materials
- Utilities- electricity, proximity to high voltage lines, substations
- Water- treatment of water and access
- Proximity to natural resources- woody biomass

SITE ANALYSIS: ECONOMIC ASSETS -

Biomass Plant: Orofino, ID

Four such sites have been identified in Clearwater County. For biomass gasification and energy production the Clearwater County Biomass Utilization Feasibility Study identified in the town of Orofino an 83-acre site north of the high school, hospital and Prison.[44] It has good access to an electrical substation, water access and close proximity to the Dworshak Dam and its high voltage lines for sale of electricity. The close proximity to the High School, Hospital and Prison make it an ideal site for sale of hot water as a heat source for these three buildings. The report notes that the property is currently zoned Low Density Rural District F1 and will have to be rezoned. Also, the location of the power plant on a hill above (rather than below) the sites for potential heat sales will decrease its efficiency as water will have to be pumped back up the hill using electricity.

Pretreatment Facility: Jaype Logging Site

The Jaype Mill site was in operation for more than 30 years. At its height of productivity, the mill was a primary job source for the surrounding

community providing jobs for nearly 350 employees. The multi acre site is located 26 miles from the town of Orofino with both vehicle and rail access. The railway is currently disrepair but with proper investment would provide a direct line to the port town of Lewiston and larger markets both domestic and abroad. The central location to woody biomass, size of the property, and infrastructure make it an idea candidate for a pretreatment facility. The two shortcomings at the site are, the wetlands and the potential environmental remnants from the previous use.

Figure 4.11: Value Added Materials- Pellets

Source: http://www.bournesenergy.com/uploads/images/burning_pellets.png

- VALUE ADDED PRODECTION

Konkolville Lumber Company and Brandt Lumber Mill
Value added production is the addition capital into a product such as wood chips to produce a product of greater value such as pellets, logs or even biofuels. These are more valuable than their raw chip counterparts and provide a uniform product that would be more marketable and easier to sell in large markets. Each of these sites (Konkolville and Brandt) are currently in operation. They have all necessary infrastructures (proximity to rail lines, roads and utilities) as manufacturing facilities.

As the infrastructure improves, so too the affordability for each of these projects. They are all able to produce these goods individually but as a potential biomass hub in Central Idaho, their markets will greatly expand as their collective costs drop.

- TAX INCENTIVES

The push towards diversifying the energy economy in the United States has been made possible through numerous Federal and State tax incentives. These make the initial input of capital into a facility more affordable and rewards entrepreneurs for investing in local economies. What ultimately dictates the feasibility of a project is the price of per kilowatt-hour of electricity. If Tax incentives can reduce the cost of a kilowatt of power produced at a biomass institution by even a penny or two it could make or break the project and keep the plant competitive in the long term.

- FEDERAL AND LOCAL INCENTIVES

The state of Idaho at this time does not have a Biomass related tax incentive however the federal government provides numerous tax incentives that aid in the biomass process. These opportunities range from infrastructure to energy production. The following are incentives that will need to be reviewed yearly as funding can run out and or tax credits may expire.

CAPITAL INVESTMENTS -

The initial capital investments pose the largest hurdle for local communities, job creation and energy independence. It does not appear feasible for a community or tribe to purchase a biomass plant over 5 MW in size without a second investor. And, anything under that size does not appear able to turn a profit in the short term. A small plant does provide jobs, and energy independence at a loss if this is a burden the community is willing to accept.

The primary method for a local community to entice a private investor in the form of an energy company would be tax breaks and infrastructure costs. There have been numerous plants throughout the Pacific Northwest that have been built and maintained by both local and foreign investment firms.

BIOMASS PLANT INVESTORS CASE STUDIES: IMPACTS OF BIOMASS ON LOCAL COMMUNITY -

Confederated Tribes of Warm Springs: Warm Springs, OR
The Confederate Tribes of Warm Springs are a group of local tribes who formed a company in Northern Oregon. The tribes built a 15 MW renewable energy biomass plant. The energy produced and sold on the grid is enough to provide for 15,000 homes in the area. The tribes' company didn't have sufficient funds to finance a project of that size so they teamed up with a partner. Their business plan required the Limited Partner to provide the majority of the initial capital and in turn the partner would receive the majority of tax credits for renewable energy and profits would be split between the tribes and partner. After 11 years, the tribes plan to buy out the partner and retain full ownership of the plant and all its assets. As a result of this biomass plant, the tribes hope to create 70 full time jobs in the area.

Northwest Energy Systems: Klamath Falls and Warm Springs, OR
The Bellevue, WA based Norwest Energy Systems proposed two 40-megawatt $150 million, biomass plants in Oregon. The company was poised to build, finance and operate the two 40-megawatt plants and provide electricity for over 35,000 homes.[45] The company believed that the Klamath Falls plant would produce $30 million in income and property taxes and that combined, the two companies would produce a combined $1 billion economic impact for the state of Oregon. [46]

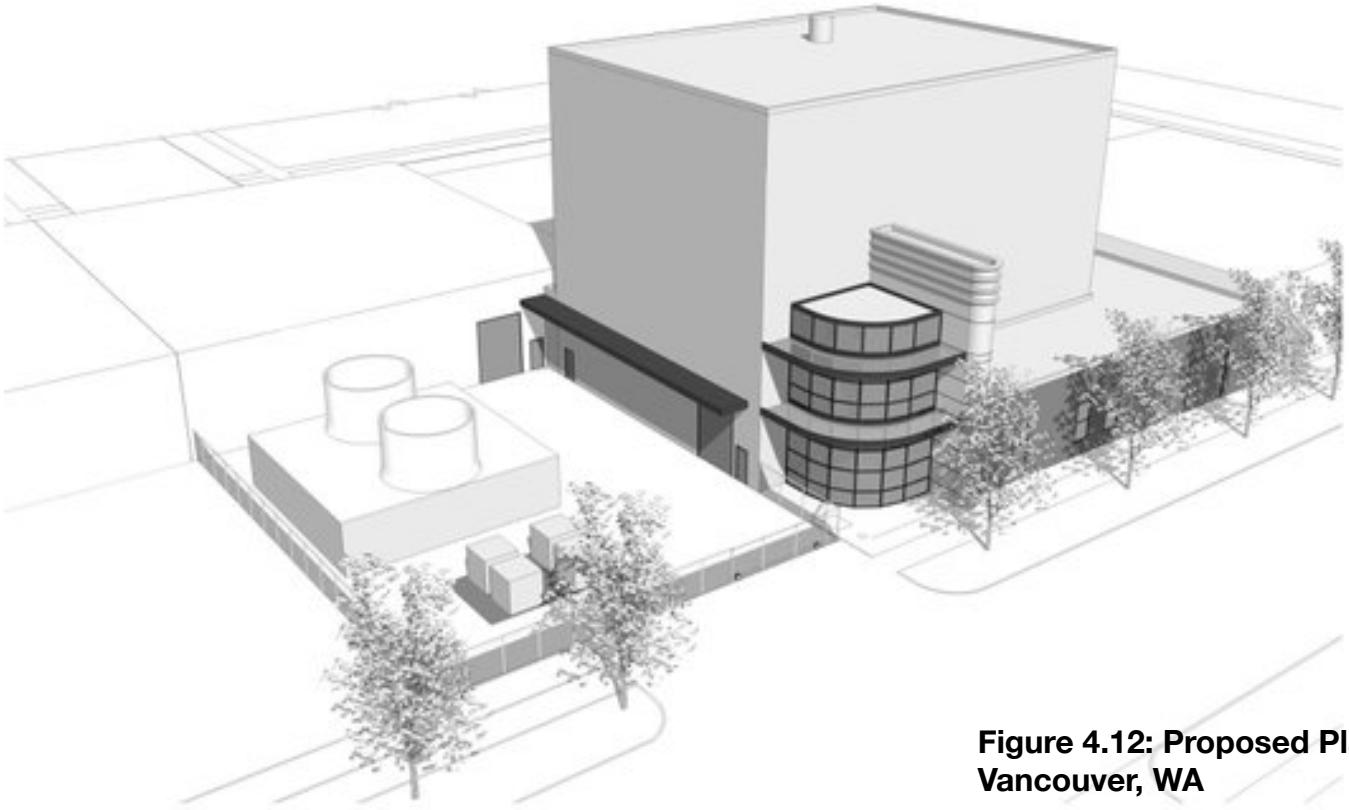


Figure 4.12: Proposed Plant- Vancouver, WA

Schnieder Electric: Vancouver WA

- IS BIOMASS COMPETITIVE?

In 2010 Vancouver Washington was approached by the Schnieder Electric- a company based in France. Schnieder wanted to build, finance and operate a 20-megawatt plant, with no financial support from taxpayers. The company had also proposed to lease the property in downtown Vancouver for $1.5 million over a 20-year period. [47] On top of the 1.5 million, local jobs and tax revenue were poised to bring in thousands of dollars per year. Due to public opposition, the project was not completed.

Biomass vs. Coal

- BIOMASS VS. COAL

Hydroelectricity in the Pacific Northwest is the least expensive power source per kWh (kilowatt hour). There is more hydroelectricity produced in the state of Idaho than can be consumed by its residents. It is a net energy exporter and apart from being very inexpensive, it provides little benefit to the local economy. Due to this inexpensive power source, Idaho has the least expensive energy costs in the nation at 6.35 cents per kWh .[48]

Coal power accounts for nearly 50% of the energy production in the United States. It releases Sulfur Dioxide and Nitrogen oxide into the air potentially causing acid rain (damaging forests) and is imported from other states into Idaho for electricity production. While hydroelectricity is most available in the winter and spring months, coal is a steady source of energy produced at just 4.97 cents per kWh. [49]

Table 4.12: Idaho Power Resource Portfolio Fuel Mix 2010

Source: http://www.idahopower.com/AboutUs/CompanyInformation/Facts/resourcePortfolio_2010.cfm

Fuel	Percentage
Hydroelectric	48.8%
Coal	43.9%
Natural Gas	2.6%
Wind	3.1%
Biomass	0.5%
Waste	0.5%
Other	0.7%
TOTAL	100%

Biomass electricity at 5.2 – 6.7 cents per kWh is just over 15% more expensive than its coal counterpart. The positive externalities of job production, reduction in pollution and tax revenue from the biomass industry makes biomass a legitimate competitor with coal in Idaho.

FINDINGS

The biomass gasification industry is the most closely related to the potential bio-jet fuel market of Central Idaho. There is great potential in the Clearwater Basin. The abundance of natural capital, infrastructure, human capital all make a promising argument for the development of a biomass hub. In order to develop an industry such as biomass in Central Idaho, the aforementioned costs and externalities must line up. The region has such potential to become a woody biomass hub, improving the lives of its citizens for decades to come. It will be up to state, local, federal and private parties to come together to get a vast project such as this off the ground- the potential exists.

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POLICIES/INCENTIVES CAPITAL

By Lanier Nabahe, Matt Janz, Anna Moody, and Xin Tan

The Policies/Incentives Capital section of the Clearwater Basin Biomass Atlas reviews policies and incentives relevant to Nez Perce, Clearwater, Idaho, Lewis and Latah counties in North-Central Idaho, as well as the Nez Perce Tribe. This section explores and identifies existing or pending policies or incentives at federal, state, and local levels, as well as at the regional level within the states of Washington, Oregon, Idaho, and Montana to support woody biomass utilization. In addition, this section includes resources pertaining to research and development in the area of woody biomass utilization in the Northwest.

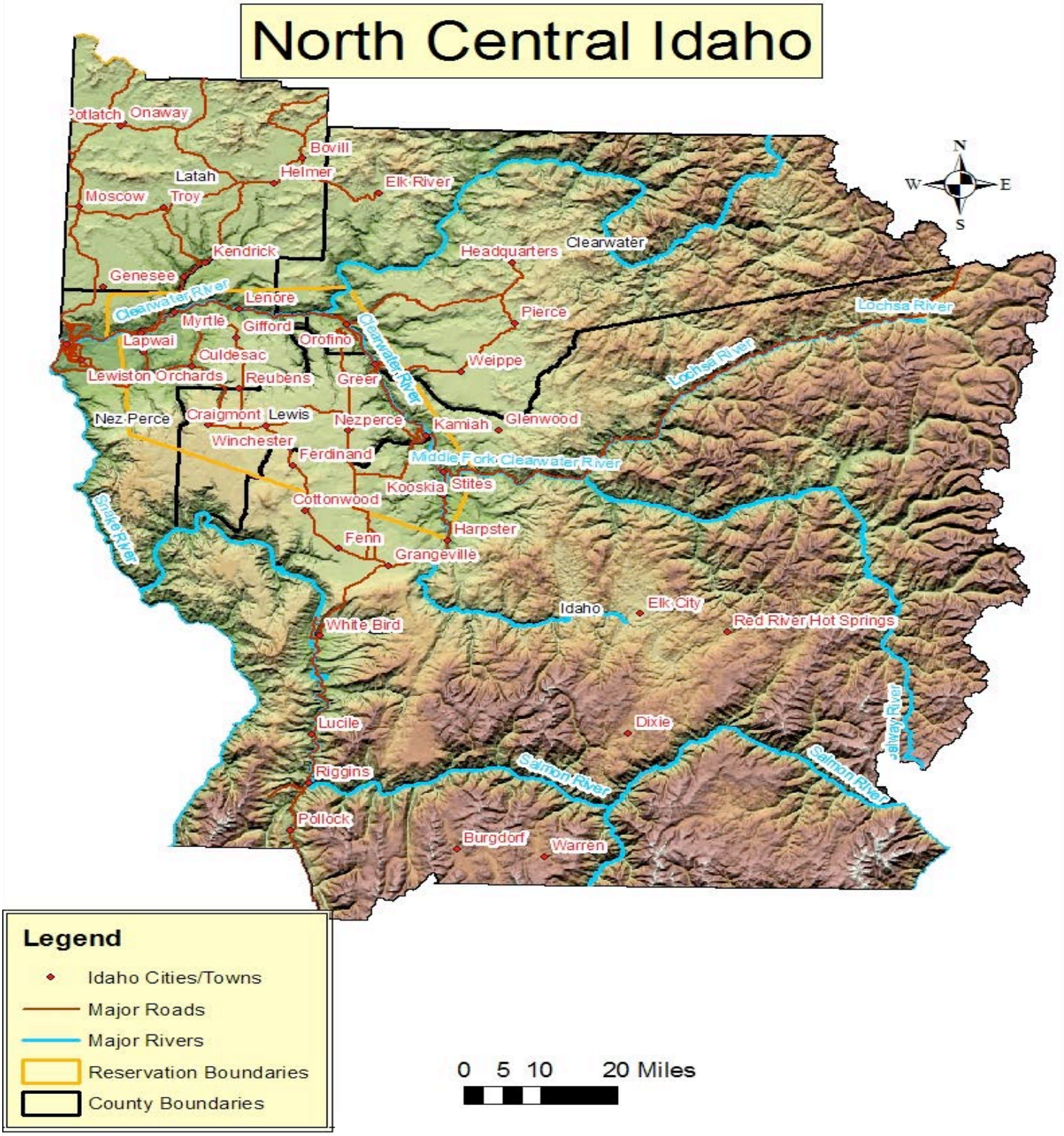
In this section:

http://brainwaves.corante.com/

The Clearwater Basin is located in North-Central Idaho, consisting of parts or all of five counties and drained by the Clearwater River. Figure 5.1 is a map of the Clearwater Basin, with several of the cities in the region labeled.

Figure 5.1 North-Central Idaho, the Clearwater River Basin and several towns and cities in the region.

Source: Jason Fales and Anna Moody utilizing ArcGIS and State of Idaho coverages.



FEDERAL POLICIES/INCENTIVES

This section provides an overview of federal policies and incentives for woody biomass utilization and energy production.

In order to maximize the efforts to utilize potential funding opportunities, several federal agencies are working on the issues of woody biomass. The following paragraphs summarize the policies and incentives that several of the federal agencies have in place, including the US Forest Service, Bureau of Land Management, and National Association of Conservation Districts.

US FOREST SERVICE -

The United States Forest Service (USFS) is an agency of the United States Department of Agriculture (USDA). This agency dedicates its mission to forest resource management in the nation's forests, for sustained yields of wood, water, forage, wildlife, and recreation. "Through forestry research, cooperation with the States and private forest owners, and management of the national forests and national grasslands, the agency strives to provide increasingly greater service to a growing Nation." [1]

• The USFS seeks to increase the amount of energy produced from forests resources in the U.S., in order to improve the utilization of woody biomass from forest management activities. There are several federal policies that relate to the utilization woody biomass from the USFS lands. These policies including, but are not limited to: The Biomass Research and Development Act of 2000, the Healthy Forest Restoration Act of 2003, and the Energy Policy Act of 2005. [2]
• The Biomass Research and Development Act of 2000 encourages collaboration between the United States Department of Energy and United States Department of Agriculture to create the Biomass Research and Development Board.

• The Healthy Forest Restoration Act of 2003 has programs to reduce accumulation of woody fuel in order to lower the risk of catastrophic wildfire.

• The Energy Policy Act of 2005 describes the federal tax credit that provide for energy production using renewable fuels, the grants for forest biomass utilization, and grants for small enterprises, training, and outreach.

• The Fuels for Schools and Beyond Program promotes and encourages the use of wood biomass as a renewable, natural resources to provide a clean, readily available energy source suitable for heat and power in public and private buildings. [3] The Council School District, in Council, Idaho, received the first Fuels for Schools grant in the state. It has been operating a woody biomass boiler since the mid-2000s. [4]

- BUREAU OF LAND MANAGEMENT

The Bureau of Land Management (BLM) is an agency of the United States Department of the Interior (DOI) which administers America's public lands. The BLM's goal is to sustain the health, diversity and productivity of the public lands for the use and enjoyment of present and future generations. Woody biomass is a part of BLM's forest product line and primarily includes restoration residues and smaller diameter material from forestry, fuels and rangeland treatments.[5]

The U.S. departments of Agriculture, Interior, and Energy produced a joint Memorandum of Understanding (MOU) to support the economic and ecological use of woody biomass. "The USFS and BLM commit to offering woody biomass for utilization as a component of all applicable contracts or agreements offered under this MOU."[6]These contracts and agreements would allow the contractor, if allowed by the government, to remove woody biomass for utilization and require payment of a minimum appraised value or payment for services. "This option would be contained in any type of contract or agreement the federal agencies utilize for vegetation management projects which are expected to generate woody biomass, unless such biomass was reserved for ecological reasons." [7]

The National Association of Conservation Districts (NACD) is the nonprofit organization that represents America's 3,000 conservation districts and the 17,000 men and women who serve on their governing boards. "The Conservation districts are local units of government established under state law to carry out natural resource management programs at the local level. Districts work with millions of cooperating landowners and operators to help them manage and protect land and water resources on all private lands and many public lands in the United States."[8]The NACD's goal is to serve conservation districts by providing national leadership and a unified voice for natural resource conservation. The NACD participates in the federal biomass MOU, which guides the processes by the agencies work with communities to improve woody biomass utilization. The MOU specifies Eight Policy Principles, which are:[9]

- Include local communities, interested parties and the general public in the formulation and consideration of woody biomass utilization strategies.
- Promote public understanding of the quantity and quality of woody biomass available from federal lands and neighboring tribal, state and private forests; as well as nationwide woodlands and rangelands.
- Promote public understanding that woody biomass utilization can be an effective tool for restoration and fuels treatment projects.
- Develop and apply the best scientific knowledge pertaining to woody biomass utilization and forest management practices for reducing hazardous fuels and improving forest health.

- Encourage the sustainable development and stabilization of woody biomass utilization markets.
- Support Indian tribes, as appropriate, in the development and establishment of woody biomass utilization within tribal communities as a way to create jobs, establish infrastructure and support new economic opportunities
- Explore opportunities to provide a reliable sustainable supply of woody biomass.
- Develop and apply meaningful measures of successful outcomes in woody biomass utilization.

There are also many incentives through the federal government, particularly the U.S. Department of Energy, promoting renewable energy and energy efficiency for private companies and states. The online Database of State Incentives for Renewables and Efficiency (DSIRE) is a comprehensive source of information on state, local, utility, and federal incentives. The database can be searched for federal incentives, state specific incentives, or by technology, such as a biomass plant.

Searching for Federal incentives for biomass plants, a list of 12 incentive programs were found, and are listed below:

- Business Energy Investment Tax Credit (ITC)
- Clean Renewable Energy Bonds (CREBs)
- Modified Accelerated Cost-Recovery System (MACRS) + Bonus Depreciation (2008-2012)
- Qualified Energy Conservation Bonds (QECBs)
- Renewable Electricity Production Tax Credit (PTC)
- Renewable Energy Production Incentive (REPI)
- Residential Energy Efficiency Tax Credit
- Tribal Energy Program Grant
- U.S. Department of Treasury - Renewable Energy Grants
- USDA - High Energy Cost Grant Program
- USDA - Rural Energy for America Program (REAP) Grants
- USDA - Rural Energy for America Program (REAP) Loan Guarantees

Additional information on any of these programs is available on the DSIRE website: http://www.dsireusa.org/incentives/.

REGIONAL -

This section provides an overview of the Western Governor's Association (WGA), a regional political organization that focuses, among other issues, on woody biomass. It includes a brief summary of what the organization is and programs of interest.

WESTERN GOVERNOR'S ASSOCIATION -

The Western Governor's Association is an independent, non-partisan organization of Western Governors from 19 states, two Pacific-flag territories and one commonwealth. "Through their Association, the Western Governors identify and address key policy and governance issues in

natural resources, the environment, human services, economic development, international relations, transportation and public management."

The WGA seeks to advance regional interests through expressing a group position and advocate this position to the federal government. With regards to woody biomass, the WGA has an initiative that they want the federal government to emphasizes woody biomass from the western region. Additionally, there is a grant program that the WGA takes part in from the United States Department of Energy.

The WGA is a proponent of woody biomass energy. Currently, they function as a lobby organization trying to rally Congress behind the idea of a Woody Biomass Initiative to establish Woody Biomass alternative energy sites throughout the West.

Additionally, the WGA oversees a grant program with its member states to look into the feasbility of biomass which has in the past included woody biomass projects. Idaho is not currently one of the 13 states to receive these grants.

- STATE POLICIES/INCENTIVES

This section provides an overview of current incentives in the State of Idaho and some comparison to incentives in the State of Oregon. It includes a brief summary of the program with: name, addresses and contact information.

- IDAHO

THE IDAHO BIOENERGY PROGRAM

The Idaho Bioenergy program is a technical organization that assists people in developing bioenergy projects. The Program's technical assistance includes evaluation of plans, referral to equipment vendors and other technical experts and assessment of biomass feedstock supply and bioenergy product markets. [12]

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cluded the recommendation that the Idaho State Legislature revisit the plan every five years. The draft 2012 Idaho Energy Plan was released October 14, 2011. The draft plan praises the use of woody biomass, but states that two impediments limit its potential: a higher comparable cost to hydropower and a perception that woody biomass is not environmental.

- IDAHO STRATEGIC ENERGY ALLIANCE (ISEA)

While Idaho does not have a renewable energy portfolio, they do have a precursor organization reviewing the implementation of such a scheme in Idaho. The ISEA is Idaho's primary mechanism

to engage in seeking options for, and enabling advanced energy production, energy efficiency, and energy business in the State of Idaho. The purpose of the Alliance is to enable the development of a sound energy portfolio for Idaho that:

- includes diverse energy resources and production methods,
- provides the highest value to the citizens of Idaho,
- ensures quality stewardship of environmental resources, and
- functions as an effective, secure, and stable system.

The Board of Directors provides options and support to the Governor's Council regarding renewable energy and energy efficiency activities for the State of Idaho.[13]

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STATE OF IDAHO'S ENERGY PLAN -

In 2007, the Idaho Legislature's Interim Committee on Energy, Environment and Technology submitted the 2007 Idaho Energy Plan, with an explicit section on woody biomass. Part of this plan included the recommendation that the Idaho State Legislature revisit the plan every five years. The draft 2012 Idaho Energy Plan was released October 14, 2011. The draft plan praises the use of woody biomass, but states that two impediments limit its potential: a higher comparable cost to hydropower and a perception that woody biomass is not environmental.[14]

STATE OF IDAHO'S OFFICE OF ENERGY RESOURCE'S RENEWABLE ENERGY ENTERPRISE ZONE (REEZ) PROGRAM -

In 2009, the state of Idaho dispersed $1.5 million in grants gained from the American Recovery and Reinvestment Act. These were given to local governments in Idaho for two purposes: the first for the purchase and installation of facilities or infrastructure to produce renewable energy within the zone or for sale outside the zone; and the second for feasibility studies, resource assessments, or marketing plans to develop, sustain, or expand the value of the zone. Unfortunately, this was a one time expenditure, but it was considered successful and may have additional support and funding in the future.

Below is a list of expenditures for this program.[15] Clearwater County was one of the recipients of the REEZ grant. The county utilized this grant to hire consultants to conduct a biomass feasibility study for energy and power at a facility in Orofino, Idaho. This study is referenced in the local section of this Atlas.

City/County	Project Name/ Type	Award Amount
INTEREST AREA #1	Purchase and installation of facilities or infrastructure to produce renewable energy within the zone or for sale outside the zone.	
Kootenai County	Landfill Gas-to-Energy	$205,000
Twin Falls County	Milner Butte Landfill Gas & Wind	$154,000
City of Sandpoint	Woody Biomass Combined Heat & Power -Sandpoint CHP Feasibility Study	$250,000
City of McCall	Solar City Project	$171,957
City of Nampa #2	Wastewater Biogas Boiler System- Final Report	$143,738
City of Franklin	Solar & Hydropower Projects	$45,000
Area 1 Total		$969,695
INTEREST AREA #2	Feasibility studies, resource assessments, or marketing plans to develop, sustain, or expand the value of the zone.	
City of Nampa #1	Amalgamated Sugar Biogas Feasibility Study -Final Report	$37,290
Adams County	Woody Biomass - Business Plan	$70,000
Boise County	Woody Biomass Combined Heat & Power - Boise County Feasibility Study	$140,000
Clearwater County	Woody Biomass Feasibility Report- Final Study	$140,000
City of Hailey	Resource Recovery Center Feasibility Study - Final Study	$130,000
Clark County	Waste-to Energy Plant - Clark County Biomass Feasibility Study	$113,015
Area 2 Total		$530,305
REEZ Program Total		**$1,500,000**

Table 5.1 Renewable Energy Enterprise Zone Program Summary

Source: http://www.energy.idaho.gov/stimulus/enterprise_zoneprogram.htm.

- RESIDENTIAL ALTERNATIVE ENERGY TAX DEDUCTION, IDAHO CODE § 63-3022C

This statute creates a 40% income tax deduction of the cost of installing biomass for heating or electricity generation. Taxpayers can apply this 40% deduction in the year in which the system is installed and can also deduct 20% of the cost each year for three years thereafter. The maximum deduction in any one year is $5,000. The total maximum deduction is $20,000. The biomass devices can be a pellet stove or an wood stove with EPA certification if it's installed in the residence of the taxpayer, replaces a wood stove that does not meet EPA certification requirements, the purchase and replacement happens in the same year, and the replaced wood stove is dropped off at a Department of Environmental Quality (DEQ)-approved site within 30 days.[16]

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Fax: (208) 334-7846
E-Mail: taxrep@tax.idaho.gov

RENEWABLE ENERGY PROJECT BOND PROGRAM, IDAHO CODE § 67-8901 ET SEQ. -

This legislation allows the Idaho Energy Resources Authority to give bonds to finance construction of electricity generation and transmission projects by public utilities. Public utilities include independent renewable energy producers that are not "qualifying facilities" under the federal Public Utility Regulatory Policies Act of 1978 (PURPA). This program defines renewable energy as "a source of energy that occurs naturally, is regenerated naturally or uses as a fuel source, a waste product or byproduct from a manufacturing process including, but not limited to, open or closed-loop biomass, fuel cells, geothermal energy, waste heat, cogeneration, solar energy, water power and wind." [17]

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OREGON

RENEWABLE PORTFOLIO STANDARD -

This is an Oregon Initiative that utilities must have a certain percentage of their electric generation from renewable sources including biomass. Large utilities, which are defined as those that supply 3% or more of Oregon's electricity must show that electricity used by instate consumers be created by renewable energy in the following amounts: 5% by 2011, 15% by 2015, 20% by 2020, and 25% by 2025. Similarly, small utilities, which provide between 1.5% and 3% must have 10% by 2025 and the smallest utilities must have 5% by 2025. [18]

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OREGON'S BIOMASS PRODUCER OR COLLECTOR TAX CREDIT -

The state of Oregon offers a tax credit to producers and collectors of biomass that is used in Oregon as biofuels, or to produce biofuels or biogas. Oregon Department of Energy has entered rulemaking to implement changes made by HB 3672 [19] during the 2011 legislative session. HB 3672 changed the credit rate from $10 per green ton to $10 per bone dry ton from woody biomass, grass, wheat and straw, and other vegetative matter from agricultural crops.[20]

- LOCAL POLICIES/INCENTIVES

This section provides a review of local policies for the five North-Central Idaho counties and the Nez Perce Tribe, as they pertain to energy and woody biomass utilization. For this review, county comprehensive plans were read and contact was made with local officials. In addition, where organizations that either have facilities that create power form woody biomass, or are planning for facilities that utilize woody biomass, staff was contacted for further information.

- NEZ PERCE COUNTY

Patty Weeks, Nez Perce County Clerk and Auditor, stated that the County does not have any policies regarding alternative energy production or utilization of woody biomass for that production.[21] She also has not heard of any policies being developed. However, the Nez Perce County Comprehensive Plan [22] under Natural Resources Goal and Policies states the county "should encourage the":

- Conservation of land most capable of crop and timber production;
- Conservation of existing energy resources and develop new energy sources; and
- Development and utilization of renewable or alternative energy sources compatible with environmental and public safety.

Each of these policy statements are part of the county's goal to "manage Nez Perce County's natural resources so as to provide for future as well as present needs."[23] They are relevant to woody biomass utilization for the production of energy, but do not have supporting ordinances, initiatives of incentives county-wide.

- CLEARWATER COUNTY

Of all the North-Central Idaho counties, Clearwater has the most directive policy language related to alternative energy and woody biomass. As the county was updating their Comprehensive Plan[24] they were also contracting with a consulting firm to develop the county Biomass Energy Report,[25] which was partially funded through the Idaho REEZ and U.S. DOE American Recovery and Reinvestment Act funding . [26]Therefore, it is timely for the county to recognize potential economic development opportunities in energy-production projects. In addition, the county recognizes regional plans and policies of the Clearwater County Economic Development (CCED) council and the Clearwater Economic Development Association (CEDA) that pertain to biomass utilization for energy production and other economic development. The CEDA plan is their Comprehensive Economic Development Strategy 2009-2014. [27]

The county has policies related to electrical-power production, timber industries, and biomass in five sections of their comprehensive plan.

timber industries, and biomass in five sections of their comprehensive plan.

• The first section, 304.6 is titled Electrical Power Production and specifically provides direction for the county to "explore and implement" alternative energy production that is practical, including, but not limited to that which utilizes biomass.[28]

• In section 304.15 Economic Development Planning Policies specify that timber industry revitalization, with year-round operations, infrastructure maintenance such as roads, and electrical power production should be part of a diverse, collective economy. [29]

• The Land Use Planning Policies in section 305.9 describe forest products, their sustainability and best uses as being an important part of the county's goal for the long term uses of all land and for economic growth and stability. [30]

• Finally, the Resource Expectations policies in section 306.13[31] and Natural Resources Planning policies in section 306.16 [32] specify that renewable resources should be utilized, but at a rate that does not exceed their renewable capacity, and industrial use of forest products should be encouraged.

LEWIS COUNTY -

Lewis County does not currently have a policy for energy and biomass and county commissioners do not have a plan to develop any policies.[33]According to Carroll Keith, Lewis County Commissioner, the county does not have the raw materials for such power generation, and thus, the county has not taken the time to explore this any further. The Lewis County Comprehensive Plan[34]also recognizes the CEDA Comprehensive Economic Development Strategy, as well as the Ida-Lew Economic Development Council (EDC) and any of their policies pertaining to energy and biomass utilization.

Latah County does not currently have a policy in place regarding energy and biomass utilization. Amanda Bashaw, Latah County Solid Waste Coordinator says that due to costs and regulations the county also does not have future plans to explore this possibility.[35] However, the Latah County Comprehensive Plan[36] does have a few policies that could guide the potential development of energy production industries utilizing biomass.

LATAH COUNTY -

In Latah County's comprehensive plan section 4, Economic Development policies related to land uses of agriculture and for

estry practices, and the commercial and industrial uses of these lands, provide a possible framework for innovative new industries and biomass utilization.[37]

- Protect agricultural and forestry land from scattered development.
- Encourage agricultural and forestry diversification and experimentation, and "value added" industries.
- Designate a sufficient amount of land suitable for commercial and industrial uses.
- Ensure buffering of new commercial and industrial uses from surrounding land uses.

- UNIVERSITY OF IDAHO STEAM PLANT, MOSCOW

The University of Idaho owns and operates a steam plant that utilizes woody biomass. This plant provides heat to a majority of campus facilities through steam generated from wood products residues (woody biomass). This plant has been in operation since 1929, although it was originally designed to run from oil and was modified in the mid-1980s to utilize woody biomass.

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- IDAHO COUNTY

Idaho County does not have policies related to energy and biomass. The County dissolved their Planning and Zoning commission in the late 1980's through a ratified ordinance. The County has not since developed a Comprehensive Plan. However, the County is a member of Ida-Lew EDC and CEDA.

Skip Brandt, Idaho County Commissioner indicates that although he has been to several seminars on the topic of woody biomass utilization for energy production, it is not feasible in the region he serves.

- FRAMING OUR COMMUNITY BIOMASS COGENERATION PROJECT, ELK CITY

Framing Our Community, Inc. (FOC) is a non-profit organization located in the unincorporated town of Elk City, Idaho. FOC integrates restoration, business and other economic development programs to promote a "Healthy Forest, Health Community" [38] as their motto states. One of the projects FOC has identified for economic development and to provide power to their Small Business Incubator in Elk City is to install a pyrolysis gasifier plant. The

plant is in the planning phase and FOC is moving toward the design phase in which they are seeking grant source funding for.

Joyce Dearstyne said that the plant would be capable of producing heat and power with from woody biomass, and produce biofuels. Other than the jobs created by this project, FOC has not found and policy or financial incentives in Idaho to support this project. They are reviewing US Forest Service grant opportunities for potential funding and FOC has money in the bank for match. Joyce says the plant could run off of waste from the FOC woods product businesses at the incubator, as well as waste from fuels reduction and restoration projects FOC is involved with. In addition to producing power, Joyce states the cogeneration plant may produce biofuels such as bio-gas or jet fuel.[39]

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The Nez Perce Tribe is currently working on a Strategic Energy Plan. Based on Jon Paisano's estimate, this plan should be complete in about 10 months.[40] Jon Paisano is the tribes Energy Efficiency/Conservation Technician out of Lapwai, Idaho. The staff members working on this plan are coordinating with the Tribe's Enterprise office in Oregon to determine the for-profit components of the plan, as the Lapwai office staff members are part of the Tribe's energy committee and are working not for profit. Jon says the Tribe has "narrowed down their renewable resources to biomass, small hydro, solar and geo-thermal for direct-use (heating/cooling)." [41]

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RESEARCH & DEVELOPMENT -

This section provides an overview of current research and development at the University of Idaho, Washington State University, University of Oregon, and University of Montana on areas of woody

biomass. It includes a brief summary of research focus, name, addresses and contacts information for possible technical assistance and other support.

- UNIVERSITY OF IDAHO

NORTHWEST ADVANCED RENEWABLES ALLIANCE

Under the Northwest Advanced Renewables Alliance, the University of Idaho - College of Natural Resources is partnering with Washington State University, to gather information to build a supply chain for domestic biofuel alternatives for U. S. commercial and military aviation. Four different teams will conduct research on feedstocks, conversion, systems metrics and education and outreach.[42]

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http://www.nararenewables.org/

- FOREST PRODUCTS/WOOD BIOMASS PYROLYSIS

The University of Idaho was funded by Texas entrepreneur, Randy Hill, to research pyrolysis of woody biomass into bio-oil. As part of the funding, the university will be installing a pilotscale pyrolysis unit at the steam plant. The goal of the research project is to assess the potential success of generating substantial amounts of clean energy with little to no waste.[43]

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- WASHINGTON STATE UNIVERSITY

The Washington State University, in partnership with the Port of Benton, Clean-Vantage, LLC., and the Pacific Northwest National Laboratory (PNNL), will conduct the $1.5 million “BioChemCat” pilot project in the Bioproducts, Science and Engineering Laboratory (BSEL) at WSU Tri-Cities . BioChemCat refers to the biofinery process that makes use of both biochemical and thermochemical processes for making biofuels and biochemicals.[44]

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UNIVERSITY OF OREGON -

The Oregon Department of Energy and the University of Oregon is completing development program, called the Oregon's Biomass Producer or Collector (BPC) tax credit, which encourages the production, collection, and transportation of biomass for biofuel production. This research is to understand the affect of how policies, like the Biomass Producer or Collector tax credit, has on woody biomass utilization.[45]

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UNIVERSITY OF MONTANA -

The Rocky Mountain Research Station of the USDA Forest Service and The University of Montana are partners in a biomass research project funded through the Biomass Research and Development Initiative. This project will investigate biomass feedstock production, logistics, conversion, distribution and end use centered on using advanced conversion technologies at existing forest industry facilities. The intent of this project is to help increase the availability of alternative renewable fuels and bio-based products to diversify the nation's energy resources.[46]

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http://news.umt.edu/2011/10/100311biom.aspx

Based on a review of policies and incentives related to the utilization of woody biomass for energy production in North-Central Idaho and some in other Northwestern states, following are constraints, opportunities and recommendations.

- OPPORTUNITIES

Financial constraints and a lack of statewide incentives appear to be a drawback for initiation of woody biomass projects in Clearwater Basin. Such projects require a substantial amount of initial capital investment and local governments currently can purchase inexpensive hydropower for less money from power companies than if they were to produce their own. Therefore, local governments are less inclined to plan for and/or implement a project unless there are substantial grant sources for funding.

- CONSTRAINTS

Local governments do however, recognize that new jobs can be created from woody biomass projects, but they still look at the cost versus benefit and costs appear to outweigh the benefits. Some regional organizations, such as the Clearwater Economic Development Association (CEDA) recognize the potential for woody biomass projects in the Clearwater region and all five counties support CEDA. Regional support is also evident in the Western Governor's Association, another supporter of woody biomass. Therefore, an opportunity may exist for willing participants to learn more about woody biomass utilization beyond power generation and how it can fit into their economic development goals. Continued outreach and education is both an opportunity and a recommendation.

- SUMMARY

It is recommended that local governments and regional organizations be informed about opportunities for woody biomass utilization. Peer to peer type information sharing may be an option. Such as learning about these types of projects from organizations are working on the planning and implementation of such projects. The Nez Perce Tribe, Framing Our Communities and the University of Idaho may be great sources of information for local governments. CEDA is also an excellent resource for information and may have opportunities in the future to provide outreach and education pertaining to the research, funding and opportunities for woody biomass utilization. The NARA grant and other University of Idaho woody biomass projects are an opportunity to partner with communities in the Clearwater Basin for outreach and education, or to implement pilot-projects

- RECOMMENDATIONS

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