



**Shoshone County Woody Biomass I**  
**Renewable Energy Enterprise Zone (REEZ) Program**  
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## **Abstract**

In the Silver Valley of Northern Idaho, a disastrous event happened in the summer of 1910. Anyone who has lived in Shoshone County, or the vicinity, knows the event simply as ‘The Fire of 1910’. Idaho was a young state with lands not yet subject to mass homesteading. Settlers had not discovered logging as something they could do for profit. At the time, towns through the modern day Silver Valley were mining towns. The mountains contained dense stands of old growth White Pine, Ponderosa Pine, Cedar, Douglas Fir, Grand Fir and Western Larch trees. However, it was the material within the ground early settlers desired and the forest lands, for the most part, were left alone. In the summer of 1910, wildfires consumed the thick stands of trees. The amounts of woody biomass contained within the forests were significant enough to combust settlements into fire many miles away from the original fires.

Over 100 years have passed since the Fire of 1910, but unfortunately, minimal steps have been taken to prevent another similar disaster. The United States Forest Service states that there currently exists 2.5 times the amount of woody biomass fuel within our public lands now, than there was before the 1910 fire. This report show that within the 105,096 acres of private and state owned land in the Woodland Urban Interface (WUI) of northern Shoshone County alone, over 500,000 tons of biomass are created per year; that is 4.9 tons of total biomass per acre per year added to Shoshone County’s timber land. The majority of the landowners in the portion of the county would be willing to take actions to help prevent another 1910 fire.

Contained within this report is a description of the research, resulting data and charts, along with pictures and recommendations regarding the woody biomass in Shoshone county.

## **Shoshone County Woody Biomass (REEZ) I**

Shoshone County, on the eastern side of the north Idaho panhandle, stretches over a large area covering 2,636 square miles of mountains and valleys. Eighty-seven percent of its land area (or 1,888,941 acres) is classified as “forest uplands,” while less than one percent (only 6,027 acres) is “urban or developed.” Shoshone County has been seeking to promote industries that utilize woody biomass in an effort to improve the health of the county’s forests, reduce potential hazards from wildland fires, and stimulate sustainable economic growth.

### **Project Introduction**

#### ***Background***

In 2008, Shoshone County contracted with the McKinstry Company to develop a study in order to determine if a Combined Heat and Power (CHP) plant would be feasible. The study concluded that a CHP plant may indeed be feasible, but a biomass inventory was needed for the area. In July 2011, Shoshone County contracted with Riverview Timber Service, LLC to complete a woody biomass availability inventory and feasibility study (REEZ I).

#### **Scope and Purpose**

The project includes:

1. An analysis of the diversity of the primary forest biomass conditions
2. Photo-interpretation data including
  - a. Acres
  - b. Number of stands by density
  - c. Basic stand statistics

- d. Summary of geographic sub-units
  - i. Prichard/Murray
  - ii. Burke/Dobson Pass
  - iii. Pine Creek
  - iv. Others
3. Preliminary field survey of several forest types as defined in the photo-interpretations including
  - a. Summary of volumes
  - b. Summary of stand statistics
4. Use field survey data to provide statistically valid inventory of entire Wildland-Urban Interface (WUI) of Shoshone County, including sub-units
  - a. Prichard/Murray
  - b. Burke/Dobson Pass
  - c. Pine Creek
  - d. Others

The purpose of the project is to develop, initiate, implement, and complete a study and analysis of the *available* biomass within the Shoshone County Wildland-Urban Interface (WUI).

## **Executive Summary**

### ***Findings***

This study has found that there is a significant amount of usable biomass in Shoshone County. It has been determined that there are 105,096 acres of private and state owned land with a combined total of 5.2 million tons of available biomass. It has also been conservatively

estimated that there is an additional 80,000 acres and 1.3 million tons of biomass in Kootenai County that could readily supply biomass to a facility in Shoshone County.

### ***Recommendations***

It is recommended that a study be conducted to determine the actual number of acres and tonnages available from Kootenai County, east of Fourth of July Pass.

It is further recommended that a sustainability study be conducted to determine the amount of biomass that could be used annually in a sustainable fashion.

## **Data Collection and Analysis**

### ***Background***

In order to have a better understanding of the data collection methods, it is necessary to understand two concepts: 1) biomass availability varies by ownership category and 2) the needs of forest product investors.

There are three types of forest land owners (private, state, and federal) in Shoshone County and the reliability of each group to produce biomass varies.

Private land owners traditionally manage their forests for maximum growth and most are involved in stewardship management programs that require best management practices for forest health and density management. Because private land owners pay property taxes and fire control taxes, they have a need to maximize their earning power. Their need to off-set expenses (including taxes and land management expenses) while increasing revenue (by harvesting larger, healthier trees) makes them premium suppliers of biomass.

Idaho Department of Lands (IDL) manages the State Endowment Trust land forests in Shoshone County, including those owned by the Public School Endowment which uses the funds generated for public schools. In the process of using best management practices on state forests, IDL generates biomass from pre-commercial thinnings and harvest slash that they have a need to mitigate economically. These factors, coupled with IDL's willingness to work with Shoshone County, make them another premium supplier of biomass.

The federal land in Shoshone County is primarily owned by the US Forest Service (USFS), with a small percent owned by the Bureau of Land Management (BLM). Due to several factors, these federal agencies cannot, at this time, commit to provide a reliable volume of biomass. Because of the unpredictable nature of the availability of biomass, federally owned lands have not been included in the data collection and analysis. As the USFS and BLM become more involved in stewardship programs, then biomass production would increase, allowing a biomass facility to expand.

Any major capital investor has to be able to analyze the risks involved in an investment and forest product investors are no exception. While collecting and analyzing the data, the needs of forest product investors were taken into consideration. Investors want to know that the supply of biomass is reliable and sustainable over time. They also want to know that they have a means of recouping their investment in case the biomass facility was to fail. Because of this, the data was only collected from reliable suppliers (private and state land owners) and volume was calculated on what would be regenerated each year.

### ***Mapping – Background***

A geographic information system (GIS) integrates hardware, software, and data for capturing, managing, analyzing, and displaying all forms of geographically referenced

information. GIS allows for viewing, understanding, questioning, interpreting, and visualizing data in ways that reveal relationships, patterns, and trends in the form of maps, globes, reports, and charts. GIS helps in answering questions and solving problems by showing data in ways that are easy to understand and share. GIS technology can be integrated into any enterprise information system framework.

The GIS network selected was ArcGIS. It is a well-respected program for accuracy and precision. The system is taught at North Idaho College and at the Coeur d'Alene campus of University of Idaho. Many local (including Shoshone County), state, and federal government agencies depend on ArcGIS for mapping and GIS needs.

### ***Mapping – Data Collection***

A base map of the area to be analyzed was developed. The base map chosen was a satellite image called *Shoshone\_2009\_1.sid*. This map can be down loaded from the United States Geological Survey (USGS) website database at <http://seamless.usgs.gov>. A point of reference was established, called a datum, so all coordinates, specific locations, and scale factors would conform to each other. Typically, any downloads from the USGS website would contain the North American Datum of 1983 (NAD83). The entire datum for this report was connected to NAD83.

After developing a base map in the ArcGIS program, 'layers' were inserted onto the base map. Layers are additional data applied to a map.

The first layer inserted was *plss100k*. This layer depicted imaginary lines that break the State of Idaho into square sections. With the *plss100k* layer having the same NAD83 datum as the base map, it created a working map that shows the location with exact reference points as the

federal and state government. This layer was important for this research because now it is possible to break down each section and study that specific location.

The next layer, *RLTY\_SMA\_PUB\_24K\_POLY*, established ownership between private land, State of Idaho Endowment Trust land, and Federal Government land (Bureau of Land Management (BLM) or United States Forest Service (USFS)). This layer is also on the USGS website and the datum used was NAD83 so that all data from this layer would match with the base map and *plss100k* layer.

With ArcGIS, a third layer was created that outlined the timber types. When creating this layer, the NAD83 datum was again used as a reference point, which allowed ArcGIS to calculate the area inside of each outline.

A fourth layer was added for farm and prairie land that has little or no timber on it.

A fifth layer was created showing the locations of ‘ground truthing’ plots.

### ***Mapping – Analysis***

With the base map, *plss100k* layer, and ownership layer, it is possible to see three distinct timber types that incorporate the I-90 corridor through Shoshone County.

When using photos, data within that image is only accurate from the point in time that photo was taken. By a process of ‘ground truthing,’ (in the field data collection of sample plots), the data from the photos was confirmed visually and additional statistical data was added.

*Shoshone\_2009\_1.sid* was a satellite image taken in the summer of 2009. It was found that most of the data within 2009 image was truthful, except for areas that were exposed to logging since 2009. Several of these logged areas were sampled and added to the appropriate color code. Due to the down turn in the economy, logging intensity has slowed over the past 4 years, further justifying the accuracy of the findings.

***Mapping – Findings***

Four distinct timber types were identified throughout the I-90 corridor. ArcGIS calculated the geometry within these different timber types. The breakdown is as follows:

<b>Type</b>	<b><u>Total Acres</u></b>	<b><u>Map Color</u></b>	<b><u>Volume</u></b>
Type A	8,260 acres	Yellow Shade	<20 Tons/acre
Type B	29,303 acres	Green Shade	20-39 Tons/acre
Type C	40,989 acres	Red Shade	40-69 Tons/acre
Type D	26,544 acres	Blue Shade	>70 Tons/acre
<b><i>Total: 105,096 acres of private and state owned land within the I-90 corridor.</i></b>			

**Table 1 Timber Types**

In the attached maps, *Figure 1, Overview Map of Forest Types* shows the locations of timber types in the study area.

***Ground Truthing – Background***

2010 IDL Cruiser, an Excel spreadsheet program designed by Idaho Department of Lands (IDL), was chosen to process the ground truthing data. It was chosen because of its unique ability to calculate tonnages, as opposed to board feet typically used in timber sale calculation. 2010 IDL Cruiser is also utilized by the US Forest Service (USFS) and contains USFS national volume equations to determine the following:

- Saw log tons per acre
- Non-saw log tons per acre
- Slash <3” tons per acre

- Trees per acre
- Ave diameter at breast height (DBH= 4.5 feet from the ground)
- Other equations not necessary for this report

### ***Ground Truthing – Data Collection***

Data was collected from the plots taken throughout the Shoshone County Wildland-Urban Interface (WUI) ranging north to the Murray-Prichard area, south to the Calder - St. Joe divide, and along the I-90 corridor from the Kootenai-Shoshone county line on the west to the Montana border on the east. Data was only collected from and applied to private and State owned properties. Data was *not* collected from or applied to federally owned lands (including USFS and BLM), land outside of Shoshone County (i.e. Kootenai County or Montana), or land within Shoshone County that would require an unrealistic haul distance (i.e. southern Shoshone County). Refer to Figure 1 *Overview Map of Forest Types*.

Data was collected from 400 random 1/50th acre (16.7 foot radius) plots. Trees within each plot were listed on an Exam Tree Data Form. Information on the Exam Tree Data Form included the species, the diameter at breast height (DBH), and the height of the tree. After acquiring the information from each plot, it was entered into the 2010 IDL Cruiser spreadsheet.

### ***Ground Truthing – Data Analysis***

Volume calculations from 2010 IDL Cruiser generated the tons per acre stated above in Table 1. This was accomplished by using a statistically sufficient number of random plots within each timber type to generalize the data for the timber type. The IDL Cruiser was then able to calculate the specific tonnages per acre within the known color code.

### ***Ground Truthing - Findings***

Total acreage on private and State owned lands: 105,096 acres.

Total present biomass in the study area equals 5.2 million tons. This volume includes non-saw logs and slash created from the harvest of saw logs. On their own, suppressed saplings, which need to be thinned to enhance forest health and provide for fire mitigation, account for 1.67 million tons (an average of 16.7 tons/acre).

Ground truthing showed that most of the data within the 2009 satellite image, *Shoshone\_2009\_1.sid*, was truthful, except for areas exposed to logging since 2009.

### **Conclusions and Recommendation**

#### ***Conclusions***

The 105,096 acres of private and state owned lands within the Shoshone County Wildland-Urban Interface currently have 5.2 million tons of biomass. Thinning the forests to remove suppressed saplings would generate 1.67 million tons of biomass and would be able to supply 80,000 tons annually to a biomass utilization facility for 20 years. Slash generated from harvesting saw logs would produce an additional 3.53 million tons and would supply the facility for an additional 44 years.

In addition to the acreage studied in Shoshone County, there are at least another 80,000 acres of private and state owned land in Kootenai County, east of Fourth of July Pass, that are more accessible than the properties in the Prichard/Murray or Dobson/Burke areas. (Refer to Figure 2 *Overview of Kootenai County*.) While these acres have not undergone analysis, a very conservative estimate of total tonnage can be calculated by applying the low end of Shoshone County's tonnage per acre. At an estimated 16.7 tons/acre, the land in Kootenai County would

yield another 1.3 million tons. This would provide an additional 16 years of supply to a biomass facility.

***Recommendation***

It is recommended that an additional study be conducted on the accessible private and state owned land in Kootenai County to determine the amount of biomass that could supply a biomass facility in Shoshone County.