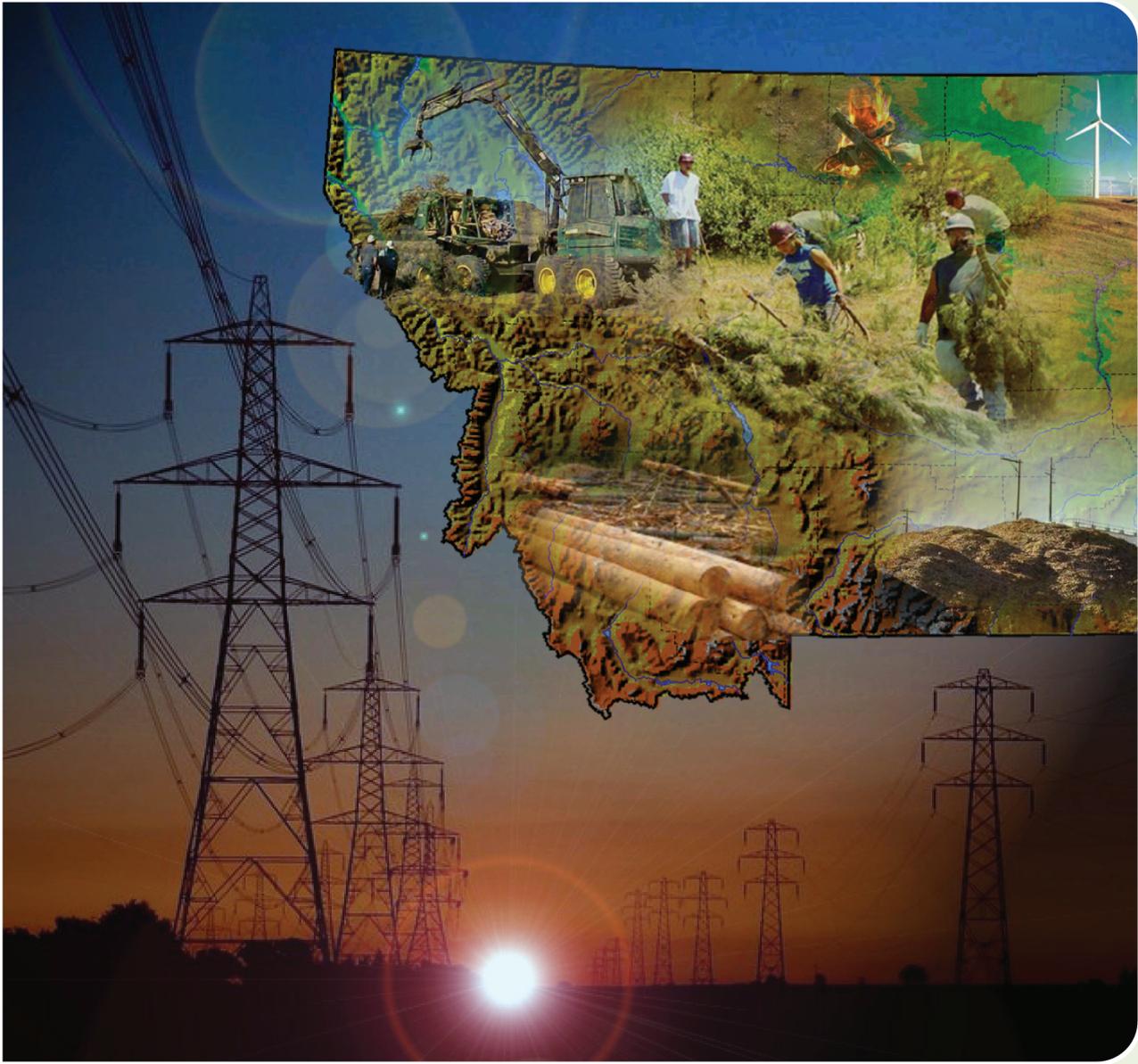


biomass

.....
FEASIBILITY STUDY

volume
2
july 2010



submitted to

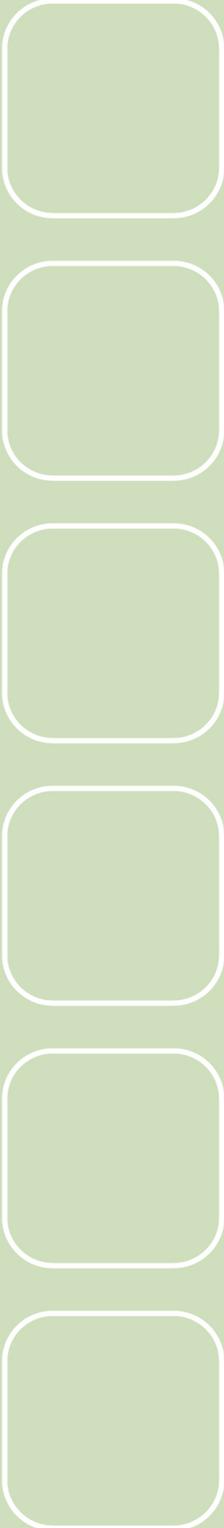


**Energy Promotion
and Development
Division**
Montana Department of Commerce

submitted by



**Porter Bench
Energy LLC**



introduction
**woody biomass fuel assessment
technical report**

In 2009 the Montana Reinvestment Act (HB 645) was passed by the 61st Montana Legislature. HB 645 implemented the federal American Recovery and Reinvestment Act (ARRA) of 2009 by appropriating funds for the Montana Department of Commerce to fund biomass project feasibility studies and other expenditures related to biomass.

As a result of the HB 645 appropriation, the Department of Commerce provided an opportunity for private companies and other entities to apply for grants to prepare studies to determine the feasibility of building and operating one or more biomass energy generation plants in western Montana. This grant application process was concluded in the fall of 2009 and grants were awarded to four entities.

Porter Bench Energy, LLC (PBE)¹ was selected by the Montana Department of Commerce and was contracted to assess the following key elements of woody biomass energy development:

- Assessment of biomass fuel supply in western Montana,
- Description of a typical biomass plant facility,
- Description of regulatory and permitting considerations,
- Identification of one or more potential plant sites,
- Assessment of financial feasibility, and
- Preparation of a comprehensive document for use by the Montana Department of Commerce in considering woody biomass energy development.

The Biomass Feasibility Study Report is the result of work conducted by the PBE team from Fall 2009 through April 2010.

Volume 1 of the study is published separately. It includes a summary of a comprehensive assessment of the woody biomass fuel supply and its availability in western Montana (Chapter 2). A description of a typical biomass plant (including its inputs, outputs, site requirements, impacts,

¹ PBE's technical team consists of Transfield Services North America, Environomics, PB Americas, Inc., ENGlobal Engineering Services, Meteorological Solutions Inc., and Parsons Behle Latimer.



and operating and maintenance characteristics) is contained in Chapter 3. Chapter 4 contains a description and explanation of significant permitting considerations. An assessment of specific sites and a description of feasible sites are provided in Chapter 5. The financial feasibility of developing a biomass plant is discussed in Chapter 6. Chapter 7 provides conclusions and suggestions for additional actions and investigation based on the foregoing analyses.

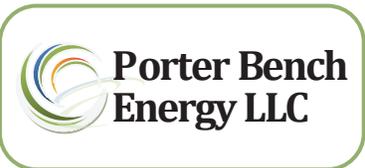
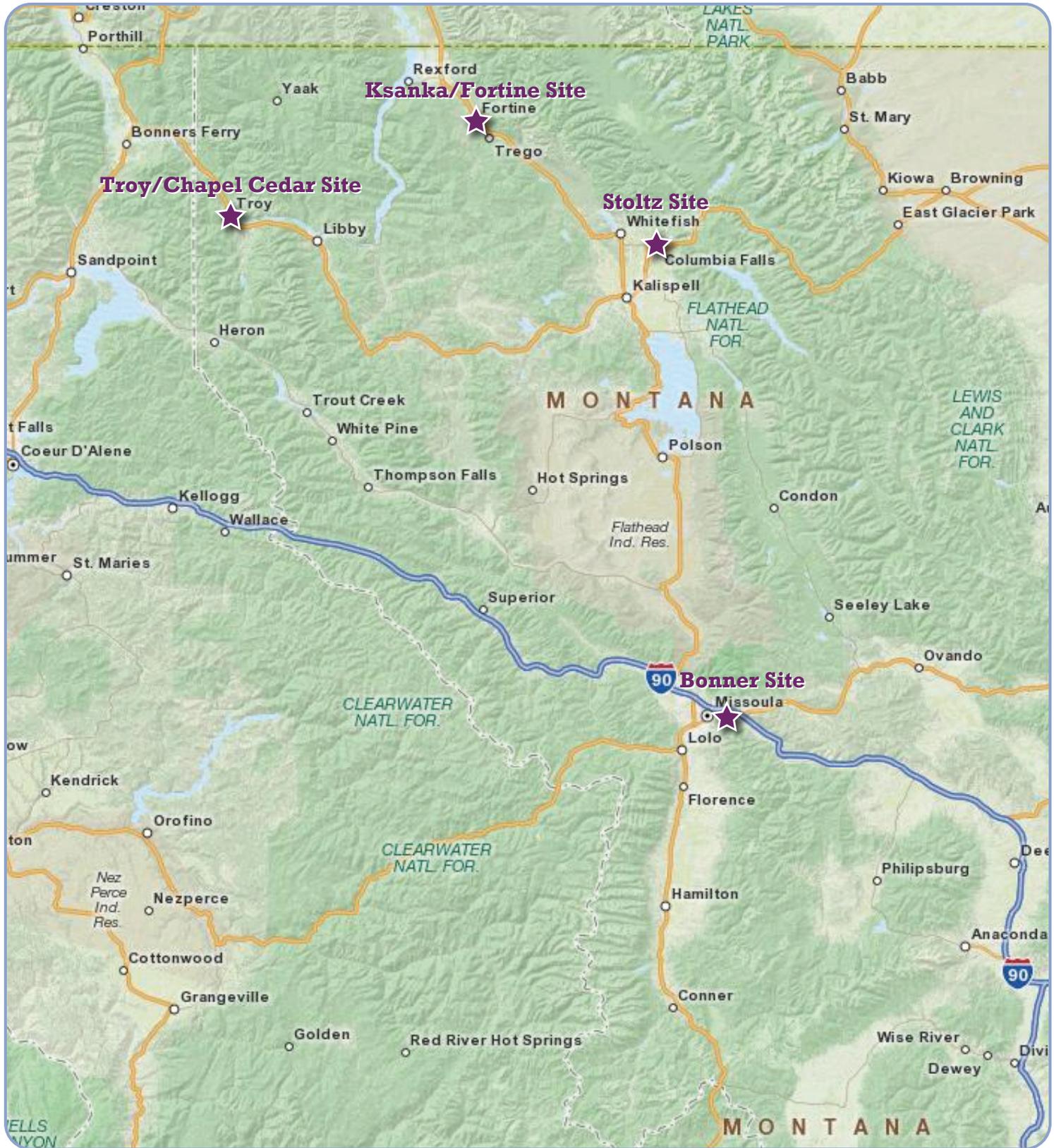
Volume 2 Woody Biomass Fuel Assessment Technical Report is a supplement to Volume 1. It provides very detailed fuel assessments for four areas in western Montana. These general locations are shown on Figure 1 and include Bonner in the Missoula area; an area around Glacier National Park and Columbia Falls; the Eureka-Fortine area; and the Troy area.

It should be noted that the fuel assessment reflected in both Volumes 1 and 2 of this Feasibility Study uses dry tons while the actual feasibility of a 60 megawatt biomass plant considered in this study uses green tons. This difference is explained by two factors:

- Fuel information is based on available Forest Inventory and Analysis EVALIDator data and information obtained from forest owners. As such, it is typically related to the forestry industry and the finished product output which is generally expressed in dry tons and board feet.
- This feasibility study for a biomass fueled power plant including the equipment selection and financial pro forma is based on the usage of green tons. In a biomass power plant, the wood harvest is utilized immediately and the moisture content only decreases minimally from the time of harvest to the time of processing and burning. As such, the financial inputs for the pro forma were based on the cost of harvesting, delivering and processing green tons at the plant and the equipment selection and associated thermal output was also based on a projected moisture content in the green tons.

The discussion presented in the following chapters focuses primarily on estimates expressed in dry tons.





| | |
|--|-------------|
| <i>figure title</i> | <i>date</i> |
| Potentially Feasible Biomass Plant Sites | June 2010 |
| <i>figure number</i> | 1 |

chapter A
bonner, montana

The Bonner site is located east of Missoula on Interstate 90, adjacent to the Montana Rail Link’s main line. Of the sites considered, this feasibility study concluded that this has the highest current potential for a 60 megawatt biomass plant. There is an abundance of private, state, tribal and federal timberland within 40 and 70 mile radiuses of the site. Until recently, this area had been home to wood product manufacturers for nearly 100 years. There is strong landowner and community interest in developing a facility on this site.

Estimates of the quantity of biomass potentially available from live and standing dead trees and forested and timberland acres were made using the latest (2003 to 2008) Forest Inventory and Analysis (FIA) EVALIDator data. Estimates of logging residue were made using the latest (2004) information in the FIA Timber Products Output (TPO) database. Estimates were done for both a 40-mile radius and a 70-mile radius from the Bonner site. Figure A-1 shows an overview of these radii and land ownership.

The total acreage of forests, by owner, within 40 miles of Bonner is shown in Table A1.

Table A1: Total Forest Acres Within 40-mile Radius of Bonner

| Ownership | Forested Acres** | Percent of Total |
|------------------------|------------------|------------------|
| National Forest System | 962,988 | 43% |
| Bureau of Land Mgmt | 67,651 | 3% |
| US Fish & Wildlife | 11,339 | 1% |
| State | 216,276 | 10% |
| County & Municipal | 7,843 | 0% |
| All Private | 981,834 | 44% |
| Total | 2,247,931 | 100% |

** Forested acres on USFS and BLM include only non-reserved timberland. Non-reserved Timberlands are defined as: “forest land that is producing or capable of producing in excess of 20 cubic feet per acre per year of wood at culmination of mean annual increment.



The ownership of privately held acreage within a 40-mile radius of Bonner is summarized in Table A2.

Table A2: Privately-owned Timberland Within 40-mile Radius of Bonner*

| Ownership | Timber Acres** | Percent of Total Private |
|-------------------------------|----------------|--------------------------|
| Plum Creek/Nature Conservancy | 443,868 | 49% |
| Stimson Lumber | 41,933 | 5% |
| Western Pacific Timberlands | 21,760 | 2% |
| YT Timber | 1,073 | 0% |
| Other Private | 473,200 | 46% |
| Total | 981,834 | 100% |

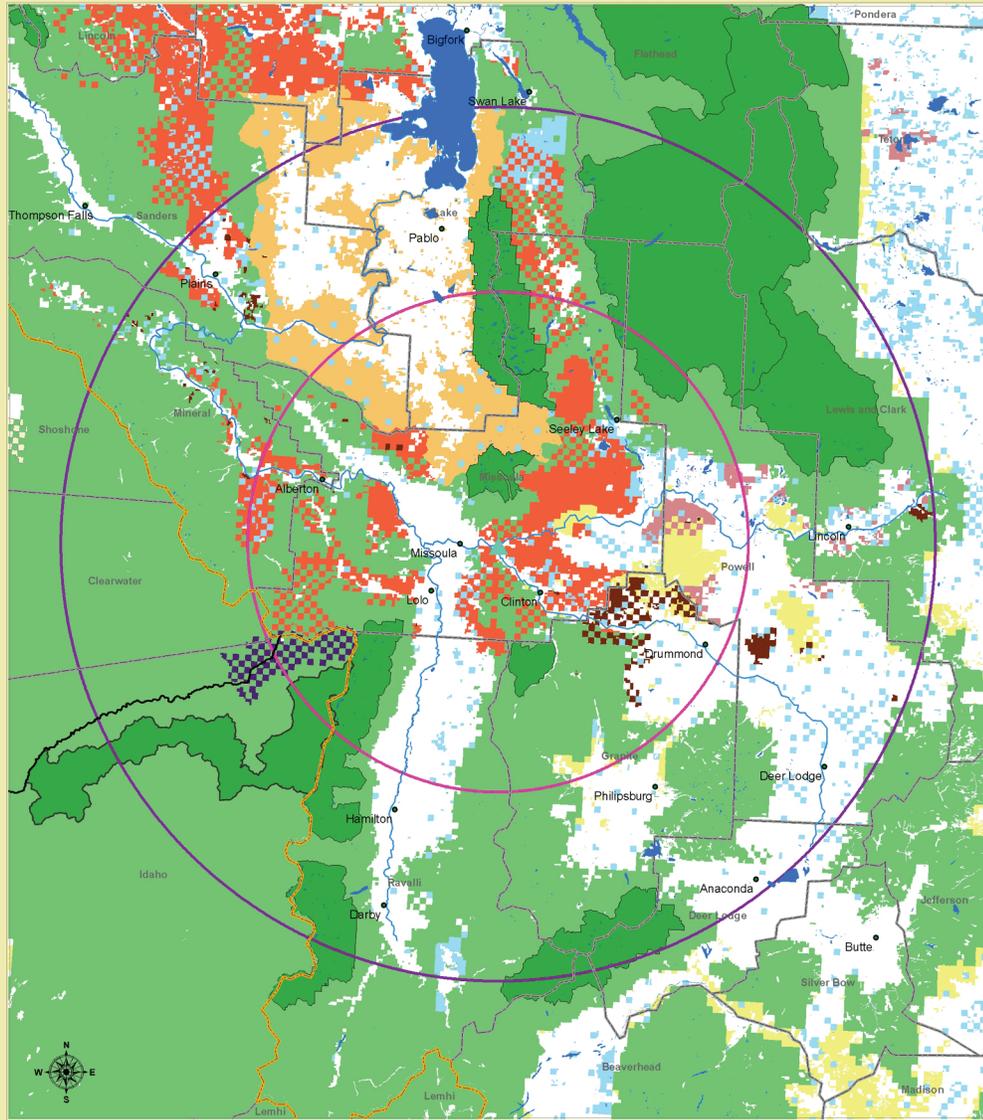
* From Montana Cadastral Database

** Timber acres is defined by the Montana Cadastral Database as “acres of the parcel in forestland exceeding 15 contiguous acres that is capable of producing timber that can be harvested in commercial quantity.”



BONNER MILLSITE BIOMASS ASSESSMENT

Land Ownership - 40 & 70-mile RSA



0 12.5 25 50 75 Miles

Legend

- ▲ Bonner Millsite
- States
- Counties
- 70milebuffer
- 40milebuffer
- Stimson_Lumber
- Western_Pacific_Timberland
- Wilderness
- Other Private
- USFS
- BLM
- State Trust Lands
- Tribal Lands
- Plum Creek / TNC
- Nature Conservancy

1 inch = 15.28 miles
SCALE = 1:968,138

NAD_1983_StatePlane_Montana_FIPS_2500
Projection: Lambert Conformal Conic

Location: Bonner, MT
Produced: March 2010
By: Ryan McHugh



Figure A-1



The volume of standing biomass on the forested acres within 40 miles of the Bonner site is shown in Table A3.

Table A3*: Dry Tons of Live Tree and Sapling Biomass Within 40-mile Radius of Bonner

| Ownership | % of Total | 1.0-2.9" | 3.0-4.9" | 5.0-6.9" | 7.0-8.9" | 9.0-10.9" | 11.0 +" | Total |
|------------------------|-------------|------------------|------------------|------------------|------------------|------------------|-------------------|-------------------|
| National Forest System | 56% | 620,448 | 1,738,080 | 3,655,637 | 5,628,531 | 5,231,659 | 21,964,738 | 38,839,092 |
| Bureau of Land Mgmt | 5% | 58,782 | 258,502 | 589,119 | 628,784 | 520,272 | 1,521,773 | 3,577,232 |
| State of Montana | 11% | 59,749 | 188,176 | 264,301 | 559,867 | 759,891 | 5,665,641 | 7,497,627 |
| Private | 28% | 314,635 | 846,745 | 1,513,648 | 2,757,906 | 3,036,675 | 10,550,074 | 19,019,683 |
| Total | 100% | 1,053,614 | 3,031,503 | 6,022,705 | 9,575,088 | 9,548,497 | 39,702,226 | 68,933,634 |

* Data from biomass supply requests, 2010

Not all of the forested acres are available for timber harvest. In an effort to get an idea of what forested lands are realistically available for timber management over time and the current status of standing timber on those lands at this specific time, certain 'screens' were identified that limit the land base considered for analysis. Based on the land ownership, these included:

- On US Forest Service lands, data provided is from those lands that are within the wildland/urban interface (WUI).
- On BLM lands, only those acres outside of Wilderness Study Areas (WSA's) were considered.
- On Bureau of Indian Affairs lands, acres that are not reserved from timber harvest (non-reserved lands) were included.
- On state lands, lands that are not-deferred from timber management (non-deferred) were considered.

Two other additional screens were used: only those forested acres that have ground slopes of less than 40%; and, on US Forest Service forested acres; any lands that have a stand designation of "old-growth" were excluded.

Information that includes the total acres on each of these classifications as well as the forest biomass currently standing on these acres (both live and dead) is included in Tables A4 and A5. The data provided in them is a compilation of information provided by public land managing agencies in response to a collaborated request of biomass analysis from Porter Bench Energy and Northwest Energy using the screens discussed above.



Table A4*: Forested Acres by Ownership

| Attribute | USFS | BLM | BIA | DNRC | Private** |
|--------------------------|---------|--------|---------|--------|-----------|
| Total Forested Acres | 580,501 | 74,748 | 471,213 | 96,554 | 981,834 |
| Screened Acres Analyzed* | 103,125 | 48,453 | 222,180 | 75,133 | 566,223 |

* Data from biomass supply requests, 2010

** Private land screened for slope only. From Forest Inventory Analysis Evaluator 4.01, Montana 2008

This screening of acreages lowers the quantities of biomass potentially accessible for management within the 40-mile working circle as identified in Table A5.

Table A5*: Biomass on Screened Acres

| Attribute | USFS | BLM | BIA | DNRC | Private** |
|--|-----------|---------|-----------|-----------|------------|
| Total Biomass on Screened Acres (Dry Tons) | 5,486,252 | 610,472 | 6,048,350 | 1,891,976 | 12,079,624 |

* Data from biomass supply requests, 2010

** Private land screened for slope only. From Forest Inventory Analysis Evaluator 4.01, Montana 2008

Owners have a variety of management regimes on forested lands with each management regime designed to achieve specific long and short term results. While it is not possible to list all of the management desires of all owners within a working circle, it is possible to identify the annual harvest from the lands within a given radius of a site by using the Forest Inventory Analysis Timber Product Output database (CY 2004). Harvest outputs from year to year reflect the implementation of the individual harvest planning of forest owners in an area. Therefore, it is harvest patterns that serve as the basis for determining available biomass within working specific working circles around each potential power generating site.

Further, harvest processes generate logging residue that can be quantified as available woody biomass. In talking with a number of experts from environmental and economical perspectives, Environomics learned that each thousand board feet harvested generates from 1 to 1.2 dry tons of biomass residue, though only about 40% of the residue is economically accessible for removal and transport (accessibility factor = 40%).

The following harvest volumes and correspondent residue for 2004 by county within 40-mile radius of Bonner were identified and are shown in Tables A6 and A7.



Table A6: Harvest Volumes for 2004 by County Within 40-mile Radius of Bonner

| County | Million Board Feet (MMBF)* | Percent of Total | Residues Produced/MBF (Dry Tons) |
|------------|----------------------------|------------------|----------------------------------|
| Missoula | 109 | 34% | 1.1 |
| Sanders | 75 | 23% | 1.1 |
| Powell | 46 | 14% | 1.2 |
| Mineral | 41 | 13% | 1.0 |
| Lake | 33 | 10% | 1.1 |
| Ravalli | 13 | 4% | 1.1 |
| Deer Lodge | 4 | 1% | 1.0 |
| Total | 321** | 100% | 1.1 |

* Volumes are Scribner board feet

** The 2008 Montana timber harvest levels were approximately 60% of the 2004 harvests. The volume of trees being cut is likely to be much lower than 2004 levels. 2008 harvest volume in these counties is estimated at 193 MMBF.

Table A7: Estimated Unused 2004 Forest Residues by County Within 40-mile Radius (Dry Tons)

| County | USFS & Other Public Lands | Private | Total | Percent of Total |
|------------|---------------------------|---------|---------|------------------|
| Missoula | 14,993 | 108,681 | 123,674 | 34% |
| Sanders | 20,448 | 65,478 | 85,926 | 24% |
| Powell | 7,023 | 47,243 | 54,266 | 15% |
| Mineral | 17,169 | 24,185 | 41,354 | 11% |
| Lake | 5,838 | 30,975 | 36,813 | 10% |
| Ravalli | 6,081 | 8,677 | 14,758 | 4% |
| Deer Lodge | 0 | 4,047 | 4,047 | 1% |
| Total | 71,552 | 289,286 | 360,838 | 100% |

* The 2008 timber harvest levels were approximately 60% of the 2004 harvest.

The volume of logging residue currently being produced is likely to be much lower than 2004 levels. Table A8 identifies the probable harvests and probable residue values for those residues that are accessible for 2008.



Table A8: Annual Forest Harvest Residue Available Within 40 Miles of Bonner*

| | |
|--|---------|
| Dry tons/year (2004) | 360,838 |
| Harvest reduction from 2004 levels** | 0.6 |
| Dry tons/year (2008) | 216,503 |
| Accessibility factor | 40% |
| Potentially accessible dry tons/year in the 10 county study area | 86,601 |

* Estimated unutilized residue volumes by counties located wholly or partially within the 40-mile radius of Bonner, Bone Dry Tons

** The 2008 Montana timber harvest levels were approximately 60% of the 2004 harvest.

MUNICIPAL SOLID WASTE

The local solid waste disposal company (Allied Waste) owns and operates a state licensed waste disposal facility in Missoula, which serves over 500,000 customers in six counties in western Montana (Missoula, Granite, Sanders, Lake, Flathead & Mineral) plus four counties in Idaho (Benewah, Clearwater, Lewis & Shoshone). The Missoula landfill is projected to receive in excess of 200,000 tons of municipal waste material annually. In a study completed by Camas Creek researchers, an Environomic’s subcontractor on this report, it is projected that 9% to 17% of the Missoula landfill’s 200,000 ton annual waste stream would consist of urban wood waste. Those calculations produce a relatively wide range in variability to demonstrate that the Missoula landfill receives approximately 18,000 to 34,000 tons of urban wood waste per year. Based on previous research estimates of non-suitable urban wood waste, Camas Creek further calculations deducted 40% of those stated amounts and determined that the Missoula landfill’s suitable urban wood waste supply was conservatively estimated to be between 10,000 and 20,000 tons annually.

It should be noted that there are two major competitors for unprocessed wood waste in the Missoula area which currently constrain the amount of urban wood waste that might otherwise be delivered to the Allied Waste landfill site. Johnson Brothers Contracting and Eko Compost currently operate collection yards in Missoula that encourage residents and businesses to dispose of their clean tree and wood waste at no charge. There should be an opportunity to increase the collection of urban wood waste at the transfer sites within the Allied service area if separate containers were designated for suitable woody biomass.

UTILITY LINE MAINTENANCE & CONSTRUCTION

Camas Creek, Environomic’s subcontractor, interviewed the utility line vegetation manager at North Western Energy, and determined that nearly all of the woody biomass residues created from utility line maintenance are currently unutilized, either deposited at local dump sites or



scattered in the right-of-way. This category of wood waste represents a potentially significant source of woody biomass feedstock for the Bonner site, but no quantities have been calculated.

70-MILE WORKING CIRCLE ANALYSIS

Environomics also analyzed forest biomass available within a 70-mile radius of the Bonner site.

The total acreage of forests, by owner, within 70 miles of Bonner is shown in Table A9.

Table A9: Forested Acres Within a 70-mile Radius of Bonner

| Ownership | Acres | Percent of Total |
|-------------------------|-----------|------------------|
| National Forest System* | 2,787,028 | 56% |
| Bureau of Land Mgmt* | 110,262 | 2% |
| US Fish & Wildlife | 11,339 | 0% |
| State | 310,821 | 6% |
| County & Municipal | 7,843 | 0% |
| All Private | 1,786,314 | 36% |
| Total | 5,013,607 | 100% |

* Forested acres on USFS and BLM include only non-reserved timberland. Non-reserved Timberlands are defined as: "forest land that is producing or capable of producing in excess of 20 cubic feet per acre per year of wood at culmination of mean annual increment and which is not permanently reserved from wood products utilization through statute or administrative designation."

The ownership of privately held acreage within a 70-mile radius of Bonner is summarized in Table A10.

Table A10: Privately Owned Timberland Within a 70-mile Radius of Bonner*

| Ownership | Timber Acres** | Percent of Total Private |
|-------------------------------|----------------|--------------------------|
| Plum Creek/Nature Conservancy | 555,565 | 31% |
| Stimson Lumber | 65,380 | 4% |
| Western Pacific Timberlands | 40,319 | 2% |
| YT Timber | 12,483 | 1% |
| Other Private | 1,112,567 | 62% |
| Total | 1,786,314 | 100% |

* From Montana Cadastral Database

** Timber acres is defined by the Montana Cadastral Database as "acres of the parcel in forest land exceeding 15 contiguous acres that is capable of producing timber that can be harvested in commercial quantity."



Table A11 shows the volume of standing biomass on the forested acres within 70 miles of the Bonner site.

Table A11: Dry Tons of Live Tree and Sapling Biomass Within 70-mile Radius of Bonner*

| Ownership All Classes | % of Total | Total | 1.0-2.9"* | 3.0-4.9" | 5.0-6.9" | 7.0-8.9" | 9.0-10.9" | 11.0 +" |
|-----------------------|------------|-------------|-----------|-----------|------------|------------|------------|------------|
| NF System | 69% | 113,737,799 | 1,613,181 | 4,445,600 | 9,280,275 | 16,189,337 | 17,191,137 | 65,018,270 |
| Bureau of Land Mgmt | 3% | 5,724,708 | 94,972 | 401,992 | 902,372 | 904,411 | 734,310 | 2,686,649 |
| State | 6% | 10,356,344 | 114,137 | 380,803 | 428,067 | 889,428 | 1,150,665 | 7,393,243 |
| Private | 21% | 35,364,259 | 634,556 | 1,597,208 | 2,954,162 | 4,895,500 | 5,400,766 | 19,882,068 |
| Total | 100% | 165,183,110 | 2,456,846 | 6,825,603 | 13,564,876 | 22,878,676 | 24,476,878 | 94,980,230 |

* Diameter at Breast Height Class (in)

Just as indicated in the 40-mile working circle analysis, not all of the forested acres are available for timber harvest in the 70-mile working circle. The following table US Forest Service lands within the wildland/urban interface (WUI); BLM lands outside of Wilderness Study Areas (WSA's); Bureau of Indian Affairs non-reserved lands; and state lands that are not-deferred from timber management (non-deferred).

Only those forested acres that have ground slopes of less than 40% were included. US Forest Service forested acres that have a stand designation of "old-growth" were excluded.

Information that includes the total acres on each of these classifications as well as the forest biomass currently standing on these acres (both live and dead) is included in Table A12.

Table A12: 70-mile Forested and Screened Acres by Ownership*

| Attribute | USFS | BLM | BIA | DNRC | Private** |
|-------------------------|-----------|---------|---------|---------|-----------|
| Total Forested Acres | 1,694,344 | 104,316 | 471,213 | 214,941 | 1,786,314 |
| Screened Acres Analyzed | 312,695 | 72,910 | 222,180 | 157,702 | 1,156,590 |

* Data from biomass supply requests, 2010

** Private land screened for slope only. From Forest Inventory Analysis Evaluator 4.01, Montana 2008

This screening of acreage also lowers the quantities of biomass potentially accessible for management within the 70-mile working circle as shown in table A13.



Table A13: 70-mile Biomass on Screened Acres*

| Attribute | USFS | BLM | BIA | DNRC | Private** |
|--|------------|---------|-----------|-----------|------------|
| Total Biomass on Screened Acres (Dry Tons) | 14,446,501 | 512,512 | 7,069,420 | 3,698,079 | 24,148,651 |

* Data from biomass supply requests, 2010

** Private land screened for slope only. From Forest Inventory Analysis Evaluator 4.01, Montana 2008

The harvest volumes and correspondent logging residue values for 2004 by county within 70-mile radius of Bonner are shown in Table A14 and Table A15.

Table A14: Harvest Volumes Within 70-mile Radius of Bonner*

| County | Million Board Feet (MMBF) | Percent of Total | Residues Produced/MBF (Dry Tons) |
|-----------------|---------------------------|------------------|----------------------------------|
| Flathead | 156 | 30% | 1.1 |
| Missoula | 109 | 21% | 1.1 |
| Sanders | 75 | 14% | 1.1 |
| Powell | 46 | 9% | 1.2 |
| Mineral | 41 | 8% | 1.0 |
| Lake | 33 | 6% | 1.1 |
| Granite | 25 | 5% | 1.0 |
| Lewis and Clark | 21 | 4% | 1.1 |
| Ravalli | 13 | 2% | 1.1 |
| Deer Lodge | 4 | 1% | 1.0 |
| Total | 523** | 100% | 1.1 |

* Volumes are Scribner board feet

** The 2008 Montana timber harvest levels were approximately 60% of the 2004 harvests.

The volume of trees being cut is likely to be much lower than 2004 levels. 2008 harvest volume in these counties is estimated at 313 MMBF.



Table A15: Estimated Unused 2004 Forest Residues by County Within 70-mile Radius (Dry Tons)*

| County | USFS & Other Public Lands | Private | Total | Percent of Total |
|-----------------|---------------------------|----------------|----------------|------------------|
| Flathead | 57,663 | 114,252 | 171,915 | 30% |
| Missoula | 14,993 | 108,681 | 123,674 | 21% |
| Sanders | 20,448 | 65,478 | 85,926 | 15% |
| Powell | 7,023 | 47,243 | 54,266 | 9% |
| Mineral | 17,169 | 24,185 | 41,354 | 7% |
| Lake | 5,838 | 30,975 | 36,813 | 6% |
| Granite | 8,059 | 17,636 | 25,695 | 4% |
| Lewis and Clark | 3,895 | 18,233 | 22,128 | 4% |
| Ravalli | 6,081 | 8,677 | 14,758 | 3% |
| Deer Lodge | 0 | 4,047 | 4,047 | 1% |
| Total | 141,169 | 439,407 | 580,576 | 100% |

* The 2008 Montana timber harvest levels were approximately 60% of the 2004 harvest.

The volume of logging residue currently being produced is likely to be much lower than 2004 levels.

Table A16 identifies the probable harvests and probable residue values for those residues that are accessible for 2008 and reflect a 60% reduction from 2004 harvest levels.

Table A16: Annual Forest Harvest Residue Available Within 70 Miles of Bonner*

| | |
|--|---------|
| Dry tons/year (2004) | 580,576 |
| Harvest Reduction from 2004 levels** | 0.6 |
| Dry tons/year (2008) | 348,000 |
| Accessibility Factor | 40% |
| Potentially accessible dry tons/year in the 10 county study area | 139,200 |

* Estimated unutilized residue volumes by counties located wholly or partially within the 70-mile radius of Bonner, Bone Dry Tons

** The 2008 Montana timber harvest levels were approximately 60% of the 2004 harvest.



SUSTAINABILITY

In discussing forest removals for biomass utilization, it is important to understand the forest growth and forest mortality occurring each year on forests surrounding the Bonner site. Within the 70-mile working circle of Bonner, forests on all ownerships grow over 2.4 million bone dry tons of biomass (Table A17). It is worthy of note that on national forest lands within the 70-mile working radius, the forest had more mortality than growth. The forest health crisis that is working towards Montana from both the north and the south is already showing an impact in these 2008 figures.

Table A17: Bonner: Forest Growth Within 70 Miles

| Owner | Net Growth In Cubic Feet/Year | Mortality In Cubic Feet/Year | Gross Growth In Cubic Feet/Year | Gross Growth In Bone Dry Tons/Year | Mortality In Bone Dry Tons/Year |
|------------------------|-------------------------------|------------------------------|---------------------------------|------------------------------------|---------------------------------|
| National Forest System | -6,131,436 | 132,500,928 | 126,369,492 | 1,516,434 | 1,590,011 |
| Bureau of Land Mgmt | 8,087,970 | 847,141 | 8,935,111 | 107,221 | 10,166 |
| State | 678,795 | 9,655,810 | 10,334,605 | 124,015 | 115,870 |
| County & Municipal | 21,641 | 0 | 0 | 0 | 0 |
| Private | 39,789,761 | 15,530,500 | 55,320,261 | 663,843 | 186,366 |
| Total | 42,446,731 | 158,534,378 | 200,981,109 | 2,411,773 | 1,902,413 |

WOOD PRODUCTS INDUSTRY WITHIN THE WORKING CIRCLE

Table A18 is a list of wood manufacturing plants inside the 70 mile RSA's of Bonner. There are several other types of wood product manufacturing operations in MT. This report includes only those that represent potential competition for the feedstock supplies necessary for additional biomass consumption. Larger diameter green and dead, straight checked timber, while more suitable for the higher values of dimension lumber or log home construction, are included in the lists because they represent entities that will likely be involved in the marketing of materials that can be used for fueling biomass heat/power generation.



Table A18: Wood Products Manufacturing Plants in 70-mile RSA: Bonner

| Company | Mill type | City | County | Phone |
|--------------------------------|------------|--------------|----------|--------------|
| Mountain West Bark Products | bark/mulch | Superior | Mineral | 208-227-1750 |
| Alpine Log Homes | house log | Victor | Ravalli | 406-642-3451 |
| Anderson Log Builders | house log | Condon | Missoula | 406-754-2218 |
| Bachmann Enterprises | house log | Darby | Ravalli | 406-821-2015 |
| Bear Creek Timberwrights | house log | Victor | Ravalli | 406-642-6003 |
| Black Dog Timber Products | house log | Stevensville | Ravalli | 406-369-2575 |
| Blackfoot Valley Log Homes | house log | Ovando | Powell | 406-793-5707 |
| Classic Log Homes | house log | Victor | Ravalli | 406-240-1392 |
| Custom Log Homes | house log | Stevensville | Ravalli | 406-777-5202 |
| East Fork Log Homes | house log | Conner | Ravalli | 406-821-4109 |
| Greg Tracy (deadwood mill) | house log | Victor | Ravalli | 406-360-5286 |
| Hummel Log Homes | house log | Condon | Missoula | 406-754-2889 |
| Lake Mountain Log Homes | house log | Ovando | Powell | 406-793-5518 |
| Legacy Log Homes | house log | St. Ignatius | Lake | 406-745-2020 |
| Lion Creek Wood Crafts | house log | Condon | Lake | 406-754-2905 |
| Logcrafters Log & Timber Homes | house log | St. Ignatius | Lake | 406-745-3482 |
| Master Log Homes | house log | Darby | Ravalli | 406-821-3756 |
| Montana Handcrafters | house log | Greenough | Missoula | 406-677-3679 |
| Montana Timber Structures | house log | Corvallis | Ravalli | 406-961-4469 |
| Montana-Idaho Log & Timber | house log | Victor | Ravalli | 406-961-3092 |
| Mountain Logs | house log | Victor | Ravalli | 406-961-3222 |
| Mountain View Log Homes | house log | Condon | Missoula | 406-754-2228 |
| Neville Log Homes | house log | Victor | Ravalli | 406-642-3091 |
| Nordique Systems Log Homes | house log | Condon | Missoula | 406-754-5647 |
| Northwest House Logs | house log | Stevensville | Ravalli | 406-642-3892 |
| Pioneer Log Homes | house log | Victor | Ravalli | 406-961-3273 |
| Real Log Homes | house log | Missoula | Missoula | 406-721-1600 |
| Rocky Mountain Log Homes | house log | Hamilton | Ravalli | 406-375-1814 |
| Small Diameter Logs Company | house log | Hamilton | Ravalli | 406-363-3663 |
| St. Regis Custom Log Homes | house log | St. Regis | Mineral | 406-649-2269 |
| Tall Timber Log Homes | house log | Clinton | Missoula | 406-825-7704 |
| Telemark Log Works | house log | Darby | Ravalli | 406-821-4602 |
| The Rustics Of Montana | house log | Condon | Missoula | 406-754-2222 |
| Three K Log Homes | house log | Swan Lake | Lake | 406-754-2377 |
| Trout Creek Log Homes | house log | Elliston | Powell | 406-492-8410 |
| Western Spirit Log Homes | house log | Corvallis | Ravalli | 406-961-3299 |
| Artistic Log Creations | log furn | Stevensville | Ravalli | 406-369-1283 |
| Bear Creek Log Furniture | log furn | Corvallis | Ravalli | 406-642-9001 |



| Company | Mill type | City | County | Phone |
|---------------------------------|----------------|--------------|---------------|--------------|
| Bearly Making It | log furn | Hamilton | Ravalli | 406-363-2875 |
| Blue Dog Custom Log Furniture | log furn | Missoula | Missoula | 406-728-3776 |
| Coyote Gulch Log Furniture | log furn | Corvallis | Ravalli | 406-961-4195 |
| Creekside Log Creation | log furn | Stevensville | Ravalli | 406-777-7121 |
| Darby Woodworks | log furn | Darby | Ravalli | 406-821-3333 |
| Dry Creek Log Furniture | log furn | Superior | Mineral | 406-822-4358 |
| Grizzly Furniture | log furn | St. Ignatius | Lake | 406-745-2494 |
| Montana Log Art | log furn | Victor | Ravalli | 406-239-6007 |
| Native Timber Log Furniture | log furn | Polson | Lake | 406-883-5801 |
| Pine Ridge Log Furniture | log furn | Superior | Mineral | 406-822-4901 |
| Provident Moose Log Furnishings | log furn | Corvallis | Ravalli | 406-642-3948 |
| Rustic Creations | log furn | Polson | Lake | 406-892-3680 |
| Roseberg Forest Products | particle board | Missoula | Missoula | 406-728-3910 |
| Johnson Brothers | pellet | Superior | Mineral | 406-882-4971 |
| Alpine Products | post/pole | Condon | Missoula | 406-754-2725 |
| Big Sky Forest Products | post/pole | St. Regis | Mineral | 406-649-2545 |
| Blixt Rail & Post | post/pole | Hot Springs | Sanders | 406-849-5809 |
| Boese's Wood Fence Supplies | post/pole | Philipsburg | Granite | 406-859-5031 |
| Bouma Post Yard | post/pole | Lincoln | Lewis & Clark | 406-362-4222 |
| Clinton Brown | post/pole | Greenough | Missoula | 406-244-3303 |
| Flathead Stickers and Dowel | post/pole | Ronan | Lake | 406-883-3397 |
| Foothill Post & Lumber | post/pole | St. Ignatius | Lake | 406-745-4931 |
| H & H Pole | post/pole | St. Regis | Mineral | 406-649-2108 |
| Pfendler Post & Pole | post/pole | Drummond | Granite | 406-288-3817 |
| Porterbilt Co. | post/pole | Hamilton | Ravalli | 406-363-1456 |
| Round Wood West | post/pole | Seeley Lake | Missoula | 406-677-2300 |
| T & C Fencing | post/pole | Ovando | Powell | 406-793-5690 |
| Tricon Timber Post & Pole | post/pole | Superior | Mineral | 406-649-2485 |
| Turtle Dove Post & Pole | post/pole | Huson | Missoula | 406-626-5710 |
| Advantage Milling | sawmill | Clinton | Missoula | 406-825-3447 |
| Blackfoot Timber Products | sawmill | Lincoln | Lewis & Clark | 406-362-4598 |
| Bromley's Wood Products | sawmill | Alberton | Mineral | 406-239-3962 |
| Coyote Forest Management | sawmill | Condon | Missoula | 406-754-2473 |
| Dupuis Lumber | sawmill | Polson | Lake | 406-883-2420 |
| Finlay Lumber | sawmill | Florence | Ravalli | 406-273-0080 |
| Foothill Post & Lumber | sawmill | St. Ignatius | Lake | 406-745-4931 |
| Gehring Lumber & House Logs | sawmill | Lincoln | Lewis & Clark | 406-362-4864 |
| Hunt's Timbers | sawmill | St. Ignatius | Lake | 406-745-4375 |



| Company | Mill type | City | County | Phone |
|-------------------------|-----------|--------------|---------------|--------------|
| Karrow Lumber Co. | sawmill | Stevensville | Ravalli | 970-653-4390 |
| L & L Custom Sawing | sawmill | Lincoln | Lewis & Clark | 406-362-4601 |
| Natural Legacy Wood | sawmill | Phillipsburg | Granite | 208-585-6002 |
| Pyramid Mountain Lumber | sawmill | Seeley Lake | Missoula | 406-677-2201 |
| Smith Sawmill | sawmill | Deer Lodge | Powell | 406-846-2867 |
| Sun Mountain Lumber | sawmill | Deer Lodge | Powell | 406-846-1600 |
| Tricon Timber | sawmill | St. Regis | Mineral | 406-649-2485 |
| Valley Board & Beam | sawmill | Stevensville | Ravalli | 406-642-6234 |
| Willow Creek Sawmill | sawmill | Corvallis | Ravalli | 406-961-2495 |
| Woodrum Lumber Company | sawmill | Superior | Mineral | 406-822-1870 |

The woody biomass consumers are shown in Table A19.

Table A19: Woody Biomass Consumers in Bonner 70-mile RSA

| Company | Type | City | County | Dry Tons |
|-----------------------------|----------------|--------------|----------|----------|
| Roseberg Forest Products | particle board | Missoula | Missoula | 600,000 |
| Johnson Brothers | pellet | Superior | Mineral | unknown |
| Mountain West Bark Products | bark/mulch | Superior | Mineral | unknown |
| Darby Schools | boiler fuel | Darby | Ravalli | 760 |
| Victor Schools | boiler fuel | Victor | Ravalli | 500 |
| Phillipsburg Schools | boiler fuel | Phillipsburg | Granite | 400 |

In December of 2009, the Smurfit-Stone Container facility in Frenchtown closed, resulting in the loss of a 1.5 Million Dry Ton outlet for the state’s primary wood products industry. The full effect of this closure has yet to be determined, but there is a clear opportunity for another commercial consumer of woody biomass.

SMURFIT-STONE CONTAINER CLOSURE

In Todd Morgan’s biomass study of April 29, 2009, his work indicated that “together, the woody biomass users in Montana consume approximately 2.2 to 2.7 MDT (Million Dry Tons) of woody biomass (including mill residue, roundwood pulpwood, industrial fuelwood, and recycled cardboard) each year, with a single facility accounting for more than one-half of total annual biomass consumption.” The single facility was Smurfit Stone and their consumption was around 1.5 million dry tons of biomass per year.

Morgan also noted that there was a sizeable deficit of between the amount of woody biomass demanded/consumed each year versus the amount supplied from in-state mill residue. He noted mill residue production in Montana was only 1.5 MDT in 2004 indicating a deficit 0.7 to 1.2 Million Dry Tons between the amount of woody biomass demanded/consumed (2.2 to 2.7 MDT) in Montana versus the amount supplied from in-state mill residue.



Morgan also noted that the deficit was filled “in part by mill residue from out-of-state mills as well by the use of some slash, industrial fuelwood, and roundwood pulpwood harvested in Montana.” His figures suggested that competition existed for the woody biomass supply then available in Montana, particularly for “clean” (i.e., free of rocks, sand, dirt, char, needles, and bark) and dry wood chips and other mill residue.

Prior to closure, the Smurfit-Stone Container facility in Frenchtown increased the amount of roundwood pulpwood purchased to help overcome the deficit of locally available clean chips, and the facility was using more slash and small material with bark on for fuelwood. Morgan also noted that only about 4% (9.1MMCF or million cubic feet) of the timber-processing capacity in the state (Montana’s saw and veneer mills, post and pole manufacturers, and log home and log furniture industries) could efficiently utilize trees less than 7 in. dbh that the total timber-processing capacity in these Montana wood products sectors declined about 22% (216 MMCF) from 2003 to 2008.

The conclusion of Morgan’s report is of critical importance to the Bonner site. The study found that in-state production of woody biomass from primary timber-processing facilities’ mill residue had fallen from about 1.5 MDT to 1.0 MDT annually between 2004 and 2008. As well, between 99 and 100% of mill residue in Montana was being used at that time. Using Morgan’s numbers, the December 2009 closure of Smurfit-Stone reversed the trend and suddenly made between 0.3 and 0.8 MDT of woody biomass available as a surplus within the state. Importantly, as the utilization was near capacity prior to the plant closing, the price points for competitively shipping fiber to Frenchtown for use at Smurfit Stone should benefit the Bonner site for biomass development.

Even if a reduction of 20 to 30% of Montana processing capacity is assumed between 2008 and 2010, the amount of biomass surplus available upon Smurfit’s closure should be up to 500,000 dry tons of available biomass that was price pointed for Frenchtown and conceivably available for contract to a facility at Bonner.

SUMMARY FOR THE BONNER SITE

If available biomass for a power generating facility is limited to unutilized forest residue within a 70-mile range of the Bonner site, (with 40% of this fiber accessible using current technology), there are some 139,000 dry tons identified as unutilized and available for power generation at the Bonner site. In addition, forest growth of some 689,000 dry tons and forest mortality of over 180,000 dry tons is found on private lands within the 70-mile working circle of Bonner.

Finally, over 1.5 million dry tons of fiber that was flowing to the Smurfit Stone facility less than twenty miles from Bonner was made available to the statewide market when Smurfit announced closure. During the last three months a certain amount of this fiber would have successfully been marketed to other buyers. However, with the overall timber and pulp market still soft, there is undoubtedly a portion of the Smurfit-destined fiber that would be available for long-term contracting at a potential Bonner power



and heat generating facility. Quantifying that amount and assigning a price point are beyond the scope of this report.

Even discounting the fiber on federal lands due to access uncertainty, the Bonner area has the potential to fuel a power generating facility with forest based biomass. The price point for this fuel that will result in a feasible economic model for a power plant needs additional investigation to fully assess feasibility.



chapter B
glacier park international airport
kalispell, montana

Glacier Park International (GPI) is the designation that was assigned to the wood processing complex that exists within a 10-mile radius of the Flathead Valley's Glacier International Airport. This is the largest wood processing center left in Montana.

Columbia Falls is the industrial hub of Flathead County and is about five miles north of Glacier Park International airport. Seattle-based Plum Creek Timber Company operates a sawmill and a medium density fiberboard [MDF] manufacturing plant in this area. Plum Creek is Montana's largest wood products manufacturer by both employment and production. The company is also Montana's and the nation's largest timberland owner. The company also operates a plywood plant and stud mill at Evergreen, a Kalispell suburb, about 5 miles south of the airport.

Adjacent to Plum Creek's MDF plant, Stoltze Lumber Company operates a mixed species sawmill that cuts lumber in varying dimensions. Stoltze, a family-owned company based in Minnesota, is Montana's oldest continuously operating lumber manufacturer. It has been operating in the Flathead Valley for more than 100 years.

Below are a series of tables detailing biomass considerations within a 40 and 70 mile radius of GPI. Estimates of the quantity potentially available from live and standing dead trees and forested and timberland acres were made using the latest (2003 to 2008) Forest Inventory and Analysis (FIA) EVALIDator data. Estimates of logging residue were made using the latest (2004) information in the FIA Timber Products Output (TPO) database. Figure B-1 shows an overview of these radii and land ownership.

Table B1 shows the total acreage of forests, by owner, within 40 miles of GPI.



Table B1: Total Forest Acres Within 40-mile Radius of GPI

| Ownership | Forested Acres | Percent of Total |
|-------------------------|----------------|------------------|
| National Forest System* | 765,850 | 49% |
| Bureau of Land Mgmt* | 14 | .1% |
| State | 155,561 | 10% |
| All Private | 635,760 | 40.9% |
| Total | 1,557,185 | 100% |

* Forested acres on USFS and BLM include only non-reserved timberland. Non-reserved Timberlands are defined as: "forest land that is producing or capable of producing in excess of 20 cubic feet per acre per year of wood at culmination of mean annual increment.



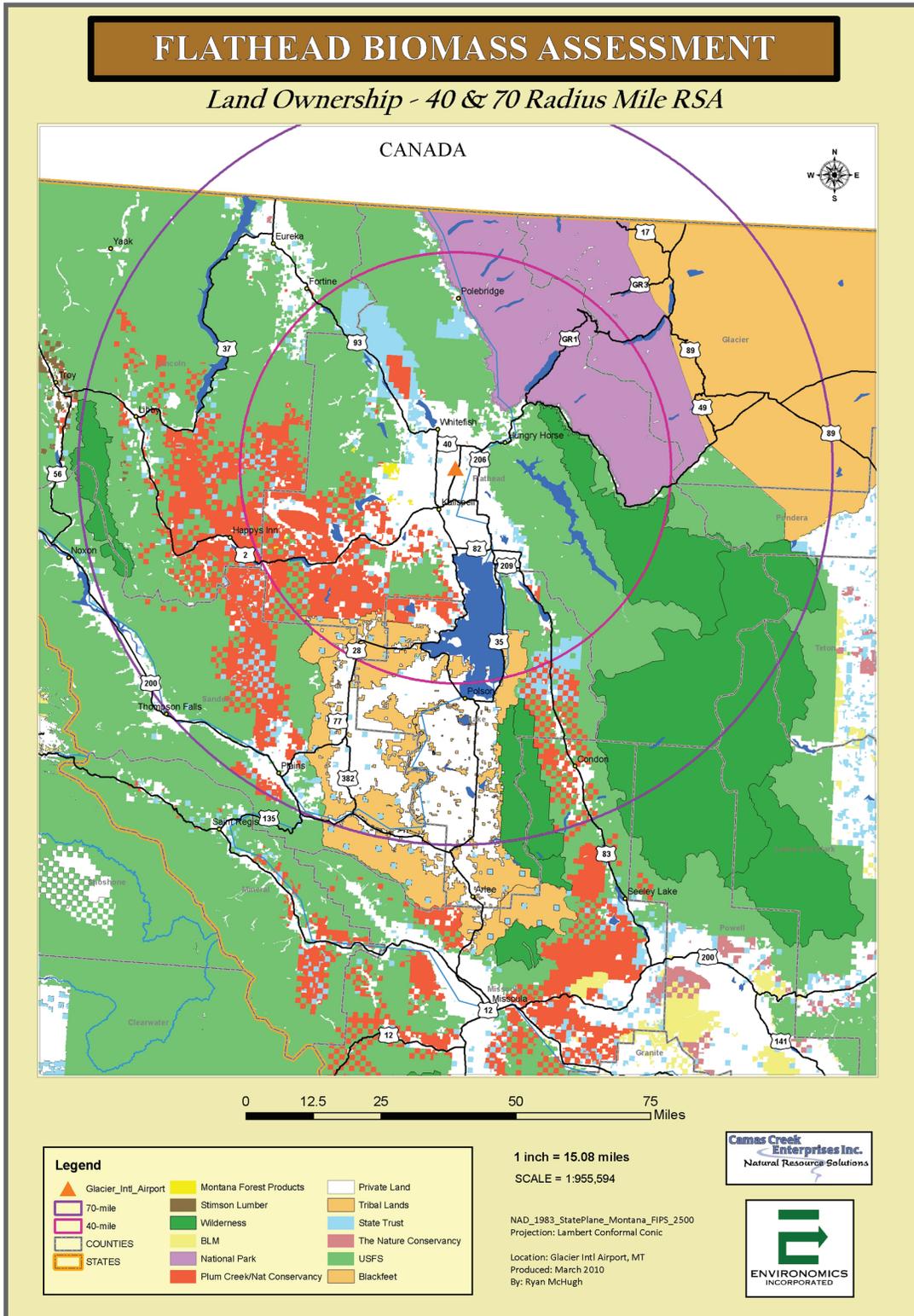


Figure B-1

Not all of the forested acres are available for timber harvest. In an effort to get an idea of what forested lands are realistically available for timber management over time and the current status of standing timber on those lands at this specific time, certain ‘screens’ were identified that limit the land base considered for analysis. Based on the land ownership, these included:

- On US Forest Service lands, data provided is from those lands that are within the wildland/urban interface (WUI).
- On BLM lands, only those acres outside of Wilderness Study Areas (WSA’s) were considered.
- On Bureau of Indian Affairs lands, acres that are not reserved from timber harvest (non-reserved lands) were included.
- On state lands, lands that are not-deferred from timber management (non-deferred) were considered.

Two other additional screens were used: only those forested acres that have ground slopes of less than 40%; and, on US Forest Service forested acres; any lands that have a stand designation of “old-growth” were excluded.

Information that includes the total acres on each of these classifications as well as the forest biomass currently standing on these acres (both live and dead) is included in the following tables. The data provided in them is a compilation of information provided by public land managing agencies in response to a collaborated request of biomass analysis from Porter Bench Energy and Northwest Energy using the screens discussed above. Table B-2 shows acreage by ownership.

Table B2*: Forested Acres by Ownership

| Attribute | USFS | BLM | DNRC | Private** |
|-------------------------------------|---------|-----|---------|-----------|
| Total Forested Acres Within Screens | 765,850 | 19 | 155,561 | 521,141 |
| Suitable Screened Acres Analyzed | 140,284 | 14 | 110,198 | 462,652 |

* Data from biomass supply requests, 2010

** Private land screened for slope only. From Forest Inventory Analysis Evaluator 4.01, Montana 2008

The quantities of biomass potentially accessible for management within the 40 mile working circle within these screened acres is summarized in Table B3.

Table B3*: Biomass on Screened Acres

| Attribute | USFS | BLM | DNRC | Private** |
|--------------------------------------|-----------|-----------|------|------------|
| Biomass on Screened Acres (Dry Tons) | 6,453,045 | 2,915,049 | 0 | 11,044,541 |

* Data from biomass supply requests, 2010

** Private land screened for slope only. From Forest Inventory Analysis Evaluator 4.01, Montana 2008



Owners have a variety of management regimes on forested lands with each management regime designed to achieve specific long and short term results. While it is not possible to list all of the management desires of all owners within a working circle, it is possible to identify the annual harvest from the lands within a given radius of a site by using the Forest Inventory Analysis Timber Product Output database (CY 2004). Harvest outputs from year to year reflect the implementation of the individual harvest planning of forest owners in an area. Therefore, it is harvest patterns that serve as the basis for determining available biomass within working specific working circles around each potential power generating site.

Further, harvest processes generate logging residue that can be quantified as available woody biomass. In talking with a number of experts from environmental and economical perspectives, it was learned that each thousand board feet harvested generates from 1 to 1.2 dry tons of biomass residue. Only about 40% of the residue, however, is economically accessible for removal and transport (accessibility factor = 40%).

Table B4 shows the resultant harvest residue volumes for 2004 by county within 40-mile radius of GPI.

**Table B4: Estimated Unused 2004 Forest Residues in GPI
40-mile Radius (Dry Tons)**

| County | USFS & Other Public Lands | Private | Total | Percent of Total |
|----------|---------------------------|---------|---------|------------------|
| Flathead | 57,663 | 114,252 | 171,915 | 41% |
| Lincoln | 33,900 | 90,090 | 123,990 | 30% |
| Sanders | 20,448 | 65,478 | 85,926 | 21% |
| Lake | 5,838 | 30,975 | 36,813 | 8% |
| Total | 117,849 | 204,342 | 295,295 | 100% |

* The 2008 Montana timber harvest levels were approximately 60% of the 2004 harvest. Consequently the volume of logging residue currently being produced is likely to be much lower than 2004 levels.

Table B5 identifies the probable harvests and probable residue values for those residues that are accessible for 2008 and reflect a 60% reduction from 2004 harvest levels.



Table B5: Annual Forest Harvest Residue Available Within 40-miles of GPI*

| | |
|--|---------|
| Dry tons/year (2004) | 418,354 |
| Harvest reduction from 2004 levels** | 0.6 |
| Dry tons/year (2008) | 251,186 |
| Accessibility factor | 40% |
| Potentially accessible dry tons/year in the 10 county study area | 100,474 |

* Estimated unutilized residue volumes by counties located wholly or partially within the 40-mile radius of GPI, Bone Dry Tons.

** The 2008 Montana timber harvest levels were approximately 60% of the 2004 harvest.

MUNICIPAL SOLID WASTE

Woody biomass from facilities within the working circles of GPI are currently being removed by an area contractor. That contractor stated that the Flathead County disposal site has some 900 dry tons of woody debris available each year, the Eureka facility yields around 500 dry tons, and Happy’s Inn yields 150 dry tons. This total of around 1500 tons per year is under contract but is currently not utilized by area biomass consumers.

UTILITY LINE MAINTENANCE & CONSTRUCTION

An interview of the utility line vegetation manager at North Western Energy revealed that nearly all of the woody biomass residues created from utility line maintenance are currently unutilized, either deposited at local dump sites or scattered in the right-of-way. This category of wood waste represents a potentially significant source of woody biomass feedstock for the GPI site, but no quantities have been calculated.

70 MILE WORKING CIRCLE ANALYSIS

Forest biomass available within a 70 mile radius of the GPI site was also evaluated.

Table B6 shows the total acreage of forests, by owner, within 70 miles of GPI.

Table B6: Forested Acres Within a 70-mile Radius of GPI

| Ownership | Acres | Percent of Total |
|-------------------------|-----------|------------------|
| National Forest System* | 1,842,443 | 45% |
| Bureau of Land Mgmt* | 202 | .01% |
| BIA, Kootenai Salish | 471,213 | 11% |
| State | 265,353 | 6.5% |
| All Private | 1,559,057 | 37% |
| Total | 4,138,268 | 100% |

* Forested acres on USFS and BLM include only non-reserved timberland. Non-reserved Timberlands are defined as: "forest land that is producing or capable of producing in excess of 20 cubic feet per acre per year of wood at culmination of mean annual increment and which is not permanently reserved from wood products utilization through statute or administrative designation."

Just as indicated in the 40 mile working circle analysis, not all of the forested acres are available for timber harvest in the 70 mile working circle. The following table lists US Forest Service lands within the wildland/urban interface (WUI); BLM lands outside of Wilderness Study Areas (WSA's); Bureau of Indian Affairs non-reserved lands; and state lands that are not-deferred from timber management (non-deferred).

Only those forested acres that have ground slopes of less than 40% were chosen. No "old-growth" US Forest Service forested acres were considered.

Information that includes the total acres on each of these classifications as well as the forest biomass currently standing on these acres (both live and dead) is included in Table B7 and B8.

Table B7*: Forested and Screened Acres Within 70-mile Radius

| Attribute | USFS | DNRC | BLM | BIA | Private** |
|-------------------------------------|-----------|---------|-----|---------|-----------|
| Total Forested Acres Within Screens | 1,843,443 | 265,353 | 202 | 471,213 | 1,559,057 |
| Screened Acres Analyzed | 332,076 | 192,493 | 183 | 222,180 | 1,320,192 |

* Data from biomass supply requests, 2010

** Private land screened for slope only. From Forest Inventory Analysis Evaluator 4.01, Montana 2008

This screening of acreage also lowers the quantities of biomass potentially accessible for management within the 70 mile working circle as identified by the Table B8.



Table B8*: Potential Available Biomass Within 70-mile Radius (Dry Tons)

| Attribute | USFS | DNRC | BLM | BIA | Private** |
|--|------------|-----------|-----|-----------|------------|
| Total Biomass On Screened Acres (Dry Tons) | 15,308,683 | 5,307,026 | 0 | 7,069,420 | 23,567,539 |

* Data from biomass supply requests, 2010

** Private land screened for slope only. From Forest Inventory Analysis Evaluator 4.01, Montana 2008

Harvest volumes and correspondent logging residue values for 2004 by county within 70-mile radius of GPI are shown in Table B9.

Table B9: Estimated Unused 2004 Forest Residues by County Within 70-mile Radius (Dry Tons)

| County | USFS & Other Public Lands | Private | Total | Percent of Total |
|----------|---------------------------|---------|---------|------------------|
| Flathead | 57,663 | 114,252 | 171,915 | 40% |
| Lincoln | 33,900 | 90,090 | 123,990 | 29% |
| Sanders | 20,448 | 65,478 | 85,926 | 20% |
| Lake | 5,838 | 30,975 | 36,813 | 9% |
| Glacier | 60 | 10,650 | 10,710 | 2% |
| Total | 117,909 | 311,445 | 429,354 | 100% |

* The 2008 Montana and Idaho timber harvest levels were approximately 60% of the 2004 harvest. Consequently the volume of logging residue currently being produced is likely to be much lower than 2004 levels.

Table B10 identifies the probable harvests and probable residue values for those residues that are accessible for 2008 and reflect a 60% reduction from 2004 harvest levels.

Table B10: Annual Forest Harvest Residue Available Within 70-miles of GPI*

| | |
|--|---------|
| Dry tons/year (2004) | 311,000 |
| Harvest reduction from 2004 levels** | 0.6 |
| Dry tons/year (2008) | 187,000 |
| Accessibility factor | 40% |
| Potentially accessible dry tons/year in the 10 county study area | 74,800 |

* Estimated unutilized residue volumes by counties located wholly or partially within the 70-mile radius of GPI, Bone Dry Tons.

** The 2008 Montana timber harvest levels were approximately 60% of the 2004 harvest.



SUSTAINABILITY

In discussing forest removals for biomass utilization, it is important to understand the forest growth and forest mortality occurring each year on forests surrounding the GPI site. Within the 70 mile working circle of GPI, forests on all ownerships grow over 3.0 million bone dry tons of biomass (summarized in Table B11). It is worthy of note that national forest lands within the 70 mile working radius witnessed the heaviest mortality. The forest health crisis that is working towards Montana from both the north and the south is already showing an impact in these 2008 figures.

Table B11: Glacier Park International: Forest Growth Within 70-miles

| Owner | Net Growth In Cubic Feet/ Year | Mortality In Cubic Feet/ Year | Gross Growth In Cubic Feet/ Year | Gross Growth In Bone Dry Tons/ Year | Mortality in Bone Dry Tons/ Year |
|------------------------|--------------------------------|-------------------------------|----------------------------------|-------------------------------------|----------------------------------|
| National Forest System | 97,664,259 | 76,809,952 | 174,474,211 | 2,093,691 | 921,719 |
| BIA | 9,468,621 | 188,659 | 9,657,280 | 115,892 | 2,264 |
| State | 12,209,820 | 5,030,091 | 17,239,911 | 206,879 | 60,361 |
| Private | 48,915,400 | 10,798,925 | 59,714,325 | 716,572 | 129,587 |
| Total | 168,258,100 | 92,827,627 | 261,085,727 | 3,133,029 | 1,113,932 |

WOOD PRODUCTS INDUSTRY WITHIN THE WORKING CIRCLE

Table B12 includes the wood manufacturing plants inside the 70 mile RSA of GPI. There are several other types of wood product manufacturing operations in Montana. For this report, only those that represent potential competition for the feedstock supplies necessary for additional biomass consumption as included. Larger diameter green and dead, straight checked timber, while more suitable for the higher values of dimension lumber or log home construction are included in the lists because they represent entities that will likely be involved in the marketing of materials that can be used for fueling biomass heat/power generation.

Table B12: Wood Products Manufacturing Plants in 70-mile RSA: GPI

| Company | Mill type | City | County | Phone |
|----------------------------|---------------|-----------|----------|--------------|
| Johnson Brothers | bark products | Olney | Flathead | 406-881-3033 |
| Johnson Brothers | bark products | C-Falls | Flathead | 406-892-9200 |
| Artisan Log Works | house log | Whitefish | Flathead | 406-250-3664 |
| Baldwin Log Homes log home | house log | Kila | Flathead | 406-755-7602 |
| Centennial Log Homes | house log | C-Falls | Flathead | 406-892-7050 |
| Eureka Montana Log Homes | house log | Eureka | Lincoln | 406-889-3293 |
| Homestead Log Works | house log | Rexford | Lincoln | 406-889-3052 |
| Kalispell MT Log Homes | house log | Kalispell | Flathead | 406-752-2992 |



| Company | Mill type | City | County | Phone |
|--------------------------------------|---------------|--------------|----------|--------------|
| Kootenai Log Homes | house log | Rexford | Lincoln | 406-889-5836 |
| Legacy Log Homes | house log | St. Ignatius | Lake | 406-745-2020 |
| Meadowlark Log Homes | house log | Libby | Lincoln | 406-293-8707 |
| Montana View Log Homes | house log | Rexford | Lincoln | 406-889-5472 |
| Old Style Log Works | house log | Kalispell | Flathead | 406-755-6669 |
| Shady Grove Log and Timber Builders | house log | Whitefish | Flathead | 406-212-0388 |
| Top Notch Log Homes | house log | C-Falls | Flathead | 406-892-0596 |
| Agape Log Furniture | log furn | Fortine | Lincoln | 406-882-4517 |
| Cabinet Mountain Furniture | log furn | Libby | Lincoln | 406-293-5255 |
| Frontier Log Furniture | log furn | Somers | Flathead | 406-857-3525 |
| Grizzly Furniture | log furn | Bigfork | Flathead | 406-837-3189 |
| Montana Woodworks | log furn | Rexford | Lincoln | 406-889-3728 |
| Native Timber Log Furniture | log furn | Polson | Lake | 406-883-5801 |
| Rustic Creations | log furn | Polson | Lake | 406-892-3680 |
| Rustic Rails Furniture and Log Works | log furn | C-Falls | Flathead | 406-892-3680 |
| Simonson's Log Furniture | log furn | Kalispell | Flathead | 406-257-6312 |
| Plum Creek | MDF | C-Falls | Flathead | 406-892-6486 |
| Johnson Brothers | pellet | Eureka | Lincoln | 406-543-5355 |
| Plum Creek | plywood | C-Falls | Flathead | 406-892-6486 |
| Plum Creek | plywood | Kalispell | Flathead | 406-892-6486 |
| Blixt Rail and Post | post and pole | Hot Springs | Sanders | 406-849-5809 |
| Larry's Post Company | post/pole | C-Falls | Flathead | 406-892-5175 |
| Branda Northwest Sawmill | sawmill | Kila | Flathead | 406.257.6952 |
| Foothill Post and Lumber | sawmill | St. Ignatius | Lake | 406-745-4931 |
| Hunt's Timber's | sawmills | St. Ignatius | Lake | 406-745-4375 |
| Jerry Hill | sawmill | West Glacier | Flathead | 406-888-5008 |
| Morton Lumber Company | sawmill | Kalispell | Flathead | 406-752-0379 |
| Plum Creek | sawmill | Kalispell | Flathead | 406-892-6486 |
| Plum Creek | sawmill | C-Falls | Flathead | 406-892-6486 |
| RBM Logging and Lumber | sawmill | C-Falls | Flathead | 406-892-4208 |
| Shady Grove Log and Timber Builders | sawmill | Whitefish | Flathead | 406-212-0388 |



Table B13 shows the biomass consumers within the 70-mile working circle.

Table B13: Woody Biomass Consumers in Stoltze 70-mile RSA

| Company | Type | City | County | Green Tons |
|------------------|---------------|---------|----------|------------|
| Johnson Brothers | bark products | Olney | Flathead | unknown |
| Johnson Brothers | bark products | C-Falls | Flathead | unknown |
| Plum Creek | MDF | C-Falls | Flathead | 735,000 |
| Johnson Brothers | pellet | Eureka | Lincoln | unknown |
| Eureka Schools | boiler fuels | Eureka | Lincoln | 960 |

In December of 2009, the Smurfit-Stone Container facility in Frenchtown closed, resulting in the loss of a 1.5 Million Dry Ton outlet for the state’s primary wood products industry. The full effect of this closure has yet to be determined, but there is a clear opportunity for another commercial consumer of woody biomass.

The impact of this closure on a potential power generating facility at the GPI site is very hard to quantify. At the time of closure, Smurfit’s wood purchasing working circle had expanded to several hundred miles and included the purchase of round logs that they processed into pulp on site. While it is clear that a great deal of woody biomass - including residue from area mills and area contractors - is now without a delivery point, the amount that can be redirected to a power facility and meet the economic needs of both buyer and seller is worthy of study that is beyond the scope of this report.

SUMMARY FOR THE GPI

The public lands portion of existing biomass for the GPI area is huge. The growth of over 3 million bone dry tons per year on just public lands reflects the fact that this is some of the most productive timberlands in the state. However, the huge public lands portion and the uncertainty of supply that goes with that ownership is coupled with the fact that the private portion of this working circle includes the ownership areas of two forest land owners who consume and market nearly all that they grow internally – Plum Creek and Stoltz Land and Lumber. The forest certainly grows enough fiber to fuel a power and heat generating plant in the GPI area. Access to the fiber and securing long term contracts to assure certainty will be needed to make a plant a reality. The best opportunity most likely lies in combining milling and power generating options with one of the two large landowners.



chapter C
eureka/fortine, montana

Fortine is a small sawmill town on Highway 93 midway between Whitefish and Eureka, Montana. Seattle-based Plum Creek Timber Company operated a small log saw mill here for many years, but shut the facility down about a year ago for lack of adequate long-term timber supply.

Owens and Hurst Lumber Company, long-ago owners of the Plum Creek Fortine mill, also operated a small-log sawmill at Eureka for many years, but the company shuttered the mill four years ago because it could no longer find competitively priced logs within a reasonable haul distance of the mill. Previous to Owens and Hurst’s closure, another sawmill, American Timber, also closed and liquidated all assets. The equipment from both the Fortine and Eureka mills was sold at auction and nothing remains on either site. Both may have potential for placement of a power plant.

Information was compiled and is summarized for both a 40 and 70 mile radius between the towns of Eureka and Fortine. Figure C-1 shows an overview of these radii and land ownership. This site provides enough fuel supply at any of the other potential sites in the immediate area. Estimates of the quantity potentially available from live and standing dead trees and forested and timberland acres were made using the latest (2003 to 2008) Forest Inventory and Analysis (FIA) EVALIDator data. Estimates of logging residue were made using the latest (2004) information in the FIA Timber Products Output (TPO) database.

The total acreage of forests, by owner, within 40 miles of Eureka/Fortine are shown in Table C1.

Table C1: Total Forest Acres Within 40-mile Radius of Eureka/Fortine

| Ownership | Forested Acres* | Percent of Total |
|------------------------|-----------------|------------------|
| National Forest System | 1,169,826 | 78% |
| Bureau of Land Mgmt | 0 | 0% |
| State | 141,441 | 10% |
| All Private | 186,474 | 12% |
| Total | 1,497,741 | 100% |

* Forested acres on USFS and BLM include only non-reserved timberland. Non-reserved Timberlands are defined as: “forest land that is producing or capable of producing in excess of 20 cubic feet per acre per year of wood at culmination of mean annual increment.



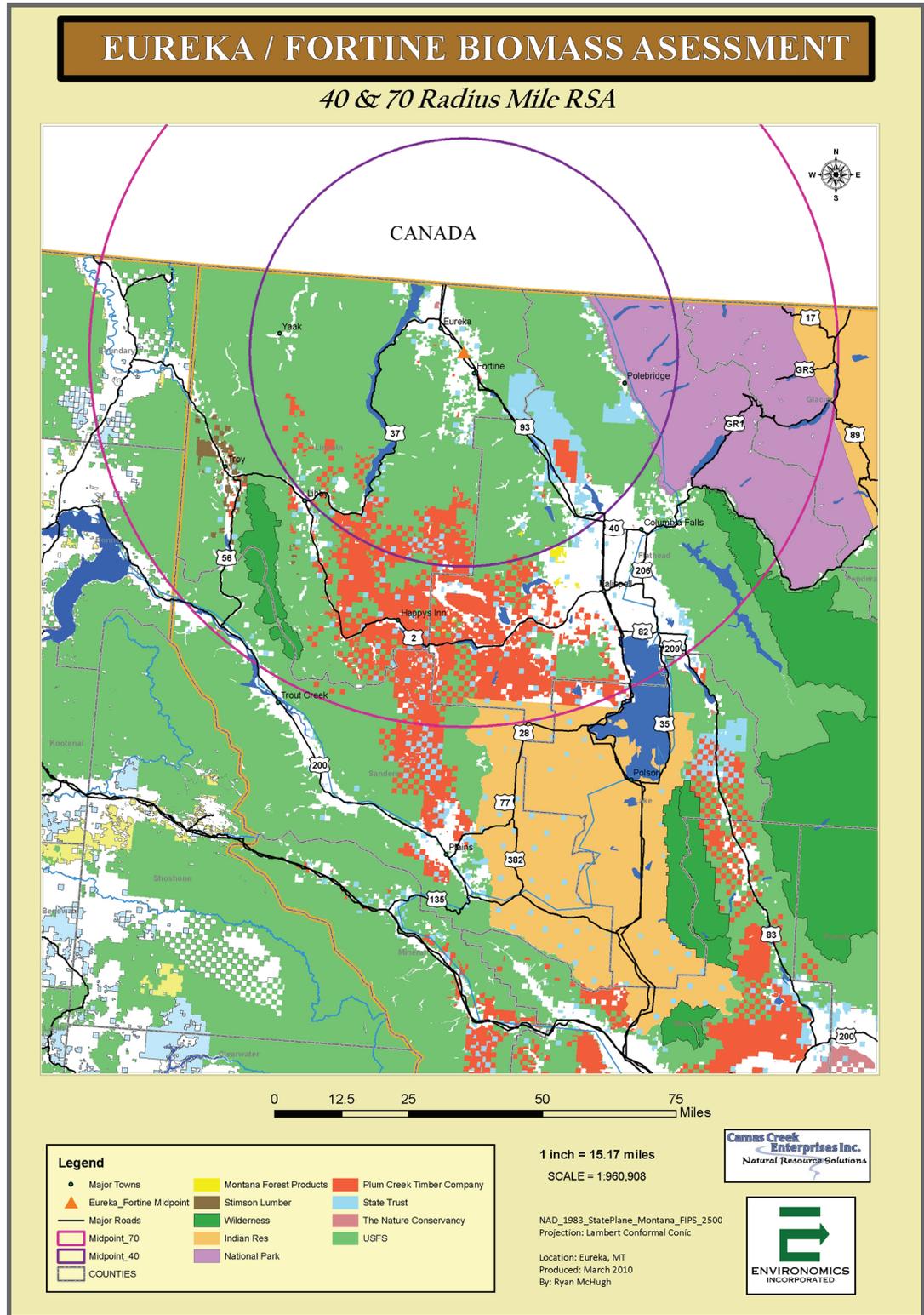


Figure C-1



Not all of the forested acres are available for timber harvest. In an effort to get an idea of what forested lands are realistically available for timber management over time and the current status of standing timber on those lands at this specific time, certain ‘screens’ were identified that limit the land base considered for analysis. Based on the land ownership, these included:

- On US Forest Service lands, data provided is from those lands that are within the wildland/urban interface (WUI).
- On BLM lands, only those acres outside of Wilderness Study Areas (WSA’s) were considered.
- On Bureau of Indian Affairs lands, acres that are not reserved from timber harvest (non-reserved lands) were included.
- On state lands, lands that are not-deferred from timber management (non-deferred) were considered.

Two other additional screens were used: only those forested acres that have ground slopes of less than 40%; and, on US Forest Service forested acres; any lands that have a stand designation of “old-growth” were excluded.

Information that includes the total acres on each of these classifications as well as the forest biomass currently standing on these acres (both live and dead) is included in the following tables. The data provided in them is a compilation of information provided by public land managing agencies in response to a collaborated request of biomass analysis from Porter Bench Energy and Northwest Energy using the screens discussed above. Table C2 shows the acreages by land owner type.

Table C2*: Forested Acres by Ownership

| Attribute | USFS | BLM | BIA | DNRC | Private** |
|-------------------------|-----------|-----|-----|---------|-----------|
| Total Forested Acres | 1,169,826 | 0 | 0 | 141,441 | 186,474 |
| Screened Acres Analyzed | 196,144 | 0 | 0 | 98,791 | 142,125 |

* Data from Biomass Supply Analysis, 2010

** Private land screened for slope only. From Forest Inventory Analysis Evaluator 4.01, Montana 2008

This screening of acreages provides the quantities of biomass potentially accessible for management within the 40-mile working circle as summarized in Table C3.

Table C3*: Biomass on Screened Acres

| Attribute | USFS | BLM | BIA | DNRC | Private** |
|--------------------------------------|------------|-----|-----|-----------|-----------|
| Biomass on Screened Acres (Dry Tons) | 10,219,094 | 0 | 0 | 2,861,058 | 3,747,100 |

* Data from USFS Biomass Supply Analysis, 2010

** Private land screened for slope only. From Forest Inventory Analysis Evaluator 4.01, Montana 2008



Owners have a variety of management regimes on forested lands with each management regime designed to achieve specific long and short term results. While it is not possible to list all of the management desires of all owners within a working circle, it is possible to identify the annual harvest from the lands within a given radius of a site by using the Forest Inventory Analysis Timber Product Output database (CY 2004). Harvest outputs from year to year reflect the implementation of the individual harvest planning of forest owners in an area. Therefore, it is harvest patterns that serve as the basis for determining available biomass within working specific working circles around each potential power generating site.

Further, harvest processes generate logging residue that can be quantified as available woody biomass. In talking with a number of experts from environmental and economical perspectives, it was determined that each thousand board feet harvested generates from 1 to 1.2 dry tons of biomass residue, though only about 40% of the residue is economically accessible for removal and transport (accessibility factor = 40%).

Table C4 reflects this accessibility factor and shows the harvest residue volumes for 2004 by county within 40-mile radius of Eureka/Fortine.

Table C4: Estimated Unused 2004 Forest Residues by County Within 40-mile Radius (Dry Tons*)

| County | USFS & Other Public Lands | Private | Total | Percent of Total |
|----------|---------------------------|---------|---------|------------------|
| Flathead | 57,663 | 114,252 | 171,915 | 58% |
| Lincoln | 33,900 | 90,090 | 123,990 | 42% |
| Total | 91,563 | 204,342 | 295,295 | 100% |

* The 2008 Montana timber harvest levels were approximately 60% of the 2004 harvest. Consequently the volume of logging residue currently being produced is likely to be much lower than 2004 levels.

Table C4.1 translates this into available dry tons of forest residue per year in the two counties, using a 40% accessibility factor.

Table C4.1: Potentially Available Dry Tons Within a 40-mile Radius

| | |
|--|---------|
| Dry tons/year (2004) | 295,905 |
| Harvest reduction from 2004 | 0.6 |
| Dry tons/year (2008) | 177,543 |
| Accessibility factor | 0.4 |
| Potentially accessible dry tons/year in Eureka/Fortine RSA | 84,501 |



Table C5 summarizes the annual forest harvest residue within the 70-mile working circle.

Table C5: Annual Forest Harvest Residue Available Within 40-miles of Eureka/Fortine*

| | |
|--|---------|
| Dry tons/year (2004) | 557,721 |
| Harvest reduction from 2004 levels** | 0.6 |
| Dry tons/year (2008) | 334,632 |
| Accessibility factor | 40% |
| Potentially accessible dry tons/year in the 10 county study area | 159,349 |

* Estimated unutilized residue volumes by counties located wholly or partially within the 40-mile radius of Eureka/Fortine, Bone Dry Tons.

** The 2008 Montana timber harvest levels were approximately 60% of the 2004 harvest.

MUNICIPAL SOLID WASTE

Woody biomass from facilities within the working circles of Eureka/Fortine are currently being removed by an area contractor. That contractor stated that the Eureka disposal site has some 500 dry tons of woody debris available each year, the Flathead facility yields around 900 dry tons, Libby 1000 dry tons and Happy's Inn 150 dry tons. This total of around 2550 tons per year is under contract but is currently not utilized by area biomass consumers.

UTILITY LINE MAINTENANCE & CONSTRUCTION

The utility line vegetation manager at North Western Energy indicated that nearly all of the woody biomass residues created from utility line maintenance are currently unutilized, either deposited at local dump sites or scattered in the right-of-way. This category of wood waste represents a potentially significant source of woody biomass feedstock for the Eureka/Fortine site, but no quantities have been calculated.

70-MILE WORKING CIRCLE ANALYSIS

The total acreage of forests, by owner, within 70 miles of Eureka/Fortine is shown in Table C6.



Table C6: Forested Acres Within a 70-mile Radius of Eureka/Fortine*

| Ownership | Acres | Percent of Total |
|-------------------------|-----------|------------------|
| National Forest System* | 3,106,306 | 70% |
| State (MT) | 210,679 | 5% |
| State (ID) | 25,970 | 1% |
| Private (MT) | 979,997 | 22% |
| Private (ID) | 110,701 | 2% |
| Total | 4,433,653 | 100% |

* Forested acres on USFS and BLM include only non-reserved timberland. Non-reserved Timberlands are defined as: "forest land that is producing or capable of producing in excess of 20 cubic feet per acre per year of wood at culmination of mean annual increment and which is not permanently reserved from wood products utilization through statute or administrative designation."

Just as indicated in the 40 mile working circle analysis, not all of the forested acres are available for timber harvest in the 70 mile working circle. Only those forested acres that have ground slopes of less than 40% were included. On US Forest Service forested acres, "old-growth" areas were not included.

Information that includes the total acres on each of these classifications as well as the forest biomass currently standing on these acres (both live and dead) was developed. The data provided in Tables C7, C8 and C9 represent a compilation of information provided by public land managing agencies in response to a collaborated request of biomass analysis from Porter Bench Energy and Northwest Energy using the screens discussed above.

Table C7 shows acreages by land owner.

Table C7*: Forested and Screened Acres Within a 70-mile Radius

| Attribute | USFS | DNRC | Private (MT Only)** |
|---|------------|-----------|---------------------|
| Total Forested Acres Within 70 Miles | 2,078,510 | 203,584 | 979,997 |
| Screened Acres Analyzed | 393,175 | 151,774 | 835,593 |
| Total Biomass Standing on Screened Acres (dry tons) | 22,057,129 | 4,327,710 | 14,941,128 |

* Data from Biomass Supply Analysis, 2010

** Private land screened for slope only. From Forest Inventory Analysis Evaluator 4.01, Montana 2008

Table C8 shows harvest volumes and correspondent logging residue values for 2004 by county within 70-mile radius of Eureka/Fortine.



Table C8: Estimated Unused 2004 Forest Residues by County Within 70-mile Radius (Dry Tons*)

| County | USFS & Other Public Lands | Private | Total | Percent of Total |
|-----------------------|---------------------------|---------|---------|------------------|
| Flathead | 57,663 | 114,252 | 171,915 | 31% |
| Bonner/ Boundary** | 58,665 | 106,515 | 165,180 | 30% |
| Lincoln | 33,900 | 90,090 | 123,990 | 22% |
| Sanders | 20,448 | 65,478 | 85,926 | 15% |
| Glacier | 60 | 10,650 | 10,710 | 2% |
| Total | 170,736 | 386,985 | 557,721 | 100% |

* Data from Timber Product Output (TPO), 2004 (dry tons)

** Idaho county values are CY 2001 (dry tons)

Table C9 identifies the probable harvests and probable residue values for those residues that are accessible for 2008 and reflect a 60% reduction from 2004 harvest levels. The numbers reflect a 40% accessibility factor.

Table C9: Potentially Available Dry Tons Within a 70-mile Radius

| | |
|--|---------|
| Dry tons/year (2004) | 557,721 |
| Harvest reduction from 2004 | 0.6 |
| Dry tons/year (2008) | 334,633 |
| Accessibility factor | 0.4 |
| Potentially accessible dry tons/year in Eureka/Fortine RSA | 133,852 |

SUSTAINABILITY

In discussing forest removals for biomass utilization, it is important to understand the forest growth and forest mortality occurring each year on forests surrounding the Eureka/Fortine site. Within the 70 mile working circle of Eureka/Fortine, forests on all ownerships grow over 3.0 million bone dry tons of biomass, as shown in Table C10. It is worthy of note that national forest lands within the 70 mile working radius witnessed the heaviest mortality. The forest health crisis that is working towards Montana from both the north and the south is already showing an impact in these 2008 figures.



Table C10: Eureka/Fortine: Forest Growth Within 70-miles

| Owner | Montana Net Growth In Cubic Feet/ Year | Montana Mortality In Cubic Feet/ Year | Idaho Net Growth In Cubic Feet/ Year | Idaho Mortality Tons In Cubic Feet/ Year | Gross Growth In Cubic Feet/ Year | Gross Growth In Bone Dry Tons/ Year | Mortality In Bone Dry Tons/ Year |
|-----------------|--|---------------------------------------|--------------------------------------|--|----------------------------------|-------------------------------------|----------------------------------|
| National Forest | 128,678,778 | 60,291,309 | 12,542,411 | 11,539,475 | 213,051,973 | 2,556,624 | 861,969 |
| State | 11,514,747 | 2,550,682 | 311,962 | 537,499 | 14,914,890 | 178,979 | 37,058 |
| Private | 32,413,361 | 4,512,645 | 8,486,438 | 771,573 | 46,184,017 | 554,208 | 63,411 |
| Total | 172,606,886 | 67,354,636 | 21,340,810 | 12,848,548 | 274,150,880 | 3,289,811 | 962,438 |

There are areas of Idaho land that fall within the 70 mile working circle of the Eureka area; however, Eureka is over 100 miles from Idaho and therefore outside the functional economic working circle for power generating biomass. It should also be noted that while there is impressive growth in the forests around the Eureka/Fortine RSA, 78% of that growth is found on national forest lands. The growing stock on private lands is found largely on the single biggest private ownership, Plum Creek.

WOOD PRODUCTS INDUSTRY WITHIN THE WORKING CIRCLE

Table C11 provides a list of wood manufacturing plants inside the 70 mile RSA of Eureka/Fortine. There are several other types of wood product manufacturing operations in Montana. Only those that represent potential competition for the feedstock supplies necessary for additional biomass consumption are included. Larger diameter green and dead, straight checked timber, while more suitable for the higher values of dimension lumber or log home construction are included in the lists because they represent entities that will likely be involved in the marketing of materials that can be used for fueling biomass heat/power generation.



Table C11: Wood Products Manufacturing Plants in 70-mile RSA: Fortine/ Eureka

| Company | Mill type | City | County | Phone |
|--------------------------------------|---------------|---------------|----------|---------------|
| Johnson Brothers | bark products | Olney | Flathead | 406-881-3033 |
| Johnson Brothers | bark products | C-Falls | Flathead | 406-892-9200 |
| Air-Lock Log Homes | house log | T-Falls | Sanders | 406-827-3193 |
| Artisan Log Works | house log | Whitefish | Flathead | 406-250-3664 |
| Baldwin Log Homes log home | house log | Kila | Flathead | 406.755.7602 |
| Blackjack Custom Log Home | house log | T-Falls | Sanders | 406-827-3010 |
| Caribou Creek Log Homes, Inc. | house log | Bonnors Ferry | Boundary | 208-267-7876 |
| Centennial Log Homes | house log | C-Falls | Flathead | 406-892-7050 |
| Cougar Ridge Log Homes | house log | Troy | Lincoln | 406-295-5434 |
| Diversified House Logs | house log | Troy | Lincoln | 406-295-5351 |
| Eureka Montana Log Homes | house log | Eureka | Lincoln | 406-889-3293 |
| Homestead Log Works | house log | Rexford | Lincoln | 406-889-3052 |
| Kootenai Log Homes | house log | Rexford | Lincoln | 406-889-5836 |
| Kalispell MT Log Homes | house log | Kalispell | Flathead | 406-752-2992 |
| Meadowlark Log Homes | house log | Libby | Lincoln | 406-293-8707 |
| Montana View Log Homes | house log | Rexford | Lincoln | 406-889-5472 |
| Old Style Log Works | house log | Kalispell | Flathead | 406-755-6669 |
| Shady Grove Log and Timber Builders | house log | Whitefish | Flathead | 406-212-0388 |
| Top Notch Log Homes | house log | C-Falls | Flathead | 406-892-0596 |
| Agape Log Furniture | log furn | Fortine | Lincoln | 406-882-4517 |
| Custom Design Furniture | log furn | Bonnors Ferry | Boundary | 208-267-5969 |
| Cabinet Mountain Furniture | log furn | Libby | Lincoln | 406-293-5255 |
| Frontier Log Furniture | log furn | Somers | Flathead | 406-857-3525 |
| Grizzly Furniture | log furn | Bigfork | Flathead | 406-837-3189 |
| Montana Woodworks | log furn | Rexford | Lincoln | 406-889-3728 |
| Rustic Rails Furniture and Log Works | log furn | C-Falls | Flathead | 406-892-3680 |
| Simonson's Log Furniture | log furn | Kalispell | Flathead | 406-257-6312 |
| Plum Creek | MDF | C-Falls | Flathead | 406-892-6486 |
| Plum Creek | plywood | C-Falls | Flathead | 406-892-6486 |
| Plum Creek | plywood | Kalispell | Flathead | 406-892-6486 |
| Johnson Brothers | pellet | Eureka | Lincoln | 406- 543-5355 |
| North Idaho Energy Logs, Inc. | pellet | Moyie Springs | Boundary | 208-267-5311 |
| Larry's Post Company | post/pole | C-Falls | Flathead | 406-892-5175 |
| Branda Northwest Sawmill | sawmill | Kila | Flathead | 406.257.6952 |



| Company | Mill type | City | County | Phone |
|-------------------------------------|-----------|---------------|----------|--------------|
| Conkle's Custom Cuts | sawmill | Olney | Flathead | 406-881-2242 |
| Idaho Forest Group | sawmills | Moyie Springs | Boundary | 208-255-3200 |
| Jerry Hill | sawmill | West Glacier | Flathead | 406-888-5008 |
| Morton Lumber Company | sawmill | Kalispell | Flathead | 406-752-0379 |
| Plum Creek | sawmill | Kalispell | Flathead | 406-892-6486 |
| Plum Creek | sawmill | C-Falls | Flathead | 406-892-6486 |
| Neumayer Mills Limited | sawmill | Bonnars Ferry | Boundary | 208-267-2754 |
| RBM Logging and Lumber | sawmill | C-Falls | Flathead | 406-892-4208 |
| Russell's Mill | sawmill | Noxon | Sanders | 406-847-2075 |
| Shady Grove Log and Timber Builders | sawmill | Whitefish | Flathead | 406-212-0388 |
| Specialty Beams | sawmill | Noxon | Sanders | 406-847-5510 |

Table C12 shows the current woody biomass consumers in the 70-mile working circle.

Table C12: Woody Biomass Consumers in Eureka/Fortine 70-mile RSA

| Company | Type | City | County | Dry Tons |
|------------------|---------------|---------|----------|----------|
| Eureka Schools | boiler fuels | Eureka | Lincoln | 457 |
| Johnson Brothers | bark products | Olney | Flathead | unknown |
| Johnson Brothers | pellet | Eureka | Lincoln | unknown |
| Plum Creek | MDF | C-Falls | Flathead | 350,000 |
| Troy Schools | boiler fuels | Troy | Lincoln | 29 |

In December of 2009, the Smurfit-Stone Container facility in Frenchtown closed, resulting in the loss of a 1.5 Million Dry Ton outlet for the state's primary wood products industry. The full effect of this closure has yet to be determined, but there is a clear opportunity for another commercial consumer of woody biomass.

The impact of this closure on a potential power generating facility at the Eureka/Fortine site is very hard to quantify. At the time of closure, Smurfit's wood purchasing working circle had expanded to several hundred miles and included the purchase of round logs that they processed into pulp on site. While it is clear that a great deal of woody biomass - including residue from area mills and area contractors - is now without a delivery point, the amount that can be redirected to a power facility and meet the economic needs of both buyer and seller is worthy of study that is beyond the scope of this report.

Finally, the proximity of Eureka-Fortine to the Canadian border raises other issues. While there is a long history of moving fiber across the border, this flow has been inconsistent in volume and pricing. While Provincial management of forest lands includes long term contracts with forest



management companies and those companies have a great deal of flexibility in marketing product, there is also a systemic preference to market fiber to other Canadian interests. Through discussions with associates in British Columbia, it was learned that there may be some potential fiber that would be economically available for the area, but that potential is neither huge nor 100% reliable and quantification of any amounts that may be available is beyond the scope of this report.

SUMMARY FOR THE EUREKA/FORTINE RSA

The public lands portion of existing biomass for the Eureka-Fortine area is significant. Just the mortality on the Forest Service ownership within 70 miles represents over 700,000 tons. The growth of over 2.5 million bone dry tons per year on just public lands reflects the fact that this is some of the most productive timberlands in the state. However, accessibility and uncertainty of supply for biomass on public lands is a major issue and constraint. Biomass on private lands within this working circle includes those lands owned and utilized by Plum Creek and Stoltz Land and Lumber. Although the forest has more than sufficient fiber to fuel a power and heat generating plant in the Eureka-Fortine area, access to the fiber and securing long term contracts to assure certainty will be needed to make a plant a reality.



chapter D
troy, montana

Troy is surrounded by timberland, including some of the most productive forestlands in the entire state. There have been sawmills in Troy from time to time over the last century. It is home to a small cedar manufacturing complex, Chapel Cedar. This firm has expressed interest in siting a biomass power plant; therefore, this site was used as the center of the fiber analysis for the Troy area. The Revett Minerals Troy Mine also has land available for potential industrial use and is 15 miles south of Troy. There is strong local support for such a biomass project in Troy.

Estimates of the quantity potentially available from live and standing dead trees and forested and timberland acres were made using the latest (2003 to 2008) Forest Inventory and Analysis (FIA) EVALIDator data. Estimates of logging residue were made using the latest (2004) information in the FIA Timber Products Output (TPO) database. Information was compiled and is summarized for both a 40 and 70 mile radius from the Troy site. Figure D-1 shows an overview of these radii and land ownership.

The total acreage of forests, by owner, within 40 miles of Troy is shown in Table D1.

Table D1: Total Forest Acres Within 40-mile Radius of Troy

| Ownership | Forested Acres | Percent of Total |
|-------------------------|----------------|------------------|
| National Forest System* | 1,390,821 | 72% |
| State of Montana | 26,432 | 1% |
| State of Idaho | 87,002 | 4% |
| All Private (MT and ID) | 440,305 | 23% |
| Total | 1,944,560 | 100% |

* Forested acres on USFS include only non-reserved timberland. Non-reserved Timberlands are defined as: "forest land that is producing or capable of producing in excess of 20 cubic feet per acre per year of wood at culmination of mean annual increment."

Not all of the forested acres are available for timber harvest. In an effort to get an idea of what forested lands are realistically available for timber management over time and the current status of standing timber on those lands at this specific time, certain 'screens' were identified that limit the land base considered for analysis. Based on the land ownership, these included:



- On US Forest Service lands, data provided is from those lands that are within the wildland/urban interface (WUI).
- On BLM lands, only those acres outside of Wilderness Study Areas (WSA's) were considered.
- On Bureau of Indian Affairs lands, acres that are not reserved from timber harvest (non-reserved lands) were included.
- On state lands, lands that are not-deferred from timber management (non-deferred) were considered.



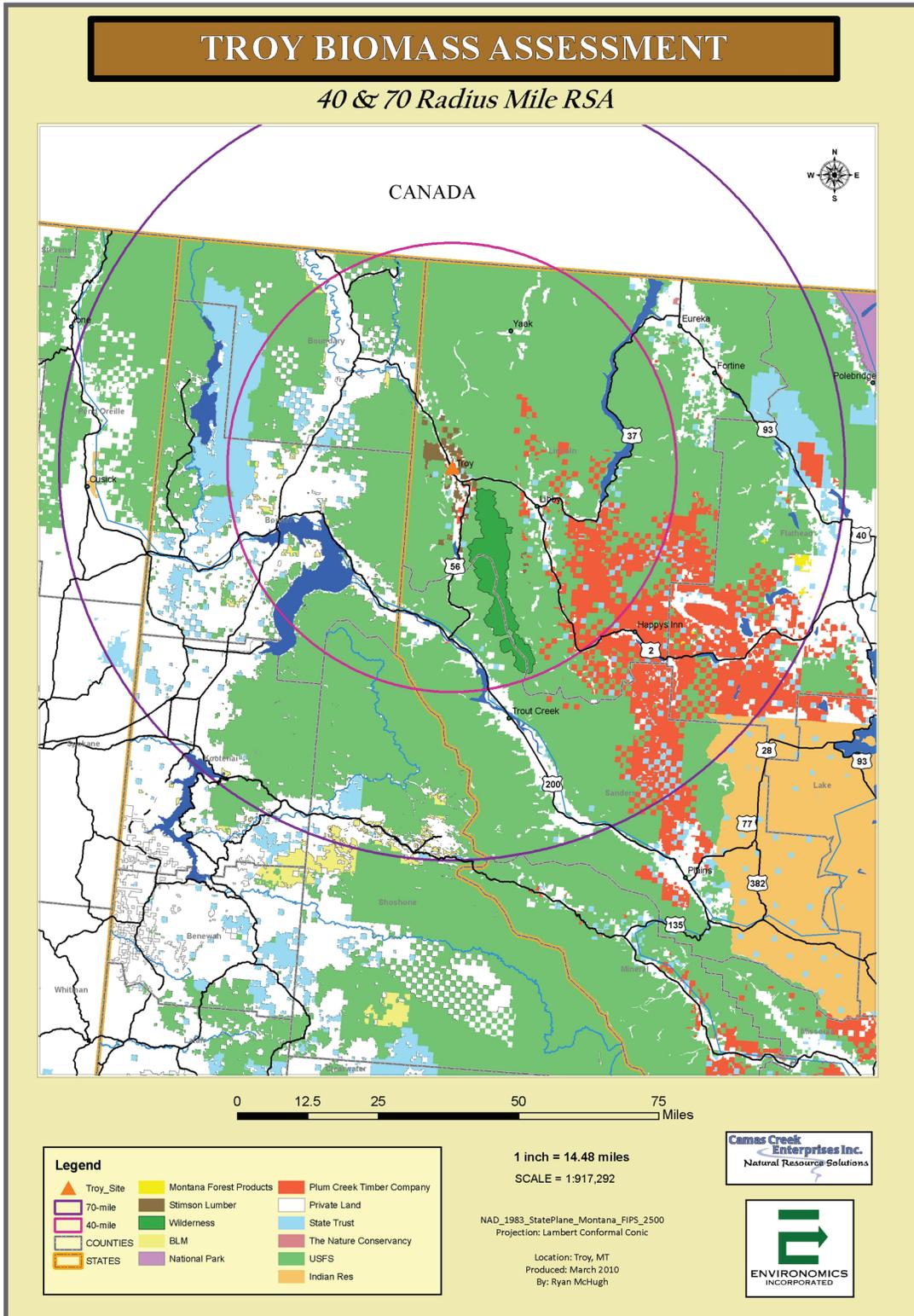


Figure D-1

Two other additional screens were used: only those forested acres that have ground slopes of less than 40% and on US Forest Service forested acres were chosen; any lands that have a stand designation of “old-growth” were excluded.

Information that includes the total acres on each of these classifications as well as the forest biomass currently standing on these acres (both live and dead) is included in the following tables. The data provided in them is a compilation of information provided by public land managing agencies in response to a collaborated request of biomass analysis from Porter Bench Energy and Northwest Energy using the screens discussed above.

Table D2 shows the number of forested acres by land ownership category.

Table D2*: Forested Acres by Ownership

| Attribute | USFS | DNRC | State of ID | Private** |
|-------------------------------------|-----------|--------|-------------|-----------|
| Total Forested Acres Within Screens | 1,390,821 | 26,432 | 26,432 | 440,305 |
| Suitable Screened Acres Analyzed | 243,020 | 21,003 | 21,003 | 341,320 |

* Data from biomass supply requests, 2010

** Private land screened for slope only. From Forest Inventory Analysis Evaluator 4.01, Montana 2008

This screening of acreages provides the quantities of biomass potentially accessible for management within the 40 mile working circle as summarized in Table D3.

Table D3*: Biomass on Screened Acres

| Attribute | USFS | MT DNRC | State of ID** | MT Private** | ID Private** |
|--------------------------------------|------------|---------|---------------|--------------|--------------|
| Biomass on Screened Acres (Dry Tons) | 15,553,295 | 851,396 | 2,874,058 | 2,087,106 | 6,520,031 |

* Data from biomass supply requests, 2010

** Private and Idaho state lands screened for slope only. From Forest Inventory Analysis Evaluator 4.01, Montana 2008

Owners have a variety of management regimes on forested lands with each management regime designed to achieve specific long and short term results. While it is not possible to list all of the management desires of all owners within a working circle, it is possible to identify the annual harvest from the lands within a given radius of a site by using the Forest Inventory Analysis Timber Product Output database (CY 2004). Harvest outputs from year to year reflect the implementation of the individual harvest planning of forest owners in an area. Therefore, it is harvest patterns that serve as the basis for determining available biomass within working specific working circles around each potential power generating site.

Further, harvest processes generate logging residue that can be quantified as available woody biomass. In talking with a number of experts from



environmental and economical perspectives, Environomics learned that each thousand board feet harvested generates from 1 to 1.2 dry tons of biomass residue, though only about 40% of the residue is economically accessible for removal and transport (accessibility factor = 40%).

Table D4 shows the harvest residue volumes for 2004 by county within 40-mile radius of Troy.

Table D4: Estimated Unused 2004 Forest Residues by County Within a 40-mile Radius (Dry Tons)

| County | USFS & Other Public Lands | Private | Total | Percent of Total |
|-----------------------|---------------------------|---------|---------|------------------|
| Bonner/ Boundary** | 58,665 | 106,515 | 165,180 | 31% |
| Shoshone** | 39,090 | 110,475 | 149,565 | 29% |
| Lincoln | 33,900 | 90,090 | 123,990 | 24% |
| Sanders | 20,448 | 65,478 | 85,926 | 16% |
| Total | 152,103 | 372,558 | 524,661 | 100% |

* The 2008 Montana timber harvest levels were approximately 60% of the 2004 harvest. Consequently, the volume of logging residue currently being produced is likely to be much lower than 2004 levels. While Idaho public land harvest levels were lower in 2001 than in 2004, we presume that private land harvests were equal to or greater than 2004 values.

** Idaho Counties

The following table identifies the probable harvests and probable residue values for those residues that are accessible for 2008 and reflect a 60% reduction from 2004 harvest levels. The numbers assume a 40% accessibility factor.

Table D5: Annual Potentially Available Dry Tons of Forest Residue Within a 40-mile Radius of Troy

| | |
|--|---------|
| Dry tons/year | 524,661 |
| Harvest reduction | 0.6 |
| Dry tons/year | 314,796 |
| Accessibility factor | 40% |
| Potentially accessible dry tons/year in Troy RSA | 125,918 |

MUNICIPAL SOLID WASTE

Woody biomass from facilities within the working circles of Troy are currently being removed by an area contractor. The Troy disposal site has some 400 dry tons of woody debris available each year; the Libby Dump facility yields around 1000 dry tons; and Happy's Inn yields about 150 dry tons. This total of around 1550 tons per year is under contract but is currently not utilized by area biomass consumers.



UTILITY LINE MAINTENANCE & CONSTRUCTION

The utility line vegetation manager at North Western Energy provided information that nearly all of the woody biomass residues created from utility line maintenance are currently unutilized, either deposited at local dump sites or scattered in the right-of-way. This category of wood waste represents a potentially significant source of woody biomass feedstock for the Troy site, but no quantities have been calculated.

70 MILE WORKING CIRCLE ANALYSIS

Forest biomass available within a 70 mile radius of the Troy site was analyzed.

Table D6 shows the total acreage of forests, by owner, within 70 miles of Troy.

Table D6: Forested Acres Within a 70-mile Radius of Troy

| Ownership | Acres | Percent of Total |
|-------------------------|-----------|------------------|
| National Forest System* | 2,980,427 | 61% |
| State of Montana | 180,209 | 4% |
| State of Idaho | 252,363 | 5% |
| All Private (MT and ID) | 1,490,096 | 30% |
| Total | 4,903,095 | 100% |

* Forested acres on USFS and BLM include only non-reserved timberland. Non-reserved Timberlands are defined as: “forest land that is producing or capable of producing in excess of 20 cubic feet per acre per year of wood at culmination of mean annual increment and which is not permanently reserved from wood products utilization through statute or administrative designation.”

Just as indicated in the 40 mile working circle analysis, not all of the forested acres are available for timber harvest in the 70 mile working circle. Available biomass is considered only for only the following lands: US Forest Service lands within the wildland/urban interface (WUI); BLM lands outside of Wilderness Study Areas (WSA’s); Bureau of Indian Affairs non-reserved lands; and state lands that are not-deferred from timber management (non-deferred).

Only those forested acres that have ground slopes of less than 40% were chosen. No “old-growth” areas on US Forest Service forested acres were considered.

Table D7 shows the total acres on each of these classifications as well as the forest biomass currently standing on these acres (both live and dead).



Table D7*: Forested and Screened Acres Within a 70-mile Radius of Troy

| Attribute | USFS | DNRC | State of ID** | MT Private** | ID Private** |
|-------------------------|-----------|---------|---------------|--------------|--------------|
| Total Forested Acres | 2,980,427 | 180,209 | 278,333 | 896,617 | 593,479 |
| Screened Acres Analyzed | 500,347 | 135,907 | 181,880 | 745,760 | 444,965 |

* Data from biomass supply requests, 2010

** Private and Idaho state lands screened for slope only. From Forest Inventory Analysis Evaluator 4.01, Montana 2008

This screening of acreage also lowers the quantities of biomass potentially accessible for management within the 70 mile working circle; the results are shown in Table D8.

Table D8*: Potential Available Biomass on Screened Acres Within a 70-mile Radius

| Attribute | USFS | DNRC | State of ID** | MT Private** | ID Private** |
|--------------------------------------|------------|-----------|---------------|--------------|--------------|
| Biomass On Screened Acres (Dry Tons) | 29,170,228 | 4,192,452 | 6,615,685 | 13,065,615 | 10,306,720 |

* Data from biomass supply requests, 2010

** Private and Idaho state lands screened for slope only. From Forest Inventory Analysis Evaluator 4.01, Montana 2008

Table D9 shows the harvest volumes and correspondent logging residue values for 2004 by county within 70-mile radius of Troy.

Table D9: Estimated Unused 2004 Forest Residues by County Within a 70-mile Radius (Dry Tons)

| County | USFS & Other Public Lands | Private | Total | Percent of Total |
|-----------------------|---------------------------|---------|---------|------------------|
| Flathead | 57,663 | 114,252 | 171,915 | 22% |
| Bonner/ Boundary** | 58,665 | 106,515 | 165,180 | 22% |
| Shoshone** | 39,090 | 110,475 | 149,565 | 19% |
| Lincoln | 33,900 | 90,090 | 123,990 | 16% |
| Sanders | 20,448 | 65,478 | 85,926 | 11% |
| Kootenai** | 1,155 | 72,375 | 73,530 | 10% |
| Total | 210,921 | 559,185 | 770,106 | 100% |

* The 2008 Montana timber harvest levels were approximately 60% of the 2004 harvest. Consequently, the volume of logging residue currently being produced is likely to be much lower than 2004 levels. While Idaho public land harvest levels were lower in 2001 than in 2004, we presume that private land harvests were equal to or greater than 2004 values.

**Idaho Counties



Table D10 identifies the probable harvests and probable residue values for those residues that are accessible for 2008 and reflect a 60% reduction from 2004 harvest levels. The numbers assume a 40% accessibility factor.

Table D10: Potentially Available Dry Tons of Forest Residue Within a 70-mile Radius of Troy

| | |
|--|---------|
| Dry tons/year (2004) | 770,106 |
| Harvest reduction from 2004 | 0.6 |
| Dry tons/year (2008) | 462,063 |
| Accessibility factor | 40% |
| Potentially accessible dry tons/year in Troy RSL | 184,825 |

SUSTAINABILITY

In discussing forest removals for biomass utilization, it is important to understand the forest growth and forest mortality occurring each year on forests surrounding the Troy site. Within the 70 mile working circle of Troy, forests on all ownerships grow over 3.0 million bone dry tons of biomass, as shown in Table D11. It is worthy of note that national forest lands within the 70 mile working radius witnessed the heaviest mortality. The forest health crisis that is working towards Montana from both the north and the south is already showing an impact in these 2008 figures.

Table D11: Forest Growth Within a 70-mile Radius of Troy

| Owner | Montana Net Growth In Cubic Feet/ Year | Montana Mortality In Cubic Feet/ Year | Idaho Net Growth In Cubic Feet/ Year | Idaho Mortality Tons In Cubic Feet/ Year | Gross Growth In Cubic Feet/ Year | Gross Growth In Bone Dry Tons/ Year | Mortality In Bone Dry Tons/ Year |
|---------------------|--|---------------------------------------|--------------------------------------|--|----------------------------------|-------------------------------------|----------------------------------|
| National Forest | 142,901,151 | 50,597,493 | 72,489,678, | 55,093,961 | 321,082,283 | 3,852,987 | 1,268,297 |
| Bureau of Land Mgmt | N/A | N/A | 3,793,901 | 891,495 | 4,685,396 | 56,225 | 10,698 |
| State | 4,793,339 | 4,513,032 | 11,527,750 | 6,613,724 | 27,447,845 | 329,374 | 133,521 |
| Private | 33,407,632 | 4,344,884 | 40,638,820 | 4,400,639 | 82,791,975 | 993,504 | 104,946 |
| Total | 181,102,122 | 59,455,409 | 128,450,148 | 66,999,819 | 436,007,498 | 5,232,090 | 1,517,463 |

Below is a list of wood manufacturing plants inside the 70 mile RSA of Troy. There are several other types of wood product manufacturing operations in MT. For this report we included only those that represent potential competition for the feedstock supplies necessary for additional biomass consumption. Larger diameter green and dead, straight checked timber, while more suitable for the higher values of dimension lumber or log home construction are included in the lists because they represent entities that will likely be involved in the marketing of materials that can be used for fueling biomass heat/power generation.



Table D12: Wood Products Manufacturing Plants in 70-mile RSA: Troy

| Company | Mill type | City | County | Phone |
|---------------------------------|---------------|---------------|--------------|---------------|
| Johnson Brothers | bark products | Olney | Flathead | 406-881-3033 |
| Air-Lock Log Homes | house log | T-Falls | Sanders | 406-827-3193 |
| Artisan log Works | house log | Whitefish | Flathead | 406-250-3664 |
| Baldwin Log Homes log home | house log | Kila | Flathead | 406-755-7602 |
| Blackjack Custom Log Home | house log | T-Falls | Sanders | 406-827-3010 |
| Caribou Creek Log Homes, Inc. | house log | Bonnors Ferry | Boundary | 208-267-7876 |
| Clearwater Log Homes | house log | Hayden | Kootenai | 208-772-7891 |
| Cougar Ridge Log Homes | house log | Troy | Lincoln | 406-295-5434 |
| Diversified House Logs | house log | Troy | Lincoln | 406-295-5351 |
| Eureka Montana Log Homes | house log | Eureka | Lincoln | 406-889-3293 |
| Homestead Log Works | house log | Rexford | Lincoln | 406-889-3052 |
| Kootenai Log Homes | house log | Rexford | Lincoln | 406-889-5836 |
| Lammers Unlimited | house log | Coolin | Bonner | 208-443-2533 |
| Meadowlark Log Homes | house log | Libby | Lincoln | 406-293-8707 |
| Montana View Log Homes | house log | Rexford | Lincoln | 406-889-5472 |
| Northern Log Homes, Inc. | house log | Sandpoint | Bonner | 208-263-3250 |
| Agape Log Furniture | log furn | Fortine | Lincoln | 406-882-4517 |
| Blue Pine Enterprises | log furn | Sandpoint | Bonner | 208-263-4074 |
| Cabinet Mountain Furniture | log furn | Libby | Lincoln | 406-293-5255 |
| Custom Design Furniture | log furn | Bonnors Ferry | Boundary | 208-267-5969 |
| Montana Woodworks | log furn | Rexford | Lincoln | 406-889-3728 |
| Northwest Handmade Furniture | log furn | Sandpoint | Bonner | 208-365-5807 |
| Johnson Brothers | pellet | Eureka | Lincoln | 406- 543-5355 |
| Lignetics, Inc. | pellet | Sandpoint | Bonner | 208-263-0564 |
| North Idaho Energy Logs, Inc. | pellet | Moyie Springs | Boundary | 208-267-5311 |
| L.D. McFarland Company Limited | post/pole | Sandpoint | Bonner | 208-263-2141 |
| Mesenbrink Lumber, LLC | post/pole | Hayden | Kootenai | 208-772-7259 |
| North Idaho Post and Pole | post/pole | Hayden | Kootenai | 208-772-3942 |
| Panhandle Forest Products | post/pole | Cocolalla | Bonner | 208-265-4603 |
| North Idaho Wood Preserving | post/pole | Rathdrum | Kootenai | 208-687-2702 |
| Ponderay Newsprint Co. | pulp | Usk | Pend Oreille | 509-445-1511 |
| Branda Northwest sawmill | sawmill | Kila | Flathead | 406-257-6952 |
| Idaho Forest Group | sawmills | Moyie Springs | Boundary | 208-255-3200 |
| Merritt Brothers Lumber Company | sawmill | Athol | Kootenai | 208-683-3321 |



| Company | Mill type | City | County | Phone |
|-------------------------------------|-----------|---------------|----------|--------------|
| Neumayer Mills Limited | sawmill | Bonnors Ferry | Boundary | 208-267-2754 |
| Priest Lake Lumber Company, Inc. | sawmill | Priest River | Bonner | 208-443-2212 |
| Stimson Lumber Company | sawmill | Priest River | Bonner | 208-448-1141 |
| Whiteman Lumber Company, Inc. | sawmill | Cataldo | Shoshone | 208-682-4602 |
| Conkle's Custom Cuts | sawmill | Olney | Flathead | 406-881-2242 |
| Dickson Woodworks | sawmill | T-Falls | Sanders | 406-827-6455 |
| Russell's Mill | sawmill | Noxon | Sanders | 406-847-2075 |
| Shady Grove Log and Timber Builders | sawmill | Whitefish | Flathead | 406-212-0388 |
| Specialty Beams | sawmill | Noxon | Sanders | 406-847-5510 |

It should be noted that in December of 2009, the Smurfit-Stone Container facility in Frenchtown closed and with it a 1.5 Million Dry Ton outlet for the state's primary wood products industry. The full effect of this closure has yet to be determined, but there is a clear need (most would say an urgency of need) for another commercial consumer of woody biomass.

The impact of this closure on a potential power generating facility at the Troy site is very hard to quantify. At the time of closure, Smurfit's wood purchasing working circle had expanded to several hundred miles and included the purchase of round logs that they processed into pulp on site. While it is clear that a great deal of woody biomass - including residue from area mills and area contractors - is now without a delivery point, the amount that can be redirected to a power facility and meet the economic needs of both buyer and seller is worthy of study that is beyond the scope of this report.

Table D13: Woody Biomass Consumers in Troy 70-mile RSA

| Company | Type | City | County | Green Tons |
|-------------------------------|---------------|---------------|--------------|------------|
| Eureka Schools | boiler fuels | Eureka | Lincoln | 960 |
| Johnson Brothers | pellet | Eureka | Lincoln | unknown |
| Lignetics, Inc. | pellet | Sandpoint | Bonner | 163,800 |
| North Idaho Energy Logs, Inc. | pellet | Moyie Springs | Boundary | unknown |
| Troy Schools | boiler fuels | Troy | Lincoln | 60 |
| Johnson Brothers | bark products | Olney | Flathead | unknown |
| Ponderay Newsprint CO | pulp | Usk | Pend Oreille | 350,000 |

In December of 2009, the Smurfit-Stone Container facility in Frenchtown closed, resulting in the loss of a 1.5 Million Dry Ton outlet for the state's primary wood products industry. The full effect of this closure has yet to be determined, but there is a clear opportunity for another commercial consumer of woody biomass.



The impact of this closure on a potential power generating facility at the Troy site is very hard to quantify. At the time of closure, Smurfit's wood purchasing working circle had expanded to several hundred miles and included the purchase of round logs that they processed into pulp on site. While it is clear that a great deal of woody biomass - including residue from area mills and area contractors - is now without a delivery point, the amount that can be redirected to a power facility and meet the economic needs of both buyer and seller is worthy of study that is beyond the scope of this report.

SUMMARY FOR THE TROY SITE

Forest residue figures for Montana counties partially or wholly included in the Troy RSA's are based upon CY 2004 data from the FIA Timber Product Output (TPO). Idaho figures are also from the TPO, but are based upon CY 2001. Shoshone County was included in the 40 mile RSA because it was partially within it, and that it significantly impacted the total of dry tonnage that could potentially be available. Forest residues from Shoshone and Kootenai Counties within the 70 mile RSA of Troy, while significant, represent very long transportation distances that will preclude much of the available dry tons from being available.

There is significant biomass available in the Troy area; however, the vast majority of it is on federal lands. The City of Troy recently had an in depth biomass study completed that determined that without certainty of access to federal forests, there may be logging and milling residuals sufficient to fuel an 8 to 10 megawatt plant in Troy. Until the access issue over federal lands is corrected, the certainty of supply may preclude a biomass power and heat generating investor from attempting placement in Troy.

