PROJECTING THE ECONOMIC IMPACTS OF THE BLACKFOOT CLEARWATER STEWARDSHIP PROJECT

by

Joe Kerkvliet, Ph.D.[@]
Resource and Environmental Economist
The Wilderness Society

April 15, 2008
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Contact Information:
Joe Kerkvliet, Environmental and Resource Economist
The Wilderness Society, 503 West Mendenhall, Bozeman, Montana 59715,
Phone: 406-581-9826
E-mail: jkerkvliet@twsnw.org.

BACKGROUND:
The proposed Blackfoot Clearwater Stewardship Project (BCSP) involves the 400,000-acre Seeley Lake Ranger District of the Lolo National Forest within the Blackfoot River watershed as well as lands within the public-private 41,000-acre Blackfoot Community Conservation Area (BCCA). BCSP proposes to appropriate federal funds for stewardship projects, community forestry, and recreation enhancement projects in the area. It also provides funding for a cogeneration facility burning woody biomass in Seeley Lake. Finally, it proposes additions to the Bob Marshall-Scapegoat and Mission Mountain Wildernesses totaling 87,000 acres. The BCSP is consistent with the current Lolo National Forest Plan.[1] The BCSP has received support from local and county officials, wood products industry representatives, outfitters, recreation groups, and conservationists.

PURPOSE AND SUMMARY:
Currently there is limited information on the economic impacts, costs, and benefits of the BCSP. To partially fill this gap, this study provides projections of the economic impacts of the proposed BCSP funding authorizations and their implementation. These impacts are described in terms of changes in final demand (sales) in as many as 509 business sectors, employees' compensation, proprietors' incomes, other property income, indirect business taxes, and employment (numbers of part-time and full-time jobs).[2]

A major part of the BCSP is federal appropriations. For each of the next ten years, $750,000 federal appropriations -- matched each year by $250,000 in private funds -- would allow the planning, implementation, and monitoring of stewardship projects on the Seeley Lake Ranger District and BCCA. Stewardship projects would address hazardous fuels reduction, habitat improvements, and stream restoration, as well as improvements to forest access and hunting on the Blackfoot. These activities would be in addition to the Seeley Lake Ranger District achieving its historic timber harvest level (about 4 million board feet per year).[3] In addition, a one time federal appropriation of $4.5 million -- matched by $2.5 million from Pyramid Lumber Company, Inc. -- would be used to construct a modern cogeneration plant burning sawmill byproducts and forest residues to generate electricity and process steam at the Pyramid site in Seeley Lake, Montana.

The following are the highlights of our findings. Spending on stewardship projects is projected to stimulate a $5.6 million annual increase in final sales for western Montana businesses, along with $1.08 million in increased wages, $0.272 million in small business income, and nearly 40 new full and part time jobs in sawmills, logging, road construction, engineering services, and other business sectors. These impacts will persist for each of the ten years of appropriations, although they are likely to decline as the real value of the annual appropriations decrease over the decade. Construction of the cogeneration plant is projected to stimulate a one-time increase of $7.5 million in sales, $0.77 million in wages, $0.27 million in small business income, and 31

[1] Tim Love, District Ranger, Seeley Lake Ranger District, personal communication April 9, 2008.
[2] Because of data limitations, we are not able to distinguish between full and part time jobs. Our employment projections are the sum of both.
[3] Information on the Blackfoot Clearwater Stewardship Project is taken from http://www.blackfootclearwater.org/proposal/restoration/funding and http://www.blackfootclearwater.org/proposal/cogen/funding, last accessed March 3, 2008.

new short-term jobs. The projected annual impacts related to the operation of the cogeneration plant will continue for the life of the plant (up to twenty years), but the projections are sensitive to the amount of new biomass harvested to fuel the plant and the cost of harvesting that biomass. Cogeneration facility operations are projected to increase sales by $0.8-$1.9 million, wages $115,000-$275,000, and small business income $53,000 to $118,000. Between 5 and 12 additional new full and part time jobs are projected.

This report also briefly discusses other ecological and economic benefits that may occur if BCSP becomes law.

BCSP PROPOSED FEDERAL AND PRIVATE FUNDS:
This section briefly outlines the purposes and amounts of federal and private funding streams proposed by the BCSP.

Annual Funding for Each of the Next Ten Years Beginning FY08:

Forest Service Restoration Projects would include in-house restoration projects addressing Forest Service priorities, $100,000;

Blackfoot Community Conservation Area Projects include forest management and restoration projects within the 41,000 acre BCCA, $50,000;[4]

Stewardship Project Administration includes funding for Forest Service planning, management, evaluation, and reporting of stewardship projects. These funds will be spent on environmental analysis and project management, $300,000;

Monitoring Projects include Forest Service and third party monitoring, monitoring reports, and support of third party monitoring committees, $50,000;

Private-Public Stewardship Projects on the Seeley Lake Ranger District would include road relocation and closures, culvert and bridge replacement, stream restoration and bank stabilization, invasive species management, trailhead and campground improvements, understory removal and vegetative treatments, tree planting, precommercial thinning, prescribed burning, and trail and road remediation, $250,000 with dollar-for-dollar match of private funds;

One Time Funding in FY2009 or FY2010:

Cogeneration Facility: In addition the BCSP would provide cost share funds to construct a 3.2 megawatt (MW) cogeneration facility at the Pyramid Mountain Lumber, Inc site in Seeley Lake, Montana. The facility would generate electricity and process steam using woody biomass byproducts of Pyramid's current sawmill operations, as well as forest fuels from federal, state, and private forestlands. The electricity and process steam would be used in the Pyramid sawmill in Seeley Lake, MT and, perhaps, within the community of Seeley Lake.

[4] The Blackfoot Community Conservation Area is composed of contiguous forestland ownerships, including private landowners, Montana Department of State Lands, Montana Fish, Wildlife, and Parks, and the Blackfoot Community Forest.

Specifically the following federal funds would be authorized if the BCSP were to become law: $1,500,000 in FY09 for federal cost share for a new boiler (to be matched with $1,500,000 by Pyramid Mountain Lumber, Inc.) and $3,000,000 in FY10 for federal cost share for a new co-generation facility (to be matched with $1,000,000 by Pyramid Mountain Lumber, Inc.).

METHOD:

The purpose of this study is to provide projections of the economic impacts of the proposed BCSP funding authorizations and their implementation. These impacts are described in terms of changes in final demand (sales), employees compensation, proprietors' incomes, other property income, indirect business taxes, and employment (numbers of part and full time jobs) in as many as 509 business sectors.[5]

There are three components of the methodology we use to estimate these impacts. First, data for FY 2006 on the economic behavior of up to 509 business sectors, several representative consumers, and federal, state and local government spending units are obtained (Minnesota IMPLAN Group, Inc). The data are available at the county level and we select the counties of Missoula, Mineral, Ravalli, Granite, Deerlodge, Silverbow, Powell, and Lewis and Clark into the economic study area (ESA) examined here. The counties selected into the ESA contained businesses which either received products from the forest harvesting activities of the Clearwater Stewardship Project (CSP), or served as subcontractors on the CSP, or have strong economic links to those counties.[6]

Second, since we know neither the descriptions of the BCSP projects that would be implemented, nor the spending levels, we assume that BCSP would be implemented in a manner mirroring the CSP in terms of project descriptions, harvest levels, contractors hired, and allocations of funds. CSP was completed on the Seeley Lake Ranger District in 2004.[7]

Third, the projected impacts are obtained using the software IMPLAN© (Minnesota IMPLAN Group, Inc 1999-2004). IMPLAN uses a system of linear structural input-output equations describing the purchase and sales decisions of as many as 509 economic sectors, several representative consumers, and several types of federal, state, and local governmental units. IMPLAN is widely used by federal agencies and private consultants to estimate the impacts of various projects, including proposed changes in resource management plans (for example see Cox and Munn (2001), Schallau, et al., 2002, and Cook and O'Laughlin 2006).

The basis of IMPLAN is that an increase in business' sales (*final demand*) in one economic sector stimulates economic activity in other sectors. This is because one sector buys from other sectors in order obtain the inputs needed to produce the goods or services it sells. These are referred to as backward linkages. In addition, as purchases from backward linkages proceed, the incomes of owners and employees increase and, as this income is spent, further economic activity is stimulated. The *Direct Effect* is the increased economic activity as final demand

[5] Because of data limitations, we are not able to distinguish between full and part time jobs. IMPLAN employment estimates are the sum of both.

[6] E-mail correspondence with Gordy Sanders, Pyramid Mountain Lumber, Inc., March 4, 2008.

[7] For a thorough discussion of the Clearwater Stewardship Project, see Hausbeck (2007). See also USDA Forest Service (2004).

changes; the *Indirect Effect* is the increased economic activity as the sector with an increase in final demand makes purchases from other sectors; the *Induced Effect* is the impact on all local industries caused by expenditures of new household income generated by the direct and indirect effects of the initial changes in final demand (Minnesota IMPLAN Group, 1999-2004, p. 81). All three effects, Direct, Indirect, and Induced, tend to be larger as a higher percentage of purchases are made within the ESA, rather than outside the ESA. This percentage will vary across business sectors and across counties and/or agglomerations of counties (Minnesota IMPLAN Group, 1999-2004).

IMPLAN provides a convenient, and widely used, means of projecting economic impacts, but it relies on strong assumptions and its results should be interpreted with caution (for example, see Haefele and Kerkvliet 2006, pp. 3-4; Niemi and Whitelaw 1997; and Niemi and Whitelaw 1999). In addition, this study focuses on the projected changes in economic indicators of outputs, employment, employee compensation, etc. This may have the effect of missing important components of the economic, ecological, and social well-being of the impacted communities (see Seidl and Myrick 2007). We will briefly discuss some of these components in the final section of this report.

FINAL DEMAND CHANGES RESULTING FROM STEWARDSHIP BCLSP APPROPRIATIONS

Columns 1 and 2 of Table 1 present the sources of changes in final demand resulting from BCSP stewardship-related appropriations and, where applicable, dollar-for-dollar matching funds. Column 3 presents the allocation of funds to various business sectors in IMPLAN. These allocations are based on the assumption that BCSP stewardship project funds are spent on the same land management activities and therefore in the same business sectors as CSP funds. Under CSP, 77.5% of non-administrative project funds were spent in sector #44 (maintenance of highways, streets, and bridges), 21.3% in sector #45 (other maintenance and repair construction), and 1.49% in sector #18 (agriculture and forestry support services). Column 4 and the footnotes provide details of the assumptions made and their justifications.

Table 1
Changes in Final Demand Resulting from BCLSP Stewardship Appropriations

Source of Funds	Amount	Sector or Sectors of Final Demand Change[8]	Justification
Federal appropriation for in-house restoration projects	$100,000	$77,480 #44 $21,030 #45 $1,490 #18	Funds expended in the same proportion as the Land Management Activities conducted under the CSP.[9]

Table 1 (continued)

[8] IMPLAN Sectors are as follows: 14—logging, 18—agriculture and forestry support activities; 44—maintenance and repair of highways, streets, bridges, and tunnels; 45—other maintenance and repair construction, 112—sawmills.

[9] See Steward (2003) and personal communication with Tim Love, District Ranger, Seeley Lake Ranger District, March 3, 2008. Steward (2003) reports the following Land Management Activities (with economic sectors in parenthesese): weed spraying $3,770 (18), roads, $512,231 (44), campgrounds, $177,061 (45), fish habitat and channel stabilization (44), $800, paving $90,311 (44), and burning and thinning$8,750 (18). In addition, Tim Love reports that $49,000 was used for road decommissioning. This gives total restoration expenditures of $841,923 with 77.48% expended in sector #44, 1.49% in sector #18, and 21.03% in sector 45.

Federal appropriations for projects on BCCA	$50,000	$50,000 #18	All funds assumed expended for forestry services (Tim Love, District Ranger, Seeley Lake Ranger District, Personal Communication, March 3, 2008)
Federal appropriations for FS oversight of stewardship projects	$300,000	$300,000 allocated to the expenditure patterns of state and local agricultural and natural resource agencies.	Assume no additional agency funds are used for these purposes.
Federal appropriations for Forest Service and third-party monitoring	$50,000	$50,000 allocated to the expenditure patterns of state and local consumption expenditures for educational facilities beyond high school.[10]	Assumes no additional agency funds or other outside funds used for these purposes.[11]
Federal appropriations for stewardship projects plus dollar-for-dollar matching private funds	$500,000	$387,400 #44 $105,150 #45 $7,450 #18	Funds expended in the same proportion as the Land Management Activities conducted under the CSP.
Stumpage revenues resulting from stewardship projects	$670,426	$519,446 #44 $140,991 #45 $9989 #18	Proportional tonnage per dollar of administrative costs as the CSP.[12] Tonnage sold at $32 per ton and revenues expended in the same proportion as the Land Management Activities conducted under the CSP.
Logging and sawmill Final Demand	$2,066,300 $63,168	$2,003,132 #112 $63,168 #14	Assumes sawlog harvests are 87.8% of total harvest by tonnage, delivered price of sawlogs is $34.24/ton, and final demand in sawmill industry could not be met without sawlog harvests.[13] Assumes delivered price of roundwood to wood preservation (#117) sector is $28.00/ton. Assumes harvesting costs are as reported by Gordy Sanders.[14]

RESULTS FOR BCSP STEWARDSHIP FUNDS:

[10] We choose this consumption pattern because we expect a high proportion of the third-party monitoring will be done by persons from higher education institutions in Montana, as was the case for the CSP (Burchfield, 2008).

[11] CSP received a $2000 grant from the Gifford Pinchot Institute for to support monitoring activities and preparation of a final report by the third-party monitoring committee (Jim Burchfield, telephone interview, March 21, 2008).

[12] USDA Forest Service (2004) reports project direct costs totaling $492,470, with harvested volume of 29,479 tons. For this study, we assume that ratio of volume harvested to administrative dollars will be the same for the BCSP as for the CSP. The BCSP appropriation for stewardship contract administration and monitoring is $350,000, so 29479/492470=BCSP volume/350000, or BCSP volume=20,951 tons. We further assume that stumpage sells for $32/ton, giving total stewardship revenues of $670,426.

[13] Gordy Sanders, Resource Manager for Pyramid Lumber Company, reports that sawlog harvests under CSP were 87.8% of total harvest by tonnage, while roundwood (post and pole material) were 12.2% by tonnage.

[14] Gordy Sanders reports that roundwood harvesting and transportation costs are $28.00/ton. For sawlogs delivered to Pyramid Lumber (77.8% by tonnage) he reports harvest and transportation costs $33/ton. For sawlogs delivered to other mills (24.2% by tonnage) he reports harvest and delivery costs of $38/ton. Thus for sawlogs the weighted average harvest and transportation cost is $34.24/ton. Since total tonnage from stewardship contracting is assumed to be 20,951 tons, 18,395 tons will be sawlogs (87.8%), each ton delivered at a cost of $34.24 for a total cost of $629,844.8. Since the logging sector is paid $0.31443 for each $1.00 of final sales in the sawmill sector, we assume that BCSP sawlog deliveries allowed the sawmill industry to meet $2,003,132 in final demand ($629,884.8/.31443=$2,003,132). The remainder of the tonnage (2256 tons) assumed to be produced from stewardship contracts under the BCSP, (2256 tons), we assume represents an increase in final sales of the logging sector of $63,168 (2256*$28.00). We do not leverage this amount as IMPLAN does not appear to have a locally accurate representation of the production function of the post and pole industry. Finally, the production functions for logging (sector #14) and sawmills (sector #112) were modified to reflect the fact that harvests originate on federal land and therefore payments to timber tract owners (sector #15) already counted in stumpage revenues, so additional payments to these sectors are forced to be zero.

The eight county ESA contains 15,182 square miles of land and has a population of 257,953. More than 175,000 ESA residents are employed, with an average household income of $74,655. There are 206 economic sectors in the ESA's $7.8 billion economy out of 509 potential sectors delineated by IMPLAN.[15]

The top quarter of Table 2 presents the projections of the economic impacts of the economic stimuli induced by the BCSP stewardship projects, matching funds, and timber harvests, as listed in Table 1. The estimates include Direct, Indirect, and Induced Impacts for the assumed on-the-ground projects. The second quarter of Table 2 reports the projected impacts of stewardship contract administration. The third quarter of Table 2 gives projected impacts of project monitoring, while the bottom quarter gives the sum of all impacts over stewardship projects, administration, and monitoring.

Table 2
Economic Impacts of Stewardship Appropriations and Stewardship Contracting Administration (2006 dollars)

	Output (Sales to Final Demand)	Employment (Full and Part Time Jobs)	Employee Compensation	Proprietor's Income	Indirect Business Taxes
Stewardship Projects Including Timber Harvests					
Direct	$2,592,801	17.2	$524,308	$113,950	$13,400
Indirect	$1,862,587	11.4	$312,068	$105,244	$40,573
Induced	$688,380	7.9	$177,433	$35,535	$43,279
Total	$5,143,769	36.5	$1,013,808	$254,729	$97,252
Stewardship Administration					
Direct	$287,623	1.7	$39,572	$10,345	$4,308
Indirect	$37,706	0.4	$9,522	$2,828	$1,963
Induced	$40,629	0.5	$10,472	$1,979	$2,554
Total	$365,958	2.6	$59,567	$15,153	$8,825
Stewardship Monitoring					
Direct	$47,930	0.2	$5,636	$1,317	$967
Indirect	$5,420	0.1	$1,329	$372	$253
Induced	$5,634	0.1	$1,452	$274	$354
Total	$58,984	0.3	$8,417	$1,963	$1574
Total Projected Impacts					
Direct	$2,928,354	19.1	$569,516	$125,612	$18,675
Indirect	$1,905,713	11.9	$322,919	$108,444	$42,789
Induced	$734,643	8.5	$189,357	$37,788	$46,187
Total	$5,568,710	39.5	$1,081,792	$271,844	$107,651

The stewardship-related economic stimuli prompted by BCSP appropriations total slightly more than $2.9 million, including increases in sales for the logging sector (recall all impacts are in 2006 dollars). These funds stimulate $5.569 million in final sales in the ESA. These increases are spread widely throughout the economy, with positive total impacts in nearly all of the 206 sectors in the ESA. It is important to note that these economic impacts would take place in each of the following 10 years, if BCSP appropriations were approved and matching funds identified. However, the actual impacts would probably be greater in the initial year and decline as inflation erodes the real value of the appropriations. It is also important to note that the implicit assumptions of constant prices and no technological change in IMPLAN become increasingly restrictive as the time horizon lengthens. This makes long-term projections increasingly unreliable.

[15] These statistics are obtained from the IMPLAN model assembly.

The largest final demand impacts are in the following sectors (total impacts in parentheses):

1. sawmills, #112 ($2.05 million);
2. logging, #14 ($1.15 million);
3. maintenance and repair of highways and streets, #44 ($0.45 million);
4. other maintenance and repair construction, #45 ($0.12 million);
5. agricultural and forestry support, #18 ($0.12 million);
6. wholesale trade, #390 ($0.11 million)
7. owner-occupied housing, #509 ($0.10 million).[16]

Employment impacts total nearly 40 full and part time jobs, including 7.9 in the sawmill sector, 6.3 in maintenance and repair of highways and streets, 4.9 in logging, 2.2 in other maintenance and repair construction, and 1.1 in food and drinking places (sector #481).

It is important to note that industry-specific employment impacts are determined largely by the industry's production structure. Industries which are capital and material intensive support fewer jobs relative to sales than labor intensive industries. Economic stimuli in the logging sector, for example, result in relative few jobs because only 9.75% of logging sales are spent on employee compensation in the ESA, and the logging industry's wages are relatively high. By comparison, wholesale trade pays employees nearly 40% of sales and has a somewhat lower average wage.

In addition, it is important to note that projected wages (and jobs) tell only part of the story of employment impacts, because self-employed workers are a substantial part of the work force in some industries. For example, more than 5% of sales in the logging industry and 11% in the sawmill industry are paid as proprietor's incomes, defined as "payments received by self-employed individuals as workers" (Minnesota IMPLAN Group, Inc 1999-2004).

Projected increases in employee compensation (wages, salaries, FICA payments, etc) from BCSP stewardship appropriations are $1.082 million, while projected increases in proprietor's incomes are about $273,000, more than 25% of the projected employee compensation increase. In addition, business tax collections are projected to increase by about $107,000.[17]

FINAL DEMAND CHANGES RESULTING FROM BIOMASS COGENERATION PLANT BCSP APPROPRIATIONS:

The proposed cogeneration plant located on a two acre Seeley Lake, MT site owned by Pyramid Mountain Lumber, Inc. would burn byproducts from Pyramid's current sawmill operations and woody biomass from various harvesting operations to first produce high temperature stream. This steam would be used to generate electricity, while the lower temperature steam leaving the generator would be used for sawmill operations, such as kiln drying of lumber.[18]

[16] These figures do not include stewardship administration and monitoring impacts, which are spread very diffusely throughout almost all sectors.

[17] Indirect business taxes consist of excise taxes, property taxes, fees, licenses, and sales taxes paid by businesses (Minnesota IMPLAN Group, Inc. 1999-2004).

[18] Pyramid Mountain Lumber, Incorporated (no date) provides an initial study of the potential biomass available on public land within a 100 mile radius of Seeley Lake. It finds that an average 34 tons per acre could be obtain from hazard fuel reduction treatments on 193,019 acres meeting certain criteria.

Table 3, Columns 1 and 2, presents the sources of changes in final demand resulting from construction and operation of the proposed cogeneration plant. Columns 3 and 4 present the business sector or sectors in which the changes in final demand are assumed to occur and the details of these assumptions.

Table 3
Changes in Final Demand Resulting from the BCLSP Cogeneration Plant and Its Operations

Source of Funds	Amount	Sector or Sectors of Final Demand Change[19]	Justification
Installation of high temperature boiler	$3,000,000	$3,000,000 #37	Assume that 25%of the funds are expended locally; the remainder is expended for capital equipment and leaves the economic study area immediately.[20] Dollars are assumed expended in 2009.[21]
Installation of cogeneration facility	$4,000,000	$4,000,000 #37	Assume that 25% of the funds are expended locally; the remainder is expended for capital equipment and leaves the economic study area immediately.[22] Dollars are assumed expended in 2010.
A cogeneration plant operation costs.	$681,000	$681,000 #30[23]	Timmons et al. reports that a study of New Hampshire biomass plants found annual operating costs of $158,000/MW for 15 MW plants (2006 dollars). Cogeneration plants are subject to decreasing average operating costs, so we assume that the 3.2MW plant will have costs 35% higher than this, or $213,000/MW annually.

[19] The business sector descriptions are logging (#14), power generation and supply (#30), and manufacturing and industrial buildings (#37).

[20] This assumption is based on Sanders (2008).

[21] Timmons, et al. (2007) report construction cost estimates for biomass-burning plants averaging $2,154,950/MW, or $6,895,840 for the 3.2MW Seeley Lake plant. This is quite close to the $7,000,000 provided in the BCSP.

[22] This assumption is based on Sanders (2008).

[23] To reflect the fact that the fuel is woody biomass, the production function for Power Generation and Supply (#30) was modified by setting the absorption coefficients for oil and gas extraction (#19) and coal mining (#20) to zero and re-balancing the remaining coefficients.

Table 3 (continued)			
Cogeneration plant fuel requirements	$578,000-$1,242,000	$578,000-$1,242,000 #14	Assume that one half of the plant's annual fuel requirements (17,000 to 27,000 bone dry tons) are met using current mill byproducts. The remaining half is met using expansions of existing harvesting operation or additional harvesting operations. The unit price of biomass fuel is assumed to equal the current price of pulpwood in western Montana, ranging from $68.00 to $92/BDT.[24]
Displaced electricity sales	-$776,167	-$776,167 #30[25]	Assume that all electricity generated by cogeneration facility displaces electricity currently purchased by Pyramid Lumber. The cogeneration facility is assumed to produce 23,827,200 kilowatt hours annually, based on 85% capacity utilization.

The annual fuel requirements of the cogeneration plant could be met by using byproducts of the normal operations of the Pyramid sawmill (bark, chips, shavings, sawdust, and other wood waste). Currently, Pyramid Lumber fuels a boiler with some of the hog fuel portion of its wood waste and produces process steam to heat its kiln lumber dryers. It ships other byproducts to Smurfit-Stone Container Corporation in Frenchtown, MT and Roseburg Forest Products in Missoula, MT. Alternatively the cogeneration plant could be fueled by biomass produced in addition to sawlogs in standard logging operations, and/or by biomass produced in forest stand prescriptions specifically designed to reduce biomass volumes on certain forest stands. Estimates for the fuel requirements of a cogeneration plant are usually given in bone dry tons (BDT) on a per MW basis.[26] Existing estimates suggest that the 3.2 MW plant's annual fuel requirements will range from 17,000 to 27,000 BDT.[27]

Estimates of the cost per BDT delivered to the cogeneration plant also vary, depending whether the fuel is produced as a byproduct of sawmill operations, as part of standard logging operations, or by applying thinning prescriptions designed to reduce biomass volumes. For this study, we take a conservative approach and assume that one-half of the plant's annual fuel requirements will be met using current sawmill byproducts. The remaining half of the requirements are assumed to be provided by additional in-woods harvesting operations. We further assume that the cost of these operations is reflected in the market price of pulp wood, which is currently $68-

[24] This assumption is grounded in the economic concept of opportunity cost. Enterprises producing biomass would be able to sell to Smurfit Stone or to Pyramid Lumber. In order for them to choose to sell to Pyramid Lumber, they would have be paid as least as much by Pyramid as they would receive from Smurfit Stone. The range of prices used here depends on the distance hauled to the Smurfit Stone paperboard facility in Missoula and were provided by Franke (2008). A weakness of this assumption is that the pulpwood market is cyclical. For example, while the CSP was being implemented, Smurfit Stone was not buying pulpwood (Gordy Sanders, 2008).

[25] To reflect the fact that electricity sold by Missoula Electric Cooperative is predominately hydroelectricity, the production function for Power Generation and Supply (#30) was modified by setting the absorption coefficients for oil and gas extraction (#19) and coal mining (#20) to zero and re-balancing the remaining coefficients.

[26] A ton of green woody biomass yields about .5 bone dry ton, i.e. green woody biomass consists of about 50 percent water.

[27] See Emergent Solutions and Christopher Allen+Associates (2003) and Timmons, et al. (2007).

$92/BDT in western Montana, depending on the distance of the haul.[28] We project economic impacts using both a low biomass fuel price ($68/BDT) and a high fuel price ($92/BDT) scenario.[29]

The cogeneration plant will also have variable operating costs. Timmons et al. (2007) relies on the results of a study of New Hampshire biomass plants (Innovative Natural Resources Solutions and Draper/Lennon Inc (2002)) which found annual operating costs of $158,000/MW for 15 MW plants (2006 dollars). Operating costs for smaller cogeneration plants are not available, but it appears that cogeneration plants are subject to substantive economies of scale (Timmons et al. 2007). That is, average operating costs (per kilowatt hour) decrease as plant size increases. Since the proposed plant has a capacity of 3.2 MW, we assume that the 3.2MW plant will have costs 35% higher than this on a per MW basis. Thus we assume the plant has operating costs of $213,000/MW, or $681,600 annually.[30]

Finally, electricity generated by the cogeneration plant will largely displace electricity currently sold to Pyramid Lumber by the Missoula Electric Cooperative. This cooperative purchases most of its electricity from the Bonneville Power Administration and sells to its industrial customers at an energy charge rate of $0.0326 per kilowatt hour.[31] For this study, we assume that the entire output of the cogeneration plant displaces power purchased from the Missoula Electric Cooperative. This results in a decrease in its final demand of $776,767.00 annually.[32]

RESULTS FOR CONSTRUCTION AND OPERATION OF COGENERATION FACILITY:

Table 4 presents the estimates of the economic impacts of the economic stimuli induced by the appropriations listed in Table 3. The top third of Table 4 presents the impacts of construction and should be considered one-time impacts, because construction will likely be completed in one year, or less (Sanders 2008). The middle third of Table 4 presents estimates of the impacts of providing biomass fuel for the facility, its annual operations, and displaced electricity sales under the high pulpwood price assumption. The lower third of Table 4 presents the same projections under the low pulpwood price assumption. Fuel, operations, and displaced sales will generate economic stimuli for each of the years the plant operates, perhaps more than 20 years. However, this should be interpreted with caution. As discussed previously, IMPLAN makes no allowance for technological improvements, changes in relative prices, or other dynamics. This means that projections beyond a year or two should be used sparingly and with great caution.

[28] Rick Franke of Smurfit Stone, the major buyer of pulpwood in western Montana, provided the prices paid for pulp logs in an e-mail, dated January 29, 2008.

[29] This cost range is roughly in keeping with other estimates of production costs for woody biomass. For example, Rummer, et al. (2003) suggests costs between $49-$61/BDT (2003 dollars) to extract biomass to the roadside on gentle slopes, with costs roughly 20% higher for rolling terrain. These costs do not include chipping or transportation to a cogeneration facility. The Texas Forest Service (2008) finds that the delivered cost of biomass (logging and transportation) is about $50/BDT under plantation thinning conditions.

[30] Gordy Sanders suggests that operating the cogeneration plant would require the employment of 3-4 operating engineers and at least one additional employee to manage unloading and storage of woody biomass fuel. Based on average wages in the sector, IMPLAN models the $681,000 of annual operating expenditures in sector #30 as involving only 2 jobs.

[31] Missoula Electric Cooperative, http://www.meccoop.com/pages/rates.html, last accessed March 31, 2008.

[32] To arrive at this estimate, we assume that the 3200 KW (3.2 MW) plant operates 24 hours per day, 365 days per year, at 85% capacity, producing 23,827,200 kilowatt hours annually. At the Missoula Electric Cooperative demand charge rate of $0.0326, this represents annual sales of $776,766.72.

Table 4 Economic Impacts of Constructing, Fueling, and Operating the 3.2MW Cogeneration Facility at Pyramid Lumber, Inc. in Seeley Lake, Montana (2006 dollars)					
Construction of Cogeneration Facility					
	Output (Sales to Final Demand)	Employment (Full and Part Time Jobs)	Employee Compensation	Proprietors Income	Indirect Business Taxes
Direct	$6,609,322	21.9	$543,533	$217,987	$8,586
Indirect	$309,590	3.0	$85,460	$27,411	$12,450
Induced	$571,412	6.5	$147,283	$27,837	$35,925
Total	$7,490,324	31.3	$776,276	$267,235	$56,961
High Biomass Costs Operating Cogeneration Facility Including Fuel, Operations Expenses, and Displaced Electricity Sales					
Direct	$954,333	4.2	$84,639	$52,981	$-2,008
Indirect	$728,602	5.0	$134,786	$54,144	$15,531
Induced	$216,350	2.5	$55,765	$10,540	$13,602
Total	$1,899,285	11.7	$275,190	$117,644	$27,125
Low Biomass Costs Operating Cogeneration Facility Including Fuel, Operations Expenses, and Displaced Electricity Sales					
Direct	$397,914	1.9	$30,338	$23,630	$-6,348
Indirect	$333,530	2.3	$61,270	$24,882	$7,027
Induced	$93,054	1.1	$23,985	$4,533	$5,850
Total	$824,497	5.2	$115,593	$53,045	$6,529

The expenditures related to constructing the cogeneration facility amount to $6,609,322 (recall construction spending occurs in 2009 and 2010, while the reported impacts are in 2006 dollars).[33] These expenditures stimulate an additional $881,000 in sales, for a total increase in final demand of $7,490,324. Accompanying this is a projected $776,276 million increase in employee compensation, $267,235 million in proprietors' income, and $57,000 in indirect tax payments. Employment gains are projected to be 21.9 full and part time jobs in the industrial and manufacturing construction sector (#37), with an additional 3.0 indirect jobs, 6.5 induced jobs, for a total of 31.3 jobs. Note that these jobs are in annual equivalents. Construction of cogeneration facility will likely take less than one year, so more jobs for shorter time periods are the likely outcome.

In terms of total sales, the largest impacts of construction are in the following sectors: domestic trade #28001 ($4.957million), manufacturing and industrial building construction, #37 ($1.652 million), architectural and engineering services, #439 ($84,203), owner occupied dwellings, #509 ($81,330), real estate, #431 ($54,000), and wholesale trade, #390 ($46,068).

The projected impacts of the cogeneration facilities operations are sensitive to assumed price of biomass, in this case pulpwood and other woody residues. Under the high fuel price scenario, cogeneration fuel supply, operations, and displaced sales are projected to have a net positive impact overall on the ESA. Sales are projected to increase by $1.899 million; wages by $275,190; and proprietor's income by $117,664. In addition, indirect tax collections increase by more than $27,000. The sectors with the largest positive impacts are generally logging (#14),

[33] Note that, given the estimates of biomass generating plants' costs in Timmons et al (2007) the amount allocated for construction under the BCLSP is just adequate to cover expected construction costs in 2007. If construction occurs later, as we assume here, the proposed funding may be less than construction costs.

agriculture and forestry support (#18), wholesale trade (#390) and real estate (#431). Power generation and supply is impacted negatively, with a projected $71,624 decrease in sales. Under the low fuel price scenario, projected economic impacts are about 40 percent of the projections using high fuel prices. For example, total sales increases are projected to be $824,497, compared to $1.899 million in the high biomass fuel price scenario.

OTHER ECONOMIC IMPACTS AND BENEFITS:

Although it is likely that other economic benefits would accrue from projects supported by the BCSP, it is impossible at this stage to quantify these benefits, because the ecological effects of these potential projects are poorly understood and peoples' preference for these outcomes in the area have not been elicited. Methods of quantifying ecosystem services such as water filtration and purification, carbon sequestration, pollination, and biodiversity protection are being developed, but, since the major focus of this study quantification of likely economic impacts, we will only briefly consider the likely major sources of economic benefits that might follow from the BCSP:

- Stewardship projects focused on thinning and other prescriptions that are designed to reduce the probability and severity of wildfire have the potential to provide economic benefits in the form of reduced air pollution (Morris 1999; U.S. Environmental Protection Agency 1999), reduced fire fighting costs, protection of legacy trees, enhanced big game habitat and associated hunting opportunities, enhanced fish habitat and associated fishing opportunities, and improved timing of runoff (Morris 1999; California Department of Water Resources 1994). Thinning and burning of overstocked stands containing old ponderosa pine trees can increase water uptake and growth rates of mature ponderosa pine (Kolb et al. 2007). [34] Also there is evidence that thinning and burning of ponderosa pine stands can reduce the depth to groundwater, thereby improving water availability (Marlow 2008).
- The values of these stewardship outcomes have not been studied in western Montana, but studies in other areas provide evidence that rural area residents and homeowners are willing to pay $45-$133 per household year to reduce the risk of fire in old growth forests by 50% (Loomis and Gonzales-Caban 1998). Kaval (2004) finds that homeowners are willing to pay $599-$722 to reduce fire risk to their homes in the wildland-urban interface. Hesseln et al. (2004 and 2004) find that hikers and mountain bikers were willing to pay more to recreate in forest areas treated with prescribed burning, but less for areas with recent crown fires.
- Designation of 87,000 acres of Wilderness is likely to contribute to the recovery plans of grizzly bear, Canada lynx, and bull trout, and provide other ecological benefits. Loomis and White (1996) survey numerous studies estimating the economic benefits of endangered species recovery programs in the U.S. They conclude, "To date, for even the most expensive recovery efforts…the costs per household fall well below the benefits [of preserving endangered species] found in the literature." Stewardship projects that decrease road densities can also decrease the costs of endangered species recovery programs.
- Economic benefits are also likely to arise from enhanced Wilderness recreation opportunities. In addition, there is evidence that Wilderness contributes to local

[34] Note, however, that Kolb et al. (2007) find that prescribed, low-intensity burning increase mortality in some older ponderosa specimens, by attracting bark beetles and increasing other stressors.

economies in ways that cannot be captured in IMPLAN, including migration-based population growth and business startups (see Morton 2001 for details). These effects are likely to be increasingly important as changing consumer tastes and technology decreases the relative importance of traditional commodity-producing industries and increases household and business mobility. [35]

- The 2000 acre winter recreation area (part of the Lolo National Forest Management Plan) is likely to provide enhanced recreational benefits for snowmobile users.
- Utilizing biomass from forest stand prescriptions for use in a cogeneration facility may reduce several types of air pollution and associated health costs otherwise associated with slash pile burning and potentially reduce the risk of wildfire after harvests (Morris 1999; Fiedler et al. 2004).

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[35] See, for example, The Montana Challenge, http://fwp.mt.gov/tmc/default.html

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