

# **Benefits and Costs of Timber Harvests from the Tongass National Forest**

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# Benefits and Costs of Timber Harvests from the Tongass National Forest

The Tongass National Forest produces goods and services such as wildlife habitat, scenic views, opportunities for recreation, and timber. Each good or service has a benefit and a cost to society. This paper examines some of the costs and benefits associated with harvesting timber from the Tongass. Some of the direct, market costs and benefits resulting from timber sales are presented first. These usually reflect market prices well and, hence, are sometimes called hard numbers. This might not be an appropriate assumption for costs in this case. The second section deals with non-market costs of timber harvest. No study of non-market costs of timber harvest on the Tongass was found in the literature and professionals contacted knew of no such study. Related studies will be presented and discussed.

## Market costs and benefits

The cost of harvesting timber from Tongass and other National Forests results in considerable criticism of the Forest Service, for both the harvests and their accounting practices. Three estimates of the net revenue from timber sales from the 1996 and 1997 fiscal years are presented.

### *COSTS IN THE MID-1990'S*

The General Accounting Office (GAO) has made several reports concerning the cost of timber sales (GAO 1998, 1999, 2001). The reports show that in 1996 and 1997 the Forest Service spent more on preparing and administering timber sales in the Tongass than it earned from sales.

Table 1  
Tongass National Forest, Timber Sales Receipts and Outlays (GAO 1998)

Year	Total receipts	Receipts, per MBF*	Preparation and Administration Outlays	Net Revenue
1996	\$23,246,320	\$335	\$26,078,793	\$<2,832,473>
1997	4,084,188	26	26,425,518	<22,341,330>
Total	27,330,508		52,504,311	<25,173,803>

\*1000 board feet

One drawback in using information based on annual sales is that the particular outlays and receipts associated with each timber sale occur over several years but the sale is reported in just one year. Thus, a sale reported in 1997 might not be paid for until 1998 or 1999-this might partially explain the dramatic decrease in the receipts per MBF in 1997. Timber sales generally require several years from planning the sale to completion of the harvest. Properly accounting for this requires using the accrual method, whereby the receipts and outlays are recorded for each sale instead of for each year.

They GAO noted the problems that arise from using annual receipts and outlays and recommended using accrued costs to determine profitability. They stated that they did not do so due to the lack of information and their desire to maintain consistency with other reports.

The Forest Service has collected accrual-based cost information on timber harvests on a regional basis (GAO 1999). Tongass National Forest is in Forest Service region 10 and it was the source for over 97 percent of the timber harvested in region 10 in fiscal 1996 and fiscal 1997. Accrued costs are reported for three different types of programs to harvest timber, the timber commodity program, the forest stewardship program, and the personal use program. The purpose of the timber commodity program is to provide timber for commercial purposes, the purpose of the forest stewardship program is to improve forest health, and the personal use program provides timber and trees, such as Christmas trees, to local residents for personal use. The harvests under this last program are small but not well documented so the costs are not presented in Table 2. The timber commodity program accounts for almost 100 percent of the timber harvested from the Tongass in fiscal 1996 and fiscal 1997.

Table 2 compares accrued costs of region 10 with the annual costs of the Tongass NF from Table 1, per 1000 board feet (MBF). The accrued costs are based on timber harvests and the annual costs are based on timber sales. If all sales are eventually harvested, the two costs should be close if averaged over a several year period.

Table 2  
Comparison of Annual Costs vs. Accrued Costs of Timber Sales from the Tongass National Forest and region 10, respectively.

Year	Timber Sold, MBF	Annual Cost, per MBF	Accrued Cost of Timber Commodity Program, per MBF	Accrued Cost of Forest Stewardship Program, per MBF
1996	69,200	\$376	\$245	\$555
1997	152,000	174	425	477

The second method of estimating the profitability of timber sales is to apply the accrued cost of the timber commodity program, instead of the annual cost, to the volume of timber sold. This is done in Table 3. This does not eliminate problems with accrued receipts nor does it ensure that accrued costs match the timber sales reported for a particular year

Table 3  
Estimated Costs and Revenues for region 10 using accrued costs.

Year	Timber Sold, MBF	Accrued Cost of Timber Commodity Program, MBF	Estimated Cost of Timber Sold	Total receipts	Estimated Net Revenue
1996	69,200	\$245	\$16,954,000	\$23,246,320	\$6,292,320
1997	152,000	435	64,600,000	4,084,188	<60,515,812>
Total	221,200	NA	81,554,000	27,330,508	<54,223,492>

This results in an estimated loss of net revenue of about twice the amount reported by the General Accounting Office for the Tongass. Since the Tongass accounts for 97 percent of the timber harvested in region 10 the final column in Table 3 can be reduced by three percent to create an estimate for the Tongass. Doing this results in a total estimated net revenue of -\$52,596,787 for the two years.

The third estimate of the cost of timber sales is taken directly from the Forest Service's Timber Sale Program Information Reporting System (TSPIRS). Although TSPIRS report expenses and revenue by forest, the regional totals are reported here because the regional office generates some of the expense to conduct timber sales and therefore should be included. The costs in TSPIRS are based on harvests, not sales. In fiscal 1996 region 10 reported a net revenue of -\$6,720,000 for the timber commodity and forest stewardship programs. In fiscal 1997 region 10 reported a net revenue of -\$41,344,000 for the same programs. This amounts to a net revenue of -\$48,064,000 for the two years, considerably more than the figure reported by the GAO and less than the second estimate that used accrued costs and timber sold. Reducing this figure by three percent to estimate the revenue for only the Tongass yields -\$46,622,000.

The three methods yield estimates for net revenue of -\$113, -\$245, and -\$210 per 1000 board feet of timber sold from the Tongass in 1996 and 1997. The revenue per 1000 board feet can also be expressed in terms of the revenue per average tree or revenue per piece of lumber. The mathematically average tree harvested from the Tongass is 60% western hemlock, 30% Sitka spruce, and 10% cedar and has a volume of approximately 64 cubic feet, about 320 board feet (Bill Wilson, Forest Service region 10. telephone call with author, 2002.) Thus the net revenue from harvesting one average tree is about one-third the revenue per 1000 board feet. The respective values for the three estimate per average tree are -\$36, -\$78, and -\$67. This is roughly a loss of \$0.60, \$1.30, or \$1.11 per eight foot 2x4 if the timber is milled (This amount also depends on the size of the tree and type of milling equipment. Board feet can be estimated from cubic feet by multiplying by five, not twelve. The discrepancy is due to what is being measured. Cubic feet are used to measure the actual volume of standing trees, a board foot of timber is the estimated volume of timber that will yield a board foot of lumber. About seven-twelfths of the tree is lost in milling.)

All three estimates made above depend at least in part on information obtained from TSPIRS reports. The GAO and the Inspector General of the United States Department of Agriculture (USDA) have questioned the validity of these reports (GAO 2001). Problems include automatically entering expenses as equal to the amounts budgeted, retroactively changing expenditures, timeliness, and reliability. On September 21, 2001 the GAO notified Representatives Cynthia McKinney and George Miller that these deficiencies rendered the Forest Service's cost information totally unreliable. The Forest Service acknowledged the problems and discontinued use of TSPIRS for fiscal 1999 and subsequent years. Unfortunately, no other source of cost information is available for years prior to 1999. The Forest Service plans to implement a new accounting system by 2004. Cost information is still being collected by the Forest Service but is not integrated into an agency-wide reporting system.

#### *RECENT COSTS*

Information on timber sales and costs for recent years is found in a variety of sources. The Alaska Region Ecosystem Planning Office of the Forest Service is currently reporting the value of timber harvests in the Tongass as part of a report to Congress (Alaska Region Ecosystem Planning 1999, 2000). The section of interest is called *Timber Supply and Demand*. Information on value and volumes for fiscal 2001 is available from the *Timber Cut and Sold* report, a document that is prepared by Forest Service Region 10 (2001) and used within the Forest Service. Information on timber volumes and costs is available from annual *Monitoring and Evaluation* reports (Forest Service Region 10 1999, 2000) published by the region 10 office and in the individual Environmental Impact Statement (EIS) or

Environmental Assessment (EA) for each timber sale. Collecting information from applicable EIS's and EA's is beyond the scope of this project, although one draft EIS is examined. Interestingly, the timber-sales volumes published in the *Timber Supply and Demand* and the *Timber Cut and Sold* reports do not match the timber-sales volumes in the *Monitoring and Evaluation* reports published by the same office, although the two year totals for fiscal 1999 and fiscal 2000 are within 10 percent. No documentation on accounting practices was supplied with any of the recent reports. The format differed between the two *Timber Supply and Demand* reports; the 1999 report does not include bid information for sales under 500 MBF and the 2000 report does not include the name of winning bidders. The *Timber Cut and Sold* reports list only volume and value. None of these documents is reporting actual receipts, the values are based on bids.

A difference in revenue reported for 1999 and subsequent years is that the Forest Service discontinued the practice of issuing purchaser road credits. Under this program the Forest Service issued credits to successful timber bidders for the cost of constructing the roads necessary to harvest their timber. Thus, the bid price of timber included the price of constructing roads. After the harvest, the purchaser would use the road credit to reduce the final cash payment to the Forest Service. Eliminating the road credit works to reduce the bid price of any timber sale that requires road construction. The bid price now reflects only the stump value of the timber; road costs are internal to the purchaser.

Values for timber sales in 1999, 2000, and 2001 are presented in Table 4. The information is based on the *Timber Supply and Demand* and the *Timber Cut and Sold* reports.

Table 4  
Tongass Timber Sales Volume and Value

Year	Volume, MBF	Value	Average bid, per MBF
1999	145,088	\$2,198,103	\$15.15
2000	66,627	3,135,672	47.06
2001	49,591	1,766,990	35.63

Estimating the costs of recent timber sales is problematic. One option is to use the accrued costs for the timber commodity program from 1996 and 1997, \$245/MBF and \$425/MBF, respectively. The *Monitoring and Evaluation* reports also provide cost information but lack a detailed description of the associated activity. Another drawback is that the costs are simply annual costs, as with the TSPIRS, not accrued costs. In Table 5 the total costs for two years, fiscal 1999 and fiscal 2000, are presented for activities probably associated with timber sales.

Table 5  
Fiscal 1999 and fiscal 2000 Tongass Timber Program Estimated Costs

Activity	Amount
Timber Management	\$34,367,019
Road Construction*	11,448,673
Road Maintenance	4,931,267
Salvage Sale	3,537,495
Total	54,284,454

\*Fiscal 2000 included total road expenditures; fiscal 1999 included timber roads only, 90% of the total.

The *Monitoring and Evaluation* reports state that the sales for the two years were 231,300 MBF. This yields an estimated cost of \$234/MBF, a little lower than the 1996 accrued cost estimate. This might be a conservative estimate since the accrued cost increased about 39 percent a year from 1993 to 1997. (The trended accrued cost is not used in this study because the rapid increase in cost for the time period data is available results in an unrealistic estimate of cost when projected three years. If it were used, the cost of the timber program would be estimated to exceed the entire budget for the Tongass.) Table 6 presents a range of estimated costs and net revenues for timber sales on the Tongass for fiscal 1999, 2000, and 2001. The low cost estimates use the \$234/MBF cost derived from recent program expenses, the high cost estimates use the \$425/MBF cost from the 1997 accrued cost (GAO 1999).

Table 6

Estimated Costs and Net Revenues from Tongass Timber Sales

Year	Sales Volume MBF	Value	Low Cost Estimate	High Cost Estimate	Low Cost Net Revenue Estimate	High Cost Net Revenue Estimate
1999	145,088	\$2,198,103	\$33,950,592	61,662,400	\$<31,752,489>	\$<59,464,297>
2000	66,627	3,135,672	15,590,718	28,316,475	<12,444,046>	<25,180,803>
2001	49,591	1,766,990	11,604,294	21,076,175	<9,837,304>	<19,309,185>

The low-cost and high-cost net-revenue estimates yield three-year-average revenues of -\$206/MBF and -\$397/MBF. This would be equivalent to a loss of \$65 and \$127 per average tree and a loss of \$1.09 and \$2.11 per eight foot 2x4 if the timber is milled. The retail price of a #2 grade eight foot 2x4 in July 2000 at an Oregon home-improvement store was \$1.98.

The draft EIS for the Madan Timber Sale (Tongass National Forest 2000) uses an estimated cost of \$101/MBF for the recommended option. This cost includes region-10-average-budget allocations of \$41/MBF for National Environmental Policy Act (NEPA) compliance, \$23/MBF for sale preparation, \$9/MBF for sale administration, and \$28/MBF for engineering. A Forest Service regional economist (Guy Robertson. e-mail to author, 2002.) stated that these costs are used as rules of thumb to allocate budgets but he was uncertain of their empirical basis. The estimated cost of \$101/MBF is a little less than one-half of the \$234/MBF figure used to make the low cost estimate in Table 6 and would reduce the cost estimates accordingly. Since this cost is based on budget allocations and not expenditures, the estimate is not used to assess profitability of timber sales.

Table 7 presents the various estimates of net revenue from harvesting timber from the Tongass.

Table 7 Summary of Net Revenue Estimates

Time Period	Data Source	Net Revenue/MBF	Net Revenue/Avg. Tree	Net Revenue/2" x 4" x 8'
1996-1997	GAO-based on annual sales	-\$113	-\$36	-\$0.60
1996-1997	GAO-based on accrued costs	-245	-78	-1.30
1996-1997	Forest Service-TSPIRS	-210	-67	-1.11
1999-2001	Forest Service-region	-206	-65	-1.09

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	10 reports			
1999-2001	GAO-based on 1997 accrued costs	-397	-127	-2.11

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The names of companies that won timber bids from the Tongass were available only in the 1999 *Timber Supply and Demand* (Alaska Region Ecosystem Planning). No names or volumes were recorded for sales under 500 MBF. Nine companies won nineteen sales over 500 MBF in 1999. The companies are: Age Cedar Products, Gateway, Ketchikan Pulp Co., Little Bit Logging, New Age Mining, Roger Grant, Silver Bay Logging, The Mill, Inc., and Viking Lumber Co. Gateway purchased the largest volume, 44,630 MBF; Viking Lumber Co. was the second largest purchaser with 41,148 MBF.

### Non-Market Costs

Not all non-timber uses of the Tongass are eliminated when timber is harvested. Recreation, views, wildlife habitat, and watershed functions still occur in areas that are cut but their values might be diminished. On the other hand, the existence value of an old-growth forest is completely lost if the forest is cut.

No study of non-market costs of timber sales from the Tongass was found in the literature. Some related studies will be presented and discussed. In addition, the final EIS of the Tongass Land Management Plan Revision contains some estimates of recreation value and these will be presented (Tongass National Forest 1997).

Englin, Boxall, and Hauer (2000) examined the recreation value of different types of forest to canoeists in Nopiming Park, Manitoba, Canada. They estimated that forest stands that were ten years old had a value of -\$0.0169/ha. (Canadian). One hectare equals 2.471 acres. Old growth stands were estimated to have a value of \$0.1133/ha. The values cannot be applied to the Tongass but it is important to note that the ten year old forest detracted from the recreation value and the old growth forest added value. The authors then created a model to determine the optimal logging rotation period when recreation values and risk of fire, as well as timber values, are included in the analysis. They found that as recreation visitation increased so did the length of the optimal rotation period. They concluded that no harvesting should occur if the park has 4,225 or more visitors per year, regardless of fire risk.

Holgen, Mattsson, and Li (2000) studied the relations among forest age, recreation values, and four different timber harvest practices, in Sweden. The four harvest practices were natural regeneration using seed trees, single tree selection, clearcutting and replanting, and natural regeneration using shelterwood. Fewer mature trees are left in the seed tree method compared to using shelterwood, and the seedtrees themselves are harvested approximately fifteen years after the initial harvest. Mature trees are always present in the shelterwood system. The authors found that clearcutting resulted in the lowest recreation values, 1359 SEK (Swedish Crowns); followed by single tree selection, 1403 SEK; natural regeneration using seed trees, 3524 SEK; and natural regeneration using shelterwood, 4170 SEK. Analysis of the different harvest practices combined with different forest ages revealed that recreational users placed high value on mixed age stands that included mature trees but that also have good views. The values estimated should not be applied to the Tongass but note that clearcutting yielded the lowest recreation values.

Thompson, vanKooten and Vertinsky (1997) used a general equilibrium model (modeling supply and demand) of the British Columbia economy to estimate the preservation and recreation values of protecting more forest wilderness. The model included values for timber production, carbon uptake, preservation, and recreation. The authors examined eighteen policy options so presenting their complete results is beyond the scope of this paper. They did estimate that residents would be willing to pay \$46.70/ha. (Canadian) to preserve additional coastal wilderness. The value of current

recreational use and the value of the option of future recreation were combined to form a total recreation value. This was estimated at approximately \$53/person in the Vancouver area or about \$34/ha. of mature forest the same region. The option value of future recreation comprised 96 percent of the total recreation value in the Vancouver region. The authors also estimated that carbon uptake values had a relatively minor effect on forest value if recreation and preservation were properly included in the analysis. Carbon sequestration was important to policy if it was the only non-timber value balanced against timber value.

In a survey of studies estimating the economic value of wilderness, Loomis (1996) presented results from Walsh et al., 1984, that estimated existing wilderness in Colorado had a total economic value of \$1,246/acre to Colorado residents. Their survey revealed that residents would pay \$320/acre to add an additional 2.6 million acres of wilderness. The authors also estimated that the value of passive uses, such as having the option for future use (option value), enjoying that wilderness exists (existence value), and passing wilderness on to future generations (bequest value), constituted about one half the total economic value of the wilderness. Loomis concludes, "Public forest management agencies should recognize that much of the public comment they receive regarding current timber management practices is probably related to existence and bequest values." (p. 100)

Although the recreation and existence values presented above are not equal to those for the Tongass, it is possible that carbon-sequestration values could apply more readily. Differences in tree species and growing conditions mean that values per acre presented below will not be identical to values generated on the Tongass but the opportunity cost of removing carbon dioxide from the atmosphere can be applied to any location on Earth. Solberg (1997) states the approach succinctly; "The main idea here is that the marginal value of fixing one unit of atmospheric CO<sub>2</sub> in forest biomass equals the marginal cost of reducing the emission of CO<sub>2</sub> in the *most costly* project which is implemented for that purpose." (italics added, p. S324) The marginal cost of reducing carbon dioxide by the most costly project is also called the shadow price of reducing atmospheric carbon dioxide. Solberg estimated the carbon-dioxide-sequestration value of Norway spruce at approximately \$68 per cubic meter of tree-stem volume (1992 dollars) or about \$387/MBF, assuming one cubic meter of stem volume yields about 176 board feet. The alternative "project" in Norway was a gasoline tax of about \$0.12/liter that generated a shadow price of \$49/ton of CO<sub>2</sub>. The market price at the time in Norway for Norway spruce was about \$29 per cubic meter, less than one-half its value as a carbon sink. As noted above in Table 4 the 2001 average bid for timber in the Tongass was \$35.63/MBF, less than one-tenth of the carbon-sequestration value of the Norway spruce in the study.

Although carbon-sequestration projects have the advantage of being undertaken in any location (creating excellent opportunities for finding a comparative advantage), a well-developed market does not seem to exist at present. Such a market depends on governments' programs to limit or reduce CO<sub>2</sub> emissions and to establish property rights for carbon sequestration. Applying carbon-sequestration values to the Tongass might not be appropriate now but the Tongass does produce other significant values.

The Final EIS of the Tongass Land Management Plan Revision (1997) estimates the present net value (PNV) of timber and recreation/tourism on the Tongass for a variety of management alternatives. The preferred alternative, number eleven, was estimated to yield a timber PNV of \$508 million (1995 dollars) and a recreation/tourism PNV of \$4,539 million. Timber, therefore, accounts for about 10 percent of the value of the Tongass under this management alternative and recreation/tourism create about 90 percent of the value. Under even the most timber intensive management alternative (number 7) timber harvest comprised only 23 percent of the total forest value. Although recreation/tourism values are not as sensitive to managing for timber harvests as timber values are, the EIS did find, "The [different recreation/tourism values] that do exist are negatively correlated with the timber intensity of the alternative." (p. 3-503) In a summary of the regional economic effects of managing the Tongass the EIS notes: "...high

levels of timber activity will generally have the highest negative impacts on the non-use values which could not be quantified and included in this analysis. These will include aesthetic considerations and concerns about preservation of species habitat and natural ecosystems.” (p. 3-504)

## **Conclusion**

There seems little question that on the Tongass the direct costs of timber sales exceed the revenue. In private discussions with Forest Service personnel the loss is acknowledged. (The Forest Service is not required to earn a profit from timber sales.) The timber industry in southeast Alaska is at a competitive disadvantage compared to the Pacific Northwest due to higher wages, higher transportation costs, and probably less-efficient capital (Robertson and Brooks 2001). This results in low prices offered for timber on the Tongass and contributes to the financial loss the timber program incurs.

One justification for the continued sale of timber from the Tongass is to sustain employment in the region. There were about 1,200 jobs in the wood products sector of the economy in southeast Alaska in 1999. This is down from about 2,070 jobs in 1995 (Forest Service Region 10 2000). Total employment in southeast Alaska, not counting self-employment, is about 36,000. Average wages in the wood products sector were about \$44,000/year compared to about \$31,000/year for all sectors in southeast Alaska.

If timber sales from the Tongass are really to promote regional employment then the policy question changes from “What is the best way to manage the Tongass National Forest?” to “What is the best way to promote regional employment?” The answer to this question might only partially involve the Tongass and the National Forest Service probably is not the best institution to fulfill this mission. If the public is currently spending \$10 million per year, not counting non-market costs, to promote employment in southeast Alaska, it is important to know if a timber sale program is the most efficient means. The current policy is essentially makes a federal-land-management agency responsible for maintaining local employment. This is more a result of history than because of the agency’s suitability. The Forest Service lacks the authority and focus to serve as an economic development agency but it is instrumental in facilitating economic development in the region. It appears that many Tongass National Forest managers recognize that timber harvests will remain smaller and that tourism and recreation will become even more important. There exist considerable evidence that continued timber harvests, especially clearcutting, act to diminish the recreational/tourism value that will provide the Tongass’ contribution to the economy of southeast Alaska.

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