



Management
Analysis
& Development

School Trust Lands

The Impact of Forest Certification on Costs, Revenues, and Market Access for School Trust Lands

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Executive Summary

This Management Analysis & Development (MAD) study for School Trust Lands (STL) highlights the following important findings about forest certification's impacts on STL costs, revenues, and markets:

- Forest certification charges to STL in fiscal 2015 are estimated at about \$94,700 for direct costs and about \$174,300 if the costs are expanded to include certification-related expenditures for general operations and administration.
- Reasonable but initial estimates of annual foregone STL revenues from harvest restrictions and reserve requirements range from a low of \$25,000 for ones specifically related to forest certification to a high of \$421,900 for forest certification standards as well as all other restrictions and reserve requirements that DNR follows on school trust land, some of which may or may not be required for forest certification.
- The study finds that forest certification yields little or no price premium for STL or DNR timber, with other market factors undermining positive price pressure for certified timber.
- Representatives from Minnesota's paper and pulp industry, which accounts for about 70% of the timber STL sells, cite a clear need for certified timber, while representatives from lumber mills report no preference for certification. Industry experts and representatives said forest certification provides access to markets for paper and pulp producers.

STL contracted with MAD for this study to explore the costs of forest certification to the trust, the impacts of forest certification on prices paid for STL timber, and the need for certified timber from the trust to meet the demands from customers of Minnesota's primary forest products industry. STL generates revenue, including from timber sales, that builds up the state's permanent school fund (PSF) and allows for twice-yearly distributions of investment earnings to school districts throughout the state. The State of Minnesota holds the lands in trust, with statutory policy mandating the STL secure maximum long-term revenue by employing sound natural resource and conservation management principles. The Minnesota Department of Natural Resources (DNR) manages STL's forest land, charging STL for its services.

DNR has adopted forest certification under standards from the Forest Stewardship Council (FSC) and the Sustainable Forestry Initiative (SFI) for all the forests that DNR manages, including school trust land. FSC and SFI define standards for sustainable and responsible forestry management and then accredit independent, third-party auditors, who assess forest lands to ensure conformance with the standards. STL requested this study to identify specific costs and benefits from forest certification. MAD analysts interviewed officials at primary forest products operations in Minnesota, interviewed industry experts and forest certification officials, reviewed published research, and used data to compile and calculate relevant measures and estimates.

DNR's Forest Certification Charges to STL

Estimates show that STL paid about \$94,700 for its share of direct DNR charges for forest certification in fiscal 2015, with the total rising to about \$174,300 if the forest certification costs are expanded to include estimates for related expenditures on general operations and administration. The direct forest

certification charges (\$94,700) amounted to 1.2% of total forestry costs borne by STL in fiscal 2015. The estimated costs to STL for forest certification with indirect administration and general operations expenditures included (\$174,300) accounted for 2.1% of STL's fiscal 2015 forestry costs.

Estimated Foregone Timber Harvests and Revenue

Reasonable but initial estimates show that foregone revenues to STL from DNR harvest restrictions and reserve requirements range from a low of \$25,000 to a high of \$421,900 annually. The low \$25,000 estimate is for harvest restrictions and reserve requirements specifically related to FSC and SFI forest certification guidelines. The higher \$421,900 estimate factors in other restrictions and reserve requirements on school trust lands from DNR policies and a state law affecting harvest set-backs near water in several Minnesota counties. (The acres affected by the state law were included in the available DNR data.) It is uncertain how many of the restrictions and reserve requirements tied to DNR policies affect the forest certification status for school trust land.

More precise estimates are possible but not presented in this study. Next steps for better estimates require first that STL and DNR officials agree on which reserves and restrictions, beyond those tied directly to FSC and SFI standards, are relevant to forest certification and reasonable to include in a more detailed analysis. Second, DNR will then need to produce more detailed estimates of lost STL revenue, incorporating this information about relevant DNR policies.

No Price Premiums Likely for STL's Certified Timber

When DNR adopted certification for STL forests in 2005, many industry leaders and state officials expected certified wood would command a price premium. However, the consensus among industry representatives and experts interviewed for this study is that forest certification yields little or no price premium for STL or DNR timber. They said certification has not increased stumpage prices paid to DNR and STL or the prices paid to mills for pulp, paper, and lumber products, except in limited cases. Officials with the FSC and SFI forest certification organizations emphasize a range of positive outcomes from certification, but acknowledge that positive impacts from certification on timber prices are hard to track and not common.

MAD researchers identified the following possible reasons for why forest certification has had no identifiable positive impact on STL and DNR timber prices:

- *Supply:* There is ample supply of certified timber in Minnesota and the Great Lakes region.
- *More important pricing factors:* Certification is generally too minor a factor to swing the price paid for timber, and other factors have greater influence.
- *Paper and pulp declines:* The timber market has been adversely affected by declines in the paper and pulp industry, which constitutes an important segment of the market interested in certification.
- *Commodity status:* Primary wood product producers make little or no differentiation between timber sellers because timber from one source can be easily substituted for timber from another.
- *Quality:* Certification does not positively affect timber quality, so buyers are unwilling to pay a higher price for certified timber.

- *No premium from consumers:* In general, the end users of wood products are unwilling to pay notably higher prices for items made from certified timber, so manufacturers are reluctant to pay a premium.
- *Lumber:* In general, the lumber and board producers in Minnesota do not need certification for their products and so won't pay for it.
- *Price dynamics:* The market dynamics for timber on forest lands are such that buyers wield significant power over the sellers of timber, making it difficult for timber sellers to boost prices.

Industry's Need for STL's Certified Timber

Representatives from Minnesota's paper and pulp mills expressed a clear need for certified timber, but lumber mill officials said they don't need certified timber to meet customer demands. However, almost all of those interviewed advised that STL should keep forest certification in some form because certification offers a "social license" that allows industry to harvest trees and produce products without environmental backlash and lets STL operate without public pressure or lawsuits over logging operations.

The split that MAD researchers found between representatives in the paper and pulp industry, who expressed a need for certified timber, and representatives from lumber mills, who had no preference for certification, may be an important one for STL. An analysis of DNR sales records, by scaled value and volume, found that about 70% of STL timber was sold to paper and pulp mills from 2012 to 2015. Paper and pulp mills account for a very small number of the businesses buying STL timber but the majority of STL timber consumption.

Industry Attitudes toward Types of Certification

Interviews with industry representatives from four primary forest products companies in Minnesota indicate a preference among paper and pulp mills for timber with certification under both FSC and SFI standards, but no preference for certification at all among lumber mills. The paper and pulp representatives said they believe the market generally prefers FSC certification to SFI certification, but they noted, too, that SFI is becoming a more prominent and accepted certification.

Forest Certification for Market Access

The industry representatives and experts interviewed said forest certification provides access to markets for paper and pulp producers, and that this access to markets is what drives the demand for STL's certified timber from major mills in Minnesota.

Forest Certification Study Research Questions and Methods

In 2005, Minnesota's Department of Natural Resources (DNR) instituted dual certification of sustainable forestry management practices for all state forests, including in both certificates the school trust lands situated within state forest boundaries. Partly in response to requests from Minnesota's wood products industry, DNR adopted dual certification under the standards of the Forest Stewardship Council (FSC) and the Sustainable Forestry Initiative (SFI) with the expectation that certification would improve the competitiveness of the state's forest products. Forest certification provides independent, third-party verification of identified forest management practices, including ecological, economic, and social components.

The director of School Trust Lands (STL) asked Management Analysis & Development (MAD) to analyze if DNR management under dual certification results in an economic benefit to the trust, in keeping with state statutory requirements.

MAD focused on three key research questions for this project:

- What is a reasonable estimate for STL's costs of forest certification, including an estimate for how much certification reduces the quantity of timber harvested from school trust lands?
- Does forest certification increase the price paid for STL timber?
- Do the companies that buy timber from STL need certified timber from the trust to meet the demand for product from their customers?

This report presents the findings from MAD's research. For this effort, MAD interviewed officials at seven primary forest products operations in Minnesota, interviewed industry experts and forest certification officials, reviewed academic articles and industry publications, and used data from DNR's Forestry Division to compile and calculate relevant measures and estimates. MAD gratefully acknowledges the assistance, insights, and guidance from those interviewed for this study. (See Appendix A.) DNR staff and officials also provided significant and valuable assistance. Economist Don Deckard, GIS specialist Paul Olson, and State Scaler Kevin Bergstrand in particular deserve thanks for their extensive help with time-consuming data requests and estimates. Others who offered substantial assistance include Tim Beyer, Jon Nelson, Ed Potter, Craig Schmid, and Doug Tilma.

Throughout this research effort, officials from STL and DNR have made clear their firm commitment to sustainable forestry management of school trust land.

School Trust Lands and Net Revenues

In 1858, the federal government granted land to the State of Minnesota to support schools, and it granted additional land in 1860 and 1866 that the state has used for that same purpose. Much of the land was sold to raise funds for schools, but today the state still holds 2.5 million acres of school trust

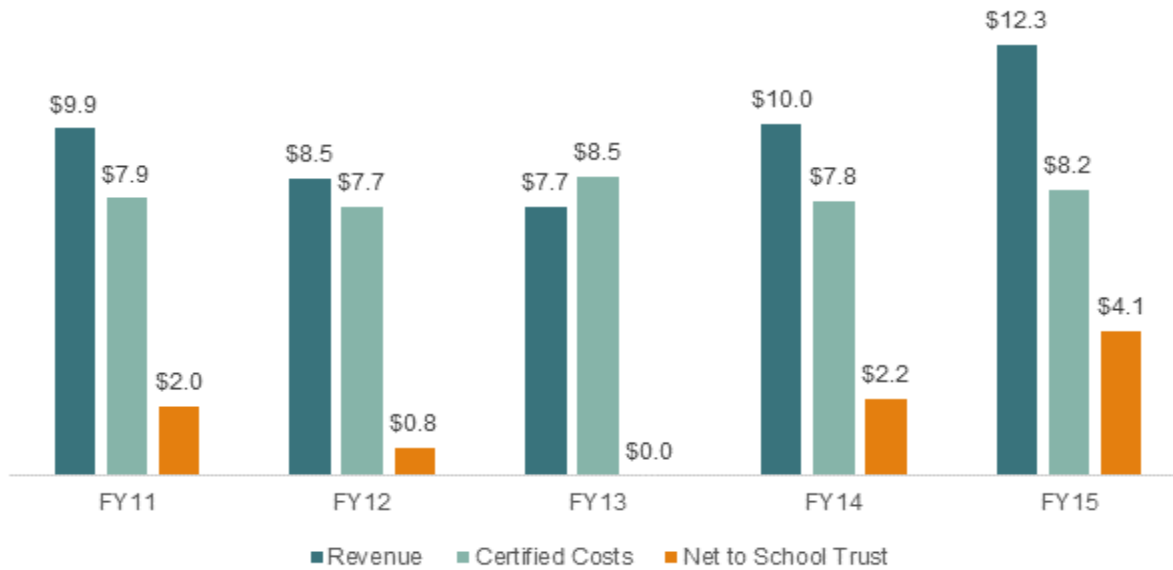
land, most of it in Northeast Minnesota. Under Minnesota's constitution, net revenues from timber sales, mineral rights, and other economic activities on the trust lands are credited to the state's permanent school fund (PSF), which distributes interest and dividends twice a year to all school districts in the state. The PSF was expected to have paid out \$26.9 million from investment earnings in 2015-16, with each district receiving approximately \$32 per student. The PSF balance for the start of fiscal 2017 was estimated in early 2016 to be about \$865 million.

The Minnesota Legislature has set the trust's goal as "maximum long-term economic return from the school trust lands..., with sound natural resource conservation and management principles, and with other specific policy provided in state law."¹

STL contributes to the state's PSF based on net revenues from timber sales and other economic activities, with net revenues being gross revenue less the forestry operating expenditures that DNR charges STL. STL's reimbursements to DNR for managing school trust forestlands are deducted from STL gross forestry revenues, most notably timber sale revenues. Figure 1 shows amounts for STL's revenues, forestry operating costs, and net revenues for fiscal 2011 to 2015, in millions of dollars. Net revenues over the period ranged from a high of \$4.13 million in fiscal 2015 to a low of \$0 in fiscal 2013.

¹ Minnesota Statutes 2015, section 127A.31.

Figure 1: School Trust Land's Forestry Revenues, Forestry Costs, and Net Revenue, Fiscal 2011-15²
(in millions of dollars)



Forest Certification

As part of its ongoing commitment to responsible, sustainable forest management, the Minnesota Department of Natural Resources has adopted forest certification under the standards of both the Forest Stewardship Council and the Sustainable Forestry Initiative for all of the forest lands it owns or manages, including school trust land. FSC and SFI define standards for sustainable and responsible forestry management and then accredit independent, third-party auditors, who assess forest lands to ensure conformance with the standards by those seeking or renewing forest certification. Under both the FSC and SFI systems, DNR undergoes separate annual surveillance audits and more-intensive, periodic full assessments in order to maintain its certifications.

A task force convened by Governor Tim Pawlenty in 2003 recommended forest certification for DNR forest lands as a way to retain or boost the competitiveness of the state’s timber and of Minnesota’s primary wood products industry, and also a strategy for improving forest management and addressing

² Data from the Minnesota Department of Natural Resources, Division of Forestry, “M.S. 16A.125 School Trust Forestry Financial Summary.” Qualifying revenues include revenues from timber sales, leases and land use, interest, and resource management access. Non-forestry revenues, such as mineral royalties, are excluded. Timber sales accounted for 91.4% of the total revenue in fiscal 2014 and 90.7% of the total in fiscal 2015. Certified costs include only those paid from the state's general fund and its Forest Management Investment Account. Costs charged to dedicated funds and federal funds are excluded from the cost certification process. Certified costs for fiscal 2011 through fiscal 2013 include fire protection costs, which were removed as qualifying cost activities as of July 1, 2013. For fiscal 2013, costs charged to STL were capped at revenues, for \$0 net to trust.

concerns about timber harvesting. In 2005, DNR chose to adopt forest certification through FSC as well as SFI to provide buyers of timber from state lands with more options for sustainable labeling, under the assumption that similarities between the two certification standards would make adherence to both standards manageable and cost effective.³

Forest certification is not the only way in which DNR—and STL—pursue sustainable forest management. A broader array of restrictions and reserve requirements used by DNR may bolster the agency's standing when it comes to forest certification and certification audits, but they may or may not be required under forest certification. There is a difference of opinion on this point within DNR and no objective way to settle the question based on FSC and SFI certification standards, many of which are open to interpretation.

As part of that broader commitment to sustainable forest management, DNR agreed to Minnesota's Voluntary Site-level Forest Management Guidelines in 2000, the same year that DNR's strategic plan identified forest sustainability as a priority. These site-level forest management guidelines consider the economic, social, and ecological values of forest resources and support sustainability. They aim to promote sustainable, productive forest lands and minimize impacts on soil and water quality.⁴ In addition to adopting the Voluntary Site-level Management Guidelines, DNR employs a range of other policies and practices to promote sustainable forests and sustainable timber yields.

Because DNR manages STL forests, DNR imposes its harvest restrictions on STL timber. These include measures taken explicitly to meet forest certification standards from FSC and SFI, but they also involve requirements tied to DNR policies as well as federal and state laws.

According to an April 25, 2014, Internal Audit Closure Report from Minnesota DNR, "Minnesota Statute and department policy requires compensating the trust when restrictions and prohibitions are placed on trust land." The audit report noted the need to evaluate the impacts of forest certification on costs and benefits, as well as other areas.⁵

³ Office of the Legislative Auditor. "Evaluation Report: DNR Forest Management," State of Minnesota, Aug. 2014, pp. 42-3. (Available at <http://www.auditor.leg.state.mn.us/ped/PEDREP/forestmgmt.pdf>.)

⁴ Ibid., p. xi and p. 49.

⁵ Ellen Sibley. "Internal Audit Closure Report: School Trust Fund Risk Assessment," Department of Natural Resources, Operation Services Division, Internal Audit Section, April 2014, p. 2.

Costs

Estimates for Forest Certification Charges and Costs to STL

Estimates show that STL likely paid about \$94,700 for its share of direct DNR charges for forest certification in fiscal 2015, including coded staff time. When forest certification costs are expanded to include estimates for the general operations and administration outlays assumed to be related to certification, then STL's total costs for forest certification rise to about \$174,300.

Direct Certification Charges

As shown in Table 1 the charges to STL that tie directly to forest certification totaled about \$94,700 in fiscal 2015. From 2011 to 2015, they ranged from a high of about \$115,800 in fiscal 2011 to a low of about \$78,400 in fiscal 2013, based on DNR data and estimates. As a percentage of the total forestry costs borne by STL, these direct forest certification charges stood at 0.9% in fiscal 2013 and 1.5% in fiscal 2011. The direct charges include staff hours coded as forest certification time, contract costs for recertification and surveillance audits, and fees paid to the certification organizations. Audit costs vary with higher charges in recertification years than in surveillance years. Costs vary, too, depending upon requested corrective actions identified in the audits. STL's shares of both DNR's forest certification charges and DNR's total forestry costs are based on STL's share of the total acreage managed by DNR (44.8%).

Table 1: STL’s estimated share of direct charges for forest certification compared to total forestry costs, fiscal 2011-15

Fiscal Year	STL’s Direct Forest Certification Charges⁶	Total Forestry Costs to STL⁷	STL’s Direct Forest Certification Charges as a Share of Total Forestry Costs
2011	\$115,800	\$7,899,200	1.5%
2012	\$87,500	\$7,663,500	1.1%
2013	\$78,400	\$8,524,000	0.9%
2014	\$90,000	\$7,824,900	1.2%
2015	\$94,700	\$8,159,300	1.2%

Source: Minnesota Department of Natural Resources, Division of Forestry, December 2015 and January 2016. Amounts are rounded to the nearest \$100.

Direct Forest Certification Charges Plus Related Administrative and General Operations Costs

The direct costs for forest certification noted in Table 1, above, do not include indirect costs for administrative and general operations related to forest certification. Some administrative costs directly linked to forest certification are included in DNR’s direct forest certification charges. For example, the direct forest certification charges include trackable costs to DNR for administering and managing the audit contracts. But indirect administrative costs also include outlays for financial, accounting, and fiscal management; general office, clerical, and administration; and leadership and human resource services. General operations includes costs for facilities and management, information technology services, records management, program management, leave and time off, fleet services, and miscellaneous costs.

DNR also estimated the accounting costs for forest certification factoring in shares of administrative and general operations costs that the agency assigned to the forest certification activity code. Table 2 shows estimated accounting costs to STL for forest certification, including indirect administration and general operations, totaled about \$174,300 in fiscal 2015. For the period from fiscal 2011 to fiscal 2015, the amounts ranged from a high of about \$199,200 in fiscal 2011 to a low of about \$159,100 in 2013. At

⁶ Direct charges for forest certification include DNR staff time coded as forest certification work, annual outlays to third-party auditors who monitor certification practices and compliance, and annual certification fees paid to forest certification organizations. The estimates in the table assign 44.8% of DNR’s full costs to STL based on the trust’s share of the total acreage managed by DNR. STL’s share of the costs for auditor outlays and certification fees only are estimated at approximately \$43,900 in 2011, \$18,400 in 2012, \$18,800 in 2013, \$23,300 in 2014, and \$21,600 in 2015.

⁷ Total forestry costs to STL cover four statutory categories: (1) management (includes timber sales and forest resource management); (2) forest improvement (includes site preparation and reforestation, and timber stand improvement); (3) forest roads (for state forest roads that provide direct access to trust lands); and (4) administration (includes DNR services and Division of Forestry activities). Costs for 2011-2013 include fire protection costs, which were removed as qualifying cost activities as of July 1, 2013. When costs exceed revenues, actual charges paid by STL in any given fiscal year are capped at the total STL qualifying revenue for that fiscal year.

these levels, STL’s certification costs—again, factoring in estimated, indirect administrative and general operations costs—accounted for 2.5% to 1.9% of STL’s total forestry costs for that period.

Table 2: STL’s estimated share of forest certification costs including indirect administration and general operations costs, compared to total forestry costs, fiscal 2011-15

Fiscal Year	STL’s Direct Forest Certification Charges	STL’s Estimated Forest Certification Costs for Indirect Admin, Gen Ops	STL’s Total Estimated Costs for Forest Certification	STL’s Total Forestry Costs	STL’s Estimated Forest Certification Costs as a Share of Total Forestry Costs
2011	\$115,800	\$83,400	\$199,200	\$7,899,200	2.5%
2012	\$87,500	\$72,500	\$160,000	\$7,663,500	2.1%
2013	\$78,400	\$80,700	\$159,100	\$8,524,000	1.9%
2014	\$90,000	\$79,000	\$169,000	\$7,824,900	2.2%
2015	\$94,700	\$79,600	\$174,300	\$8,159,300	2.1%

Source: Minnesota Department of Natural Resources, Division of Forestry, December 2015 and January 2016. Amounts are rounded to the nearest \$100.

DNR’s estimated costs to STL for general operations related to forest certification are based on costs associated with state land forest management (SLFM) and allocated in proportion to the SLFM expenditures assigned to STL as costs under state statute. The focus here, of course, is on the share relevant to forest certification. The administrative costs were estimated based on STL’s share of SLFM direct costs and general operations allocations, as a share of overall direct and general operations outlays, again determining the level relevant to forest certification. In keeping with established DNR accounting practices, the estimates are based on amounts for non-fire SLFM, non-fire general operations, and non-fire administrative activities.

Estimated Foregone Timber Harvests and Revenue

In addition to direct and indirect expenses, foregone revenues constitute a significant and quantifiable cost to STL for forest certification—and broader DNR restrictions and reserve requirements similarly impose costs on STL in terms of unrealized revenues from timber that otherwise would be harvested. Reasonable but initial estimates show that the costs of foregone revenues to STL from DNR harvest restrictions and reserve requirements range from a low of \$25,000 to a high of \$421,900 annually. The \$25,000 estimate (low) is for harvest restrictions and reserve requirements specifically related to FSC and SFI forest certification guidelines. The \$421,900 estimate (high) factors in the forest certification guidelines but also all other restrictions and reserve requirements on school trust lands from DNR policies and a provision in state law that affects harvest set-backs near water in several Minnesota

counties.⁸ It is uncertain how many of the restrictions and reserve requirements tied to DNR policies affect the forest certification status for school trust land.

More precise estimates are possible but not presented in this study. Next steps for better estimates require first that STL and DNR officials agree on which reserves and restrictions, beyond those tied directly to FSC and SFI standards, are relevant to forest certification and reasonable to include in a more detailed analysis. Second, DNR will then need to produce more detailed estimates of lost STL revenue, incorporating this information about which DNR policies relate to forest certification status.

These two different estimates of annual impacts provide a sense of the range for potential foregone revenue to STL resulting from dual forest certification and additional DNR policies. The estimated annual impacts—from as low as \$25,000 to perhaps as high as \$421,900—apply to current circumstances but will not necessarily hold for future years because of expected changes to DNR policies, as well as likely shifts in timber prices and forest management costs. The model used to estimate impacts assumes annualized annuity values for perpetual, sustainable harvests and assumes all timber available for harvest is sellable, for a success rate on sales of 100%. Given that these are initial estimates, no risk analysis was carried out for high, medium, and low ranges, with, for example, adjustments to assumptions about stumpage prices or the rate of successful sales for timber.

Estimates of Revenue Impacts on STL from HCVF and RSA Restrictions and Reserve Requirements

STL and DNR concur that harvest restrictions and reserve requirements for high conservation value forests (HCVF) and representative sample areas (RSA) are tied directly to forest certification standards. MAD calculated timber revenues for STL with and without harvest restrictions and reserve requirements for HCVF and RSA to reasonably but roughly estimate STL lost revenues from these two designations. In total, the estimated impacts from the hypothetical lifting of the HCFV and RSA requirements amount to an overall annual gain of about \$25,000 in annual gross STL revenues. All of that \$25,000 stems from lifting the HCFV requirements. (See Table 3 below.)

⁸ The estimated \$421,900 in annual foregone revenues to STL from all harvest restrictions and reserve requirements factors in the impacts from a Minnesota law known Little Shipstead Newton Nolan because acres affected by this law were included in the data from DNR. STL would, of course, be required under all circumstances to follow this state law. affected by this law were included in the data from DNR. STL would, of course, be required under all circumstances to follow this state law.

Table 3: Reasonable but initial estimates of annual impacts on STL timber sales revenues from lifting HCVF and RSA reserves and restrictions directly tied to forest certification requirements⁹

Net revenue from STL HCVF timber with HCVF requirements	\$90,700
<i>Net revenue from timber shifted from HCVF to R5 & R6 requirements</i>	\$46,200
<i>Net revenue from timber shifted from HCVF to no requirements</i>	\$69,500
Total net revenue from STL HCVF timber with HCVF requirements lifted	\$115,700
Annual gain to STL from lifting HCVF requirements (\$115,700 - \$90,700)	\$25,000

Net revenue from STL RSA timber with RSA requirements	\$0
<i>Net revenue from timber shifted from RSA to R3 & R4 requirements</i>	-\$100
<i>Net revenue from timber shifted from RSA to R5 & R6 requirements</i>	\$100
<i>Net revenue from timber shifted from RSA to no requirements</i>	\$0
Total net revenue from STL RSA timber with RSA requirements lifted	\$0
Annual gain to STL from lifting RSA requirements	\$0

Estimated total annual gain to STL from lifting HCVF & RSA requirements	\$25,000
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MAD roughly estimates that without HCVF restrictions, STL annual revenues rise to about \$115,700, compared to about \$90,700 if HCVF restrictions are in place, for an annual gain to STL of \$25,000. (See Appendix B for more detail.) For RSA reserve requirements, timber revenue gains for STL are estimated to be negligible if RSA reserve requirements are lifted (shown at \$0 in Table 3) despite increased timber harvests because timber sales revenue gains are canceled out by losses. This happens in the model because a significant share of the increased timber available for harvest if RSA requirements were to be lifted are from cover types for which the per acre costs that DNR charges STL for forest management exceed the estimated average revenues from timber sales per acre. Consequently, with the hypothetical lifting of RSA requirements, the gains from some cover types are canceled out by losses from other cover types. (See Appendix C for more detail.)

These calculations use annualized annuity values for perpetual, sustainable harvests. This means that the impacts of the changes in restrictions and reserves on STL timber harvests for each cover type are

⁹ Amounts rounded to the nearest \$100. The estimates classify timber in HCVFs as part of DNR’s R4 restriction group, which restricts harvests to 70-80% of the timber at or above rotation age, and classifies timber in RSAs as part of DNR’s R2 restriction group, which restricts harvests to 5%. Other DNR restriction categories are as follows: R1 (no harvests allowed), R3 (harvests up to 70%), R5 (harvests up to 15%), and R6 (harvests up to 95%). For these calculations, DNR data combined the restriction groups as follows: R1 with R2, R3 with R4, and R5 with R6. For the calculations used here, levels for allowable harvests were set to 75% for R3 and R4 combined, and 90% for R5 and R6 combined. For timber acres with no restrictions, allowable harvests were set to 95%, in keeping with Minnesota’s Voluntary Site-level Management Guidelines for forest management regarding the share of trees to leave standing from a harvest (leave trees). For some cover types, the per acre costs that DNR charges to STL for forest management and timber sales (\$257 in fiscal 2015) exceeds the estimated average revenue from those timber sales per acre, resulting in a loss to STL. For this reason, removing the RSA requirements leads to only a negligible change in STL revenues (rounded to \$0 in Table 3). For more detail, see Appendix B.

spread out evenly over the full span of that cover type's economic rotation age. For example, the potential gain of \$1.48 million from removal of HCVF restrictions on Aspen/Balm timber for the full 45 years of that cover type's rotation age is spread out over the full 45-year period, for an annual gain of \$1.48 million divided by 45, or \$32,900 annually.

For these calculations of reasonable but initial estimates, timber removed from the HCVF and RSA requirements is reclassified to other levels of restrictions and reserves if the timber stands on acres where other restrictions and reserves are in place under DNR policy or state law. This was done because the hypothetical elimination of the HCVF and RSA limits on timber harvests would leave in place other DNR forest management harvest restrictions and reserve requirements. For further explanation, consider this example: STL's estimated 1,155 productive acres of birch classified as HCVFs, where harvests are restricted to 70-80% of the timber at or above rotation age, were reclassified in these calculations without HCVF requirements as 615 acres under R5 and R6 restrictions, where harvests are restricted on average to about 90%, plus 540 acres with no restrictions other than Minnesota's Voluntary Site-level Management Guidelines for leave trees, allowing for harvests of 95%. Similarly, STL's 12 productive acres of Jack pine classified as RSAs, where harvests are restricted to 5% of the timber at or above rotation age, were reclassified in these calculations without RSA requirements as 5 acres under R3 and R4 restrictions, where harvests are restricted on average to about 75%, plus 7 acres with no restrictions other than the site-level management guidelines, again allowing for harvests of 95%. DNR harvest restrictions and reserve requirements are applied over and above the site-level management guideline of 5% for leave trees.

Revenue Impacts on STL from All Restrictions and Reserve Requirements

DNR data was also used to calculate timber revenues for STL with and without all the current restrictions and reserves that DNR uses to manage forests on state and school trust land, including DNR policies, state laws, and forest certification standards. Without any of the harvest restrictions and reserve requirements, the estimates show that that STL annual revenues rise by about \$421,900. (See Table 4.) This factors in gains from the harvests of timber cover types for which the estimated average revenue from timber sales per acre exceeds per acre costs DNR charges to STL for forest management, as well as the losses for harvests from other timber cover types for which the costs exceed the revenues. (See Appendix D for more detail.)

Table 4: Reasonable but initial estimates of annual impacts on STL timber sales revenues from lifting all current reserves and restrictions (forest certification requirements, DNR policies, state law)¹⁰

Net revenue gain from STL timber shifted from R1 & R2 restrictions to none	\$84,300
Net revenue gain from STL timber shifted from R3 & R4 restrictions to none	\$288,700
Net revenue gain from STL timber shifted from R5 & R6 restrictions to none	\$48,900
Annual gain to STL from lifting all restrictions & reserves	\$421,900

In this scenario, hypothetically removing all harvest restrictions and reserve requirements on STL forest lands would allow for the maximum harvest of timber at or above rotation age for all cover types from all the existing restriction and reserve classifications. The maximum harvest for these estimates is set to 95%, in keeping with Minnesota’s Voluntary Site-level Management Guidelines regarding leave trees.

Once again, these calculations use annualized annuity values for perpetual, sustainable harvests. This means that the impacts of the changes in restrictions and reserve on STL timber harvests for each cover type are spread out evenly over the full span of that cover type’s economic rotation age.¹¹

¹⁰ Amounts rounded to the nearest \$100. The restriction groups now in place restrict harvests of timber at or above rotation age to 0% for R1, 5% for R2, 70% for R3, 70-80% for R4, 85% for R5, and 95% for R6. These harvests restrictions and reserve requirements are applied over and above Minnesota’s Voluntary Site-level Management Guidelines of 5% for leave trees. For the calculations used here, DNR data combined the restriction groups as follows: R1 with R2, R3 with R4, and R5 with R6. Levels for allowable harvests were set to 5% for R1 and R2 combined, 75% for R3 and R4 combined, and 90% for R5 and R6 combined. The estimates for this report are based on calculations that increase allowable harvests of STL timber from their levels under current restrictions to 95% instead, under the Minnesota’s Voluntary Site-level Management Guidelines of leaving 5% of the trees standing from a harvest. For more detail, see Appendix C.

¹¹ MAD originally requested DNR data to estimate the impacts of all reserve requirements and harvest restrictions based on the hypothetical assumption that STL would harvest within 10 years all of the affected timber at or within 10 years of economic rotation age. Preliminary and rough calculations based on this scenario indicated revenue impacts for STL that were dramatically higher than those based on the annualized annuity values. (The annualized annuity values are used in this report.) The 10-year scenario, again roughly estimated using preliminary data, showed annual increases in STL timber revenues of more than \$1 million. However, the 10-year scenario assumes harvest of roughly half the available STL acres in a 10-year period, an unsustainably high harvest level for STL timber. This hypothetical approach would leave the available STL timber after those 10 years at unprecedentedly low levels. By way of example, such a hypothetical 10-year harvest for timber that has a 60-year rotation age would take half the available timber in those 10 years and reduce harvests after that to 1% in each of the next 50 years, creating an untenable boom and bust cycle for STL harvests. For this reason, MAD and STL moved away from the 10-year scenario and requested the annualized annuity values for perpetual, sustainable values that spread harvests out equally for each year of every cover type’s full economic rotation age.

Limits to the Estimates of Foregone Revenue and Areas for Further Analysis

In light of limits both to this study's scope and to the work time available from DNR's economist and GIS specialist, the analysis here focuses only on these two reasonable but initial estimates of lost STL revenue from restrictions and reserve requirements, using available DNR data. To specify, the two scenarios are as follows:

- estimates for the impacts from forest certification requirements for (1) high conservation value forests, and (2) representatives sample areas, and
- estimates for all current reserves and restrictions used by DNR in managing forests on state and school trust land, including DNR policies, state laws, and forest certification requirements.

DNR policies aimed at responsible and sustainable forest management contribute to forest certification under the FSC and SFI standards and may in this way link directly to forest certification. At the same time, DNR policies may standardize best practices in DNR forest management that are not critical to forest certification and therefore not relevant to a more precise calculation of lost STL revenues from forest certification requirements.

More precise estimates are possible but not presented in this study. STL and DNR officials would first need to agree on which reserves and restrictions beyond those required by FSC and SFI are relevant to forest certification and reasonable to include in a more detailed analysis of foregone STL revenues. DNR analysts would also need to produce additional and detailed breakdowns for STL timber acres by cover type and reserve and restriction groupings, perhaps based on stand-level data. As is, the estimates presented in this report are in keeping with the goal of this study to provide a sense for the potential range of foregone STL revenue using available DNR data and reasonable calculations.

As noted earlier, the high-end estimate here of lost revenues includes the impacts of reserves and restrictions required by state law, and these requirements clearly would be necessary for STL forests even without forest certification standards. Based on discussions with STL and DNR, MAD used DNR data that includes STL acres covered by these state-required reserves and restrictions because they are grouped with other acres in the classifications used for existing DNR data. Exclusions of these acres would have involved additional time and effort by DNR analysts, as would have other potential refinements of the data.

At the request of MAD, DNR used existing data to identify STL forest holdings by forest cover type managed under harvest restrictions and reserve requirements, calculating total and productive forest acres. In addition, DNR provided data by cover type on harvest yields and gross and net timber revenues per acre for reasonable but initial calculations of the impacts on revenue from reserves and restrictions.

A Missing Piece: Increased Staff Hours for Forest Management

While this report provides estimates of some important costs for STL linked to forest certification, no estimate is made for the full staff hours and the compensation costs involved in managing school trust

lands under forest certification standards. The estimates above for direct certification charges and costs to STL do indeed include costs for staff hours coded as forest certification time, so they account for work tied to specific certification tasks, such as forest certification audits. But forest certification has broader impacts on hours. DNR has adopted general and ongoing forestry management approaches that align with forest certification and guidelines, ones that require additional staff time aside from hours coded for forest certification tasks. For this report, none of the methods explored to address this issue of staffing hours produced acceptable estimates either for hours required or dollar costs.

A number of DNR officials at a January 8, 2016, meeting made the point that the costs STL pays to DNR for managing school trust lands incorporates hours logged by DNR staff for forestry management practices influenced or shaped by forest certification. There is evidence that those types of forest management practices affect DNR's forestry management hours. Looking at what are now referred to as Minnesota's Voluntary Site-level Management Guidelines, professors with the University of Minnesota's Forest Resources Department in 2005 documented that the staff hours required to set up timber sales in Minnesota under those guidelines was more than 50% higher than for timber sales not set up under those guidelines. The professors were unable to explore other aspects of forest management under the guidelines beyond setup times for sales.¹² But their findings do indicate that DNR's use of best forest management practices can increase forestry staff time. The focus of their research, however, was the site-level management guidelines, as distinct from forest certification.

DNR Forest Management Staff Hours and Estimated Costs

DNR staff hours for forestry management duties broadly—whether the work relates directly to forest certification or not—constitute a significant share of DNR's overall costs for state land forest management and consequently a significant share of the DNR forest management costs that are passed on to STL. At MAD's request, DNR calculated fiscal 2015 hours and total compensation for state land forest management work on both direct forestry activities and closely related support activities, based on selected SLFM categories from its accounting system.¹³ That data shows that DNR staff logged some 248,470 hours in fiscal 2015 and some 235,630 hours in fiscal 2014 for this forestry management work in the relevant SLFM categories.

DNR also calculated total compensation in fiscal 2015 for SLFM staff time on forestry activities: \$9.01 million. This is the sum of salary and benefit costs for the 248,500 fiscal 2015 forestry hours in the SLFM

¹² Charles R. Blinn and Michael A. Kilgore, "The Impact of Minnesota's Forest Management Guidelines on the Time Required to Set Up Public Agency Timber Sales," *Northern Journal of Applied Forestry*, 22, no. 3 (2005), pp. 175-180.

¹³ DNR tallies for direct forestry activities and closely related support activities included SLFM hours spent on work in the following categories: timber sale preparation and design (23210), interdisciplinary forest management (23211), timber permit supervision (23212), timber scaling (23213), timber program administration (23214), timber enforcement (23215), site preparation and reforestation (23311), timber stand improvement (23312), forest health management (23313), environmental quality control and monitoring (23314), forest tree improvement (23317), forest inventory (23402), regeneration survey (23403), roads and bridges (23405), subsection forest resource management plan (SFRMP) planning (23601), forest management certification (23604), the Forestry Information System (FORIST) (23607), and forest resource assessment (23654). Hours categorized as forest management certification specifically (23604) are included in the direct costs of certification presented elsewhere in this report.

categories identified by DNR as both direct forestry management work and closely related support activities. This equates to an average hourly rate of \$36 for compensation when carrying out this forestry management work.¹⁴

While DNR does not assign costs for service to STL based on the hours and compensation present here, they are a significant factor in the annual payments from STL to DNR for forest land management services. As noted in Table 1, DNR charged STL \$8.2 million for forestry costs in fiscal 2015, based on STL's share of the total acreage managed by DNR. If that same share (44.8%) were to be applied to the \$9.01 million that DNR estimates as fiscal 2015 staff compensation costs for direct forestry management work and closely related support activities, STL's share of the compensation costs would amount to almost half of its overall forestry costs. This demonstrates the significance of forest management staffing and hours to DNR's forest management costs and to STL's share of DNR's costs for forest management services.

Unknown Impacts of Forest Certification on Forestry Management Hours

Clearly, staff hours and time for forestry management matters. But what's unknown and indeterminable is how forest certification specifically affects overall forest management hours worked and staffing costs for DNR. Under DNR's systems, it is not possible to accurately identify all the forestry management work that DNR carries out because of forest certification, as distinct from forestry management work overall or work done in keeping with Minnesota's Voluntary Site-level Management Guidelines. Much of this work is intertwined and interrelated. It is also difficult to ascertain when adherence to forest certification practices results in added hours and staff rather than a shift in the work being performed with existing staff within already available work hours.

Nonetheless, the MAD project team and DNR officials considered several possible approaches to estimating the impacts of forest certification on forestry management hours without finding a reasonable and accurate approach. Several DNR staff collaborated to produce educated guesses for how much added forestry management time might be necessary because of forest certification, but these estimates were too rough and subjective to be used for cost calculations. Interviews with forestry staff were ruled out also as too subjective—and potentially inaccurate if coming from forestry staff who have only worked on DNR forestry management under forest certification and therefore have no other point of comparison.

With help from DNR, MAD also examined data on forestry staffing hours for the two years before DNR adopted forest certification and then again for the two years after DNR adopted forest certification. However, this data also fails to provide a clear indication of the impacts of forest certification on staff hours and costs. Many factors influence forestry staffing hours from one year to the next, including a range of factors likely to be more significant in magnitude than the shift in forest management practices under forest certification. Important factors affecting forestry hours include

¹⁴ Total compensation includes employee salary and wages, employer FICA contributions, employer costs for employee health insurance, employer retirement contributions, vacation time, holidays, and other employer-funded benefits.

timber output, weather, DNR budget allocations and their effect on forestry staff levels, and the experience levels and training of forestry staff.

So while staff hours for direct forestry management work increased from the two years before DNR adopted FSC and SFI certification for the state's forests in fiscal 2005 to the two years after, in all likelihood only a small share of that upward shift is tied to forest certification, and there is no way to estimate that share within the scope of this study. With two-year averages used to smooth out year-to-year variations, DNR data show that staff recorded about 38,700 more hours for direct forestry management work and closely related support activities in the two years after adoption of forest certification (fiscal 2006 and 2007) compared to the two years before adopting certification (fiscal 2003 and 2004).¹⁵ The hours recorded for relevant SLFM categories totaled about 224,800 on average for fiscal 2003 and 2004, then 263,500 on average for fiscal 2006 and 2007. Again, this 17% increase cannot be linked directly to adoption of forest certification because too many other significant factors affect staffing hours from any year to the next, and the data are presented here only for context.

No Price Premiums for STL's Certified Timber

When forest certification was adopted, many state officials and industry leaders in Minnesota expected it would result in price premiums for the state's primary forest products, however this seems not to be the case. The consensus from those interviewed for this study is that forest certification yields little or no price premium for timber from school trust land or other State of Minnesota land. Forestry experts at the University of Minnesota drew this conclusion based on qualitative information they have gathered over the years from many sources. Similarly, representatives from a number of primary forest products companies stated that certification for Minnesota forests fails to generate a price premium for harvested timber.

Assessments from Minnesota's Experts: Price Impacts Unlikely

A review of the academic literature turned up no definitive studies on the impacts of certification on timber prices. Consequently, for research into the possible price impacts on STL timber from forest certification, Management Analysis & Development depended primarily on interviews with industry experts and contacts. (See Appendix A.) To explore this issue, the MAD research team conducted face-to-face interviews in January and February 2016 with 13 industry officials working at or with seven different primary forest products operations in Minnesota. In addition, MAD carried out telephone

¹⁵ The relevant staff hour categories for state land forest management used for fiscal 2003, 2004, 2006, and 2007 are those matching up with categories from the current DNR accounting system, noted previously in the discussion of hours for fiscal 2014 and 2015. Hours categorized as forest management certification specifically (23604) are included in the direct costs of certification presented elsewhere in this report. The categories used for fiscal 2003, 2004, 2006, and 2007 are not strictly comparable to the fiscal 2014 and 2015 categories in all cases.

interviews—and email follow-ups in some cases—with another 10 industry experts in Minnesota and nationwide. The information and findings presented here are drawn mostly from those interviews.

When the Minnesota Department of Natural Resources adopted forest certification in 2005, the conventional wisdom was that certified wood would command a price premium, according to officials from a number of mills in Minnesota. This turned out not to be true, they said, neither for stumpage prices paid to DNR and STL nor prices paid to mills for pulp, paper, and lumber products, except in limited cases. Buyers of products from the mills expect certified output but are unwilling to pay for it, the industry officials said. For DNR and STL, then, certification has become another cost of doing business.

The Molpus Woodlands Group manages 286,000 acres of private forest lands in Minnesota that were once held by Boise Cascade, and it sells timber to mills. Molpus-managed lands meet SFI forest certification requirements in part because of investor interest in this approach, according to Craig Halla, the Minnesota property manager for Molpus. Halla said he is not aware of anyone in the industry receiving a price premium for their certified wood.

Counties in the northeast and north central regions of Minnesota manage forest land and sell timber to mills. Land commissioners from several of those counties similarly reported that forest certification does not likely have an impact on the price paid for harvested timber.

From outside the industry, Charlie Blinn and Mike Kilgore, professors in University of Minnesota's Department of Forest Resources, both said it is their educated and informed assessment that forest certification has had no impact on the prices paid for timber in Minnesota to date. Blinn is involved in forest certification in Wisconsin, and Kilgore is involved in hands-on forest certification work in Minnesota. Interviewed together in January, Blinn and Kilgore noted that theirs is a qualitative assessment—albeit an informed and educated one—because there has yet to be a careful, quantitative study on possible price impacts from forest certification in Minnesota. But they added that a controlled, econometric study likely wouldn't show an impact from certification on timber prices, in their opinion.

Indications from Beyond Minnesota: Limited Price Impacts

The organizations behind the forest certification standards used by the State of Minnesota—FSC and SFI—emphasize a range of positive outcomes from certification, including improved water quality, better environmental impacts, reduced environmental costs, and market access for sellers of certified timber and products. But based on experience from the start of forest certification to now, the certification organizations don't imply that forest certification will yield price premiums for timber, and they recognize that positive impacts from certification on timber prices are both hard to track and limited.

FSC and SFI aren't involved in buying and selling certified timber. What's more, antitrust regulations and concerns about fair competition among forest certification users restrict FSC and SFI from systematically compiling information about sales and pricing. But in general, anecdotal terms, current

materials from the forest certification organizations and interviews with their officials indicate that price premiums to landowners for certified timber are not to be expected.

Does forest certification have an impact on price? “The short answer that satisfies no one is, ‘It depends,’” said Corey Brinkema, president of FSC United States. He knows of specific examples where the adoption of forest certification has had a positive impact on prices, but such impacts vary by market to market, he said. Even in cases where there is an identifiable price premium to the landholder, the variations from market to market make it unreasonable to use that quantitative information to draw conclusions about price impacts in other situations.

“Initially, advocates thought that forest certification would be spurred by direct price premiums for certified wood,” states an FSC factsheet. “While some manufacturers are enjoying higher prices for sales, most say price benefits have been limited. Where they have experienced increased value for end products, higher prices paid to landowners producing the wood are not common.” The factsheet notes that this may change as the market for certified timber and wood products reaches scale and the certification chain from land to product realizes efficiency gains over time.¹⁶

Jason Metnick, SFI’s senior vice president for customer affairs, said that positive price impacts were expected back when SFI began, some 20 years ago. “The idea was that certification would command a price premium. That’s not certain, now. It’s a question mark.” SFI doesn’t promote certification based on price impacts, he said. There may be instances where consumers are paying more for certified products, according to Metnick, but even when end-users of wood products pay price premiums, generally those premiums don’t make it down the supply chain to the owners of timberland.

Professors Blinn and Kilgore from the University of Minnesota warn that comparisons between timber circumstances and sales in Minnesota and circumstances and sales elsewhere are problematic for a range of reasons, including the mix of industrial uses for Minnesota’s tree types, the dominance of public forest lands in the state, and easier access in some U.S. regions to international export markets for timber. Nonetheless, the limited information available and gathered for this study regarding timber prices beyond Minnesota also indicates that positive price impacts from certification are likely constrained, particularly for Minnesota.

Mark Heyde, the DNR forest certification specialist in nearby Wisconsin, said it is difficult to say if forest certification has an impact on timber prices in that state, citing a lack of data. “What we’re seeing is that it likely is primarily market access and there are some price premiums.” Anecdotally, he has heard of certified wood products commanding a price premium in high-demand markets, particularly for hardwood timber, like walnut, that is used for furniture and other high-end products. Minnesota has few hardwood forests, particularly in the northern part of the state where most of the state-owned forest lands are located.

¹⁶ “Costs and Benefits of Forest Certification,” factsheet, Forest Stewardship Council – United States, pp. 1-2. Downloaded 2016 at

https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=0ahUKEwj_hOWI19LLAhWhyIMKHcMoBmcQFggdMAA&url=https%3A%2F%2Fus.fsc.org%2Fdownload.costs-and-benefits-of-forest-certification.198.htm&usg=AFQjCNHPiYqZ4q5E3enLT9HLrX_9_SBiA.

A Duke University student pursuing master's degrees in forestry and environmental management studied forest certification for The Forestland Group (TFG), a private company that manages forests across 3.4 million acres in 24 states and holds a portfolio that is 90% hardwood trees. The author used interviews with TRG's regional managers to determine whether forest certification resulted in price premiums for the company's timber. In her resulting 2012 master's thesis, which has not been published in a peer-reviewed journal, the author writes, "The Appalachian and Lake States regions reported that they received no price premiums for certified sales..."¹⁷ Minnesota is in TFG's Lake States region.

Possible Reasons Forest Certification Fails to Secure Higher Timber Prices for STL and DNR

When Governor Pawlenty's 2003 advisory task force on Minnesota's primary forest products industry advocated for forest certification, many expected that certification would positively affect timber prices.¹⁸ The industry representatives interviewed for this report noted that Time Warner and other large-scale purchasers of paper nationwide were advocating strongly for certified paper and pulp. At the time, many industry players and stakeholders expected that price premiums for certified timber would offset increased forest management costs and possibly lead to increased net revenues. (However, the state pursued certification for a range of reasons beyond possible financial impacts.¹⁹)

Why then has forest certification failed to yield a price premium for DNR and STL? The following possible reasons were drawn from interviews and other research conducted for this report:

Supply: There is ample supply of certified timber in Minnesota and the Great Lakes region generally, so timber buyers face no pressure to increase the price they pay in order to secure certified timber. In some cases, too, the parent corporations of the mills in the area can tap supplies from elsewhere to satisfy their overall need more certified timber.

More important pricing factors: Certification is generally too minor a factor to swing the price paid for timber. Timber prices are greatly affected by other, more important factors than certification. The long list of other factors that affect price include labor costs, tree type, wood quality, product markets, distance to roads and ease of access, distance to mill location, other transportation factors, the impacts of weather on available supply, the quantity of timber available for harvest at a site, the season when the timber is harvested, foreign exchange rates, worldwide harvest levels, and U.S. and worldwide economic growth rates.

Paper and pulp declines: The timber market has been adversely affected by declines in the paper and pulp industry, with consumer demand for paper dropping significantly in recent years, even during periods of economic growth. Paper and pulp producers account for a significant segment of the market

¹⁷ Schreiber, Jenna and Jeff Vincent, "A Cost Benefit Analysis of Forest Certification at The Forestland Group," master's thesis, Duke University, 2012, p. 26.

¹⁸ Op. cit., Office of the Legislative Auditor, "Evaluation Report: DNR Forest Management," p. 42.

¹⁹ Ibid., p. 42.

that is interested in certification. Decreased demand for paper and tight margins in the industry make it unlikely that paper producers will offer price premiums for certified timber.

Commodity status: Timber is mostly a commodity in both the pulpwood market for paper and the market for boards used in construction, with little or no differentiation made on the part of the primary wood product producers between one timber seller and the next. As a raw material, timber from one source can easily be substituted for timber from another source at the corporate level. This is less the case for specialty wood products.

Quality: Certification does not positively affect the quality of the timber, and buyers are unwilling to pay a higher price for certified timber that is of the same quality as non-certified timber.

Generally no premium from consumers: For most wood product markets, the end consumer is unwilling to pay more for products made from certified timber. Without a price premium from their consumers, manufacturers in turn are unwilling to pay a premium for certified forest products, and mills then are unwilling to pay a premium for certified timber.

Lumber: In general, the lumber and board producers in Minnesota do not need certification for their products, and so certified timber does not lead to added value for which producers are willing to pay a premium.

Price dynamics: The market dynamics for timber on forest lands are such that buyers wield significant power. While the public agencies set a minimum (or “reserve”) price for their timber, timber buyers likely have the advantage because of the very local nature of the market for any standing timber and the limited number of potential buyers in any particular area. For DNR, these price dynamics may be exacerbated by a DNR policy to sell two-thirds of its timber through oral bid auctions, a format that may constrain prices because the buyers in an oral bid auction have the ability to observe and perhaps influence the prices offered. Once harvested, timber can be and is shipped, although primary wood products producers likely prefer to purchase cut timber from nearby sellers given the weight of and shipping costs for this raw material.

Industry’s Need for STL Certified Timber

The interviews with 10 industry representatives from four of Minnesota’s mills revealed differences in the need for certified timber from School Trust Lands: officials from the paper and pulp mills expressed a clear need for certified timber, but lumber mill officials said they don’t need certified timber to meet customer demands. All noted the importance of STL timber, certified or not, to their operations.

Officials from two of Minnesota’s major paper and pulp mills said that they rely upon STL’s certified wood to meet the demands of their customers, given STL’s status as one of the largest suppliers of certified wood in the state. The paper and pulp mills adopted certification for their products because their direct customers insisted on it, the industry representatives reported. All the competitors for these two Minnesota paper and pulp mills produce certified products, according to those interviewed, and consequently the Minnesota mills need to be producing certified output, too, in order to compete.

One of the interviewees from the paper and pulp business said that if STL dropped certification for its timber, the company's mill operations in Minnesota would be hugely affected and that the company might stop buying STL wood altogether—a very significant, if unverifiable, assertion. One interviewee cited the example of a mill on the West Coast that gave up certification, with negative consequences for its parent company and even for an operation in Minnesota linked to the West Coast mill.

Another person from the paper and pulp mills noted that the certified timber available in Minnesota gives a Minnesota mill a strategic advantage within the corporation because the certified output produced here in the state can be used to balance out production at mills elsewhere where certified timber is less available.

At the same time, officials from two Minnesota lumber mills, producing boards rather than pulp or paper, reported they have no preference for whether or not STL offers certified timber, from the standpoint of meeting customer demand for their product. The buyers of lumber from these Minnesota mills have not placed a high priority on certified product, these interviewees said.

The officials from the lumber mills expressed interest in securing more STL timber, regardless of certification status. As one interviewee explained, mill sustainability is based on three factors: increased efficiencies, good margins, and increased volumes. Given the low profit margins for lumber and Minnesota's highly efficient mills, the lumber industry wants more volume of STL wood, regardless of certification.

Almost all the industry representatives interviewed advised that STL should keep forest certification in some form, even the officials from the lumber mills. Several interviewees called certification a “social license” to practice logging. Forest certification shows society that STL is following good management practices, and it allows STL to operate without public pressure or, worse, expensive lawsuits over logging operations. If STL removes even one of its two certification types, one interviewee warned, it should expect significant public attention and pressure from environmental groups. An official from one of the Minnesota mills noted that use of certified timber has allowed the paper and pulp industry to harvest trees and produce its product without environmental backlash, negative press, and legal challenges.

Share of STL Timber Used by Paper and Pulp Mills

The representatives interviewed for this study from two Minnesota paper and pulp mills clearly stated a need for certified timber from STL to meet customer demand, while representatives interviewed from two of Minnesota's lumber mills said they need STL timber but don't need the timber to be certified. Assuming this split between types of mills holds for other purchasers of STL timber, then the paper and pulp mills that account for the bulk of the timber purchases from STL timber likely require certified timber for their operations. Almost 70% of STL timber, by scaled value and volume, is sold to paper and pulp mills, based on data for the period from fiscal 2012 to fiscal 2015.

For this study, DNR provided data on purchases of STL timber based on where the timber was weighed, or “scaled.”²⁰ In almost all cases, cut timber is scaled at the location of the company that then purchases and uses the logs. Consequently, the location where the STL timber is scaled almost always indicates which company is taking in the timber for production or other uses.

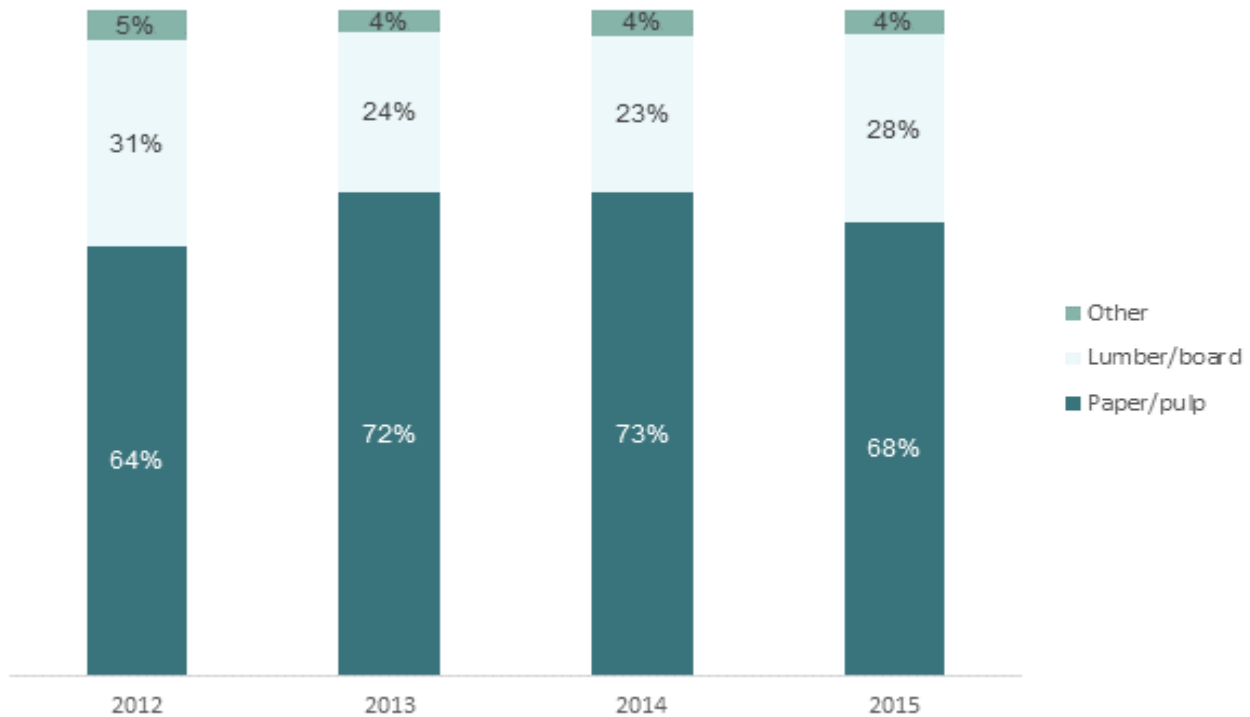
MAD researchers worked with DNR to identify the companies where the harvested timber was weighed in fiscal 2012-15²¹ based on type—paper and pulp, lumber and board, and other. The “other” category includes companies that produce a range of output, including pallets, utility poles, biomass, and ice cream sticks.

Chart 2 shows the share of STL timber used by paper and pulp mills, lumber and board mills, and other buyers for fiscal 2012-15, based on the type of operation where the harvested wood was scaled. From 64% to 73% of the STL timber, by dollar value, was scaled for use at paper and pulp mills during the period. Lumber and board mills accounted for from 23% to 31%, with other buyers accounting for rest. Over the five-year period as a whole, STL timber scaled at paper and pulp mills accounted for 69% of the total, compared to 27% for lumber and board. The “other” category accounted for about 4%. By volume, as distinct from dollar value, paper and pulp mills accounted for 68% of the scaled STL timber in fiscal 2015 and 69% for the total from fiscal 2012 to fiscal 2015.

²⁰ The scaled volume and value for a given fiscal year may differ from the sales volume and value for that year because the scaled measures are for the timber that has been cut and hauled, rather than the estimated volume at the time of the sale. In addition, the sales volume and scaled volume for any given fiscal year will differ because some of what is scaled in that fiscal year was sold in previous fiscal years and some of what is sold in that fiscal year will not be scaled until future fiscal years.

²¹ This analysis of scaled value and volume uses fiscal 2012-15 instead of the five-year period from 2011 to 2015 used elsewhere in this report because an unusually high share of STL timber in fiscal 2011 appears to have been scaled at one wood products company but perhaps then delivered to another company or companies that were the actual buyers of the logs.

Chart 2: Share of scaled value by type of user for STL timber sold from fiscal 2012 to fiscal 2015



Based on scaling records, paper and pulp mills account for a very small number of the businesses buying STL timber—just six of the 50 scaling locations in fiscal 2015—but account for the majority of STL timber sales. Table 5 lists the top 10 locations where STL timber was scaled in fiscal 2015, based on dollar values, with paper and pulp mills taking four of the top five slots.

Table 5: Top 10 buyers of STL timber based on dollar value for where timber was scaled, fiscal 2015

Company	Type	Scaled \$ value	% of overall FY15 scaled value
Boise White Paper LLC	Paper/pulp	\$2,807,348	29.5%
Sappi Fine Paper	Paper/pulp	\$2,062,075	21.6%
Louisiana Pacific Corporation	Lumber/board	\$939,768	9.9%
UPM - Blandin Paper	Paper/pulp	\$782,073	8.2%
NewPage Wisconsin System Inc	Paper/pulp	\$749,245	7.9%
Potlatch Forest Products Corp.	Lumber/board	\$735,917	7.7%
Norbord Minnesota	Lumber/board	\$544,707	5.7%
Cass Forest Products	Lumber/board	\$184,044	1.9%
Hedstrom Lumber Company Inc	Lumber/board	\$121,378	1.3%
Savanna Pallet	Other	\$76,897	0.8%

Industry Attitudes toward Types of Certification

Since 2005, Minnesota’s Department of Natural Resources has managed its forests and those on school trust land under the forest certification standards of both the Forest Stewardship Council and the Sustainable Forestry Initiative. Interviews in 2016 with industry representatives from four primary forest products companies in Minnesota indicate a preference among paper and pulp mills for timber with both FSC and SFI certification but no preference for certification at all among lumber mills.

DNR pursued dual certification in the early 2000s for a number of reasons, according to a 2014 report from the Office of the Legislative Auditor, including a desire to offer buyers of DNR and STL timber more sustainable options. At the time, it was not clear if one or another of the certifications would emerge as the industry leader. Consequently, DNR instituted dual certification from both FSC and SFI, which was assumed manageable because the standards—while not identical—are similar in many respects.²²

In interviews with industry officials working at or with primary forest products operations, MAD researchers asked if the buyers of STL timber preferred one forest certification to another. Representatives from paper and pulp mills said that they need wood that is both FSC and SFI certified, because this allows them more flexibility in terms of sales and because their competitors have both certifications. Representatives from the lumber mills said that neither certification was important to their ability to sell product.

The officials that MAD interviewed from Minnesota’s paper and pulp mills said they thought that generally the market prefers FSC certification to SFI certification because FSC was founded by a group that included timber users but also players outside of the industry itself, including environmental organizations and human rights groups. SFI was started by the industry, as an initiative of the American Forest and Paper Association. That said, the representatives from the paper and pulp mills also noted that SFI is becoming a more prominent and accepted certification.

Mark Heyde, the forest certification specialist with the Wisconsin DNR, also pointed to a preference for FSC over SFI certification among timber product buyers. In an interview for this study, Heyde said it was his sense that the customers of the mills, at least in Wisconsin, are asking for certified product with the FSC label more so than the SFI label. “One of the drivers for certification in the marketplace is the big buyers expressing a preference for this certification or that certification,” he said.

A representative from one of Minnesota’s paper and pulp mills said that FSC certification helps with sales to international markets and noted that the mill can’t offer certain products to some customers without it. One interviewee said that even though their customers demand FSC or SFI certification, many of those customers don’t understand the difference between the two types of certification or even

²² Office of the Legislative Auditor, “Evaluation Report,” op. cit., p. 43.

the meaning of certification itself, adding that those customers simply know they need the forest certification stamp on their final product.

Interestingly, markets aside, paper and pulp interviewees expressed a preference for SFI over FSC, noting that SFI carries out more on-the-ground logger education and also allows some logging techniques that FSC bans, restrictions that they said may make sense elsewhere but do not make sense in Minnesota.

Forest Certification for Market Access

The industry representatives and experts interviewed for this report repeatedly flagged market access as a key business consideration and argued that forest certification increases market access both for the sellers of timber and the sellers of primary forest products. Market access was cited so often as a business benefit from certification that the research team for this report captured and analyzed these comments and present the findings here, even though market access issues fall outside the initial research scope for this study.

Paper and pulp industry representatives stressed market access as a positive outcome from forest certification, although representatives from lumber-producing mills said certification is not important to their business or their access to markets. Some industry representatives noted the importance of certification to international markets.

Kathy Abusow, SFI's president and CEO, called out market access as a major benefit of certification for forest land owners. "It's a huge one," she said. Commenting on what matters when it comes to the business impacts of certification, Abusow said, "You don't know the sales you've lost because you're not certified. It's the difference between you selling your wood or not, not the difference in price." She cited a 2014 SFI survey of its program participants in which respondents from all the varied product sectors reported increases in demand for certified forest products.

University of Minnesota professors Blinn and Kilgore echoed Abusow's comments, cited forest certification as a market access issue and noting that mills in particular increase their options for sales when producing certified forest products. According to the professors, access to markets is what drives the demand for certified timber from major mills in Minnesota.

Mark Rickenbach, a University of Wisconsin professor and chair of the Department of Forest & Wildlife Ecology at the school's Madison campus, also cited market access as an important forest certification outcome. Responding to questions via email, Rickenbach wrote, "[T]he fact remains that for some industries (paper), certification affords access to markets. As you likely know, market access is important in that it provides for diversification in [terms of] to whom mills can sell their products."

Said Brinkeman, president for FSC United States, "We hear time and again that access to markets and stability of customer bases are often the greatest value to suppliers [of timber], having that long term relationship with that customer." He said mill access to certified timber and production of certified output helps keep primary forest products manufacturing from shifting out of a state like Wisconsin or Minnesota.

Representatives from the paper and pulp industries noted a growing trend towards traceability and transparency when it comes to the supply chain. Comments from these representatives noted that consumers increasingly want to know where their products came from and that they were produced in an environmentally responsible way.

One industry representative noted that while the traditional paper and pulp business has experienced decline in recent years, there has been a rise in demand for specialty papers and new pulp products. He cited the example of Sappi, which changed its mill to accommodate the growing market for dissolving wood pulp. For Sappi's Minnesota facility, dissolving wood pulp is now said to account for about 75% of the pulp output. The industry representative argued that certification is becoming a marketing strategy for dissolving pulp, something attractive to buyers of the beauty products, household items, textiles, and clothing that are made with it.

Conclusion

This report on the impact of forest certification identified about \$174,300 in costs to School Trust Lands tied directly to forest certification, estimated a wide but reasonable range of \$25,000 to \$421,900 for potential foregone revenues to STL resulting from dual forest certification and additional DNR restrictions, found that forest certification yields little or no price premium for STL and DNR timber, and determined that Minnesota's paper and pulp industry, which accounts for about 70% of the timber STL sells, has a clear need for certified timber.

Forest certification charges to STL in fiscal 2015 are estimated at about \$94,700 for direct costs and about \$174,300 if the costs are expanded to include certification-related expenditures for general operations and administration. This is a clear cost to STL from forest certification.

A reasonable but initial estimate of annual foregone STL revenues from harvest restrictions and reserve requirements stands at \$25,000 for ones specifically related to forest certification. The estimate is \$421,900 in foregone revenues for forest certification standards as well as all other restrictions and reserve requirements that DNR follows on school trust land, some of which may or may not be required for forest certification. More precise estimates are possible but not presented in this study. Next steps for better estimates require first that STL and DNR officials agree on which reserves and restrictions, beyond those tied directly to FSC and SFI standards, are relevant to forest certification and reasonable to include in a more detailed analysis. Second, DNR will then need to produce more detailed estimates of lost STL revenue, incorporating this information about which DNR policies relate to forest certification status.

The consensus among industry representatives and experts interviewed for this study is that forest certification yields little or no premium for stumpage prices paid to STL and DNR. Officials with the FSC and SFI forest certification organizations emphasize a range of positive outcomes from certification, but acknowledge that positive impacts from certification on timber prices are hard to track and limited. A range of other market factors undermine positive price pressure for certified timber.

Representatives from Minnesota's paper and pulp mills expressed a clear need for certified timber, but lumber mill officials said they don't need certified timber to meet customer demands. However, almost all of the industry officials interviewed advised that STL should keep forest certification in some form because certification offers a "social license" that allows industry to harvest trees and produce products without environmental backlash. Forest certification provides access to markets for paper and pulp producers, according to industry representatives and experts.

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Appendix A. Interviews Conducted

Industry Representatives in Minnesota

Aube, Peter. Lumbermill Manager, Potlatch, Bemidji, Minnesota.

Brandt, Wayne. Minnesota Forest Industries Association, Duluth, MN.

Chelseth, Archie. Consultant to Sappi, Inc., CDC Consulting, Cloquet, Minnesota.

Chura, Dave. Key Account Manager, Minnesota Power, Duluth, Minnesota.

Erickson, Gary. Head Forester, Sappi, Inc., Cloquet, Minnesota.

Halla, Craig. Minnesota Property Manager, Molpus, Inc., International Falls, Minnesota.

Holt, Brad. Certification Manager, Boise, Inc., Idaho.

O'Hara, Tim. Wood Procurement Manger, Boise, Inc., International Falls, Minnesota.

Mai, Bob. Vice President, Sales, Potlatch, State of Washington.

Parma, Jim. Eastern Fiber Manager, Bell Timber, Inc., New Brighton, Minnesota.

Perala, Mary. Certification Manager, Boise, Inc., International Falls, Minnesota.

Richards, Jerry. Procurement Manger, Norbord, Inc., Solway, Minnesota.

Schultz, Mike. Plant Manager, Sappi, Inc., Cloquet, Minnesota.

Wallingford, Jack. Vice Presdient. Northern Operations, Norbord, Inc., Solway, Minnesota.

Forestry Experts and Practitioners

Abusow, Kathy. President & CEO, Sustainable Forestry Initiative, Inc.

Blinn, Charlie. Professor and Extension Specialist, Department of Forest Resources, University of Minnesota.

Brinkema, Corey. President, Forest Stewardship Council United States.

Cox, Bruce. Land Commissioner, Clearwater County, Minnesota.

Deckard, Don. Forest Economist, Minnesota Department of Natural Resources.

Eide, Nathan. Land Commissioner, Lake County, Minnesota.

Heyde, Mark. Forest Certification Specialist, Wisconsin Department of Natural Resources.

Hoganson, Howard. North Central Research and Outreach Center, Department of Forest Resources, University of Minnesota.

Kilgore, Michael. Professor and Interim Department Head and Director of Graduate Studies, Department of Forest Resources, University of Minnesota.

Metnick, Jason. Senior Vice President, Sustainable Forestry Initiative, Inc.

Rickenbach, Mark. Chair, Department of Forest & Wildlife Ecology, University of Wisconsin-Madison.

Tillma, Doug. Supervisor, Timber Sales Unit, Minnesota Department of Natural Resources.

Appendix B. Data for Estimating STL Foregone Revenues from HCFV Restrictions on STL's Productive Forest Acres

Foregone revenue from high conservation value forest restrictions for STL is reasonably but roughly estimated at \$25,000 annually. This is calculated from the estimated annual revenues of \$115,700 (\$46,200 + \$69,500) with HCFV restrictions hypothetically removed, less \$90,700 from the estimated revenues on this acreage with HCFV restrictions in place.²³

B1. Estimates with HCFV Restrictions: Harvest restriction at 25% for restriction groups R3 & R4 (a)

Forest Cover Type	Acres (MN Site-level Mgmt Guide-lines) (b)	Avg. Rotation Age (c)	Avg. Yield in Cords per Acre for Rotation Age (d)	Estimated Market Value per Cord (e)	Gross Timber Sales Revenue per Acre	Net Timber Sales Revenue per Acre (f)	Total Net Revenues for Full Rotation Age (g)	Annualized Annuity Values for Perpetual Harvests (h)
Aspen/Balm	9,237	45	18.7	\$32	\$598	\$341	\$2,365,100	\$52,600
BSL - Low SI	626	120	11.2	\$18	\$202	(\$55)	(\$26,000)	(\$200)
BSL - Medium SI	789	100	15.7	\$20	\$314	\$57	\$33,700	\$300
BSL - High SI	293	80	16.8	\$20	\$336	\$79	\$17,300	\$200
Red Pine - planted	969	65	38.6	\$85	\$3,281	\$3,024	\$2,197,700	\$33,800
Red Pine - natural	289	110	44.8	\$65	\$2,912	\$2,655	\$575,100	\$5,200
Jack Pine	428	50	16.9	\$30	\$507	\$250	\$80,300	\$1,600
White Pine	273	110	36.4	\$60	\$2,184	\$1,927	\$394,000	\$3,600
Birch	1,096	55	18.2	\$14	\$255	(\$2)	(\$1,800)	\$0
Tamarack - low SI	629	95	10.7	\$7	\$75	(\$182)	(\$85,900)	(\$900)
Tamarack - high SI	1,130	70	11.4	\$7	\$80	(\$177)	(\$150,100)	(\$2,100)
White Cedar (i)	1,798	100	19.1	\$6	\$115	(\$142)	na	na
Other (j)	3,894	80	15.0	\$11	\$165	(\$92)	(\$268,700)	(\$3,400)
Totals	21,451						\$5,130,800	\$90,700

²³ For its data, DNR assumed all timber available for harvests would be sellable. Site index values used for the estimates were based on statewide averages for each cover type, rather than site index values specific to the physical acres currently under restrictions and reserve requirements.

B2. Estimates with HCVF Restrictions Removed: Acres reassigned to harvest restriction at 10% for restriction groups R5 & R6 (k)

Forest Cover Type	Acres (MN Site-level Mgmt Guidelines) (b)	Avg. Rotation Age (c)	Avg. Yield in Cords per Acre for Rotation Age (d)	Estimated Market Value per Cord (e)	Gross Timber Sales Revenue per Acre	Net Timber Sales Revenue per Acre (f)	Total Net Revenues for Full Rotation Age (g)	Annualized Annuity Values for Perpetual Harvests (h)
Aspen/Balm	5,568	45	18.7	\$32	\$598	\$341	\$1,710,800	\$38,000
BSL - Low SI	90	120	11.2	\$18	\$202	(\$55)	(\$4,500)	\$0
BSL - Medium SI	162	100	15.7	\$20	\$314	\$57	\$8,300	\$100
BSL - High SI	86	80	16.8	\$20	\$336	\$79	\$6,100	\$100
Red Pine – planted	143	65	38.6	\$85	\$3,281	\$3,024	\$387,800	\$6,000
Red Pine – natural	76	110	44.8	\$65	\$2,912	\$2,655	\$181,600	\$1,700
Jack Pine	10	50	16.9	\$30	\$507	\$250	\$2,400	\$0
White Pine	185	110	36.4	\$60	\$2,184	\$1,927	\$321,300	\$2,900
Birch	584	55	18.2	\$14	\$255	(\$2)	(\$1,200)	\$0
Tamarack - low SI	82	95	10.7	\$7	\$75	(\$182)	(\$13,400)	(\$100)
Tamarack - high SI	291	70	11.4	\$7	\$80	(\$177)	(\$46,400)	(\$700)
White Cedar (i)	398	100	19.1	\$6	\$115	(\$142)	na	na
Other (j)	1,634	80	15.0	\$11	\$165	(\$92)	(\$135,300)	(\$1,700)
Subtotals	9,310						\$2,417,600	\$46,200

B3. Estimates with HCVF Restrictions Removed: Acres reassigned to no harvest restriction other than best practice guidelines of 5%

Forest Cover Type	Acres (MN Site-level Mgmt Guide-lines) (b)	Avg. Rotation Age (c)	Avg. Yield in Cords per Acre for Rotation Age (d)	Estimated Market Value per Cord (e)	Gross Timber Sales Revenue per Acre	Net Timber Sales Revenue per Acre (f)	Total Net Revenues for Full Rotation Age (g)	Annualized Annuity Values for Perpetual Harvests (h)
Aspen/Balm	3,670	45	18.7	\$32	\$598	\$341.40	\$1,252,900	\$27,800
BSL - Low SI	536	120	11.2	\$18	\$202	(\$55.40)	(\$29,700)	(\$200)
BSL - Medium SI	628	100	15.7	\$20	\$314	\$57.00	\$35,800	\$400
BSL - High SI	205	80	16.8	\$20	\$336	\$79.00	\$16,200	\$200
Red Pine - planted	826	65	38.6	\$85	\$3,281	\$3,024.00	\$2,496,500	\$38,400
Red Pine - natural	213	110	44.8	\$65	\$2,912	\$2,655.00	\$565,000	\$5,100
Jack Pine	418	50	16.9	\$30	\$507	\$250.00	\$104,500	\$2,100
White Pine	87	110	36.4	\$60	\$2,184	\$1,927.00	\$168,400	\$1,500
Birch	513	55	18.2	\$14	\$255	(\$2.20)	(\$1,100)	\$0
Tamarack - low SI	547	95	10.7	\$7	\$75	(\$182.10)	(\$99,600)	(\$1,000)
Tamarack - high SI	839	70	11.4	\$7	\$80	(\$177.20)	(\$148,600)	(\$2,100)
White Cedar (i)	1,400	100	19.1	\$6	\$115	(\$142.40)	na	na
Other (j)	2,259	80	15.0	\$11	\$165	(\$92.00)	(\$207,800)	(\$2,600)
Subtotals	12,141						\$4,152,300	\$69,500

a) Actual harvest restrictions for DNR restriction groups R3 and R4 are up to 30% and up to 20-30%, respectively.

b) DNR follows Minnesota's Voluntary Site-level Management Guidelines and leaves standing no less than 5% of the trees being harvested, over and above other required restrictions. Acres shown are total acres less this 5% for site-level management guidelines.

Note: Totals by cover type for STL's RSA acres when those acres are reclassified to the next most restrictive group may differ from the totals for cover type under RSA restrictions by up to 1 acre, perhaps due to rounding.

c) Average rotation age equivalents are used for cover types managed with uneven-aged timber.

d) Rotation age yields from Walters and Ek (1993), modified and fitted by Curtis VanderSchaaf, Biometrician.

e) DNR provided the estimated market values based on actual price data for 2013, 2014, and 2015, and estimated equilibrium market values for 2016 and 2017, developed from end product prices and regional stumpage prices across North America. DNR does not include salvage or biomass for woodsrun cord and Mbf (1000 board feet) products in its calculations for average and estimated

market values. For more on recent price trends and factors, see "2015 Minnesota Public Stumpage Price Review and Price Indices," Don Deckard, April 15, 2016 (available for download at <http://www.dnr.state.mn.us/forestry/timbersales/stumpage.html>).

f) Net timber sales per acre were calculated from gross timber sales revenue per acre less \$257 per acre for DNR's timber sales and management costs to STL, using the fiscal 2015 cost levels cited in DNR's trust cost certification report.

g) Total net revenues for full rotation age were calculated by taking acres for each cover type multiplied by net timber sales revenue per acre and then multiplied by the following: 0.75 for Table A to reflect 75% allowable harvests under DNR's R3 and R4 restriction groups combined; or 0.1 for Table B1 to reflect 90% allowable harvests under DNR's R5 and R6 restriction groups combined; or 0.05 to reflect 95% allowable harvests on acres with no reserve requirements or restrictions, under Minnesota's Voluntary Site-level Management Guidelines regarding leave trees. Amounts rounded to the nearest \$100, so totals of the amounts in tables may differ from the totals listed in the tables.

h) Annualized annuity values for perpetual harvests were calculated by taking each cover type's total net revenues for full rotation age divided by the average rotation age to produce an annual revenue amount for perpetual, sustainable harvests. Amounts rounded to the nearest \$100, so totals of the amounts in tables may differ from the totals listed in the tables.

i) White Cedar is not actively managed for timber production.

j) For estimates involving HCVF and RSA reserves and restrictions, Balsam Fir is included in "Other." For estimates involving all reserves and restrictions, Balsam Fir is listed separately.

k) Actual harvest restrictions for DNR restriction groups R5 and R6 are up to 15% and up to 5%, respectively.

l) For acres managed without DNR reserves and restrictions, DNR follows Minnesota's Voluntary Site-level Management Guidelines and holds harvests to no more than 95% of the timber at or above rotation age.

Appendix C. Data for Estimating STL Foregone Revenues from RSA Reserve Requirements on STL's Productive Forest Acres

A hypothetical lifting of representative sample area reserve requirements for STL is reasonably but roughly estimated to have a negligible or only slightly positive impact. This is because increased STL harvests without RSA restrictions would lead to more harvests of some cover types for which the per acre costs DNR charges to STL for forest management and timber sales exceeds the estimated average revenue from those timber sales per acre. The estimates here show an annual gain for STL revenues of \$0.²⁴

C1. Estimates with RSA Restrictions: Harvest restriction at 95% for restriction group R2

Forest Cover Type	Acres (MN Site-level Mgmt Guidelines) (a)	Avg. Rotation Age (b)	Avg. Yield in Cords per Acre for Rotation Age (c)	Estimated Market Value per Cord (d)	Gross Timber Sales Revenue per Acre	Net Timber Sales Revenue per Acre (e)	Total Net Revenues for Full Rotation Age (f)	Annualized Annuity Values for Perpetual Harvests (g)
Aspen/Balm	32	45	18.7	\$32	\$598	\$341	\$600	\$0
BSL - Low SI	0	120	11.2	\$18	\$202	(\$55)	\$0	\$0
BSL - Medium SI	2	100	15.7	\$20	\$314	\$57	\$0	\$0
BSL - High SI	0	80	16.8	\$20	\$336	\$79	\$0	\$0
Red Pine - planted	0	65	38.6	\$85	\$3,281	\$3,024	\$0	\$0
Red Pine - natural	7	110	44.8	\$65	\$2,912	\$2,655	\$900	\$0
Jack Pine	11	50	16.9	\$30	\$507	\$250	\$100	\$0
White Pine	0	110	36.4	\$60	\$2,184	\$1,927	\$0	\$0
Birch	5	55	18.2	\$14	\$255	(\$2)	\$0	\$0
Tamarack - low SI	8	95	10.7	\$7	\$75	(\$182)	(\$100)	\$0
Tamarack - high SI	150	70	11.4	\$7	\$80	(\$177)	(\$1,300)	\$0
White Cedar (g)	25	100	19.1	\$6	\$115	(\$142)	na	na
Other (h)	28	80	15.0	\$11	\$165	(\$92)	(\$100)	\$0
Totals	267						\$100	\$0

²⁴ For its data, DNR assumed all timber available for harvests would be sellable. Site index values used for the estimates were based on statewide averages for each cover type, rather than site index values specific to the physical acres currently under restrictions and reserve requirements.

C2. Estimates with RSA Restrictions Removed: Acres reassigned to harvest restriction at 25% for restriction groups R3 & R4 (j)

Forest Cover Type	Acres (MN Site-level Mgmt Guidelines) (a)	Avg. Rotation Age (b)	Avg. Yield in Cords per Acre for Rotation Age (c)	Estimated Market Value per Cord (d)	Gross Timber Sales Revenue per Acre	Net Timber Sales Revenue per Acre (e)	Total Net Revenues for Full Rotation Age (f)	Annualized Annuity Values for Perpetual Harvests (g)
Aspen/Balm	10	45	18.7	\$32	\$598	\$341	\$2,400	\$100
BSL - Low SI	0	120	11.2	\$18	\$202	(\$55)	\$0	\$0
BSL - Medium SI	0	100	15.7	\$20	\$314	\$57	\$0	\$0
BSL - High SI	0	80	16.8	\$20	\$336	\$79	\$0	\$0
Red Pine - planted	0	65	38.6	\$85	\$3,281	\$3,024	\$0	\$0
Red Pine - natural	7	110	44.8	\$65	\$2,912	\$2,655	\$13,200	\$100
Jack Pine	5	50	16.9	\$30	\$507	\$250	\$900	\$0
White Pine	0	110	36.4	\$60	\$2,184	\$1,927	\$0	\$0
Birch	0	55	18.2	\$14	\$255	(\$2)	\$0	\$0
Tamarack - low SI	8	95	10.7	\$7	\$75	(\$182)	(\$1,000)	\$0
Tamarack - high SI	150	70	11.4	\$7	\$80	(\$177)	(\$19,900)	(\$300)
White Cedar (h)	25	100	19.1	\$6	\$115	(\$142)	na	na
Other (i)	14	80	15.0	\$11	\$165	(\$92)	(\$1,000)	\$0
Subtotals	218						(\$5,400)	(\$100)

C3. Estimates with RSA Restrictions Removed: Acres reassigned to harvest restriction at 10% for restriction groups R5 & R6 (j)

Forest Cover Type	Acres (MN Site-level Mgmt Guide-lines) (a)	Avg. Rotation Age (b)	Avg. Yield in Cords per Acre for Rotation Age (c)	Estimated Market Value per Cord (d)	Gross Timber Sales Revenue per Acre	Net Timber Sales Revenue per Acre (e)	Total Net Revenues for Full Rotation Age (f)	Annualized Annuity Values for Perpetual Harvests (g)
Aspen/Balm	23	45	18.7	\$32	\$598	\$341	\$7,000	\$200
BSL - Low SI	0	120	11.2	\$18	\$202	(\$55)	\$0	\$0
BSL - Medium SI	2	100	15.7	\$20	\$314	\$57	\$100	\$0
BSL - High SI	0	80	16.8	\$20	\$336	\$79	\$0	\$0
Red Pine - planted	0	65	38.6	\$85	\$3,281	\$3,024	\$0	\$0
Red Pine - natural	0	110	44.8	\$65	\$2,912	\$2,655	\$0	\$0
Jack Pine	0	50	16.9	\$30	\$507	\$250	\$0	\$0
White Pine	0	110	36.4	\$60	\$2,184	\$1,927	\$0	\$0
Birch	5	55	18.2	\$14	\$255	(\$2)	\$0	\$0
Tamarack - low SI	0	95	10.7	\$7	\$75	(\$182)	\$0	\$0
Tamarack - high SI	0	70	11.4	\$7	\$80	(\$177)	\$0	\$0
White Cedar (h)	0	100	19.1	\$6	\$115	(\$142)	na	na
Other (i)	13	80	15.0	\$11	\$165	(\$92)	(\$1,100)	\$0
Subtotals	43						\$6,000	\$100

C4. Estimates with RSA Restrictions Removed: Acres reassigned to no harvest restriction other than best practice guidelines of 5% for leave trees from a harvest

Forest Cover Type	Acres (MN Site-level Mgmt Guide-lines) (a)	Avg. Rotation Age (b)	Avg. Yield in Cords per Acre for Rotation Age (c)	Estimated Market Value per Cord (d)	Gross Timber Sales Revenue per Acre	Net Timber Sales Revenue per Acre (e)	Total Net Revenues for Full Rotation Age (f)	Annualized Annuity Values for Perpetual Harvests (g)
Aspen/Balm	0	45	18.7	\$32	\$598	\$341.40	\$0	\$0
BSL - Low SI	0	120	11.2	\$18	\$202	(\$55.40)	\$0	\$0
BSL - Medium SI	0	100	15.7	\$20	\$314	\$57.00	\$0	\$0
BSL - High SI	0	80	16.8	\$20	\$336	\$79.00	\$0	\$0
Red Pine - planted	0	65	38.6	\$85	\$3,281	\$3,024.00	\$0	\$0
Red Pine - natural	0	110	44.8	\$65	\$2,912	\$2,655.00	\$0	\$0
Jack Pine	7	50	16.9	\$30	\$507	\$250.00	\$1,600	\$0
White Pine	0	110	36.4	\$60	\$2,184	\$1,927.00	\$0	\$0
Birch	0	55	18.2	\$14	\$255	(\$2.20)	\$0	\$0
Tamarack - low SI	0	95	10.7	\$7	\$75	(\$182.10)	\$0	\$0
Tamarack - high SI	0	70	11.4	\$7	\$80	(\$177.20)	\$0	\$0
White Cedar (h)	0	100	19.1	\$6	\$115	(\$142.40)	na	na
Other (i)	0	80	15.0	\$11	\$165	(\$92.00)	\$0	\$0
Subtotals	7						\$1,600	\$0

a) DNR follows Minnesota’s Voluntary Site-level Management Guidelines and leaves standing no less than 5% of the trees being harvested, over and above other required restrictions. Acres shown are total acres less this 5% for the site-level management guidelines.

b) Average rotation age equivalents are used for cover types managed with uneven-aged timber.

c) Rotation age yields from Walters and Ek (1993), modified and fitted by Curtis VanderSchaaf, Biometrician.

d) DNR provided the estimated market values based on actual price data for 2013, 2014, and 2015, and estimated equilibrium market values for 2016 and 2017, developed from end product prices and regional stumpage prices across North America. DNR does not include salvage or biomass for woodrun cord and Mbf (1000 board feet) products in its calculations for average and estimated

market values. For more on recent price trends and factors, see "2015 Minnesota Public Stumpage Price Review and Price Indices," Don Deckard, April 15, 2016 (available for download at <http://www.dnr.state.mn.us/forestry/timbersales/stumpage.html>).

e) Net timber sales per acre were calculated from gross timber sales revenue per acre less \$257 per acre for DNR's timber sales and management costs to STL, using the fiscal 2015 cost levels cited in DNR's trust cost certification report.

f) Total net revenues for full rotation age were calculated by taking acres for each cover type multiplied by net timber sales revenue per acre and then multiplied by the following: 0.75 for Table A to reflect 75% allowable harvests under DNR's R3 and R4 restriction groups combined; or 0.1 for Table B1 to reflect 90% allowable harvests under DNR's R5 and R6 restriction groups combined; or 0.05 to reflect 95% allowable harvests on acres with no reserve requirements or restrictions, under Minnesota's Voluntary Site-level Management Guidelines regarding leave trees. Amounts rounded to the nearest \$100, so totals of the amounts in tables may differ from the totals listed in the tables.

g) Annualized annuity values for perpetual harvests were calculated by taking each cover type's total net revenues for full rotation age divided by the average rotation age to produce an annual revenue amount for perpetual, sustainable harvests. Amounts rounded to the nearest \$100, so totals of the amounts in tables may differ from the totals listed in the tables.

h) White Cedar is not actively managed for timber production.

i) For estimates involving HCVF and RSA reserves and restrictions, Balsam Fir is included in "Other." For estimates involving all reserves and restrictions, Balsam Fir is listed separately.

j) Actual harvest restrictions for DNR restriction groups R3 and R4 are up to 30% and up to 20-30%, respectively.

k) Actual harvest restrictions for DNR restriction groups R5 and R6 are up to 15% and up to 5%, respectively.

Appendix D. Data for Estimating STL Foregone Revenues from All Restrictions and Reserve Requirements on STL's Productive Forest Acres

Foregone revenue from all current reserve requirements and restrictions on STL timberlands—including those from DNR policies, state law, and forest certification standards—is reasonably but roughly estimated at \$421,900 annually. This is calculated from estimated additional annual revenues of \$84,300 from lifting R1 and R2 requirements, \$288,700 from lifting R3 and R4 requirements, and \$48,900 from lifting R5 and R6 requirements.²⁵ See tables A through C on the pages that follow.

²⁵ For its data, DNR assumed all timber available for harvests would be sellable. Site index values used for the estimates were based on statewide averages for each cover type, rather than site index values specific to the physical acres currently under restrictions and reserve requirements.

D1. Estimated Impacts for Acres in Restriction Groups R1 & R2 (changes to harvest at 95% level) (a)

Forest Cover Type	Acres (MN Site-level Mgmt Guidelines) (b)	Avg. Rotation Age (c)	Avg. Yield in Cords per Acre for Rotation Age (d)	Estimated Market Value per Cord (e)	Gross Timber Sales Revenue per Acre	Net Timber Sales Revenue per Acre (f)	Total Net Revenues for Full Rotation Age (g)	Annualized Annuity Values for Perpetual Harvests (h)
Aspen/Balm	4,339	45	18.7	\$32	\$598	\$341	\$1,481,200	\$32,900
BSL - Low SI	12,044	120	11.2	\$18	\$202	(\$55)	(\$667,200)	(\$5,600)
BSL - Medium SI	12,180	100	15.7	\$20	\$314	\$57	\$694,300	\$6,900
BSL - High SI	3,749	80	16.8	\$20	\$336	\$79	\$296,100	\$3,700
Red Pine - planted	101	65	38.6	\$85	\$3,281	\$3,024	\$304,500	\$4,700
Red Pine - natural	2,157	110	44.8	\$65	\$2,912	\$2,655	\$5,725,500	\$52,100
Jack Pine	709	50	16.9	\$30	\$507	\$250	\$177,200	\$3,500
White Pine	1,701	110	36.4	\$60	\$2,184	\$1,927	\$3,278,700	\$29,800
Birch	2,951	55	18.2	\$14	\$255	(\$2)	(\$6,500)	(\$100)
Balsam Fir	1,071	50	19.9	\$14	\$279	\$22	\$23,100	\$500
Tamarack - low SI	9,989	95	10.7	\$7	\$75	(\$182)	(\$1,819,000)	(\$19,100)
Tamarack - high SI	4,999	70	11.4	\$7	\$80	(\$177)	(\$885,800)	(\$12,700)
White Cedar (i)	15,250	100	19.1	\$6	\$115	(\$142)	na	na
Other	10,759	80	15.0	\$11	\$165	(\$92)	(\$989,800)	(\$12,400)
Totals	81,997						\$7,612,300	\$84,300

D2. Estimated Impacts for Acres in Restriction Groups R3 & R4 (changes to harvest at 25% level) (j)

Forest Cover Type	Acres (MN Site-level Mgmt Guide-lines) (b)	Avg. Rotation Age (c)	Avg. Yield in Cords per Acre for Rotation Age (d)	Estimated Market Value per Cord (e)	Gross Timber Sales Revenue per Acre	Net Timber Sales Revenue per Acre (f)	Total Net Revenues for Full Rotation Age (g)	Annualized Annuity Values for Perpetual Harvests (h)
Aspen/Balm	67,549	45	18.7	\$32	\$598	\$341	\$5,765,300	\$128,100
BSL - Low SI	7,651	120	11.2	\$18	\$202	(\$55)	(\$106,000)	(\$900)
BSL - Medium SI	10,956	100	15.7	\$20	\$314	\$57	\$156,100	\$1,600
BSL - High SI	4,232	80	16.8	\$20	\$336	\$79	\$83,600	\$1,000
Red Pine - planted	11,387	65	38.6	\$85	\$3,281	\$3,024	\$8,608,300	\$132,400
Red Pine - natural	4,696	110	44.8	\$65	\$2,912	\$2,655	\$3,116,900	\$28,300
Jack Pine	7,827	50	16.9	\$30	\$507	\$250	\$489,200	\$9,800
White Pine	2,117	110	36.4	\$60	\$2,184	\$1,927	\$1,019,700	\$9,300
Birch	9,648	55	18.2	\$14	\$255	(\$2)	(\$5,300)	(\$100)
Balsam Fir	5,425	50	19.9	\$14	\$279	\$22		
Tamarack - low SI	14,366	95	10.7	\$7	\$75	(\$182)	(\$654,000)	(\$6,900)
Tamarack - high SI	9,253	70	11.4	\$7	\$80	(\$177)	(\$409,900)	(\$5,900)
White Cedar (i)	12,155	100	19.1	\$6	\$115	(\$142)	na	na
Other	30,324	80	15.0	\$11	\$165	(\$92)	(\$697,500)	(\$8,700)
Subtotals	197,587						\$17,395,700	\$288,700

D3. Estimated Impacts for Acres in Restriction Groups R5 & R6 (changes to harvest at 10% level) (k)

Forest Cover Type	Acres (MN Site-level Mgmt Guide-lines) (b)	Avg. Rotation Age (c)	Avg. Yield in Cords per Acre for Rotation Age (d)	Estimated Market Value per Cord (e)	Gross Timber Sales Revenue per Acre	Net Timber Sales Revenue per Acre (f)	Total Net Revenues for Full Rotation Age (g)	Annualized Annuity Values for Perpetual Harvests (h)
Aspen/Balm	54,707	45	18.7	\$32	\$598	\$341	\$1,867,700	\$41,500
BSL - Low SI	5,323	120	11.2	\$18	\$202	(\$55)	(\$29,500)	(\$200)
BSL - Medium SI	8,980	100	15.7	\$20	\$314	\$57	\$51,200	\$500
BSL - High SI	3,565	80	16.8	\$20	\$336	\$79	\$28,200	\$400
Red Pine - planted	1,858	65	38.6	\$85	\$3,281	\$3,024	\$561,900	\$8,600
Red Pine - natural	739	110	44.8	\$65	\$2,912	\$2,655	\$196,200	\$1,800
Jack Pine	1,019	50	16.9	\$30	\$507	\$250	\$25,500	\$500
White Pine	352	110	36.4	\$60	\$2,184	\$1,927	\$67,900	\$600
Birch	4,889	55	18.2	\$14	\$255	(\$2)	(\$1,100)	\$0
Balsam Fir	3,509	50	19.9	\$14	\$279	\$22		
Tamarack - low SI	7,798	95	10.7	\$7	\$75	(\$182)	(\$142,000)	(\$1,500)
Tamarack - high SI	4,521	70	11.4	\$7	\$80	(\$177)	(\$80,100)	(\$1,100)
White Cedar (i)	5,729	100	19.1	\$6	\$115	(\$142)	na	na
Other	19,735	80	15.0	\$11	\$165	(\$92)	(\$181,600)	(\$2,300)
Subtotals	122,726						\$2,371,900	\$48,900
Totals	402,310						\$27,379,900	\$421,900

a) Actual harvest restrictions for DNR restriction groups R1 and R2 are 0% and up to 5%, respectively.

b) DNR follows Minnesota's Voluntary Site-level Management Guidelines and leaves standing no less than 5% of the trees being harvested, over and above other required restrictions. Acres shown are total acres less this 5% for site-level management guidelines.

c) Average rotation age equivalents are used for cover types managed with uneven-aged timber.

d) Rotation age yields from Walters and Ek (1993), modified and fitted by Curtis VanderSchaaf, Biometrician.

- e) DNR provided the estimated market values based on actual price data for 2013, 2014, and 2015, and estimated equilibrium market values for 2016 and 2017, developed from end product prices and regional stumpage prices across North America. DNR does not include salvage or biomass for woodsrun cord and Mbf (1000 board feet) products in its calculations for average and estimated market values. For more on recent price trends and factors, see "2015 Minnesota Public Stumpage Price Review and Price Indices," Don Deckard, April 15, 2016 (available for download at <http://www.dnr.state.mn.us/forestry/timbersales/stumpage.html>).
- f) Net timber sales per acre were calculated from gross timber sales revenue per acre less \$257 per acre for DNR's timber sales and management costs to STL, using the fiscal 2015 cost levels cited in DNR's trust cost certification report.
- g) Total net revenues for full rotation age were calculated by taking acres for each cover type multiplied by net timber sales revenue per acre and then multiplied by the following: 0.95 for Table A to reflect Minnesota's Voluntary Site-level Management Guidelines for 5% of the available harvest left standing; or 0.25 for Table B to reflect the additional harvest volumes above the existing restriction of roughly 75% allowable harvests under DNR's R3 and R4 restriction groups combined; or 0.1 for Table C to reflect the additional harvest volumes above the existing restrictions of roughly 90% allowable harvests under DNR's R5 and R6 restriction groups combined. Amounts rounded to the nearest \$100, so totals of the amounts in tables may differ from the totals listed in the tables.
- h) Annualized annuity values for perpetual harvests were calculated by taking each cover type's total net revenues for full rotation age divided by the average rotation age to produce an annual revenue amount for perpetual, sustainable harvests. Amounts rounded to the nearest \$100, so totals of the amounts in tables may differ from the totals listed in the tables.
- i) White Cedar is not actively managed for timber production.
- j) Actual harvest restrictions for DNR restriction groups R3 and R4 are up to 30% and up to 20-30%, respectively.
- k) Actual harvest restrictions for DNR restriction groups R5 and R6 are up to 15% and up to 5%, respectively.