Trembling aspen and hardwood yield assumptions for the Duck Mountain, Manitoba

Comparison of the 1995 Louisiana-Pacific Canada Ltd.-TetrES Environmental Impact Assessment assumptions to the 2004 Manitoba Forestry Branch wood supply analysis assumptions

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Introduction

In their examination of the 'sustainability' of their proposed forestry development, Louisiana-Pacific Canada Ltd. and their 'environmental' consultants used 'growth and yield' assumptions respecting the growth of trembling aspen and other deciduous species in the forests of the Duck Mountain (Louisiana-Pacific Canada Ltd. 1995, TetrES 1995). Growth and yield assumptions are the empirical assumptions of the rate at which a forest grows, and how much fibre the forest will yield for industry. The growth and yield assumptions are fundamental and critical to modeling forest 'sustainability'. For example, if one **assumes** that a forest will yield twice the volume per unit area than it really does (i.e., a case where a modeling assumption confronts the 'real world'), then one will have to cut twice the area predicted on the basis of the faulty assumptions to achieve the same total volume (e.g., cut an area of 200 km^2 vs 100 km^2). An error of this magnitude has huge implications to the real-world impact of such a forestry development on biological diversity, the number of ovenbirds in the forest, the number of moose in the forest, protected areas, water yield, soils, etc., etc., etc..

Prior to, and during, the 1995 Manitoba Clean Environment Commission (CEC) hearings, several independent technical experts challenged the hardwood growth and yield assumptions developed by Louisiana-Pacific and their consultants, and accepted by the provincial bureaucrats and government-of-the-day. For example,

- Mr. Jim Ball, a Canadian Forest Service forester who sat on the Technical Advisory Committee (TAC) on the development, in his letter of October 17, 1995 as posted to the Public Registry, wrote "... the AAC calculations--and the assumptions on which they are based--should be clearly explained e.g. Is the company really planning to cut 150-170 m^3ha^{-1} now and to grow 325-435 m^3ha^{-1} (p. 7-16) or 256-484 m^3ha^{-1} (p. 11-26)?". Mr. Ball had previously raised this concern in his letter of August 17, 1995 to Forestry TAC Chairman Dr. Floyd Phillips, wherein he wrote "… the company should explain this apparent incongruity and reconcile the yield values of 150-170 $m^3{\cdot}ha^{-1}$ to be cut in the first three years with volumes of 300-400 $m^3{\cdot}ha^{-1}$ for well stocked stands used in the HSG simulation (7-17) to project future stands.". Mr. Ball continued to document his concerns following the CEC hearings (e.g., in his December 15, 1995 letter to Manitoba Environment Director Mr. Larry Strachan). This was the same Jim Ball who was to appear as an expert witness before the Manitoba Clean Environment Commission, but was told not to do so ~20 minutes before he was to appear (e.g., see Mr. Ball's December 15, 1995 letter to Mr. Strachan – "… I received instructions that Thursday morning not to appear.").
- Mr. Dan Soprovich, in the second of his presentations to the Clean Environment Commission

(Soprovich 1995), outlined a number of important sampling problems respecting the data from which Louisiana-Pacific had derived their growth and yield assumptions. On that basis, and on the basis of published growth and yield data from the scientific literature, Soprovich concluded that Louisiana-Pacific's yield assumptions represented substantive overestimates, and recommended that the growth and yield assumptions, and Environmental Impact Statement (EIS), be rejected by the Commission. Soprovich (1995) stated "In the absence of being able to independently assess LP's data collection methodology, and to quantify the impact of this methodology on bias and precision, we cannot have a great deal of confidence in the LP data." and "If growth and yield is considerably overestimated, as I suggest, this invalidates all analyses presented in the EIS.".

Over a decade after the first exercise, Louisiana-Pacific is in the midst of the development and licensing of a second long-term Forest Management Plan. Of particular importance, since the use of the questionable growth and yield assumptions in the original Environmental Impact Assessment, Manitoba Forestry Branch has recently completed a wood supply analysis and Annual Allowable Cut determination for the Duck Mountain (Manitoba Forestry Branch 2004). To conduct this exercise, the Forestry Branch made use of new yield assumptions derived from a new sampling effort. For aspen and other hardwoods, the yield assumptions used by the Forestry Branch for their wood supply analysis were substantially lower then those used by Louisiana-Pacific and their consultants in their Forest Management Plan and Environmental Impact Assessment.

Environmental Impact Assessment and Forest Management Plan yield assumptions

Louisiana-Pacific and their consultants used "... net merchantable volume (cu. m) yield curves ..." (Page 7-16; Louisiana-Pacific Canada Ltd. 1995) for their 'sustainability' predictions, and assumed that yield curves were identical for trembling aspen, balsam poplar, and white birch. In the context of the Environmental Impact Statement and Forest Management Plan, 'net merchantable volume' was meant to express the amount of usable fibre for the purpose of Louisiana-Pacific's mill.

For the Duck Mountain (Forest Management Unit 13), Louisiana-Pacific and their consultants used the 'Site Index 21' yield curve (i.e., the first group of numbers in the Table on Page 7-17; Louisiana-Pacific Canada Ltd. 1995). These yield curves were to "... express the volume available in a fully-stocked stand for a specific site, species and age." (Page 7-16; Louisiana-Pacific Canada Ltd. 1995). For example, the assumption of 328 m^3 per ha was appropriate for a pure stand of aspen on a Site Index 21 site at age 60. Stands having a crown closure of 71% to 100% were assumed to be 'fully stocked' per the method of applying yield curves to the forest stands of the Duck Mountain (i.e., yield was not modified for stands having crown closures of Class 4 per the Table on Page 7-16; Louisiana-Pacific Canada Ltd. 1995). For definitions of Crown Closure Classes, see Manitoba Natural Resources (1992).

Manitoba Forestry Branch yield assumptions

The Manitoba Forestry Branch developed yield curves for 'yield strata' (Table 5; Manitoba Forestry Branch 2004) that were species/density class (crown closure) groupings that had been developed to facilitate sampling. Of particular interest to this comparison are the Density Class 2 (>50% crown closure) PTA (Pure Trembling Aspen) and MDE (Mixed Deciduous) strata. The PTA stratum was defined as 80-100% trembling aspen and 0-20% softwood, while the MDE stratum was defined as 80-100% hardwood (trembling aspen, balsam poplar, white birch) and 0-20% softwood.

Yield curves for the strata can be found in Appendix V of Manitoba Forestry Branch (2004). The Appendix provides assumptions for both tree length yield and merchantable log length yield. One would typically use the merchantable log length yield assumptions for comparative purposes, because this curve is supposed to represent the amount of fibre available to industry after a tree has been cut into logs for transport, and because the curves used by Louisiana-Pacific were for net merchantable volume. The merchantable log length yield should be somewhat less than the tree length yield (e.g., if one cuts trees into ~2.4-m lengths for transport, one is left with short sections that are left on site). However, the tree length and merchantable log length yield curves of Appendix V were almost identical for the PTA and MDE strata, and merchantable log length volumes often exceeded those of tree length, contrary to the relationship that should exist. For these reasons, tree length yield curves were used for the purpose of this comparison. If the tree length yield curves were correct for strata at rotation age and older, then the comparison of yield curves is conservative because the Manitoba Forestry Branch volume assumptions would have been even lower for accurate merchantable log length curves.

Considerations for the comparison of yield curves

The yield assumptions used by Louisiana-Pacific and their consultants were for 'fully-stocked' (71%-100% crown closure) single-species stands. Because Louisiana-Pacific's yield curves were identical for aspen, balsam poplar and white birch, the three species were effectively treated as one species for the purpose of yield. In contrast, the yield assumptions developed by Manitoba Forestry Branch for PTA and MDE were for stands with a crown closure of 51%+ that could have a softwood component of up to 20%.

Of relevance to comparison of the yield curves, the methodology for derivation of crown closure differed between the two inventories. The new inventory used 'leaf-off' photography for the Duck Mountain and it was therefore possible to consider species found beneath the canopy, whereas the old inventory was based on summer photography (Mr. Rob Frank, Manitoba Forestry Branch, pers. commun.) which precluded the determination of subcanopy composition. Of particular importance to the comparison, where two layers of trees occurred, Manitoba Forestry Branch (2004) incorporated both if the height difference between layers was ≤6 m. Methodological differences might influence the comparison of yield assumptions if low crown closure stands per the earlier inventory method were classified as Density Class 2 stands in the new inventory. In the absence of examination of the raw data for various strata, one cannot be certain that methodological variation would not influence the comparison of the yield curves. However, the aspen-dominated and hardwood-dominated forests of the Duck Mountain almost

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universally have relatively high crown closure (e.g., see below relative to Crown Closure Classes 2 to 4), and it is reasonable to conclude that any 'crown closure' effect would be insignificant.

Because the Manitoba Forestry Branch yield curves were derived from data that may have included stands with a crown closure of 51% to 70%, upward adjustment of the curves is indicated for comparison to Louisiana-Pacific's curves. The extent to which the Manitoba Forestry Branch curves should be adjusted would be a function of the relative contribution of the 'low' crown closure stands to the total sample for a given yield stratum. In the absence of this information, it is reasonable to examine and consider other information. The high proportion of aspen suggests that sites in the Pure Trembling Aspen stratum were of high quality for aspen, and therefore that crown closure would typically be relatively high. For the purpose of selecting sites for a study of cavity-dependent wildlife in the Duck Mountain, and using the same Forest Resource Inventory (FRI) as was used by Louisiana-Pacific and their consultants, Soprovich examined stands that were >80 ha in size, or >80 ha in size when combined with adjacent stands. For Pure Trembling Aspen stands, as defined by Manitoba Forestry Branch (2004), only 1.6% of the area of old stands (Cutting Class 5) was Crown Closure Class 2 or 3 (i.e., 21% to 70% crown closure) out of Crown Closure Classes 2 to 4 (D. Soprovich, unpublished data). This percentage is insignificant, and suggests that adjustment to the Manitoba Forestry Branch yield curve for PTA would have an insignificant impact**.** For the MDE stratum, the areal percentage of Crown Closure 2 and 3 stands was 2.7% and also insignificant. Canopy openness appears to be greater in old aspen mixedwood forests as compared to 'mature' forests (Lee et al. 1995), and therefore one would anticipate an even lower areal percentage of low crown closure stands among the Cutting Class 4 ('mature'; 60 ± 10 years old per Manitoba Natural Resources 1992) PTA and MDE stands of the Duck Mountain. Given this information, it was concluded that adjustment of the Manitoba Forestry Branch yield curves for crown closure effects was not warranted.

The Forestry Branch yield strata of Pure Trembling Aspen and Mixed Deciduous could include forest stands having up to 20% softwood. Consequently, the yield curves derived for PTA and MDE were not directly comparable to Louisiana-Pacific's yield curves for single-species, or multi-species, stands of aspen, balsam poplar, and white birch.

Manitoba Forestry Branch (2004) does not provide data on the mean species composition of the yield strata. Therefore, for the purpose of comparison of yield assumptions, the PTA and MDE yield curves were modified in the following way to adjust for species effects.

$$\text{Deciduous volume}_{\text{Modified}}\ (\text{m}^3 \text{ per ha}) = \text{Deciduous volume}\ (\text{m}^3 \text{ per ha}) \div 0.9 \text{ ha.}$$

Consider a PTA forest stand comprised of 90% aspen and 10% white spruce. The Manitoba Forestry Branch assumption was that stands of this species composition would yield an average of 142.6 m^3 per ha of aspen at age 60. Division of 142.6 m^3 per ha by 0.9 produces a modified yield of 158.4 m^3 per ha. For the stand in this example, the softwood component might be spatially isolated from the aspen (e.g., as a small patch of white spruce on the north-facing slope of a creek, or adjacent to a wetland where beaver and cervids have exerted their influence on species composition). Under these conditions, the calculation represents an adjustment to estimate the aspen yield per unit area for the ~90% of the stand where aspen is the only species present (i.e., under single-species conditions). This adjustment is consistent with the means by which Louisiana-Pacific and their consultants applied their hardwood yield curve to the forest stands of the Duck Mountain, and therefore allows reasonable comparison of the modified Forestry Branch yield curves to those of Louisiana-Pacific.

Modification of the Manitoba Forestry Branch yield curves is based on two primary assumptions, as follows.

- The mean softwood component is 10% for the PTA and MDE yield strata (i.e., the midpoint between 0% and 20%), and the mean deciduous component is 90%.
- Division by the deciduous proportion is a reasonable adjustment irrespective of whether the softwood component of a stand is spatially isolated or the distribution is homogeneous. Louisiana-Pacific and its consultants made no distinction between these two occurrences (Page 7-16; Louisiana-Pacific Canada Ltd. 1995).

In the absence of data on species composition, the use of a mean softwood composition midway between the minimum (0%) and maximum (20%) allowable under yield strata definitions seems reasonable. Furthermore, reasonable divergence from a mean of 10% would exert little influence on modified yield curves. For example, the modified aspen yield at age 60 would be 153.3 m^3 per ha if the mean PTA softwood percentage was 7%, and 163.9 m^3 per ha if the mean was 13%.

The assumption of lack of an influence of softwood distribution is simplistic. In the forest inventory that Louisiana-Pacific and their consultants used, it was not uncommon for spatially isolated patches of softwoods to be included within the boundaries of a hardwood stand. For example, the FAVL site of the cavity-dependent species study was within a stand that incorporated a spatially isolated patch of lowland black spruce that comprised 10% of the stand species composition (D. Soprovich, unpublished data). Adjustment of the Manitoba Forestry Branch yield curves, for the purpose of comparison of assumptions, is reasonable for this type of stand. It is also not uncommon to observe white and black spruce intermixed with deciduous species in the canopy of Duck Mountain forests (i.e., distributed in a relatively homogenous manner), or as a subcanopy beneath aspen and other deciduous species (e.g., classical forest succession of mixedwood forests on mesic sites per Kabzems et al. (1986) and Lee et al. (1995), and see Manitoba Conservation (2003)). This might be particularly true for the PTA stratum whose stands would generally be expected to occur on good quality sites. For the circumstances where softwoods occur as a subcanopy, or are found in the canopy as a function of stand age (e.g., due to the determinate growth of aspen, and canopy breakup in old-growth aspen mixedwood forests), adjustment for species composition is likely not warranted because the softwood composition and volume are likely to be additive (e.g., per Kabzems et al. 1986), and therefore would have little or no influence on the hardwood volume.

The suggestion that the softwood volume can be additive is consistent with various ecological theory. For example, because dissimilar species often make use of somewhat different resources and/or occupy different niches (e.g., a species like jack pine being able to thrive on xeric sites where aspen cannot), areas that support several species can exhibit greater overall productivity. Furthermore, single-species forest stands may be more sensitive to the effects of outbreaks of insects and disease, as opposed to multi-species stands.

Manitoba Forestry Branch (2004) developed their yield curves for the Duck Mountain on the basis of a new Forest Lands Inventory that used leaf-off photography. For stands where conifers were present as a subcanopy ≤6 m below the canopy, species composition was defined on the basis of the composition of both layers. For example, the compositions of both layers would be used for a stand with a canopy of 60% aspen and 40% white spruce, and a second layer of 80% white spruce and 20% balsam fir, where the height difference was 4 m (Appendix III; Manitoba Forestry Branch 2004). In contrast, because summer photography was the basis for the Forest Resource Inventory used by Louisiana-Pacific and their consultants, it was not uncommon for stands to be designated as pure trembling aspen where a significant understorey of white spruce existed. For those stands with a softwood subcanopy, the yield assumptions used by Louisiana-Pacific and their consultants would not have been adjusted for the species composition of the subcanopy. Therefore, for comparison of the two sets of yield assumptions, adjustment of the Manitoba Forestry Branch yield curves is not warranted for at least some of the stands with a softwood subcanopy located ≤6 m below the canopy. To precisely apply the adjustment for species composition would require an understanding of the extent to which multi-layer stands contributed to the overall sample in the PTA and MDE yield strata. In the absence of this information, it is reasonable to conclude that the comparison of yield curves is conservative from the perspective of the adjustment for species composition, because comparable adjustment for understorey softwood effects would tend towards modified yield curves with lower values.

There is further reason to believe that the comparison of aspen yield curves is a conservative comparison. Louisiana-Pacific and their consultants applied their yield assumptions universally from sites where aspen grows well (e.g., see Peterson and Peterson (1992) for a *Populus-Aralia/Linnaea* ecosystem from the Saskatchewan mixedwoods, and for other ecosystems) to sites where aspen grows poorly (e.g., dry sites adjacent to some Duck Mountain prairies where the aspen is of poor form). In contrast, the PTA (Density Class 2) yield curve of Manitoba Forestry Branch was likely derived principally from relatively good sites for aspen, given the high percentage of aspen in the stratum definition.

One consequence of the consideration of a softwood understorey is that stands classified as monotypic deciduous, or having a high composition of deciduous species, in the Forest Resource Inventory could be classified as mixedwood strata (e.g., NWS) in the Forest Lands Inventory. While this is likely to have occurred to some extent, examination of the volume contributions of hardwoods and softwoods for the NWS and MWS yield curves suggests that this would not significantly influence comparison of the yield assumptions.

Comparison of Forestry Branch and Louisiana Pacific-TetrES yield assumptions

Trembling aspen

Perhaps the most useful comparison of yield assumptions is for an aspen forest of age 60 years post-disturbance, because this was the hardwood rotation age in the Duck Mountain at the time of the Environmental Impact Assessment (Manitoba Forestry Branch 1992). For the purpose of their ‘sustainability’ analysis, Louisiana-Pacific and their consultants assumed the aspen forest to yield an average of 328 m^3 per ha across the Duck Mountain (Table 1; Figure 1). In contrast, after modification for species effects, the Manitoba Forestry Branch assumption was 158.4 m^3 per ha. Given the almost decade of experience, the obvious sampling biases by Louisiana-Pacific and their consultants (Soprovich 1995), and a presumed increase in sample size, one must conclude that the Manitoba Forestry Branch (2004) yield assumptions are ‘correct’. Therefore, for the purpose of their Environmental Impact Assessment, Louisiana-Pacific and their consultants assumed that the aspen forests of the Duck Mountain would yield 2.07 times the true yield at rotation age.

Table 1. Trembling aspen yield assumptions for the Duck Mountain, Manitoba.

	Volume (m^3 per ha)			Volume overestimate	
Age (years since disturbance)	LP/TetrES[1]	Forestry Branch[2]	Forestry Branch Modified[3]	Comparison one[4]	Comparison two[5]
0	0	0	0		
10	1	5.5	6.1	0.18	0.16
20	29	24.1	26.8	1.20	1.08
30	100	52.0	57.8	1.92	1.73
40	187	83.7	93.0	2.23	2.01
50	266	114.9	127.7	2.32	2.08
60	328	142.6	158.4	2.30	2.07
70	378	165.1	183.4	2.29	2.06
80	406	181.6	201.8	2.24	2.01
90	428	192.1	213.4	2.23	2.01
100	435	197.1	219.0	2.21	1.99

[1]Forest Management Plan (Page 7-17; Louisiana-Pacific Canada Ltd. 1995) and Environmental Impact Statement (TetrES 1995) assumptions.
[2]Manitoba Forestry Branch assumptions for Pure Trembling Aspen (PTA) Closed Density stratum (Column 7 of 'Log Length Yield Table for FMU 13 and 14', Appendix V; Manitoba Forestry Branch 2004).
[3]Manitoba Forestry Branch assumptions modified to account for the softwood component of the Pure Trembling Aspen stratum.
[4]LP/TetrES volume assumption divided by Foresty Branch volume assumption.
[5]LP/TetrES volume assumption divided by Foresty Branch Modified volume assumption.

Hardwoods

Louisiana-Pacific and their consultants assumed that the balsam poplar and white birch forests of the Duck Mountain would yield at the same rate as the aspen forests, and applied one set of yield assumptions for all three species. The veracity of this assumption was challenged by Canadian Forest Service forester Mr. Jim Ball. For example,

- In his letter of August 17, 1995 to Dr. Floyd Phillips, Manitoba Environment Chairman of the TAC, Mr. Ball wrote "Aspen and balsam poplar should not be managed as a single species." and "Combining the two species in one height/diameter equation is really pretty sloppy forest mensuration.".
- In his letter of December 15, 1995 to Mr. Larry Strachan, Director of Manitoba Environment, Mr. Ball wrote "Balsam poplar differs from aspen in several ways.", "On mixedwood sites in Riding Mountain, balsam poplar (both reproduction and mature trees) grows more slowly

and does not reach the same diameter as aspen; I suspect that this is also generally true for FML #3.", and "In my opinion, arguments for grouping, as presented by TetrES ... are seriously flawed.".

- In his December 15, 1995 letter, Mr. Ball noted that "The significance of balsam poplar has been marginalized in the addendum to the EIS by trivializing its volume percentage to 2%. Balsam poplar is common and widespread throughout the western boreal forest and aspen parkland (Johnson et al. 1995). Peterson and Peterson (1992) reported average balsam poplar percentages of the hardwood component to be 13.9, 14.1, and 16.8 for Manitoba, Saskatchewan, and Alberta, respectively.". Mr. Ball further wrote "An extremely low value of 2% balsam poplar ... strongly suggests that wet but still productive sites---where balsam poplar would have been more abundant---were avoided. If plot selection was biased to well drained sites where greater growth occurs ... it follows that the sustainability analysis should be rejected.".

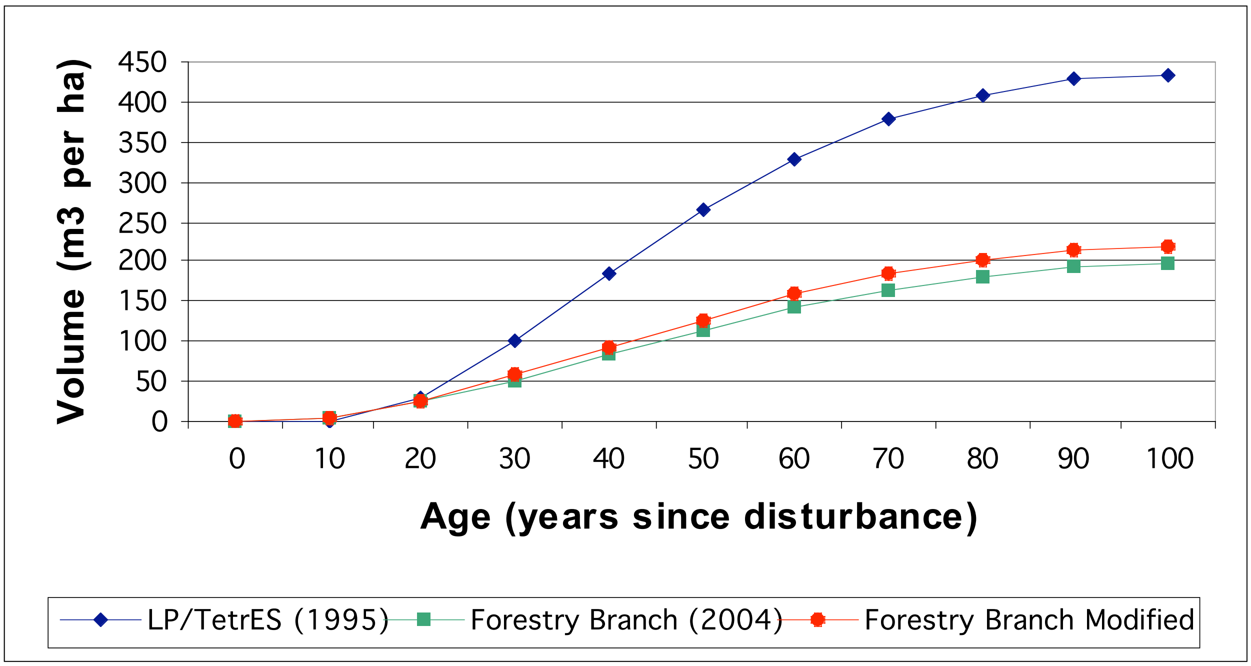

Figure 1. Trembling aspen yield assumptions for the Duck Mountain, Manitoba.

The Manitoba Forestry Branch (2004) did not provide yield curves for monotypic balsam poplar or white birch forests, and therefore direct comparison of yield assumptions for these species is not possible. However, the availability of yield curves for the MDE stratum does provide an opportunity to examine whether Mr. Ball's concerns were justified.

For the purpose of their 'sustainability' analysis, Louisiana-Pacific and their consultants assumed monotypic forests of balsam poplar or white birch, and mixed-species deciduous forests, to yield an average of 328 m^3 per ha at age 60 across the Duck Mountain (Table 2; Figure 2). The MDE stratum of Manitoba Forestry Branch incorporates monotypic forests of balsam poplar or white birch, and mixed-species deciduous forests. It is therefore valid to compare the two sets of yield assumptions. After modification for species effects, the Manitoba Forestry Branch assumption was 129.8 m^3 per ha. For the purpose of their Environmental Impact Assessment, Louisiana-

Pacific and their consultants assumed that these hardwood forests would yield 2.53 times the true yield at rotation age. Louisiana-Pacific's assumption was almost three times greater for 100-year old hardwood forests (Table 2). The even greater disparity for the MDE stratum as compared to the PTA stratum is clear evidence in support of Mr. Ball's assertion that Louisiana-Pacific and their consultants had wrongly assumed that yields of the three species would be equivalent. Furthermore, the evidence strongly validates the other concerns of independent forester Mr. Jim Ball.

Table 2. Hardwood yield assumptions for the Duck Mountain, Manitoba.

	Volume (m^3 per ha)			Yield overestimate	
Age (years since disturbance)	LP/TetrES[1]	Forestry Branch[2]	Forestry Branch Modified[3]	Comparison one[4]	Comparison two[5]
0	0	0	0		
10	1	6.0	6.7	0.17	0.15
20	29	24.5	27.2	1.18	1.07
30	100	49.9	55.4	2.00	1.80
40	187	76.1	84.6	2.46	2.21
50	266	99.1	110.1	2.68	2.42
60	328	116.8	129.8	2.81	2.53
70	378	128.5	142.8	2.94	2.65
80	406	134.4	149.3	3.02	2.72
90	428	135.2	150.2	3.17	2.85
100	435	132.0	146.7	3.30	2.97

[1]Forest Management Plan (Page 7-17; Louisiana-Pacific Canada Ltd. 1995) and Environmental Impact Statement (TetrES 1995) assumptions.

[2]Manitoba Forestry Branch assumptions for Mixed Deciduous (MDE) Closed Density stratum (Column 7 of 'Log Length Yield Table for FMU 13 and 14', Appendix V; Manitoba Forestry Branch 2004).

[3]Manitoba Forestry Branch assumptions modified to account for the softwood component of the Mixed Deciduous stratum.

[4]LP/TetrES volume assumption divided by Foresty Branch volume assumption.

[5]LP/TetrES volume assumption divided by Foresty Branch Modified volume assumption.

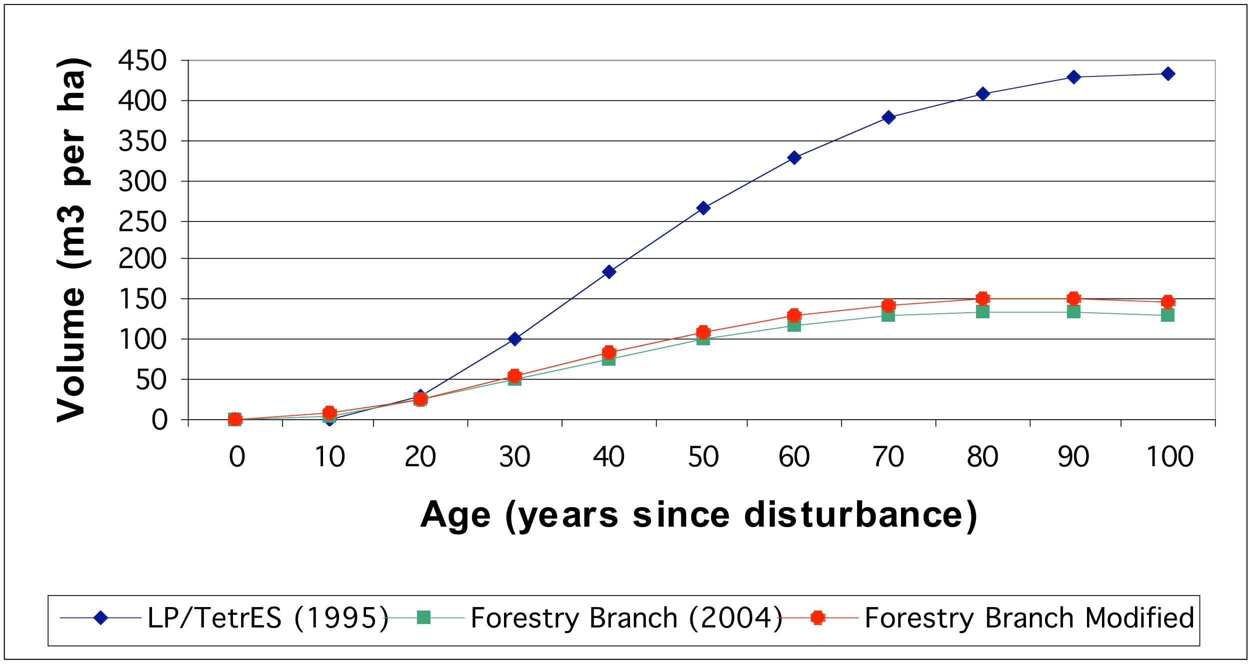

Figure 2. Hardwood yield assumptions for the Duck Mountain, Manitoba.

Conclusion

It is now obvious that Louisiana-Pacific and their consultants used grossly inflated yield assumptions for their examination of the 'sustainability' and environmental impact of the Louisiana-Pacific Canada Ltd. forestry development. It is also clear that independent experts were correct in their assessment of the Louisiana-Pacific yield assumptions. For example, the evidence demonstrates that Soprovich (1995) and Canadian Forest Service forester Mr. Jim Ball were correct when they made the following statements and conclusions.

- Soprovich (1995). "… we cannot have a great deal of confidence in the LP data." and "If growth and yield is considerably overestimated, as I suggest, this invalidates all analyses presented in the EIS.".
- Mr. Jim Ball (August 17, 1995 and December 15, 1995). "... the company should explain this apparent incongruity and reconcile the yield values of 150-170 $m^3 \cdot ha^{-1}$ to be cut in the first three years with volumes of 300-400 $m^3 \cdot ha^{-1}$ for well stocked stands used in the HSG simulation (7-17) to project future stands." and "If plot selection was biased to well drained sites where greater growth occurs (Jameson 1963), and if such elevated growth data---for example, 400 m^3/ha---were used in the Harvest Schedule Generator it follows that the sustainability analysis should be rejected.".

The disparity between the two sets of yield assumptions is huge for the PTA and MDE strata. Most importantly, because future forest age structure is extremely sensitive to yield assumptions, the magnitude of the discrepancy is so great that one can only conclude that Louisiana-Pacific's environmental impact assessment and 'sustainability' analysis were not valid. Under these conditions, it is fair to state that Louisiana-Pacific has been operating for the last decade in the absence of an environmental impact assessment, and that the Manitoba government has allowed the Company to do so.

The use of inflated yield assumptions is a primary reason, and likely the primary reason, for Manitoba Conservation's recent 36.1% decrease in the hardwood Annual Allowable Cut (AAC) of the Duck Mountain to 348,823 m^3 per year (Manitoba Forestry Branch 2004, Soprovich 2005). At the time of the allocation to Louisiana-Pacific, the Manitoba Forestry Branch 'Massaged' hardwood AAC for the Duck Mountain was 545,691 m^3 per year (Mr. Jim Ball, in his December 15, 1995 letter, wrote "How was the FRI massaged to double the hardwood AAC?"), and Louisiana-Pacific proposed to log 542,530 m^3 on an annual basis (Table 8-1; TetrES 1995). The reduction by Manitoba Conservation came some nine years after Louisiana-Pacific's consultant wrote "… the hardwood timber supply contemplated by the FMP is sustainable over the next 100 years." (September 15, 1995 letter from Mr. J.M. McKernan of TetrES to Mr. Barry Waito of Louisiana-Pacific Canada Ltd.). These same consultants had concluded that a hardwood cut of 597,125 m^3 per year was 'sustainable' over a 100-year period (HSG Sustainable Crown Land AAC, Table 8-1; TetrES 1995). This 'sustainable' harvest was 1.71 times greater than Manitoba Conservation's recent allocation, made on the basis of the 'correct' yield assumptions. One can be very confident in concluding that the use of grossly inflated yield assumptions by Louisiana-Pacific and their consultants is primarily responsible for the significant disparity between AACs.

One might question why the 'sustainable' Annual Allowable Cut disparity was only 1.71 times given that the yield curves of Louisiana-Pacific and their consultants exceeded those of Manitoba Forestry Branch by 2.07 times for the PTA and 2.53 times for the MDE yield strata. The Annual Allowable Cut represents the sum total of the influence of a number of management decisions and ecological or management assumptions, and therefore relevant comparison represents a complex challenge. However, it is apparent from critical examination of the basis for the recent Annual Allowable Cut determination (Manitoba Forestry Branch 2004) that the relatively low 'sustainable' harvest disparity is a function of some omissions and some extremely risky assumptions on the part of Manitoba Forestry Branch (Soprovich 2005). For example, in accordance with the Manitoba Forestry Branch AAC determination methodology of the day, Louisiana-Pacific and their consultants applied a 15% netdown to their 'sustainable' harvest level to account for assumptions on fibre losses to fires and other factors (Table 8-1; TetrES 1995). However, for their recent determination of AAC, Manitoba Forestry Branch (2004) assumed that fires would not occur in the Duck Mountain over the 200-year simulation period. If the wood supply analysis had assumed a reasonable impact of fire (i.e., fires will occur in the Duck Mountain), and made reasonable assumptions respecting other relevant factors that were ignored, the hardwood AAC would have been lower than 348,823 m^3 per year. The decision to ignore obvious factors that will influence forest age structure and fibre yields of the Duck Mountain demonstrates that Manitoba Conservation continues to favour the allocation of fibre to industry over the maintenance of the biological diversity, and other ecological 'goods' and 'services', of the forest. Further to this, the basis for the wood supply analysis is clearly not in keeping with the 'precautionary principle', and there exists a certain level of risk respecting the long-term 'sustainability' of the Annual Allowable Cut (e.g., as was the case for the first Manitoba government allocation of fibre to Louisiana-Pacific).

The objective reader may wonder why it is that a Canadian Forest Service forester and a Manitoba Natural Resources wildlife biologist clearly understood that Louisiana-Pacific's yield assumptions were grossly inflated, while Louisiana-Pacific and their highly paid consultants were wrong. The objective reader may also wonder why it is that government bureaucrats from the Manitoba Departments of Environment and Natural Resources, whose presumed role was to implement policy and serve the public interest, accepted the grossly inflated yield estimates. While Soprovich (2005) addresses these issues to some extent, there remains considerable room to explore the questions.

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