EXPERT WORKSHOP ON THE IMPACT OF INTENSIVE FOREST MANAGEMENT ON THE ALLOWABLE CUT

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1.0 INTRODUCTION

Tembec's forest-level management objective within the province of Ontario is to increase its volumetric annual allowable cut (AAC) by 10% within 10 years on its post-LLLUS[2] productive forest land base via the allowable cut effect (ACE), arising principally from an intensive forest management (IFM) program[3]. However, existing knowledge regarding yield responses to IFM treatments and their resultant effect on the AAC via the ACE, is discrete and limited. Thus an essential first step is to benchmark and synthesize the current state of knowledge pertaining to ACE-based IFM treatments. Consequently, research scientists, foresters, policy makers and forest management planners were invited to an expert workshop to present research findings, discuss policy and operational constraints, examine case studies and identify knowledge gaps; specifically, the workshop was entitled, *Impact of Intensive Forest Management on the Allowable Cut,* and was held at the Canadian Ecology Centre, Mattawa, Ontario, during the November 1-2, 2000 period. The overall objective of the workshop, as documented in this report, was to summarize the existing state of knowledge as inferred from experts in the field.

1.1 Tembec's Operations and Forest Management Focus

Tembec Inc. manages approximately 25% of the productive forest land base in Ontario which is concentrated within 3 administrative regions: (1) Central Region which includes the French Severn Forest, Nipissing Forest and Algonquin Park; (2) Boreal East Region which includes the Romeo Malette Forest, Smooth Rock Falls Forest, Moose River Forest, Driftwood Forest, Temiskaming Forest, Iroquois Falls South Sub-Unit and the Cochrane Crown Management Unit; and (3) Boreal West Region which includes the Gordon Cosens Forest and Hearst Forest. Tembec has 4 pulp mills and 7 sawmills within these regions: 5 Spruce-Pine-Fir (SPF) lumber mills; 1 pine lumber and hardwood mill; and 1 hardwood lumber and flooring mill. The SPF lumber is used in residential and commercial construction and produced at Timmins, Hearst, Kapuskasing, Cochrane and Kirkland Lake. The pine lumber is used in millwork furniture, specialty residential and commercial finishing applications and produced at Mattawa.

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[2] *Living Legacy Land Use Strategy* (LLLUS) is a plan to protect 12% of the terrestrial and aquatic resources within the Boreal West, Boreal East and Great Lakes - St. Lawrence Provincial Planning Areas (OMNR 1999). This combined planning area consists of a 51.2 million hectare province-wide transect stretching from the 44th parallel in the south to the 51st parallel in the north; an area representing 48% of the province's terrestrial and aquatic resources. Specifically, the *Living Legacy Land Use Strategy* sets aside an additional 2.4 million hectares (4.6%) of the terrestrial and aquatic area within the combined planning area as protective area; 378 mutually-exclusive areas consisting of 0.9 million hectares of wilderness, natural environment, waterway, nature reserve, recreation and historical provincial parks, and 1.5 million hectares of conservation reserves.

[3] The underlying objective of IFM is to *increase* the intrinsic productivity of the forest land base via the application of an integrated silvicultural regime involving the application of various temporal-spatial-specific treatment matrices encompassing intensive site preparation (*e.g.*, mechanical scarification), plantation establishment including use of genetically improved stock, controlling competing vegetation (*e.g.*, manual

The hardwood lumber is used in furniture, flooring, residential, commercial, and industrial applications and produced at Mattawa and Huntsville. Wood chips are used in the manufacture of pulp and newsprint and produced at Kapuskasing, Marathon, Smooth Rock Falls and Temiskaming. The relative importance of species to Tembec's operations, ranked in order of preference and/or value, is the following: (1) Central Ontario the focus is on quality and volume where Hard Maple > Yellow Birch > White Pine > Red Pine >Aspen> White Birch (*n.*, although Black Cherry and Red Oak are profitable species, they are not in abundance); and (2) Boreal Ontario the focus is on volume with Black Spruce > Jack Pine >Aspen> Balsam Fir.

1.2 Tembec's Forest-level Management Objective

Tembec's forest-level management objective within the province of Ontario is to increase its volumetric AAC by 10% within 10 years on its post-LLLUS productive forest land base via the ACE, arising principally from an IFM program. Within the context of Schweitzer *et al.* (1972) original definition[4], ACE is defined as the immediate increase in the current volumetric AAC due to expected/demonstrated future increases in merchantable volumetric yield. Utilizing the ACE is conditional on the availability of an excess of harvestable mature stands within a management unit. The ACE can result from any forest management activity which increases the productive capacity of the forest management unit (*e.g.*, a suite of silviculture treatments which increase the merchantable mean annual increment at the forest level). Note, historically the ACE has been the only instrument of public forest policy utilized by provincial governments to encourage discretionary investments in IFM activities within Canada (*i.e.*, IFM activities over and above those defined in statutory acts and contractual agreements; Luckert and Haley 1995). Thus from a sustainable forest management perspective, utilizing the ACE via a suite of IFM treatments, is conditional on the assumption that responses will result in consequential increases in merchantable mean annual increment (MAI) at the stand and resultant forest level, relative to intrinsic MAI's currently obtained under a basic forest management[5] regime.

1.3 An Essential Prerequisite: Benchmarking Existing Knowledge

The basic prerequisites for implementing an ACE-based IFM program include: (1) quantitative knowledge pertaining to responses to IFM treatments in terms of ACE parameters

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and/or chemical herbicides), continuous and active protection from insects and pathogens (IPM), and density management (*e.g.*, maximizing product quality and quantity via precommercial and/or commercial thinning).

[4] *"...Allowable cut effect is the immediate increase in today's allowable cut which is attributable to expected future increases in (timber) yields..."* Schweitzer *et al.* (1972).

[5] The underlying objective of basic forest management is to *maintain* the intrinsic productivity of the forest land base via the application of standardized silviculture treatment protocols (*e.g.*, implementing vegetation management and/or remedial planting on harvested sites which have not attained statutory-defined standards in terms of free-to-grow status in order to ensure that the regenerated site will attain a long-term historical-based productivity level as expressed by its mean annual increment within one rotation).

(*e.g.,* MAI estimates by treatment, species, site and region); (2) continuous assessing, monitoring and measuring sample-based ACE responses via adaptive sampling protocols and adaptive experimentation; (3) spatial-explicit forest-level models for (i) scaling stand-level IFM treatment responses to forest-level ACE responses, and (ii) assessing/simulating the consequences of ACE-based harvesting regimes on species/age-class distributions, biological diversity and wildlife habitat, at both the local and regional scale; and (4) explicit specification of risk and error tolerance levels including corrective action plans if the targeted ACE is not achieved. The objective of this report is to partially address the first prerequisite: specifically, summarizing the main points arising out of the expert workshop on IFM impacts on the AAC.

1.4 Scope and Context

A preliminary survey of Tembec's forest managers was carried out in order to identify realistic IFM treatment possibilities given their forest resource configuration and regional management objectives. Specifically, Tembec's personnel within the boreal regions, where black spruce, jack pine and balsam fir are the principal species, identified volumetric increases and enhanced stand operability, arising principally via density management, inclusive of early vegetation management, as plausible IFM treatments given their experience, productive land base and management objectives. Tembec's personnel within the Great Lakes St. Lawrence regions, where white pine and tolerant hardwoods are the principal species, identified product quality, in addition to volumetric increases, via stocking control including vegetation management, as plausible IFM treatments given their experience, productive land base and management objectives. Commonalities were also expressed by Tembec's woodlands staff in terms of the need for better forest resource inventory information, concern over the future of the use of herbicides in forest management given recent changes in other jurisdictions (*e.g.,* Quebec), the need for species/site specific tools for implementation of stand-level density management treatments (*e.g.,* better stocking guides), and enhanced utilization opportunities of the forest resource (*e.g.,* other species).

These survey results were used to structure a workshop in order to address the major IFM treatment opportunities identified by Tembec staff. Experts within forest science, policy and forest management communities, were invited to update the current state of knowledge within their respective fields (*e.g.,* forest policy, forest-level modelling, vegetation management, density management). Furthermore, 2 out-of-province guest experts were invited to present key note addresses pertaining to IFM treatment opportunities within the Boreal and Great Lakes - St.

Lawrence Forest Regions. Refer to APPENDIX B for the actual agenda and APPENDIX C for a list of the participants.

2.0 CONTEXTUAL SUMMARY

The main summary points derived from the individual presentations are as follows; for a complete account of the presentations refer to APPENDIX A.

2.1 Tembec's Goals and Expectations (Bruemmer)

The presentation summarized Tembec's forest management and corporate objectives including the role of the CEC-CFS-OMNR-Tembec Forestry Research Partnership in assisting in the attainment of those objectives. Main points: (1) Tembec's forest-level management objective is to attain a 10% increase in AAC in 10 years via an ACE-based IFM program, subject to spatial, productivity, economic and social constraints; (2) given (1), description and overview of the R&D program with specific reference to plausible IFM treatment suites given Tembec productive forest land base, regulatory and operational constraints including economic realities; and (3) although subject to results derived from current landscape-level productivity mapping and biodiversity research projects, ACE-based IFM treatment suites may be spatially concentrated on approximately 10-20%(I would like George to have a look at this number before we send out workshop summary) of Tembec's productive forest land base.

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2.2 Tembec's Operations and AAC (Mutchmor; APPENDIX A: A1)

The presentation summarized Tembec’s landscape and forest resources including regional-specific management objectives, AAC requirements, mill-gate requirements and plausible IFM treatment suites, as identified by Tembec's woodland personnel. Specifically, Tembec's personnel within the boreal regions, where black spruce, jack pine and balsam fir are the principal species, identified volumetric increases and enhanced stand operability arising principally via density management, inclusive of early vegetation management, as plausible IFM treatments given their experience, productive land base and management objectives. Tembec's personnel within the Great Lakes St. Lawrence regions, where white pine and tolerant hardwoods are the principal species, identified product quality in addition to volumetric increases via stocking control including vegetation management as plausible IFM treatments given their experience, productive land base and management objectives. Commonalities were also expressed by Tembec's woodlands staff in terms of the need for better forest resource inventory information, concern over the future of the use of herbicides in forest management given recent changes in other justrications (*e.g.*, Quebec), the need for species/site specific tools for implementation of stand-level density management treatments (*e.g.*, better stocking guides), and enhanced utilization opportunities of the forest resource (*e.g.*, other species).

2.3 Policy Implications of IFM (Stocker; APPENDIX A: A2)

The presentation summarized the policy implications and requirements of an ACE-based IFM program. Main points: (1) provincial policy is currently evolving; (2) increases in AAC's via the ACE may result in additional delineation of protected areas at the provincial level (*i.e.*, sharing principle via Article 7 of the Forest Accord); (3) there is a critical need to quantify the degree of uncertainty surrounding ACE-based responses to IFM treatments; and (4) given (3), the need to configure and operationally establish an enhanced monitoring program of ACE-based IFM treatments in order to quantitatively assess actual versus predicted responses.

2.4 Forest Level Effects of Stand Level Treatments (Erdle; APPENDIX A: A3)

Summary of an actual New Brunswick example of how stand-level IFM treatments involving plantation establishment, pre-commercial thinning and commercial thinning, when scaled to the forest-level, can resultant increased AAC via the ACE. The analysis clearly demonstrated the applicability of an ACE-based IFM treatment program in terms of its effect on significantly increasing the AAC: density management (we may want to expand upon the treatments that resulted in these AAC increases although they were density management I believe that they also captured effects of vegetation management tree improvement etc, it may be better to replace density management with intensive forest management then we are capturing the full scope of treatments that have contributed to the increase in ACC resulted in 35-50% increase in AAC in New Brunswick. In summary, forest-level effects are governed by stand-level responses, forest structure and IFM treatment type and area. Furthermore, the acceptance of New Brunswick policy makers of model-based stand-level yield responses to IFM treatments (*e.g.*, long-term plantation, PCT and CT yield responses) within the forest-level models was of prime significance to the Ontario situation.

2.5 Vegetation Management Effects on IFM (Bell and Pitt; APPENDIX A: A4)

Summary of experimental results regarding the effect and utility of manual and chemical vegetation management techniques on the early development of coniferous crop trees. Experimental evidence clearly illustrated substantial increases in size were attainable via the use of chemical and manual techniques: ranging from 150-350% increases in size at year 5. The acknowledgement of timing of treatments was of critical importance if gains to vegetation management are to be attained.

2.6 Assessing the ACE of IFM with SFMM (Arlidge and Davis; APPENDIX A: A5)

Summary of SFMM implications in terms of the integration of stand-level case study results. Specifically, two basic prerequisites were identified: (1) the IFM-applicable land-base must be delineated via a number of priority-driven filters (*e.g.*, economic and productivity priorities); and (2) given the lack of empirical response information pertaining to ACE-based IFM treatments, species-site-treatment-specific IFM response curves must be formulated through expert option. Given the attainment of these prerequisites, SFMM will be able to determine the marginal return of additional IFM investments from a forest-level perspective.

2.7 Response of Jack Pine to Density Regulation (Bowling & Towill; APPENDIX A: A6)

Historical summary of individual spacing and thinning trials of Jack Pine located throughout New Brunswick, Ontario, Manitoba and the Lake States. Specifically, the main inference derived from 6 long-term density experiments was that early density regulation on good-quality fully-stocked jack pine sites could result in 20-40% increases in merchantable yields at rotation.

2.8 Decision Support Tools for Use in Black Spruce Management (Newton; APPENDIX A: A7)

Summary of the utility of support tools for use in density management decision-making for upland black spruce types. Specifically, demonstration of the software tools for determining site-specific density management regimes for attaining early stand operability, maximizing product quality and net production. Experimental and model-based yield estimates suggest that density management can result in earlier stand operability, consequential increases in merchantable yields, and enhanced product value.

2.9 Lowland Black Spruce: Role of CLAAG and HARP (Groot; APPENDIX A: A8)

Summary of modelling approaches and their potential in predicting responses of HARP-managed lowland black spruce stands. Specifically, the spatial and temporal heterogeneity of the residual stands following treatments may require a number of modelling approaches, ranging in complexity from adjusting existing yield curves to developing new empirical yield curves to developing individual-tree based models to developing process-based models.

2.10 Increasing Productivity in the Great Lakes - St. Lawrence Forest Region (Burgess; APPENDIX A: A9)

Based on a review of IFM experiments throughout the Great Lakes - St. Lawrence Forest Region the following plausible opportunities where identified for increasing productivity: (1) increase area of productive forest land via reforestation backlog and private forest land; (2)

improve level of utilization; (3) improve inventories and monitoring, define the productive capacity of the land based on FEC system; (4) develop better growth and yield models; (5) reduce length of regeneration phase; (6) increase level of tending and extend rotations; (7) focus attention on what you leave i.e. residual tree species, tree form and vigor; (8) use genetic improvement and ecological restoration; (9) experiment with new techniques (*e.g,*. science-based fertilization); (10) expand use of alternative silvicultural systems; and (11) increase proportion of area growing high quality and high-value commercial species.

2.11 Red Oak Regeneration (Batchelor; APPENDIX A: A10)

Summary of the silvicultural characteristics of red oak including the species adaptive characteristics to fire disturbance (*e.g.,* thick bark, tall crowns, basal bud sprouting). Experimental results demonstrating the utility of prescribe burning as useful management tool in regenerating red oak stands were presented (*e.g.*, early diameter and height growth responses of pin oak to varying fire intensities). Additional experimental results of planted red oak responses following prescribe burning were also presented.

2.12 Productivity Increases in Hard Maple and Yellow Birch (Anderson; APPENDIX A: A11)

Summary of the ecological and biological factors underlying potential increases in productivity of hard maple and yellow birch and identification of the knowledge gaps which requiring further research: (1) evolve appropriate stocking levels, structure curves, and cutting cycles for stands on less-than-best sites; (2) develop methods for controlling species composition of regeneration in single-tree selection cuts on dry/fresh sites (especially controlling Beech); (3) produce and ecologically-sound and biologically-relevant simulator for uneven-aged prescription testing; (4) develop “made-for Ontario” even-aged stocking charts/guides, including species mixtures; (5) consider scenarios for potential climate-change effects, which may negate present knowledge in future; and (6) critically evaluate multi-functional logging devices for their potential negative impact on residual tree quality and make design suggestions for machines compatible with partial cuttings.

3.0 CONCLUSIONS AND RECOMMENDATIONS

The following are the main conclusions and recommendations derived from the workshop presentations and discussions, as offered by the invited experts. Additionally, a number of side issues outside the scope of the workshop objectives were identified within the discussion sessions, usually with complete agreement. These issues included: (1) the need for better inventory; (2) better training of the mechanized workforce in order to reduce damaging residual trees when implementing intermediate treatments (HARP; uneven-aged management); (3) increased concentration on product quality objectives; (4) the need for continuous effectiveness monitoring; and (5) the need for the Crown to define acceptable error (comfort levels) when IFM treatment responses are not explicitly known (proof).

3.1 Boreal Forest Region (Erdle; APPENDIX A: A12)

Subset of Strategic Issues which Require Attention

(1) Clear Statement of the Forest-level Management Objective. Specifically, the forest-level management objective must be explicitly defined in terms of the forest resource under consideration (*e.g.,* temporal, spatial and structure of the forest resource) including desired management outcomes (*e.g.,* volumetric increases, product and quality specifications by species).

(2) Identification/Delineation of the Problem(s). Specifically, given (1), plausible solutions should be identified (*e.g.,* IFM treatment opportunities) and subsequently simulated within the planning model (*e.g.,* SFMM). Sensitivity analysis should be used to identify the limiting factors (*e.g.,* what breaks, limits the increase, what form does this limitation take, and when does it occur). This analysis should lead to conclusions regarding the most plausible IFM treatment opportunities.

(3) The Planning Model should be used to identify and understand the nature of the problems rather than finding solutions to the problems.

(4) Identify sources of information inadequacy in terms of yield forecasting ability and the inventory base in order to direct subsequent data acquisition efforts; forecasting yield responses to treatments best addressing the problem; and determining the spatial and temporal availability of treatable stands (*e.g.,* abundance, status and location of suitable stands).

(5) Defining a level of acceptable uncertainty regarding ACE-based responses to IFM treatments using the best available knowledge (*e.g.,* plausible yield expectations for specific conditions) followed by subsequent testing (*e.g.,* systematic conformance and performance monitoring).

Subset of Technical Issues which Require Attention

(1) Linking forest and stand level decision making: stand-level objectives (prescriptions) must be derived from forest-level requirements.

(2) Practice and productivity: practice and productivity are not mutually exclusive (*e.g.*, poor practice may negate gains in productivity).

(3) Attaining volumetric objectives based on current operability targets may adversely affect future wood quality, products and product quality.

3.2 Great Lakes - St. Lawrence Forest Region (Burgess; APPENDIX A: A13)

(1) The Great Lakes-St. Lawrence Region forests contain high-valued tree species of relatively high productivity growing on productive sites. Access is generally good and the area is situated near manufacturing facilities and large markets.

(2) Additional efforts are needed to closely monitor forest inventories and detect changes in forest characteristics resulting from management activities.

(3) Improvements are needed in designing skid trial layout, falling and log removal techniques to minimize the damage to residual trees.

(4) More research is needed to improve the management of mid-tolerant species such as basswood, red oak and white ash. On some site types, the growth and quality of mid-tolerant species is superior to sugar maple.

(5) Stand prescriptions need to be stand specific and based on its history, present structure and species composition. Management methods are needed that improve stand development without fighting the forces of natural succession.

(6) The use of certified and highly trained tree markers/loggers is encouraged to maintain residual stand quality. Greater flexibility in the system is needed to take advantage of within stand conditions, for example, maintaining good quality mid-tolerant trees in hardwood stands.

(7) Site preparation activities need to be better planned to match good seed years of species such as white pine and yellow birch.

(8) Many opportunities exist to increase tending activities to extend rotations and produce greater volumes of high quality timber. Examples include use of shorter cutting cycles and extended rotations in stands of eastern white pine or tolerant hardwoods growing on productive sites.

(9) The use of large harvesting equipment is not recommended when thinning tolerant hardwood stands because the risk of damage to the site or residual trees is too high. Might want to capture the need to conduct more research into the impacts of mechanized harvesting in selection management, it seems to me that the jury is out regarding this operation in selection stands

(10) Opportunities exist to use genetic improvement and ecological restoration. Planting high quality seedlings and leaving high quality seed trees will help offset past high grading of stands.

(11) Focus should be on the trees you leave behind after harvesting. Residual trees should be selected carefully for health and of vigor. Rotation length and residual tree number will vary and depend on site quality and species composition.

(12) The emphasis should be placed on developing low cost, environmentally sound approaches to forest management.

(13) Link forest management activities with other important or emerging issues whenever possible. Opportunities exist to address such environmental/social issues as carbon sequestration, biofuel production, sewage effluent disposal and high unemployment.

(14) Research and development should not only occur in the woods, but should occur and be integrated with activities in other components of the forest sector including equipment design and the development of new wood processing technologies.

(15) Work with natural succession where possible. A good example can be found in pine mixedwoods. The shorter-lived tree species such as aspen and birch can be harvested earlier releasing white pine.

(16) Opportunities exist to convert low grade maple stands to produce high quality white pine or yellow birch.

(17) Use available funding programs e.g. improvement funds to utilize low grade hardwoods and improve stands.

(18) Intensive forest management will increase the quality of wood harvested in future. In some cases, but not all, it will increase the quantity of wood harvested as well.

(19) There are a lot of knowledge gaps that need to be addressed before we can optimize management practices. Better forest inventories and audits are needed, as well as the growth response and quality of the various commercial tree species after silvicultural treatment on the various site types. Research is needed to improve predictions of future forest productivity and ensure that forest management activities are sustainable and that they are maintaining all forest values. Opportunities exist to test nutrient management techniques and introduce genetic gains to improve future yields.

(20) Much valuable information already exists and is, or can be, applied in forest management within the Region. Long-term studies within the Petawawa Research Forest, as well as others such as the yellow birch study at Swan Lake are valuable, irreplaceable experiments. A

commitment to maintain, protect and evaluate these studies in future will ensure that they continue to contribute to our understanding, and the development of better forest management techniques.

3.3 Next Steps within the Knowledge Benchmarking Project

Based on the main inferences derived from the presentations and accompanying discussions, a comprehensive literature review and associated meta-analysis will be initiated. Initially, the review and analysis will concentrate on reviewing published experimental results pertaining to yield responses (qualitative and quantitative) to the plausible ACE-based IFM treatments identified: (1) density manipulation treatments (*e.g.,* initial spacing, precommercial thinning and commercial thinning; possibility with and without fertilization) for black spruce (upland and lowland), jack pine, balsam fir, red pine, and white pine; (2) optimal stocking (e.g., residual basal area levels) and stand structural management (e.g., *q*-factor targets) within tolerant hardwoods and resultant yield differentials in terms of product quality and quantity; (3) vegetation control treatments (*e.g.*, manual and chemical) for black spruce (upland and lowland), jack pine, red pine and white pine; and (4) use of genetically improved planting stock. May want to capture the fact that there will be a paper prodcued that summarizes the results on the review of potential IFM practices and recommends best bets. Also should capture that some of the preliminary results will be presented at the FERIC workshop in Que.

4.0 REFERENCES

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Schweitzer, D.L.R., Sassaman, R.W., and Schallau, C.H. 1972. Allowable cut effect: some physical and economic implications. *Journal of Forestry* 70:415-418.

5.0 ACKNOWLEDGEMENTS

The Co-Chairs (Peter Newton, Scott Jones and Al Stinson) would like to express their appreciation to: (1) Dr. Erdle and Dr. Burgess for their keynote addresses and summary presentations; (2) George Bruemmer, Andy Mutchmor, Neil Stocker, Wayne Bell, Dr. Doug Pitt, Colin Arlidge, Colin Bowling, Bill Towill, Dr. Art Groot, Brian Batchelor and Harvey Anderson, for their individual presentations; (3) Guy Smith for facilitating the discussion sessions; (4) Paula Konka and other members of the CEC-CFS-OMNR-Tembec Forest Research

Partnership for organizational and logistical support; (5) CEC for use of their faculties; and (6) CEC-CFS-OMNR-Tembec Forest Research Partnership and the Ontario Living Legacy Trust Fund for fiscal support.

APPENDIX A: INDIVIDUAL PRESENTATIONS

Title	Format	Author	Section
Tembec's Operations and AAC	Subset of Overheads	Mutchmor, A.	A1
Policy Implications of IFM	PowerPoint Presentation	Stocker, N.	A2
Forest Level Effects of Stand Level Treatments	PowerPoint Presentation	Erdle, T.	A3
Vegetation Management Effects on IFM	Word Document	Bell, W. and Pitt, D.	A4
Assessing the ACE of IFM with SFMM	PowerPoint Presentation	Arlidge, C.	A5
Response of Jack Pine to Density Regulation	PowerPoint Presentation	Bowling, C. and Towill, B.	A6
Stand Density Management: Decision Support Tools for Use in Black Spruce Management	Subset of Overheads	Newton, P.F.	A7
Lowland Black Spruce: Role of CLAAG and HARP	PowerPoint Presentation	Groot, A.	A8
Increasing Productivity in the Great Lakes - St. Lawrence Forest Region	Word Document	Burgess, D.	A9
Red Oak Regeneration	PowerPoint Presentation	Batchelor, B.	A10
Productivity Increases in Hard Maple and Yellow Birch	Word Document	Anderson, H.	A11
Boreal Forest Region: Summary	PowerPoint Presentation	Erdle, T.	A12
Great Lakes - St. Lawrence Forest Region: Summary	Word Document	Burgess, D.	A13

APPENDIX B: PARTICIPANTS

Name	Organization	Role/Contribution
Anderson, H.W.	Emeritus Research Scientist, Science, Development and Transfer Branch (SDTB), Forest Research Section (FRS), Ontario Forest Research Institute (OFRI), Ontario Ministry of Natural Resources (OMNR), Maple, ON	Presentation
Arlidge, C.	Consultant, Mitig Forestry Services Ltd., Huntsville, ON	Presentation
Batchalor, B.	Management Staff, OMNR, North Bay, ON	Presentation
Bell, W.	Research Scientist, SDTB, FRS, OFRI, OMNR, Sault Ste. Marie (SSM), ON	Joint Presentation
Bowling, C	SDTB, FRS, OFRI, OMNR, Kenora, ON	Joint Presentation
Bruemmer, G.	Manager Forestry Research and Development, Tembec, Mattawa, ON	Presentation
Burgess, D.	Research Scientist, Pacific Forestry Centre, Canadian Forest Service (CFS), Victoria, BC	Keynote Speaker
Cole, W.	Research Scientist, SDTB, FRS, OFRI, OMNR, SSM, ON	Participant
Erdle, T.	Professor, University of New Brunswick, Fredericton, NB	Keynote Speaker
Farintosh, D.	OMNR	Participant
Groot, A.	Research Scientist, Great Lakes Forestry Centre (GLFC), CFS, SSM, ON	Presentation
Jones, S.	Management Staff, Provincial Terrestial Assessment Unit, OFRI, OMNR, SSM, ON	Co-Chair
Kayahara, G.	SDTB, FRS, OMNR, Timmins, ON	Participant
Konka, P.	Technology Transfer, GLFC, CFS, SSM, ON	Organizational Support
McDonell, C.	Central Region, Tembec Inc.	Participant
McLaughlin, J.	OMNR, ON	Participant
Mutchmor, A.	Consultant, North Bay, ON	Presentation
Newton, P.	Research Scientist, GLFC, CFS, SSM, ON	Co-chair and Presentation
Parton, J.	PTAU, OMNR, Timmins, ON	Participant
Perera, A.	Research Scientist, SDTB, FRS, OFRI, OMNR, SSM, ON	Participant
Picking, S.	Boreal Region, Tembec, Timmins, ON	Participant
Pitt, D.	Research Scientist, GLFC, CFS, SSM, ON	Joint Presentation
Robinson, B.	OMNR, Timmins, ON	Participant
Smith, G.	Technology Transfer, GLFC, CFS	Facilitator

Deleted: CEC-CFS-OMNR-TEMBEC Forestry Research Partnership (FRP)

Stinson, A.	Coordinator Forestry Research and Development, Tembec, Mattawa, ON	Co-chair
Stocker, N.	Boreal Silviculturist, OMNR, SSM, ON	Presentation
Towill, B.	NWST, OMNR, Thunder Bay, ON	Joint Presentation
Woods, M.	PTAU, OMNR, North Bay, ON	Participant
Zakreswski, V.	Research Scientist, SDTB, FRS, OFRI, OMNR, SSM, ON	Participant

I had a quick look at the presentations attached and noted that for presentation A7 the graphs on pages 43,44,45,46 were not very clear, might want to see if there was some way of improving their resolution.

Deleted: Management Staff, CEC-CFS-OMNR-TEMBEC FRP

APPENDIX C: WORKSHOP AGENDA

Title: *IFM Impacts on Allowable Cut Workshop*
Date: November 1st AND 2nd, 2000
Location: Canadian Ecology Centre, Mattawa, Ontario.
Organization Committee and Co-chairs: Dr. Peter Newton, Al Stinson and Scott Jones.
Invited Keynote Speakers: Dr. Thom Erdle and Dr. Darwin Burgess.
Facilitator and Logistics: Guy Smith, Paula Konka and Canadian Ecology Centre Staff.

Objectives of the Workshop: (1) To examine a suite of plausible IFM techniques that could be used by Tembec to increase the AAC, principally via the ACE, without compromising sustainability and future fiber quality; and (2) given (1), To benchmark the knowledge base pertaining to these plausible IFM treatment suites and identify knowledge gaps.

Wednesday, November 1st, 2000

Central themes: (1) Introduction, scope and statement of objectives and major issues pertaining to plausible ACE-based IFM treatment suites given Tembec's forest management objectives, productive forest land base, and economic, social, policy and regulatory constraints; (2) IFM treatment suites within the Boreal forest at both the stand and forest levels including case studies in (i) scaling stand level IFM treatments to the forest level, (ii) coniferous responses to vegetation and density management, and (iii) modeling approaches; and (3) given (1) and (2), discussion on the linkage and applicability of IFM treatment suites from Tembec's perspective.

08:30	Introduction and Welcoming Statements	Jones
	Introduction and Setting the Stage	
08:40	Tembec's Goals and Expectations	Bruemmer
09:00	Tembec's Operations and AAC	Mutchmor
09:30	Forest Level Effects of Stand Level Treatments	Stocker
	Boreal Theme	
10:30	Forest Level Effects of Stand Level Treatments	Erdle
11:30	Vegetation Management Effects on IFM	Bell & Pitt
13:00	Assessing the ACE of IFM with SFMM	Arlidge & Davis

13:30	Response of Jack Pine to Density Regulation	Bowling & Towill
14:30	Stand Density Management: Decision Support Tools for Use in Black Spruce Management	Newton
15:20	Lowland Black Spruce: Role of CLAAG and HARP	Groot
15:50	**Discussion of Boreal Theme**	Smith
19:30	An Introduction to the Forest Research Partnership Website	Smith

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Day 2: Thursday, November 2nd, 2000

Central themes: (1) Density management within white pine stands, (2) uneven-aged hardwood management involving stocking control, regeneration, quality and vegetation management, and (3) given (1) and (2), discussion on the linkage and applicability of IFM treatments from Tembec's perspective.

Great Lakes - St. Lawrence Theme

08:00	Introduction and Welcoming Statements	Jones
08:15	Increasing Productivity in the Great Lakes - St. Lawrence Forest Region	Burgess
09:00	Red Oak Regeneration	Batchelor
09:30	Productivity Increases in Hard Maple and Yellow Birch	Anderson
11:00	**Discussion of Great Lakes - St. Lawrence Theme**	Smith
13:00	**Boreal Summary**	Erdle
13:30	Discussion	Smith
14:00	**Great Lakes Summary**	Burgess
14:30	Discussion	Smith
15:00	Summary, Next Steps and Action Items	Newton
16:00	**Adjournment**	Jones

APPENDIX D: WORKSHOP EVALUATION

Criterion	Ratings (%)				
	Very Good	Good	Average	Poor	Very Poor
Workshop Facilities	20	60	20	0	0
Meals and Accommodations	80	20	0	0	0
Speakers	60	30	10	0	0
Relevance of Topics	50	30	20	0	0
Overall Value of the Program	40	60	0	0	0