WORKSHOP PROCEEDINGS

sustainable forest management network

réseau sur la gestion durable des forêts

Stakeholder Perspectives and Research Strategy Framework

Intensive Forest Management Workshop
June 11-12, 1999
University of Alberta
Edmonton, Alberta

A Network of Centres of Excellence
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SFM Network - IFM Research Umbrella

Stakeholder Perspectives and Research Strategy Framework

First Approximation

Prepared for --

SFM Network - IFM Research Umbrella

University of Alberta

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TABLE OF CONTENTS

TABLE OF CONTENTS

Continued

EXECUTIVE SUMMARY

The Sustainable Forest Management Network recently broadened its mandate to include consideration of intensive forest management (IFM) as a topical area for research to address the impacts on ecological function and the maintenance of other values of the forest. Some feel that intensive forest management is an inevitable response to a diminishing forestland base and subsequent reduction in annual allowable cut. Others feel that intensive forest management, if applied intelligently, will allow the current over-capacity of mills to be satisfied and, at the same time, alleviate pressure on forestland, which could then be allocated to other uses or reserves.

The question that the Intensive Forest Management Research Umbrella plans to address is concerned with the impacts of IFM on ecosystem function as it relates to issues such as biodiversity, wildlife, soil processes, and so on, relative to natural disturbance regimes and current day forest operation practices.

The team of Keith M. McClain of the McClain Forest Company Ltd. and Keith Jones of R. Keith Jones & Associates was engaged to prepare an IFM Research Framework to guide the initiation, scoping, and implementation of the research program. The approach taken was to conduct a series of telephone interviews of industrial partners, research providers and associated groups to gain an appreciation of perspectives on intensive forest management, information needs, directions for research, concerns, and expectations. The findings were reviewed and synthesized into eight common themes. Many interviewees held the opinion that there is an immediate need to consider the many ecological, social and economic issues surrounding the implementation of intensive forest management. There was also recognition that with the implementation of intensive forest management, tradeoffs will be necessary and these will have to be weighed against to what is socially and biologically acceptable. The TRIAD approach to land allocation for specific use (intensive forest management, extensive forest management, protection forest) was offered as a construct to help visualize how IFM might be implemented on the landscape. Scale is an important issue in planning for the implementation of IFM, and modeling to forecast forest and landscape level impacts will be an important tool to assist forest managers to evaluate various management scenarios.

This and other information provided the basis for the development of a Framework used to guide discussions during a Workshop presented on June 11 and 12, 1999, at the University of Alberta. The purpose of the Workshop was to develop, through special presentations, breakout sessions, and plenary discussions, a first approximation of a Research Strategy Framework for the IFM Research Umbrella.

The Research Strategy Framework presented here depicts the scope of IFM research of the SFM Network: goals and objectives, supporting architecture, processes for delivery, implementation sequence and pertinent recommendations. These elements were derived through breakout and plenary discussions. Three goals were accepted, each with specific time-bound objectives. Of immediate concern to the Research Umbrella is the task of defining the extent of current knowledge of IFM. In this regard, industrial and research collaboration will be important in setting research direction and priorities. Research conducted will be targeted to the achievement of specific IFM Research Umbrella goals and objectives.

SFM Network - IFM Research Umbrella
Stakeholder Perspectives and Research Strategy Framework

First Approximation

Introduction

The Canadian boreal forest is vast, representing nearly 75% of all inventoried forestland in Canada[1]. It stretches across Canada and in some provinces, such as Alberta, it is the predominant forest type. In the past 20 years there have been numerous symposia dealing with issues surrounding its management, and because of its diversity in species composition, sites occupied, productivity and industrial development, it remains the subject of intensive research. Recent interest has expanded to include broad topics such as ecological biodiversity, ecological integrity, forest health, economic and social considerations, and procedures for ensuring, through monitoring and adaptive management, that these values are sustained over time. Indeed, this objective, which is not unique to the boreal forest, is largely in response to global recognition of the need to enhance understanding of ecological processes in order to sustain them, while deriving varied economic and social benefits.

In this regard, the SFM Network is directing its efforts at implementing multidisciplinary research aimed at achieving its mission of ensuring the preservation of ecological function and biological diversity of Canada's boreal forests[2]. Moreover, research activities are directed at improving the nation's economy through the acquisition of new knowledge and the integration of existing information to support the development of innovative technologies for sustainable forest management and biological conservation. At the same time, research will be responsive to broad questions related to the operational challenges of the forest industry, which, if not addressed, could negatively affect long-term community well being.

A healthy forest industry is a profitable forest industry. Remaining healthy has much to do with implementing cost-effective operational practices, as well as being responsive to the public's need to be assured that forests are being managed sustainably and that public values are being maintained.

Boreal forestland is under intense pressure to provide multiple values (forest products, mineral extraction, recreational opportunities, wildlife, clean water, wilderness experience, opportunities for cultural expression and aesthetic landscapes, and so on), while at the same time providing a basis for local and provincial economies. The dilemma facing us is that, while we embrace the precepts of sustainable forest management as measured by CCFM criteria and indicators (Canadian Council of Forest Ministers, 1995[3]), we find it necessary at the same time to withdraw land from the working forest landbase or modify practices and reduce certain outputs such as AAC and recreation. Reduced outputs are often seen as necessary in order to implement

1 Anon. 1986. Canada's Forest Inventory. Forestry Canada. Minister of Supply and Services Canada. 60p.
2 Anon. 1999. The Sustainable Forest Management (SFM) Network. (http://www.biology.ualberta.ca/sfm.hp/sfm.web/main_e.html)
3 Anon. 1995. Defining Sustainable Forest Management: A Canadian Approach to Criteria and Indicators. Canadian Council of Forest Ministers, Ottawa. 22p.

strategies that incorporate the rights and interests of First Nations, and to ensure that forest conservation and biological diversity are maintained. Under these circumstances, the forest industry may lose flexibility in planning and foregoes certain opportunities.

However, provincial strategies are now being considered and even adopted to embrace co-ordinated efforts to increase forest productivity across the landscape. These actions and supporting policies will provide the flexibility required by forest enterprises to address public needs and respond to development opportunities. However, efforts in this direction cannot be undertaken with disregard for the fundamental need to ensure that ecosystem function remains intact and that all values are acceptably maintained.

Sustainable Forest Management Network

The original approach adopted by the SFM Network was along disciplinary lines. However, consideration of the advantages and synergy created when research is conducted across disciplines provided the basis for the SFM Network to work toward the implementation of highly integrated research programs that reflect the collaborative approach to problem solving. "Legacies" now provide the context of the SFM Network in this regard:

Legacy 1: Understanding Disturbance

Legacy 2: Strategies and Institution for Sustainable Forest Management

Legacy 3: Life Cycle Impacts of Wood Fibre processing

Legacy4: Highly Qualified Personnel

Legacy 5: Partnerships

Understanding the ecology of natural disturbance of the boreal forest and the contributions made by human activity is essential if we hope to devise forest management regimens that emulate these patterns and lessen the extent to which ecosystems are impacted. Contemporary views are that there is a purported advantage to aligning forest management practices with natural disturbance regimes. For example, Ontario presently provides policy and legislative direction[4] to support such management. However, the hypothesis that harvesting can emulate natural disturbance regimes has not been adequately tested. Johnston (1996)[5] contends that distinct differences might occur between natural disturbance regimes and the conditions created by harvesting; for example, from the standpoints of regeneration (seed banks), soil chemistry, and soil temperatures. Nevertheless, as research elucidates the similarities and differences between natural disturbance regimes and harvesting and their associated impacts on ecological diversity and function, thresholds of human disturbance can be postulated and used to guide forest management activities.

[4] Anon. 1994. Crown Forest Sustainability Act. Bill 171. (Bill to amend the Crown Timber Act to provide for the sustainability of Crown forests in Ontario. Legislative Assembly of Ontario, Queen's Park, Toronto, Ontario. 37p.

[5] Johnston, M. 1996. Can harvesting emulate natural disturbance in boreal mixedwoods? pp 155-157. In: C. R. Smith and G. W. Cook (eds.) Advancing Boreal Mixedwood Management in Ontario: Proceedings of a Workshop. Natural Resources Canada & Ontario Ministry of Natural Resources. Sault St. Marie, Ontario.

Legacy 2 complements Legacy 1 by providing strategies for securing the protection of biodiversity, and at the same time providing opportunities for social and economic development through the creation of innovative planning and modeling tools. There is fundamental acceptance in the forestry community of managing within the range of natural ecological variability that is both socially acceptable and ecologically feasible. However, managers find themselves in a position of considering intensive forest management regimens in the face of land withdrawals, as well as the need to enhance production to justify capital expenditures and decrease the amount of unused mill capacity. Enhancing forest productivity is seen as a legitimate option within the natural disturbance paradigm (Legacy 1) to mitigate the effects of fibre loss to forest industry and accompanying social and economic impacts. Several Canadian provinces embrace the concepts of enhanced forest management (Alberta[6]) or intensive silviculture (Ontario[7, 8]), and are working toward increasing forest investment and activity without forfeiting the fundamental basic tenets of managing sustainably. However, many ecological, economical and social questions still need to be answered.

Intensive Forest Management Research Umbrella

Based upon the premise that intensive management will be variably practiced within the boreal forest and that this represents an alternative to current and "new forestry" practices, the SFM Network recognized the importance of broadening its mandate to accommodate consideration of intensive forest management. But in keeping with the SFM Network focus of understanding natural disturbance ecology, the Intensive Forest Management Research Umbrella is weighted to considering the impacts of intensive forest management practices on broader forest values rather than on procedures for increasing wood yields *per se*. Ecological, social and economic components of sustainable forest management will provide the broad basis for developing pertinent questions about the implementation of intensive forest management. In support of this direction, the SFM Network adopted (May, 28, 1998) the following working definition to define the scope of Intensive Forest Management research:

> ***…to study the effects on patterns and processes at the organism, stand and landscape levels of the improvement of fibre production via intensive forest management practices compared to natural forest disturbance as well as current forest management practices. (This program will be integrated with other programs in intensive forest management[10].***

More recently, a background paper sketched out a possible operational context for the IFM Research Program[9]. It suggested it was inevitable that some intensively managed forest areas will be developed within the boreal forest, giving rise to, but not limited to, the following key questions:

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6 Anon. 1999. An Implementation Framework for Enhanced Forest Management in Alberta. Alberta Environmental Protection, Lands and Forest Service. 6p.

7 Anon. 1999. Principle to Practices to Products: A discussion paper. 3p.

8 Anon. 1999. 1999 Ontario Forest Accord — "A Foundation for Progress". Ontario.

9 Macdonald, S. E. 1999. Sustainable Forest Management Network (SFM-NCE), Intensive Forest Management Umbrella: Vision and Plan for Development of the IFM Research Program. Department of Renewable Resources, University of Alberta. 3p.

i. *What are the impacts of IFM on biodiversity and ecosystem function at the stand and landscape levels?*

ii. *Can intensively managed areas serve any role in the natural disturbance paradigm and in preservation of biodiversity?*

iii. *How much area should be devoted to IFM, and how do we want that area distributed on the landscape? What increases in volume yield need to be realized in order to compensate for potential reduction in yields associated with ecosystem management practices in extensively managed areas, or with the establishment of conservation areas?*

iv. *What are the economic and social impacts of IFM and how do we come to terms with the trade-offs if forest areas are zoned by level of management (i.e., intensive management, extensive management, and land reserves)?*

Towards the Development of a SFM Network - IFM Research Strategy

The acceptance of Intensive Forest Management Research as a member umbrella of the SFM Network created the need to plan for its successful implementation. Existing documentation suggests variance exists in opinion as to what the operational character and breath of the IFM Research Umbrella ought to be and what scale it should focus on. Well-formulated research in pursuit of understanding and new knowledge is paramount in finding solutions or partial solutions to real problems within the context of management. However, it must not be assumed that upon completion of research, management problems will automatically disappear. If only parts of real problems are solved, integration of pieces of information must occur and be applied, monitored and evaluated. Success can be expected when the manager and researchers collaborate to achieve the desired result.

The Need for an IFM Research Framework

The defined scope for IFM research (page 3) clearly describes the approach to be taken by the IFM Research Umbrella. In turn, a research strategy was deemed necessary to effectively and to efficiently support the achievement of IFM research goals and the mandate of the SFM network, while being responsive to the needs of its industrial partners. The basic elements of the research strategy framework provide for:

i. Context and scope of the IFM research program

ii. Goals and objectives

iii. A set of guiding principles

iv. Identification and assessment of priorities

v. Architecture in support of governance; program delivery (governance, advisory committees, processes, and so on); application (transfer); performance

management; and communication (industrial partners, scientific community, and the public).

vi. Implementation and management of program

The Approach

The approach taken to development of the IFM Research Strategy Framework is portrayed in a "road map" which illustrates processes and components (Figure 1). Initially, information was solicited from SFMN - IFM partners (university and industrial) and key stakeholders (46 in total) through interviews and e-mail responses (questions and interviewees are listed in Appendixes A and B, respectively). A review of selected literature and SFM Network perspectives on the topic of IFM was also conducted. Gleaned from the interviews were some guiding principles and constructs, opinions of an organizational nature, and thoughts on what the program's goals and objectives ought to be. In addition, variable definitions of intensive forest management and thoughts on the scope of the IFM research program were also obtained.

This information provided a basis for discussion during a subsequent two-day Workshop held on June 11-12, 1999[10]. The Workshop Agenda (Appendix C) called for the presentation of background information, a summary of interview themes (Appendix E), statements regarding information need (Appendix G), and special topics and reports from associated programs. To initiate the process based upon available information and understanding, a *pro forma* IFM Research Strategy Framework was constructed (Figure 2).

During the Workshop, breakout sessions were conducted which focused on the cornerstone components proposed for the IFM Research Strategy Framework.

[10] List of attendees appears in APPENDIX D

Figure 1. "Road Map" depicting the process taken to develop a Research Strategy Framework for the IFM Research Umbrella.

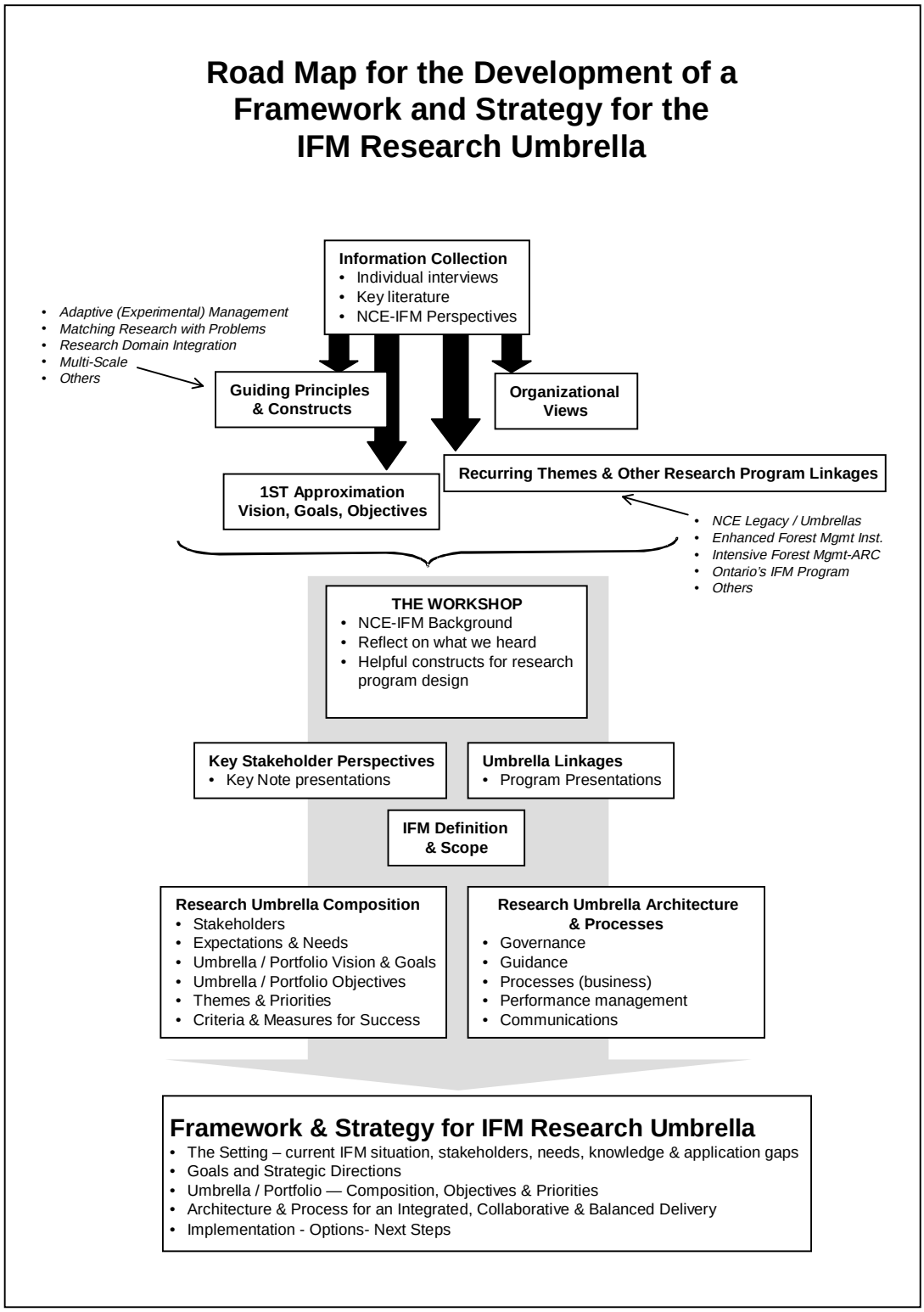
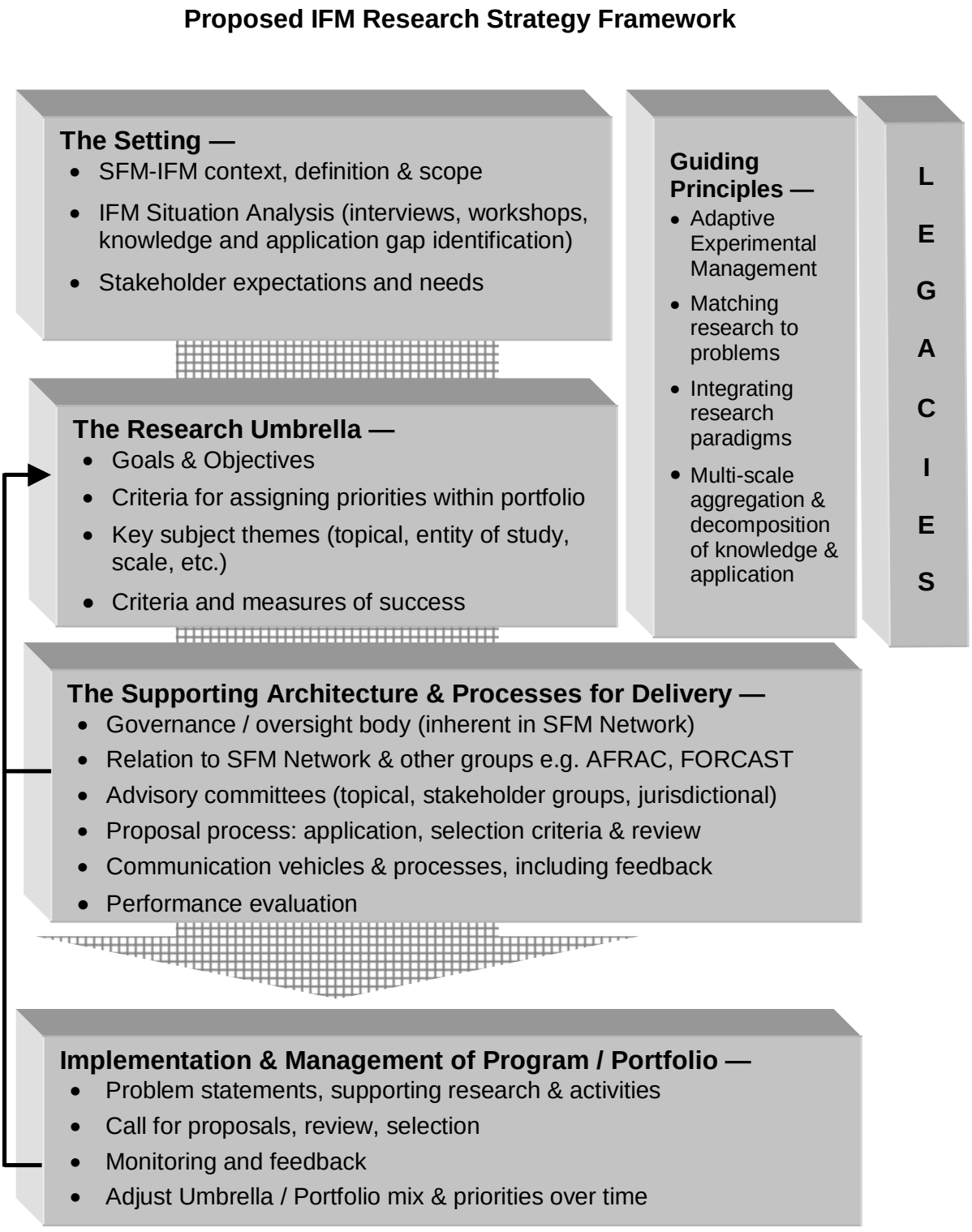


Figure 2. *Pro forma* IFM Research Strategy Framework showing five components and guiding principles for the SFM Network IFM Research Umbrella.



Collectively, the interviews and Workshop outputs served to expand on the four components of the IFM Research Strategy Framework. The four components included the following:

The Setting
- *Definition, scope, stakeholders, expectations*

The Research Umbrella / Portfolio
- *Goals and objectives, priority setting, measures of success*

The Supporting Architecture & Processes for Delivery,
- *Governance, processes, project selection, communication*

Implementation & Management of the IFM Research Umbrella / Portfolio
- *Problem statements, call for proposals, selection, monitoring*

The Setting

Synthesis of Interviews

Although there were unique elements in each interview, there was a surprising commonality in major issues. These commonalties were incorporated into themes (Appendix E) and are reflected in the following synthesis.

Current Understanding and Context of IFM

A successful research program is one that is based on asking the right questions and matching the research with problems. Baskerville (1993)[11] suggests that it is of paramount importance that there be a match between research (to address information and knowledge gaps) and the issues / problems. Indeed, Baskerville further supports the notion that it is imperative that during periods of limited funding, the most research impact in terms of usable solutions for real problems, especially those with long-term implications in the forest, ought to be a priority. Too often, research is not found to be useful because neither the scientist nor the practitioner took the necessary time and effort to arrive at an operational statement of the problem. It is likely that this problem will be compounded further when there is no common definition of what it is we are concerned about, for example, intensive forest management and its impacts.

Interviews with stakeholders confirmed that there is no commonly-held definition of intensive forest management. Many respondents defined IFM by first indicating that it depends on what the regulatory requirements are or what is normally done. Once predicated, the definition of IFM was defined by default as anything above regulatory requirements or what was normally and routinely done. From the standpoint of some practitioners, spraying for vegetation control was considered intensive management. In some instances, planting with improved seedling conifer stock was also considered intensive forest management.

[11] Baskerville, G. L. 1993. Matching Research with Problems. Based on a presentation to the Partnership in Forestry Research Workshop, sponsored by the Committee of Forest Research Agencies, Sheraton Landmark Hotel, Vancouver, BC. June 15, 1993. 7 pp.

Despite what was perceived to be IFM, there was general acceptance that activities must occur within the context of long-term planning and coordination to achieve a desired outcome such as increased fibre yields. Moreover, intensive forest management was not to be undertaken for the attainment of a single forest value at the expense of other values. While careful planning may employ approaches such as ecosystem management there is no guarantee that all values will be maintained. Tradeoffs are inevitable.

Some interviewees felt that enhanced management was different than intensive forest management. Enhanced forest management was suggested as being *"greener, or is at least, perceived to be greener by the public than intensive forest management".* In one instance, it was expressed firmly that what is really desirable is "*the opportunity to be a good forest steward with the flexibility to address the issues of economic stability and social well-being of communities, while at the same time ensuring sustainability*". IFM / enhanced forest management should simply be, therefore, a degree of good forest stewardship.

Most representatives of forest companies expressed unequivocally that intensive forest management is necessary and will be reflected in future forest management plans. Issues of where and how to implement IFM are now being addressed, but their variable impacts on other values remain unresolved. Land withdrawals, "mill creep", risk management, and planned expansion all contribute to the decision to intensify forest management. A small number of forest enterprises whose land base is considered sufficient currently remain unconvinced of the need to employ intensive silviculture to increase fibre yields. Even with their extensive management approach, their present and foreseeable fibre requirements can be satisfied. However, there is recognition that the future will be different and the option to implement intensive forest management may need to be reconsidered.

Meanwhile, many questions remain to be answered. Appendix G provides a categorization of priorities that are variably consistent with the intent of the SFMN - IFM Research Umbrella to conduct research on the impacts of IFM activities on matters pertaining to sustainability. It is anticipated that many of the questions can be amalgamated into broad categories from which specific research problem areas can be derived and used to assist in strategic decisions regarding allocation of funding for research.

Of the many questions posed, that of how the landscape can be allocated by forest activity seemed to predominate. The Planning Group of the IFM Research Umbrella recognized the importance of this question, among others. It has been suggested that the TRIAD approach as proposed by Hunter and Calhoun (1995)[12] might be a plausible construct in which to consider the implementation of IFM. Hunter and Calhoun contend that all forms of land use have validity, as, for example,:

i. Intensive commodity production areas,

ii. Areas with little or no resource use by people except low-intensity recreation, and

iii. Areas in which modest resource use is allowed while ecological values are carefully protected.

[12] Hunter, M. L. and A. Calhoun. 1995. A Triad Approach to land-use Allocation. pp. 477-491. In: R. Szaro and D. Johnston (eds.). Biodiversity in Managed Landscapes. Oxford University Press.

Paramount to the TRIAD approach is the consideration of scale. At one extreme, a province or FMA can be partitioned into land use categories based on some criteria for stratification. On the other hand, intensive forest management may be implemented as a "continuum-mosaic" whereby a gradient in forest management intensity would occur across the landscape. While some form of land allocation may be necessary, the idea of a continuum was generally more tenable.

Using an analogy, IFM was described as "chocolate chips in cookie dough". That is to say, only some sites (the chocolate chips) would be targeted for intensive management (productive, close to mills, proximity of road infrastructure) while the surrounding area (the cookie dough) would be managed extensively or perhaps partially placed into reserves. This approach was also considered to be a very realistic approach to intensive forest management.

Regardless of how intensive forest management is viewed, there is unanimous opinion that landscape issues are important. Activities at the stand level aggregate into landscape impacts and in order to project these impacts, modeling will be an essential tool to assist the forest manager with decision-making. There is substantial support for the development or modification of existing modeling tools to aid in landscape-level planning that embodies intensive forest management.

The degree to which IFM is implemented should logically depend on site characteristics, mill location, access, unique ecological features, wildlife habitat, and other important values. With this form of land-use allocation, forest enterprises have the freedom to develop detailed management plans to achieve specific objectives across their licence area. Over the long term, intensive management areas can be alternated so as to avoid any perceived or real problems associated with "tree farming". It was emphasized, however, that before intensive forest management becomes "a way of life", dramatic changes with respect to the tenure system would have to occur. Security of investment was a key determinant that would keep many forest enterprises from making investments in intensive forest management. For a few others, the main issue was wood supply, in that without intensive management, long-term wood supplies could not be guaranteed to maintain mills and communities. From a research standpoint, interviewees agreed that many issues need to be addressed and that caution and deliberation were required to ensure that the best decisions are made to ensure cost-effective research. It was recognized that, as with any type of research, there are risks; not all research will lead to the solution of a problem. It was considered beneficial that the experimental adaptive management approach be considered to learn and implement intensive forest management.

While the role of First Nations was not considered in the development of the IFM Research Umbrella, they, as landowners, have concerns with respect to provincial support of intensive forest management. From a science standpoint there may be little concern, but with a management perspective there is a need to recognize prior rights and interests of First Nations at a time when forest land is allocated to specific use; for example, as proposed by the TRIAD approach. First Nations have fundamentally different views from industry regarding forest management. They are concerned with industry's need to "over-manage" the forest. The use

of herbicides and fertilizers, and the structural manipulation of the forest are a cause of concern for First Nations, as environmental and long-term impacts are not well understood. Although intensive forest management is not consistent with their philosophy of resource management (human use management), they recognize that there may be other forms of management that would be amenable to them in which they could participate as a partner.

As research is conducted, results implemented and operational practices improved, forest managers at large and the public and must be informed through an effective communication program. Indeed, such a program would serve as an important feedback mechanism to ensure that research remains focused on real problems.

Workshop Summary of Discussions and Conclusions

To provide additional depth to the discussion of issues for consideration in the development of the intensive forest management research strategy, a number of keynote discussion papers were presented covering the realm of the practitioner, the researcher and the collaborator. Each of the presentations is briefly summarized below.

Keynote Summaries

Our reality: "I need to use the outputs tomorrow".

Trevor Wakelin
Director, Fibre Resources
Millar Western Forest Products Ltd.

Mr. Wakelin provided an industry perspective from the standpoint of Millar Western. Industry faces many challenges including the real prospects of reduced fibre supplies, strong public opinion, the inevitability of natural disturbances from fire further exacerbating fibre losses, and the need to satisfy mill requirements. These challenges have prompted Millar Western to adopt a strategy that essentially focuses on increasing fibre yield within the context of landscape planning in a manner that emulates natural disturbance, maintaining biodiversity, and ecosystem integrity.

There is general recognition that increasing fibre yields does not result from single silvicultural activities, but through detailed forest management planning that involves many activities such as, protection, harvest scheduling, planting, and tending. It is recognized that some form of desired future forest conditions can be achieved only through thoughtful planning and implementation of silviculture. However, public values and needs, real or otherwise, have pushed industry to consider management approaches that are fully consistent with maintaining most, if not all forest values somewhere on the landscape (for example, within the designated forest management area). To support these approaches, new information and the refinement of existing information is required. Information needs include:

- Impacts of IFM (thinning, fertilization, weed control, and so on) on biodiversity, wildlife populations, habitat, fire risk
- Natural disturbance emulation

- Management regimens to obtain desired future forest condition encompassing biodiversity objectives
- Effective planning tools
- Global warming (act now, but what about tomorrow?)

Finally, there was recognition that the best opportunity for advancement, which provides for forest researchers to work on real problems, is to interact with forest practitioners on an ongoing basis. Practitioners need timely output that address their needs.

Viewpoints of First Nations

Jim Webb
First Nations Representative
Little Red River Cree and Tallcree First Nations

Mr. Webb provided an overview that expresses the belief that it is not forest management that we ought to be considering, but human use of the forest. Although a generalization, because exceptions exist, nearly 85 percent of First Nations live in the forest; of these nearly 60 percent live in the boreal forest. Here, they have no economic base, and in the face of failed government promises many natives have been forced on to welfare. The problem is growing as population levels are increasing and conditions, if not reversed, will lead to heightened tensions and discontent which could have serious implications for the forest industry. There appears to be hope, however, with recent court rulings that require First Nation input into planning processes and the utilization of forest resources. There is the belief that the forest industry is larger than it needs to be, and under current rates of utilization the forest cannot be sustained. Recent losses due to fires suggest that current management systems are not working.: Clearly, the social and economic ramifications of forest activities need to be reconciled. Indeed, a system is required that provides an opportunity for involvement as well as a means to promote First Nation values. Consideration of intensive forest management as an approach to managing forests heightens the need to strike a realistic and workable balance.

The Alberta Advantage? - fibre - environmental and economic trade-offs.

Harry Stelfox
Provincial Wildlife Ecology Specialist
Alberta Environmental Protection
Natural Resources Services

Mr. Stelfox alluded to the Regional Sustainable Development Strategies and Detailed Management Plans as establishing the context and long-term goals and strategies for intensive forest management. Operationally, these documents provide direction for, and agreement on, the general layout for types, amounts, and locations of intensive forest management over a given time frame. The Alberta Forest Conservation Strategies and the Alberta Forest Legacy document support the idea that forest land can be managed incorporating a range of intensities of use: facility / infrastructure areas, intensive management areas, extensive management areas and protection areas. Mr. Stelfox listed a number of important areas of concern related to the following:

1. Landscape level planning as an input to sustainable forest management,
2. Aggregation of practices *vs.* dispersion of practices,
3. Rational approach to management: intensive today, extensive tomorrow,
4. Spatial distribution of intensive management activities: are they site-determined; what are the long-term implications?
5. The classification of intensive forest management practices based on their potential to alter the range of natural variability of ecosite types; could this classification be used to guide the implementation of intensive forest management?

Mr. Stelfox concluded with a statement that forested landscapes would be increasingly subjected to modification by forest management. Forestry in the north is relatively immature relative to development in southern Alberta, but knowledge gained there and elsewhere will provide a valuable roadmap to planning for issues that we already recognize as likely to be contentious, such as biodiversity and ecological integrity.

Financial Perspectives on Intensive Forest Management

Glen W. Armstrong
Department of Rural Economy and Renewable Resources
University of Alberta

Dr. Armstrong was very clear in his first statement that time is expensive and that at the stand level, intensive forest management is a bad investment. However, the need to sustain yield and the opportunity to take advantage of the allowable cut effect (ACE) will encourage IFM. Several examples using different rates of return were given to substantiate these statements. There are certain opportunity costs associated with investing in intensive forest management. Policy was recognized as having a significant influence on what actions are taken, but it should be the desired future forest that should guide the development and implementation of silviculture strategies, not the lure of increased AAC. The reality of the situation, however, is that there is excess mill capacity and IFM / ACE is the only viable option, unless it seems that the provincial public is willing to reduce its economic and social expectations.

Application, precision, realism, trade-offs.

John Spence
Professor, Biological Sciences
University of Alberta

Dr. Spence addressed the issues of research after Levins, 1966. Dr, Spence suggests that:

- Armchair ecologists sacrifice realism;
- Applied ecologists sacrifice generality; and

- Population biologists sacrifice precision.

Within the context of establishing an intensive forest management research program, trade-offs are inevitable. This stems from the expectations of practitioners and scientists regarding their respective needs. As described by Livens (1966) and later by Baskerville (1993), most researchers need to match the conduct of their research to the needs of the practitioner. In doing so, precision is sacrificed for general applicability and functional realism (a usable solution). This may satisfy the need of the research to ensure sufficient precision in data. However, unless there are appropriate trade-offs between researchers and practitioners, it is likely that the system under consideration will have changed, thereby necessitating new information.

Scaling up, scaling down

Steve Cumming
Renewable Resources
University of Alberta

Dr. Cumming provided his thoughts on being able to move from stand level considerations to the landscape level by means of modeling. By way of example, Dr. Cumming pointed out that we are concerned with the growth of trees, the treatment of stands and the scheduling of events that affect the landscape. All of this occurs with the bounds provided by policy and provincial objectives. It is what we do at the stand level, over time and in space, that has an effect on landscape elements. It was Dr. Cumming's suggestion that IFM research concentrate on those activities that introduce new landscape elements, in other words, those with no natural analog. Not all treatments applied create new types of stands, so for efficiency and the opportunity to obtain new information, specific criteria ought to be developed to assist in prioritizing research.

When scaling down, we often run into the problem of calibration. In some instances, the application of radical treatments exceeds our ability to model. Modeling, therefore, may sometimes fall short of expectations. Planned experimentation is required to supplement these information needs. The practitioner should be involved at this stage to help define information needs. In sum, models need to be developed, or existing ones modified, to assist in evaluating the impact of stand treatments on tree growth and on cumulative effects at the landscape level.

Definition of IFM within the context of forest management planning

Gordon Weetman
Faculty of Forestry
University of British Columbia

Dr. Weetman made it abundantly clear that enhanced forest management is about neither the effects of intensive silviculture practices on stand level structure and function, nor about the social and economic tradeoffs between treated stands *vs.* more protected stands. Instead, enhanced forest management is about how to plan, in time and space, the forest management actions of harvest scheduling, harvest allocation, silviculture, and protection to produce the desired future forest with a residual AAC that meets societal goals. Reliable information on all aspects of forest dynamics, corporate goals, and social goals is required to develop possible

future scenarios that eventually feed into the development of forest management plans. In the face of rising needs and multiple values, the question arises of how much silviculture is enough. The boreal forest is not an attractive silviculture investment (c.f. G. Armstrong), but it does work— for example, in Sweden— but at what cost?. Dr. Weetman illustrated his point with an example of timber revenues (1996 statistics) from BC, Alberta, Ontario and Quebec. His analysis indicated that only in coastal BC were revenues sufficiently high to warrant investment ($10,000 per ha, Alberta $1,800; Ontario $1,200; Quebec $475 per ha). The message is that low volumes and low value of pulp provide little revenue for intensive silviculture and enhanced forest management.

Dr. Weetman concluded by saying that there need to be greater efforts directed at both co-ordinating the understanding of forest management planning, and the place of intensive silviculture within the realm of enhanced forest management. In support of this effort, information needs to be carefully evaluated, articulated, and acted upon. Policymakers have much to do with the success of achieving sustainable forest management, and it is incumbent on them to participate in the development of a solution.

Centre for Enhanced Forest Management

Victor Lieffers
Renewable Resources
University of Alberta

Dr. Lieffers described recent activities associated with the establishment of the Centre for Enhanced Forest Management at the University of Alberta. The main purpose of the Centre will be to conduct research into ways that wood production can be increased using systems that sustain the productive capacity of the land. Initial emphasis will be placed on silviculture / tree biology, forest nutrition, and forest genetics / tree improvement; in the future, the program will be extended to forest growth and yield, and forest management planning. The core group presently includes Dr. Lieffers, with additional contributions to be made from a Junior Chair position in silviculture and a Tree Improvement professor. Weldwood Canada Ltd. and Weyerhaeuser Canada Ltd. currently provide industrial support to the Centre. It is the intention of the Centre to fully participate in the activities of the SFM Network.

Activities of the Alberta Research Council

Dave McNabb
Manager, Forest Resources
Alberta Research Council

Dr. McNabb briefly described the activities of the ARC, and first and foremost indicated that their program is client-driven and focuses on outcomes. Technology transfer represents a major portion of their work: geomatics, remote sensing, and humane trapping. ARC has a broad range of expertise available in the area of forest resources and presently has long-term projects underway in ecological modeling, biodiversity, and regeneration. ARC is prepared to collaborate in the IFM Research Umbrella as a provider of research / information.

Ontario's Interest in IFM

Dave DeYoe
General Manager
Ontario Forest Research Institute
Sault Ste. Marie, Ontario

Recent policy changes and programs in Ontario have prompted the Ontario Ministry of Natural Resources to consider intensive forest management options in a manner that encompasses the cornerstones of sustainable forest management, while at the same time considering target specified forest products (in other words, management with purpose and products in mind). Dr. DeYoe presented four main points in his discussion in support of this direction:

1. Scale: three broad scales can serve as a guide for the formulation of research hypotheses concerning intensive forest management namely, tree / site, stand / forest and landscape;
2. Measures of sustainable practices: current criteria and indicator provided by the CCFM are not well-suited to test the sustainability of site-specific intensive silviculture practices. Thus, there is an opportunity to integrate research of sustainable intensive forest management practices with the development and testing of indicators;
3. Designer forests: there is a need to fully explore the range of products that can be derived from managed and unmanaged forests (food, health products, eco-tourism, timber-related products);
4. Industrial partners: partnerships are considered a prerequisite to success in future forest resource management. Ontario has identified three likely partners, but is not limited to FERIC, Forintek and Paprican. The broader the industrial partnership, the more diverse the investment portfolio, and the more dynamic the program.

Dr. DeYoe suggested that demographics will play a significant role in structuring the future and that they should not be ignored when attempting to forecast the desired future forest.

Definition and Scope of Intensive Forest Management

A synthesis of interview responses, keynote presentations, and discussions from the first breakout session provided the basis for the following definition of IFM for the IFM Research Umbrella:

> *The planned implementation of management actions such as protection, scheduling of timber harvests, stand regeneration and tending activities, in time and space, to meet specific management objectives related, but not exclusively, to increased fibre production.*

It is unlikely that this definition will suit every stakeholder or management situation, but implicit in the definition is that intensive forest management regimens would be weighed against expected economic outcomes (investment value) and management objectives that embody all values

(such as fiber, wildlife, biodiversity, water, recreation, aesthetic values, and cultural opportunities).

With the essence of the above definition in mind discussion on the scope of intensive forest management research included matters pertaining to scale, issues, and research direction. While it was recognized that detailed management planning considers operational activities at the stand level, it was important to consider future forest conditions at the landscape level. However, before this could be considered, basic understanding how forests respond to intensive forest management would be required. At present there is a dearth of good information on the growth and yield of forest associations, habitat types and changes in biodiversity over time relative to various management regimens. These information gaps need to be filled before operational activities could be scaled up to the landscape level.

Amidst the various regulatory frameworks that either facilitate or restrict the implementation of intensive forest management, the question arose as to where exactly it should be practiced, how, and for how long? These questions lead directly to issues of social, economic, and biological trade-offs that might be anticipated, as well as the question of where the efforts of the IFM Research Umbrella could be most effectively placed. When considering this matter it was clearly accepted that the "wheel does not have to be reinvented". For much of the evaluation of the impacts of IFM on issues of sustainability, reliance can be placed on existing knowledge. However, immense value is also gained when research efforts are focussed on practices, which have no natural analogue and are likely to make a significant mark on the landscape. Such a focus would be expanded by questions related to global changes that might affect intensive forest management. Anticipation of these impacts could be postulated through scenario planning exercises.

Stakeholders and Expectations

Efforts to identify the stakeholders for IFM research resulted in a list that is all-encompassing (Table 1). However, the immediate stakeholders of the IFM Research Umbrella are the owners of the land, the research providers, the research receivers, and the local public. Each category has specific expectations of the research program, and these need to be clearly defined.

Table 1. List of stakeholders identified during Breakout Session.

Stakeholders	
Publics • Canadian • Present generation • Future generation • International Communities • Forest-dependent • Non-forest dependent • Non-first nations boreal communities Governments – regulators-enforcement, MLA/MPs, others • local • provincial • federal Sectors • Energy • Agriculture Other consumptive users Non-consumptive users	Land owners • Government • First Nations • Woodlot association members Researchers • University-based • Government (provincial, federal) • FAO-like organizations Technical transfer Consultants Forest Industry Environmental NGO's Forest product consumers (Canadian & International) Certification Groups • ISO, FSC, others Interest groups • Public • Environmental groups • Tourism & recreation

Governments and the local public: Collectively, government regulators and the general public need to be assured that the implementation of IFM is within the range of ecological tolerance / acceptability, and that social and economic impacts promote community well-being. It is clear that all groups, unequivocally, do not want the productive capacity of the land base to be jeopardized, nor do they want intensive forest management implemented to the extent that other values would scarcely occur elsewhere on the landscape. Whereas government regulators require information to monitor and evaluate the effectiveness of industry to manage sustainably, the public needs to know that management on the landscape is science-based and that various values are being maintained. They also need the assurance that the biological system is not being damaged by intensive forest management.

Forest Industry: Forest managers are under public pressure to manage sustainably, and where intensive forest management is implemented on the landscape, the need for information regarding IFM impacts on biodiversity, ecological integrity, water, forest health,

aesthetics, and so on, . is great. The expectations of forest managers are for research providers to supply this information and assist with its interpretation for operational use.

Research providers: Research providers are located within universities, government, or independent research organizations. For most, if not all, researchers, the need to have research published in peer-reviewed journals is important for advancement and recognition. Therefore, there is resistance on the part of researchers to engage in research that would not lead to publishable material and the advancement of knowledge. On the other hand, researchers must consider their obligations to support the practical application of new knowledge in solving management problems. The burden that is often carried by researchers is the expectation of forest managers that all research results will be applied and will solve all problems. In reality, research from a single project frequently provides only part of the answer. Solving management problems usually requires the collation of other research, the creative integration of all information, and its application to solve the problem.

First Nations: As a landowner, First Nations have the expectation that they will be consulted and included in the decision-making process with respect to management of forest resources. Their need to be involved with management is real, as their communities depend on developing an economic base to support a growing population.

Non-consumptive users: Those that have a non-consumptive association with the forest have certain expectations that the forest landscape will be protected against destructive practices. It is important that management provides for social benefits and employment, while at the same time protecting some areas on the landscape from human intervention.

Forest-dependent communities: In a direct sense, forest dependent communities rely on wise decision-making by forest managers, and on the outputs of forest scientists. Science-based and traditional / expert knowledge decision-making provides the best opportunity of avoiding ecological mistakes that can eliminate jobs, decrease recreational opportunities, and destroy productive hunting habitat. Forest-dependent communities clearly rely on the best economic, ecological, and social information for their well-being.

To ensure that all stakeholders are adequately informed, communication of activities associated with IFM is a priority.

Goals and Objectives

The goal of the IFM Research Umbrella has been implicitly stated in the definition of the scope of IFM research (page 4). In keeping with this definition, members of the IFM Research Umbrella worked together to develop a series of goals that were consistent with this definition (Appendix I). From this plenary list, a final list of goals and specific objectives were identified as follows:

Goal 1: To understand the current state of our knowledge of IFM in primarily the temperate and boreal regions of the world.

Objective 1.1 *To characterize the extent of current practical application knowledge of IMF techniques, experiences and needs, through workshops, interviews, targeted tours, and so on; (prepare first draft as soon as possible).*

Objective 1.2 *To complete a series of incremental information statements (synthesized in the form of "White Papers", "literature reviews", and problem statements) that identify knowledge gaps and lead to a focused effort over the next 3-12 months (by Sept /99). Orientation of Statements: problem-opportunity; define the client -audience relationship. Prepare to develop a common level of understanding; can be used as a "prospectus" for future partners.*

Goal 2: To determine the effect of various IFM activities on biodiversity, fibre production and socio-economic factors, and how these activities compare to natural ecological processes.

Objective 2.1 *To identify or develop an integrating landscape model to examine trade-offs between key ecological, social and economic factors under different scenarios by year 2002 This model to be SFMN -centric.*

Objective 2.2 *Concurrent with 2.1, to design, adapt or develop a stand-level model to estimate IFM impacts, including biodiversity and fibre variables. Yield curves will be a key element.*

Objective 2.3 *Undertake a scenario planning exercise to identify alternative futures and knowledge gaps, and to set priorities for research. Carry out scoping exercise*

Objective 2.4 *Determine measurable features (indicators?) for the factors by the end of year one.*

Objective 2.5 *Design operation IFM trials / field experiments and obtain baseline measures by end of year two.*

Objective 2.6 *Implement operational IFM trials and measure response over time (ongoing).*

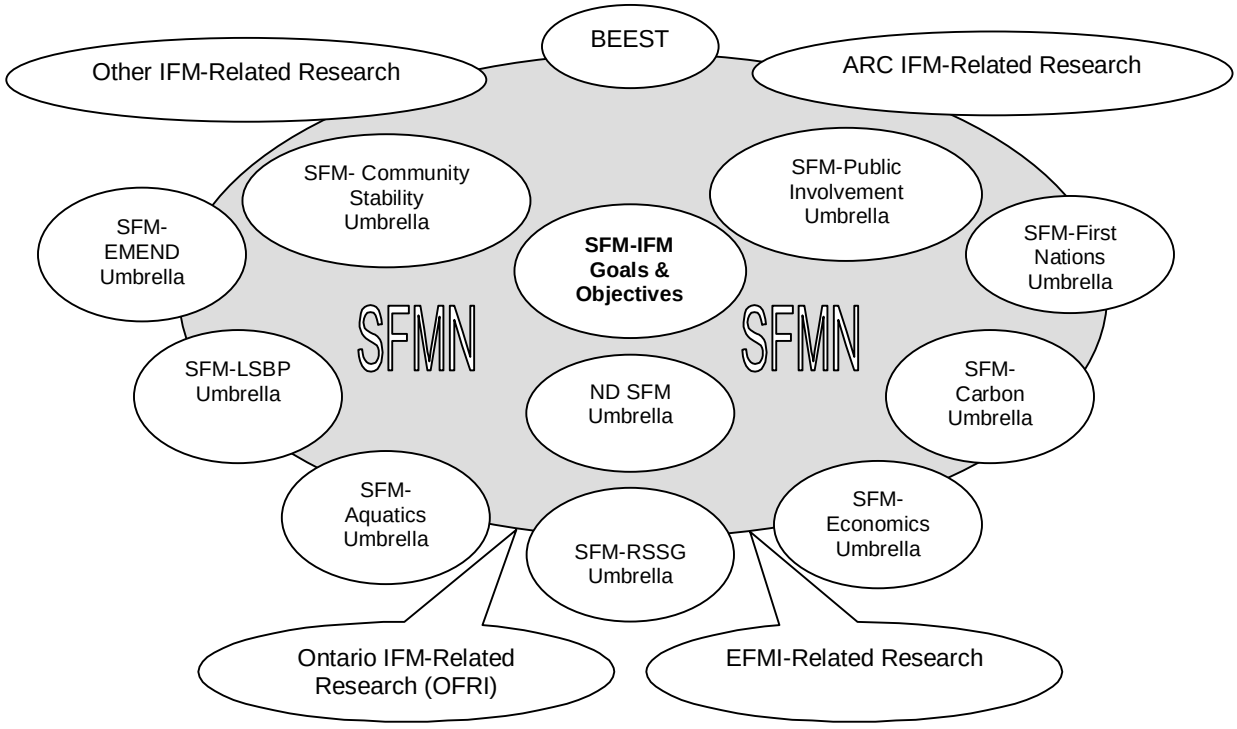
Objective 2.7 *Complete a scenario analysis using integrating models (a. natural conditions, b. complete IFM intensive, c. variations to be defined with key stakeholders).*

Goal 3: To ensure that there are appropriate linkages between the IFM Research Umbrella and other (SFMN) research initiatives to enable trade-off analysis, cumulative effects analysis, and to allow a scale-up to the landscape level.

Objective 3.1 To define and implement appropriate governance and/or advisory groups to ensure coordination within and outside SFMN within next year (Figures 3 and 6).

While each of the SFMN Umbrellas operates under their own mandate, none provides the full spectrum of results necessary to answer the myriad of questions related to the sustainability of boreal forests. Interdisciplinary research is necessary to address some of the complex issues and problems that have been proposed by the IFM Research Umbrella.

Figure 3. Portrayal of the SFM Network and its associated Research Umbrellas[13], and affiliated research groups and organizations. Achievement of IFM Research Umbrella goals and objectives will require interdisciplinary co-operation from within the SFMN, and with affiliated research organizations with similar interests and expectations.



[13] Key
BEEST - Boreal Ecology and Economic Synthesis Team
SFMN - Sustainable Forest Management Network
RSSG - Regeneration, Succession and Stand Growth
OFRI - Ontario Forest Research Institute
EFMI - Enhanced Forest Management Institute
EMEND - Ecological Management Emulating Natural Disturbance
ND - Natural Disturbance
LSBP - The Landscape Structure Biodiversity Project
ARC - Alberta Research Council

Guiding Principles

During the course of the interviews, it became apparent that there was a sincere desire on the part of many partners and researchers to develop and operate in interdisciplinary research teams. This was considered an excellent signal that prospective participants are eager to move forward and initiate the development of well-formulated and integrated research. Directly or indirectly, via interviews and the Workshop, several guiding principles were identified that could set the stage for further development of the IFM Research program (Appendix F).

Clearly, working in interdisciplinary research teams provides the greatest opportunity to develop synergy and develop creative solutions to real problems. Often, disciplines fail to collaborate on problems or appreciate opportunities that other viewpoints / technology may provide for solving problems (Jones, 1994[14]). The initial challenge is, however, to be able to match real problems with research (Baskerville, 1993, footnote 11). When research fails to provide answers to operational questions, it is usually a result of the researchers and the practitioner failing to jointly articulate the problem within an operational context. Meaningful and continual communication is required from the outset if research is to match real problems.

As research is designed, its properties become an important question. Dr. John Spence alluded to this matter in his presentation during his keynote discussion (also refer to Levins, 1966[15] and Baskerville, 1994). The three properties of research include generality of application, functional realism, and the precision of expression. What is sought by a scientist in the pursuit of knowledge (precision) is not usually adequate for operational problem solving (generality of application). All three properties cannot be satisfied simultaneously for either the researcher or the practitioner in pursuit their respective objectives. Solving operational problems requires that functional realism and generality of application be favored over precision of estimate. In solving operational problems, the experimental adaptive management approach provides opportunities to balance research activities with field effect studies. In this way, the approach can engage both the manager and the researcher in the design of studies at a management scale. Hence, with the study being at the management scale, the research is more immediately amenable to landscape-related questions as well as TRIAD allocation questions.

Measures of Success

Inasmuch as the mandate of the SFMN is to contribute to the sustainability of boreal forests, it is paramount that research activities (within the Research Umbrella and its projects) individually and incrementally contribute to the achievement of this goal. As the research program is implemented, it is important that it remain adaptive. Research progress must be subject to monitoring and evaluation and directions changed if required. To facilitate this process, acceptable criteria or measures of progress are required.

Measuring the extent to which sustainability of boreal forests is augmented by research will be difficult to assess directly. Research that assists forest managers in providing for the

[14] Jones, R. K. 1994. Site classification: Its role in predicting forestland responses to management practices. pp 187 - 218. In: W. J. Dyck, D. W. Cole and N. B. Comerford (eds.). Impacts of Forest Harvesting on Long Term Productivity. Chapman & Hill, London.
[15] Levins, R. 1966. The Strategy of Model Building in Population Biology. Amer. Scientist 54:421-431.

maintenance of conditions that reflect sustainability as per the CCFM criteria and indicators—. biodiversity, soil and water quality, habitat forest productivity, and the like —may be deemed successful. From the standpoint of the forest practitioner, knowledge, understanding, and tools are required to develop management regimens to progress toward sustainable forest management. Similarly, research that provides useful knowledge / technology, understanding, and tools toward this end can be deemed successful[16]. Other criteria of success can be developed and each should be considered within the context of stakeholder expectations.

Supporting Architecture and Processes for Delivery

Matching Research With Problems

The success of the IFM Research Umbrella will depend on a number of important factors. Organizational structure for the selection of desirable research is one of these factors. Amidst the desire of scientists to undertake research in support of the IFM Research Umbrella, there is a danger that unless the research is specific and targeted to the IFM goals and objectives, the needs of key stakeholders will not be met efficiently, nor will coordinated progress be made toward sustainable forest management of boreal forests. This situation would likely occur if a general request for proposals (the "shotgun approach") were issued with the hope that some of the project proposals would address the needs of the IFM Research Umbrella.

Recognizing this, an organizational structure is proposed that will allow the IFM Research Umbrella to ensure that funded research is directly aligned with its goals and objectives (Figure 6)

Processes of Delivery

Figure 6 illustrates the IFM Research Umbrella as having clearly defined goals and a series of objectives for each goal. The goals and objectives are developed in common amongst the stakeholders and researchers (pages 12-13). These goals and objectives can then be used to construct a matrix of specific needs based upon priorities as defined by stakeholders. The matrix provides the context for the development of "Requests for Proposals" (RFPs). Each RFP is unique in that it defines for the prospective researchers the objectives that must be met and the deliverables achieved. This puts the onus on the IFM Research Umbrella to have a clear understanding of what is required for it to achieve its mandate through its goals and objectives.

[16] Based upon discussions during telephone interviews and Workshop.

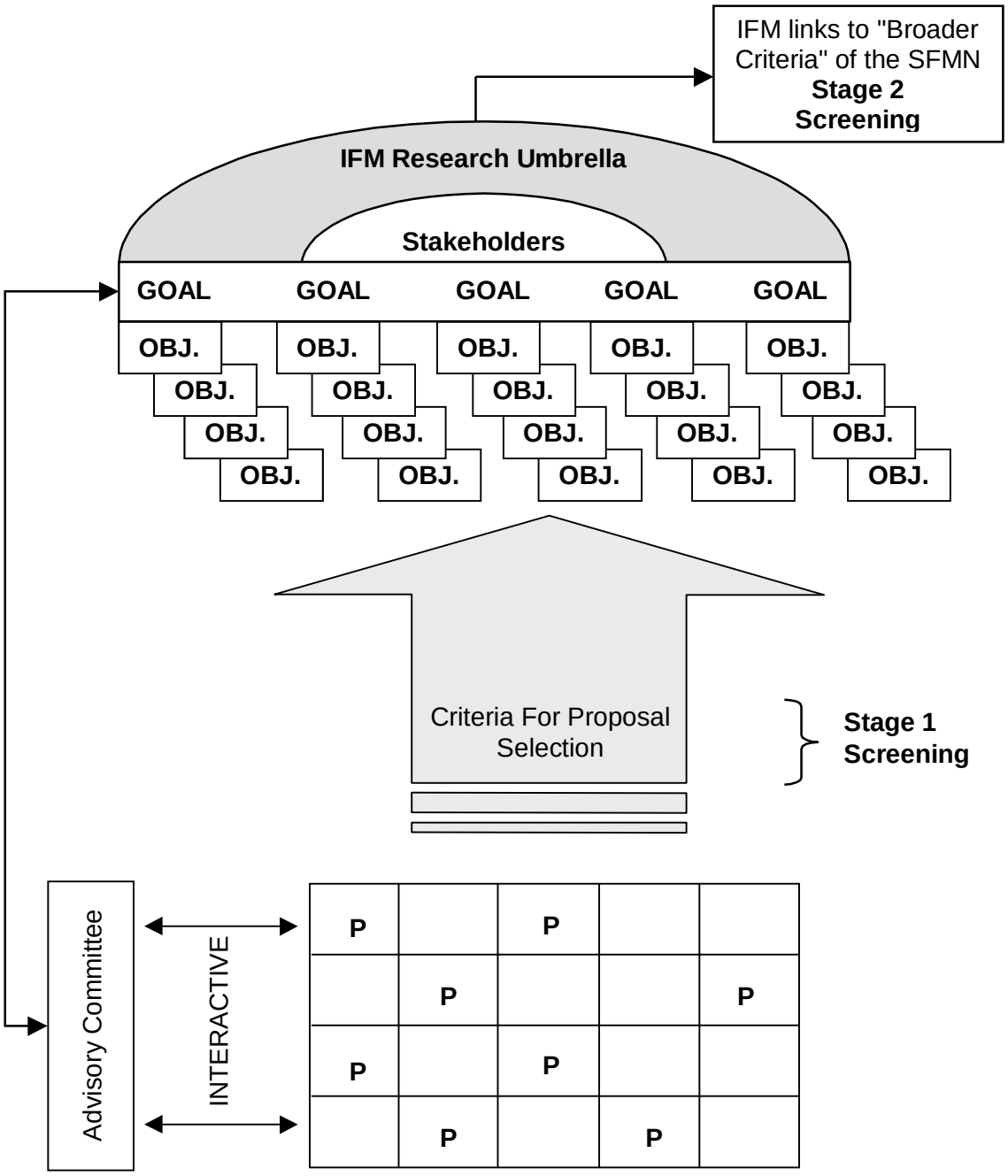


Figure 6. Organizational structure proposed for the IFM Research Umbrella to ensure that the needs of the Umbrella, as defined by the Goals and Objectives Matrix, are addressed by targeted research projects. An Advisory Council will provide support to the IFM Research Umbrella at the SFMN level and advise on directions for future research.

To this end, it is recommended that an Advisory Committee consisting of industry and government partners (industry, fish and wildlife, forest service) be struck, with terms of reference to carry out the following:

- Provide direct interactive input into the process of assigning priorities to goals and objectives;
- Evaluate research proposals based upon a set of predetermined criteria (Stage 1 Screening); for example:
  - *Relevant to goals and objectives*
  - *Lack of redundancy (other SFMN and non-SFMN research)*
  - *Position in critical path (need X before you can do Y, Z)*
  - *Is it interdisciplinary?*
  - *Linkage/integration with other research groups*
  - *Partnership opportunities*
  - *Focus on practices which are likely to occur, likely to have an impact, don't have natural analogues*
  - *Opportunity for success is high*
  - *Cost effectiveness*
  - *Strong, integrated group (s)*
  - *Integration/collaboration of scientists and clients*
  - *Ability to leverage resources (people, time, dollars)*
  - *Scientifically sound*
  - *Communication plan*
  - *Student involvement (SFMN criteria)*
- Ensure research proposals are interdisciplinary and take advantage of interagency opportunities;
- Provide support and recommendations to the SFM Network for the approval of research proposals; and
- Other functions, as required, to support the achievement of IFM Research Umbrella goals and objectives and progress toward sustainability of northern boreal forests.

The number of goals and objectives roughly defines the number of RFP's that could be prepared, but priorities and limited funding will limit the actual number issued and projects accepted. In order to ensure that *value for dollar* is obtained multiple proposals for the same RFP should be sought from agencies capable of undertaking the work. It is worthwhile at this juncture to note that the team approach was a widely accepted format for conducting IFM Research. This approach would facilitate the SFMN goal of interdisciplinary research and provide opportunities of drawing upon a broader research base than would occur if the team approach was not used. An example of an interdependent, interdisciplinary work team is illustrated in Figure 7. Team members collaborate within the team structure as well as between team structures. Interaction allows for the flow of ideas and information and creates conditions for synergy.

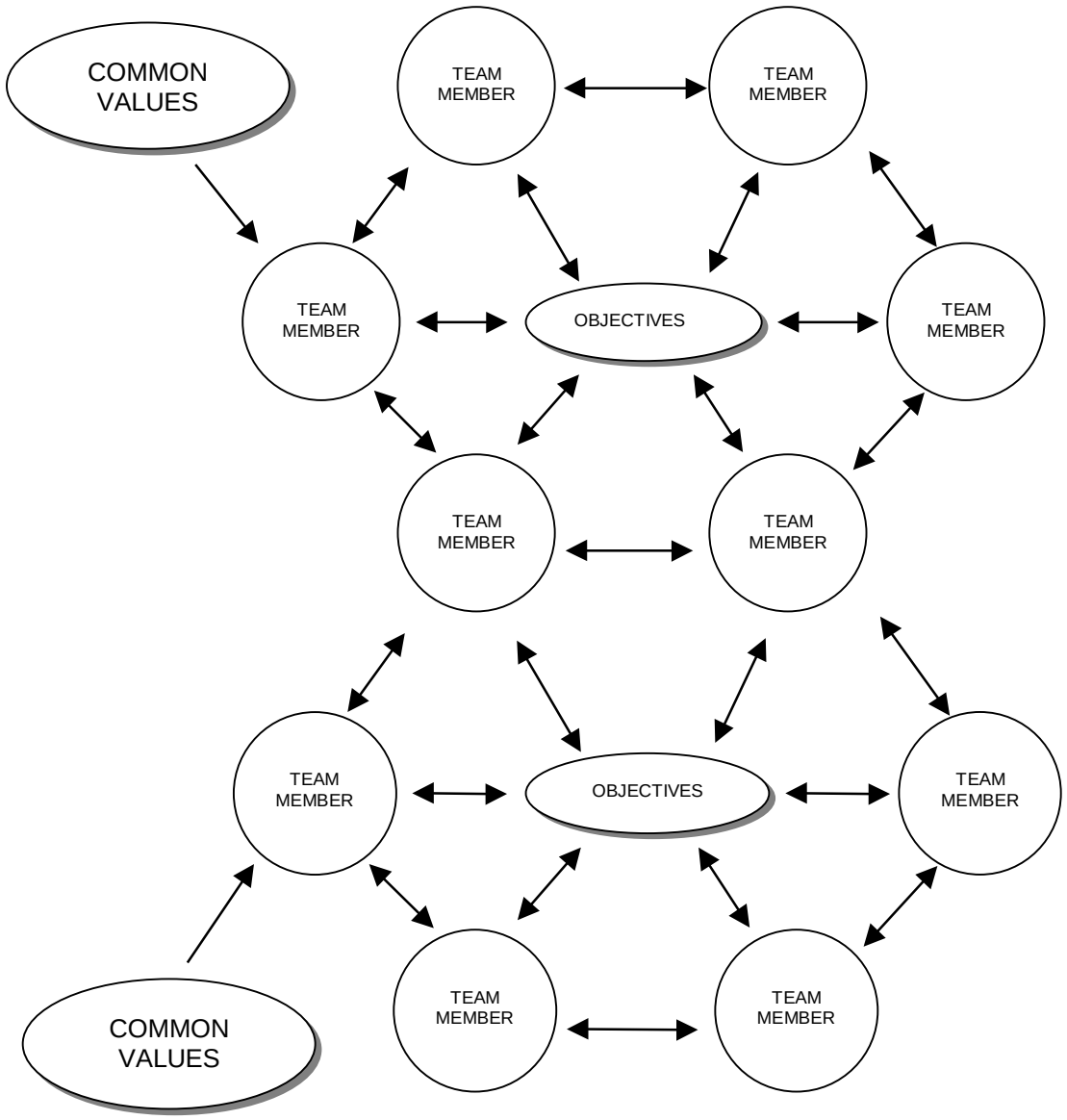


Figure 7 A self-directed team management model illustrating interdependence between two teams. Each team has a specific objective or research project to which team members apply their skills and expertise. In this example, the skills and expertise of two team members are shared between two research projects.

Communications

It is vital for a research program that promotes stakeholder involvement to have an effective communication plan. However, before a communication plan is devised, it is necessary to define the objective of communication and who is responsible for it. Once defined, the best vehicle and means to communicate can be determined. At the research level communication will occur in at least four forms:

- Peer communication;
  - *Research articles, discussions, scientific presentations, posters*
- Researcher to stakeholder communication (information, technology transfer);
  - *Verbal reports, annual reports, field tours, technical notes, operational advice*
- Administrative communication; and
  - *Biannual progress reports*
- Public communication.
  - *Presentations at general meetings, newspaper articles, interviews etc.*

The detail included in each form of communication will be dependent on whom the information is directed to, and the desired outcome. Each research proposal should have a detailed communication plan with emphasis on the stakeholder or industrial partner. The IFM Research Umbrella should have a communication plan, which would benefit by providing upward communication to the SFM Network. The frequency of communication will vary depending on the target audience and availability of new information.

Performance Evaluation

While there is general recognition of the need for performance evaluation, scientists strongly oppose frequent and detailed reporting requirements. There must be a defined purpose to make reporting a worthwhile endeavor. From an administrative standpoint, progress reports provide a monitoring function to indicate progress and to make changes if required. In this regard, reporting and evaluation would be done against objectives, predetermined milestones and outputs that are mutually agreed upon at the outset. The timing of reporting should be linked to milestones and funding deadlines. The SFMN currently has reporting and evaluating procedures in place.

Implementation and Management of Program

The foregoing discussion has provided important information relative to the four cornerstones of the IFM Research Strategy Framework (Figure 2). The challenge remains for the IFM Research Umbrella to proceed with the implementation of the program. Goals and objectives have been tentatively defined as well as early project activities. A structural context has been suggested to facilitate the selection of research projects and to ensure that research is matched with problems.

Key steps for the implementation of IFM Research Program

1. **Formalize and acknowledge the IFM Research Umbrella management team**
2. **Prepare Requests for Proposals by proceeding with problem statements (Goal 1)**
3. **Review goals and objectives**
   - *obtain acceptance from stakeholders; modify if required as per results of problem statements*
4. **Form Advisory Committee**
   - *Clarify terms of reference*
   - *Ensure members understand roles and responsibilities*
   - *Ensure acceptance by SFMN*
5. **Develop unambiguous criteria for proposal preparation, evaluation, monitoring and reporting**
   - *Ensure criteria are consistent with goals and objectives, and reflect shared expectations of researchers and clients*
6. **Prepare RFP's that reflect priority needs of the stakeholders (Fall 1999)**
   - *Include all pertinent information regarding how the proposal addresses particular goals and objectives (as per goal and objective matrix) within specified timeframes*
   - *Self-rate proposal against list of selection criteria (against which all proposal will be judged)*
   - *Indicate what aspects of the research are collaborative, multi-disciplinary and/or involve direct client participation. Provide requirements of the research to be conducted by the interdisciplinary team approach and other requirements such as student training*
   - *Technology Transfer plan — determine the anticipated forms of the research outputs and vehicles for its transfer, including the potential use of intermediary agencies, companies, and individuals*
   - *Communication plan*
7. **Review submissions**
   - *Rank and select proposals based on criteria, comparing applicant's self-rating with reviewer's rating*
   - *Recommend adjustments to proposal and or funding of SFM Network*
8. **Monitor research**
   - *Evaluate performance based on milestones and in relation to success criteria*
   - *Implement changes as required*
9. **Adjust IFM Research Umbrella portfolio as required**
10. **Evaluate research against criteria of success**
    - *Assess stakeholder feedback using common criteria as reference for progress and value*
    - *Implement technology transfer initiatives including engagement of intermediaries, as required*

- *Effectiveness of change management in achieving desired objectives*

11. Communications

- *Formalize and implement communication activities inside and outside SFM Network*
- *Encourage partner research organization participation*

Recommendations

During the Workshop, it was pointed out that if several activities were undertaken forthwith, the delivery and overall effectiveness of the IFM Research Umbrella would be enhanced.

The mandate of the SFMN is to ensure the sustainability of the northern boreal forest. In support of this, communication of research results to stakeholders is recognized as an important function of the IFM Research Umbrella. However, if practices are to improve and sustainability is to be achieved, research results must be put into action, otherwise they remain only information. Research information must be incorporated into the process of technology transfer, where it is ultimately used to change a practice or create a new product. This is not a simple process; it is multifaceted and requires individuals to introduce information to those who might benefit from it. Information may first require testing in an operational setting that may lead to modification of operational procedures or identify the need for additional research. Once research information is acceptably adapted and converted to useful technology it can be adopted and regularly employed. Clearly, this is a time-consuming process that requires commitment, special skills, operational understanding, and creative aptitude. At the present time there appears to be a disconnection between industry expectations and researchers' views of their respective functions in this process of technology transfer.

Recommendation 1. *That the SFMN formally recognize the need for technology transfer for the successful achievement of their mandate of contributing to the sustainability of northern boreal forests.*

Recommendation 2 *That the SFMN designate funding to support a formal process of technology transfer that would facilitate the practical implementation of research results and transfer activities in a management context.*

Recommendation 3. *That the SFMN consider alternative intermediary parties to take the outputs of the IFM Research Umbrella and turn them into practical tools and transfer activities. The Alberta Research Council is especially suited for this purpose.*

At this fledging stage of development of the IFM Research Umbrella program, and since the SFMN is university-based, research will be largely carried out by scientists at the University of Alberta. With development of the program it is expected that research undertakings will be conducted by a growing number of universities outside Alberta whose interests include the

sustainable management of boreal forests. Furthermore, the IFM Research Umbrella has a unique opportunity to be the first of its kind to establish itself as a centre for intensive forest management research. The Province of Alberta, like other provinces, is facing wood shortages wrought by factors such as First Nations rights, need for land reserves, damaging fire history, and so on, and will ultimately require the province to embrace intensive forest management as a valid use of forest land. The alternatives would significantly impact forest- dependent communities and social programs that the public would like to see maintained.

> ***Recommendation 4.*** *That in recognition that IFM is a common topic across most, if not all, Canadian forest jurisdictions and therefore represents a good opportunity for the SFMN to show leadership in this area by coalescing available research talent and pool stakeholder-clients. Therefore, this science and research opportunity needs to marketed more widely to expand research partnership and NCE memberships and thereby increase resources. This effort will also help to reduce the strongly Alberta- and boreal-centric view of the problem and the subsequent solutions.*

The organizational structure that has been proposed to facilitate the implementation of the IFM Research Umbrella requires the establishment of an Advisory Committee, which in its formative months will require the support of all participants of the IFM Research Umbrella and the SFMN. The Advisory Council is seen as playing a pivotal role in ensuring that problems are matched with the appropriate research. In many respects, this could mark the start of a more formal science and research management system which formally links strategy, goals, and objectives to common criteria developed by the providers and receivers of research. Such systems can help to match expectations on all sides, thus making the decision-making processes more transparent and reducing the often onerous processes of application, review, progress monitoring, and reporting.

> ***Recommendation 5*** *That during the implementation of the IFM research program there be an objective evaluation of the process involving the newly formed Advisory Committee and its role in promoting a formal science and research management system.*

INTERVIEWEE: / email	CLASS:
INTERVIEWER: Keith McClain	DATE:

APPENDIX A

INTERVIEW QUESTIONS

1. What has been (is) your role in the SFM Network and interest in the IFM research umbrella?
2. What is your concept of intensive forest management and how would you define it?
3. Do you think that there will be a need to practice intensive forest management in the boreal forest?
4. What do you think will drive the need to initiate intensive forest management in the boreal forest?
5. Do you know of any examples of where IFM is being practiced in the boreal forest region?
6. Considering the definition that has been accepted for IFM Research and intended approaches, do you feel that it is too broad, to narrow, missed the mark or is appropriate. The definition is as follows:

> *The study of the effects on patterns and processes at the organism, stand and landscape levels of the improvement of fibre production via intensive forest management practices compared to natural forest disturbance as well as current forest management practices. This program will be integrated with other programs in intensive forest management*

7. What expectations with regard to outputs / outcomes do you have of the IFMR Umbrella?
8. If you had to develop a framework for intensive forest management research, what components (not a list of research topic, but topic like vision, goals etc) would you consider to be essential?
9. What would be your top 3 priorities for the IFMR Umbrella to accomplish
10. How would you like to see research carried out given that industrial partners consider themselves as one of the recipients of research results?
11. What would you do to promote effective ongoing dialogue with your industrial collaborator? How would like to see the industrial partner participate in this dialogue?
12. At what level (stand, forest, landscape) would you recommend to target resources and expertise.
13. What process would you use to assign priorities to the research opportunities that will be defined?
14. Do you feel that some form of *performance management* would be a valuable tool to use to ensure that value for dollar is obtained?
15. Concluding remarks.

APPENDIX B
Interview Contact List

Last Name	Title	First	Category	Affiliation	Prov.
Adamowicz	Dr.	Vic	Research	University of Alberta	AB
Armstrong	Dr.	Glen	Research	University of Alberta	AB
Baskerville	Dr.	Gordon	Key	UBC	BC
Bauer	Mr.	Jerry	Partners	Canadian Forest Products Ltd.	AB
Beck	Dr.	Jim	Research	University of Alberta	AB
Beck	Mr.	Dave	Partners	c/o Ainsworth Lumber Company Ltd.	AB
Bergeron	Dr.	Yves	Research	Groupe de Recherche en Ecologie Forestiére	QC
Blake	Mr.	Peter	Partners	Canadian Forest Products Ltd.	AB
Bousquet	Dr.	Jean	Research	Université Laval	QC
Boutin	Dr.	Stan	Partners	Alberta-Pacific Forest Industries	AB
Carignan	Dr.	Richard	Research	Université de Montréal Dep. sciences biologiques	QC
Coates	Dr.	Dave	Research	B.C. Forest Service	BC
Cumming	Dr.	Steve	Research	University of Alberta	AB
Dancik	Dr.	Bruce	Research	University of Alberta	AB
Donnelly	Ms.	Margaret	Partners	Louisiana-Pacific Canada Ltd.	MN
Dorion	Ms.	Françine	Partners	Abitibi-Consolidated Inc.	QC
Drummond	Mr.	Alex	Research	University of Alberta	AB
Duinker	Dr.	Peter	Research	Dalhousie University	NS
Fyles	Dr.	Jim	Research	Macdonald Campus of McGill University	QC
Greenway	Dr.	Ken	Research	Alberta Environmental Centre	AB
Hannon	Dr.	Susan	Research	University of Alberta	AB
Hebert	Dr.	Daryll	Partners	Encompass Strategic Resources	BC
Kessler	Dr.	Winifred	Research	University of Northern British Columbia	BC
Krygier	Mr.	Richard	Partners	Millar Western Forest Products	AB
Lieffers	Dr.	Vic	Research	University of Alberta	AB
Luchkow	Mr.	Steve	Partners	Daishowa-Marubeni International Ltd.	AB
Macdonald	Dr.	Ellen	Research	University of Alberta	AB

Last Name	Title	First	Category	Affiliation	Prov.
Mackay	Mr.	Darryl	Other	Vanderwell Contractors Ltd.	AB
MacMillan	Dr.	Bruce	Partners	Weyerhaeuser Canada Ltd.	AB
Mallett	Dr.	Ken	Partners	Canadian Forest Service	AB
McNabb	Dr.	David	Research	Alberta Environmental Centre	AB
Messier	Dr.	Christian	Research	Ministry of Forests	BC
Morgantini	Dr.	Luigi	Partners	Weyerhaeuser Canada Ltd.	AB
Munson	Dr.	Alison	Research	Université Laval	QC
O'Byrne	Mr.	Marty	Other	Environmental Protection Forest Service	AB
Paré	Mr.	Germain	Partners	Ministère des ressources naturelles du Québec	QC
Purdy	Dr.	Brett		Sustainable Forest Management Network	AB
Reid	Dr.	Mary	Research	University of Calgary	AB
Russell	Mr.	Jonathan	Partners	Millar Western Forest Products	AB
Scheik	Dr.	Jim	Research	ARC	AB
Schmiegelow	Dr.	Fiona	Research	University of Alberta	AB
Simard	Dr.	M. Gaétan	Partners	Cartons St-Laurent Inc.	QC
Spence	Dr.	John	Research	University of Alberta	AB
Stelfox	Dr.	Harry	Partners	Alberta Environmental Protection	AB
Stewart	Dr.	Jim	Partner	Canadian Forest Service	AB
Titus	Dr.	Stephen	Research	University of Alberta	AB
Todd	Mr.	Arlen	Partners	Alberta Environmental Protection	AB
Udell	Mr.	Bob	Other	Weldwood of Canada Ltd., Hinton Division	AB
Van Rees	Dr.	Ken	Research	University of Saskatchewan	SA
Vitt	Dr.	Dale	Research	University of Alberta	AB
Volney	Dr.	Jan	Partners	Canadian Forest Service	AB
Wakelin	Mr.	Trevor	Industry	Millar Western Forest Products Ltd.	AB
Ward	Mr.	Brydon	Partners	Alberta-Pacific Forest Industries	AB
Wearmouth	Mr.	Pat	Partners	Weyerhaeuser Canada Ltd.	AB
Webb	Mr.	Jim	Partner	Little River Cree Nation	BC
Weetman	Dr.	Gordon	Research	University of British Columbia	BC

APPENDIX C

SFM Network -IFM Research Umbrella

Framework Strategy Workshop

June 11 -12, 1999

University of Alberta
Room CW - 410, Biological Sciences Building
University of Alberta

Time	Activity	Responsibility
FRIDAY **JUNE 11, 1999**		
8:15 a.m. - 8:40 a.m.	Welcome & Introduction NCE Overview & Context of the IFM Research Program The Workshop • Objectives & Expectations • Agenda overview	Ellen Macdonald Vic Adamowicz Keith Jones
8:40 a.m. - 8:55 a.m.	• Background - IFM Sub-committee Work • Initial Perspectives on IFM Research Program • Definition of the NCE-IFM – to start our thinking	Ellen Macdonald
8:55 a.m. - 9:30 a.m.	**Highlights of Interviews** • "What I heard you say about IFM" • Input for the IFM Research Framework	Keith McClain
9:30 a.m. - 9:45 a.m.	**Coffee**	
9:45 a.m. - 11:30 a.m.	**POSER Session** Expectations & Perceptions • Our reality: "I need to use the outputs tomorrow". *Trevor Wakelin* • *Viewpoints of First Nations on IFM. Jim Webb* • The IFM Advantage? — fibre - environmental trade & economic offs. *Harry Stelfox & Glen Armstrong* • Application, precision, realism, trade offs. *John Spence* • Scaling up and scaling down. *Steve Cumming* • Definition with in the context of forest management planning. *Gordon Weetman*	Keith McClain
11:30 p.m. - 12:00 noon	Questions / Discussion	

Time	Activity	Responsibility

12:00 p.m. - 1:00 p.m.	**Working Lunch: Associated Research Programs & Workshop Breakout Orientation**
	• **Other Initiatives**
	  • Enhanced Forest management Institute *Vic Lieffers*
	  • Intensive Forest Management - ARC *Dave McNabb*
	  • Ontario's interest in IFM – OMNR *Dave DeYoe*
	• **Information for Breakout Groups**
		K. McClain / K. Jones

1:00 p.m. - 2:20 p.m.	**Breakout No. 1** • Definition of IFM & Scope • Stakeholders of Research Program & Its Outputs • Expectations / Needs	K. McClain / K. Jones
2:20 p.m. - 3:40 p.m.	**Breakout No. 2** • Construct SMART objectives for achieving goals • Identify priority criteria, assign priorities to objectives	K. McClain / K. Jones
3:40 p.m. - 5:00 p.m.	**Breakout No. 3** • Architecture of IFM Program & mechanisms for effective delivery • Performance Management—criteria to measure our success in relation to expectations & needs	K. McClain / K. Jones

Saturday **June 12, 1999**		
9:00 - 10:30 a.m.	**Breakout No. 4** • Develop Framework • Identify components, elements & linkages • On the basis of the workshop discussions, conduct a mini-SWOT analysis of Research Umbrella	
10:30 a.m. - 12:00 noon	**Plenary session: Wrap-up** • Expectations and required actions to complete the framework & strategy	Keith McClain Keith Jones Ellen Macdonald
12:00 noon - 1:00 p.m.	LUNCH	

1:00 p.m. - 4:00 p.m.	**Concluding Session: Next Steps**
	• What we heard the stakeholders say
	• Research Framework implications
	• IFM Strategy Development including Implementation Plan — An Outline & Next Steps
	  • Organization
	  • Procedures for development of proposals
	  • Other immediate needs
		Ellen Macdonald

APPENDIX D
WORKSHOP ATTENDEES

IFM Research Strategy Framework Workshop
June 11-12, 1999

Last Name	Title	First Name	Affiliation
Adamowicz	Dr.	Vic	University of Alberta
Armstrong	Dr.	Glen	University of Alberta
Boutin	Dr.	Stan	Alberta-Pacific Forest Industries
Cumming	Dr.	Steve	University of Alberta
Drummond	Mr.	Alex	University of Alberta
Greenway	Dr.	Ken	Alberta Research Council
Hannon	Dr.	Susan	University of Alberta
Hebert	Dr.	Daryll	Encompass Strategic Resources
Krygier	Mr.	Richard	Millar Western Forest Products
Lieffers	Dr.	Vic	University of Alberta
Macdonald	Dr.	Ellen	University of Alberta
Mallett	Dr.	Ken	Canadian Forest Service
McNabb	Dr.	David	Alberta Research Council
Purdy	Dr.	Brett	SFM Network, University of Alberta
Reid	Dr.	Mary	University of Calgary
Salkie	Ms.	Fiona	SFM Network, University of Alberta
Scheik	Dr.	Jim	Alberta Research Council
Spence	Dr.	John	University of Alberta
Stelfox	Dr.	Harry	Alberta Environmental Protection
Stewart	Dr.	Jim	Canadian Forest Service
Titus	Dr.	Stephen	University of Alberta
Volney	Dr.	Jan	Canadian Forest Service
Wakelin	Mr.	Trevor	Millar Western Forest Products Ltd.
Webb	Mr.	Jim	Little Red River Cree Nation
Weetman	Dr.	Gordon	University of British Columbia

APPENDIX E

SFM - IFM Research Umbrella

INTERVIEW OVERVIEW : MAJOR THEMES

INTERVIEW PROCEDURE

- 10 TO 12 questions
- guide discussion - 46 interviews
- objectives were to provide:
- insights into the realm of IFM
- definitions
- why / should we implement
- how, where, concerns
- knowledge requirements, priorities

Synthesis & Use

- aggregate information into main themes
- determine commonalties
- perspectives needed for interpretation
- develop appreciation of probable direction
- priorities
- sense of how to do things
- framework approach

Themes: What I Heard …….1

- land allocation
- thresholds
- trade-offs / benefits
- social
- economic
- ecological
- urgency to get on with it
- caution

Themes: What I Heard……...2

- ecological considerations
- function
- integrity (structure, function)
- biodiversity
- what are we affecting?
- emulating natural disturbance
- need to link to growth and yield
- policy support & regulation

Theme 1
Let's Straighten Out the Landscape

- drivers
- industrial competitiveness
- growing for purpose, but
- what about the natural disturbance paradigm?
- can IFM be sustainably sustained?

Theme 2

- Working on the Right Stuff
- variable definitions
- decide what we mean (let's get on the same page)
- co-ordinate effort to match research to problems, but
- what are the real problems (practitioner directed, but in concert with researcher to develop the right questions)

Theme 3
Too Much – Bad, Too Little – Bad

- need / site determine extent
- where and how should IFM be practiced? TRIAD.
- Decision scenarios to help decide:
- employ as "chocolate chips " or
- as a continuum across the landscape
- close to mills / access

Theme 4
Manage The Forest, But Don't Break It!

- Public trust to safe guard the resource
- IFM is being done now (as per the variety of definitions)
- how far can we push the system?
- what are the thresholds?
- First Nations (traditional knowledge)

Theme 5
Where Have All The People (and the birds, bugs and bambis) Gone?

- restructuring has consequences
- biodiversity (species, structure, dynamics)
- trade-offs are important (social, economic, ecological, real costs)
- tenure reform is the answer
- better resource allocation

Theme 6
Can't Measure It ……..No Problem, We'll Model It

- application (organism, stand, forest, landscape)
- scale is an important issue
- integrate knowledge across disciplines
- start, develop hypotheses, test, extrapolate >>>>>>>> solutions

Theme 7

OK, Where to Now? See Theme 8.

- Recognition of the need for information, but what do we really need?
- Set the stage
- White Papers (all aspects of IFM), guiding documents, publishable
- What's going on now (inventory)
- document activity / response

Theme 8

Build On A Rock & Succeed - Build On Silt … Fasten Your Seat Belt

- plan (direction, implement)
- test drive, classification - practices by site
- evaluate, adapt, adjust
- communicate (members, public)
- sustain the interest amongst doers

Theme 9 Key Words

- need?
- partnership
- real problems
- communication
- collaboration
- biodiversity
- thresholds
- long term effects
- policy & regulations
- trade offs
- social economic
- where, how
- land allocation (TRIAD)
- start
- how to
- G&Y linkages
- lasting network

APPENDIX F

GUIDING PRINCIPLES

Working Together Produces The Best Results

Traditionally, it has been sufficient in the field of science to pursue one's endeavors in isolation. In forestry research, this has been common practice, but over the past decade there has been decidedly more collaborative research. One has only to look at the number of co-authored articles in research journals to confirm this statement. Working together clearly has advantages: it promotes synergy through discussion, provides insight into natural process and relationships from different perspectives, and may even spawn new ideas and opportunities for research. While working together within a field is helpful, it is equally advantageous for research teams to work across fields. One field can provide substantive material for the other field to consider, test, and develop, with the output again being input for yet another group to explore and develop. Finally, an integrative synthesis of information can be provided to support the resolution of complex problems, solution to which might otherwise evade scientists.

Jones (1994)[17] explored three research paradigms, site classification, empirical modeling, and process modeling, which collectively contribute to the prediction of the effects of management on forestland response. Jones explained that each paradigm brings with it a certain perspective on the nature of the problem by what they do best. Unfortunately, none of the groups has traditionally interacted except through the literature. Although research findings from each paradigm have contributed individually to the base of knowledge for the development of predictive tools, new opportunities to solve complex problems exist by integrating knowledge from all three paradigms (Figure 4).

The SFMN promotes interdisciplinary research, and indeed is encouraged to encompass outside agencies. Each discipline must bring its unique set of skills and technologies to bear on the problem. How these skills and technologies are applied within the context of specific problems and combined with the skills and technologies of other disciplines creates the conditions for the development of innovative solutions to complex problems.

[17] Jones, R. K. 1994. Site classification: Its role in predicting forestland responses to management practices. pp 187 - 218. In: W. J. Dyck, D. W. Cole and N. B. Comerford (eds.). Impacts of Forest Harvesting on Long Term Productivity. Chapman & Hill, London.

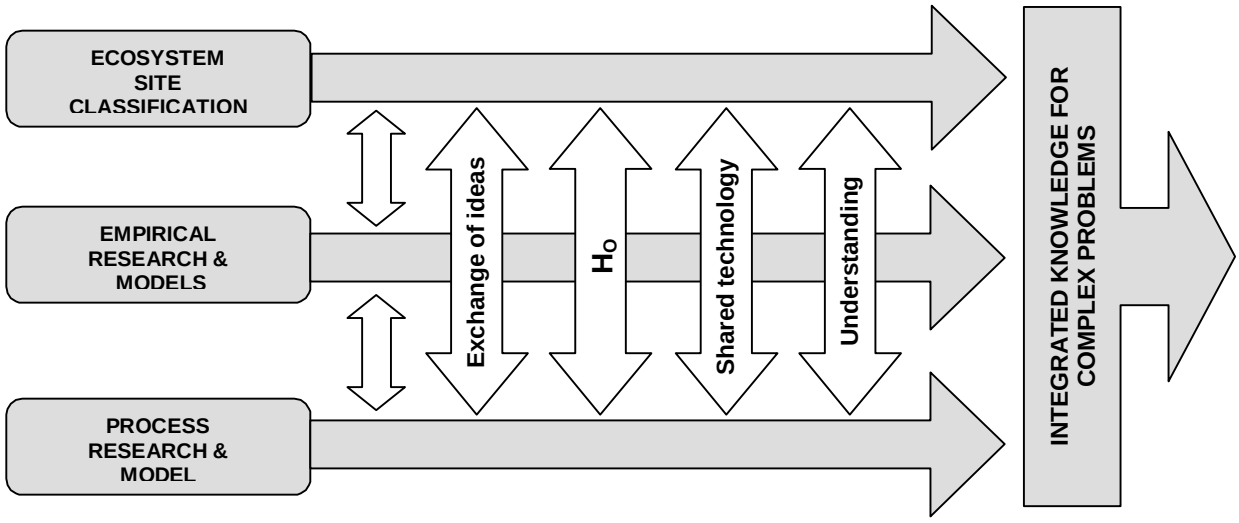


Figure 4. Stylized relationship of three typical research paradigms and the process of integration and resulting output to solve complex problems. (after Jones, 1994).

Matching Research With Problems

Although this topic was alluded to earlier, it is of such importance that we propose it be a central guiding principle for the IFM Research Framework. The basis for this principle is Baskerville's paper with the same title (refer to footnote 11). Baskerville (1993) articulated some of the pivotal issues related to matching research with problems. In a few words, matching research with problems comes down to people, communication, and understanding. There are basically two groups that are responsible for ensuring that research matches problems the researchers and the practitioner.

Baskerville describes both groups as rather insular. Practitioners are focused on the bottom line and when problems arise they need to act now. Rarely do they have the time to peruse the literature to obtain information on how best they may be able to solve the problem. Researchers, in a similar vein, work in an environment where it is possible to define the problem or develop a hypothesis to test without ever confronting the problem in the real form. And once the problem has been picked, researchers customarily conduct a review of the literature and proceed from there with their research. It is completed once results have been analyzed, reported upon and a publication prepared and published in a peer review journal. Astonishingly, much, if not all of this, is done without contact with the practitioner, who is ultimately supposed to use the information in its real world context.

Baskerville (1994) concludes by saying that making research match real problems requires clear / honest / blunt communication. Typically, however, each contends that they know what really is important, thereby relegating meaningful communication to generalities. Matching research to problems requires a number of steps to be taken (Baskerville, 1994):

i. Researchers need to talk to the practitioner with operational problems long enough and in sufficient detail to determine what incremental piece of science presented in what form could really help the practitioner;

ii. At the outset, practitioners need to be more forthright in their appraisal of the usability of results from proposed research, and they need to be more willing to devote the time necessary to reach with the researcher a practically appropriate trade-off amongst generality of application, functional realism, and precision of expression before the research is undertaken; and

iii. Communication between the two groups needs to be maintained.

As an outcome of continual dialogue, respect and trust can evolve along with clearer resolution of problems and a willingness to carry on in partnership to match research with problems.

An Appropriate Scale For Research

In the previous principle of *matching research with problems,* several issues were raised. Considerable importance in matching research with problems can also be attributed to the characteristics of research as originally proposed by Levins (1966)[18], and as interpreted by Baskerville (1994). Each model or research approach has three properties in relation to the subject area: generality of application, representation of functional realism, and precision of expression. In nature, these properties seem to be mutually exclusive. For any abstraction of nature, it is impossible to maximize simultaneously the generality of application, functional realism and the precision of expression (Figure 5). Depending upon one's standpoint, as a scientist or practitioner, one is likely to seek a niche within the triangle. The researcher who is judged upon scientific endeavors is likely to sacrifice generality of application and some functional realism in favour of precision of expression. The practitioner, who must apply solutions in the forest, has a different perspective on the same problem. The emphasis sought by the practitioner is practical, in which case precision of expression is given up along with some generality of application in favour of functional realism.

What we learn from the work of Levins (1966) and Baskerville (1994) is that researchers and practitioners have very different outlooks on the same issue from the standpoint of resolving problems. Interestingly, both the scientists and the practitioner are committed to seeing the problem resolved, the former by conducting science and the latter by using science to solve problems.

[18] Levins, R. 1966. The Strategy of Model Building in Population Biology. Amer. Scientist 54:421-431.

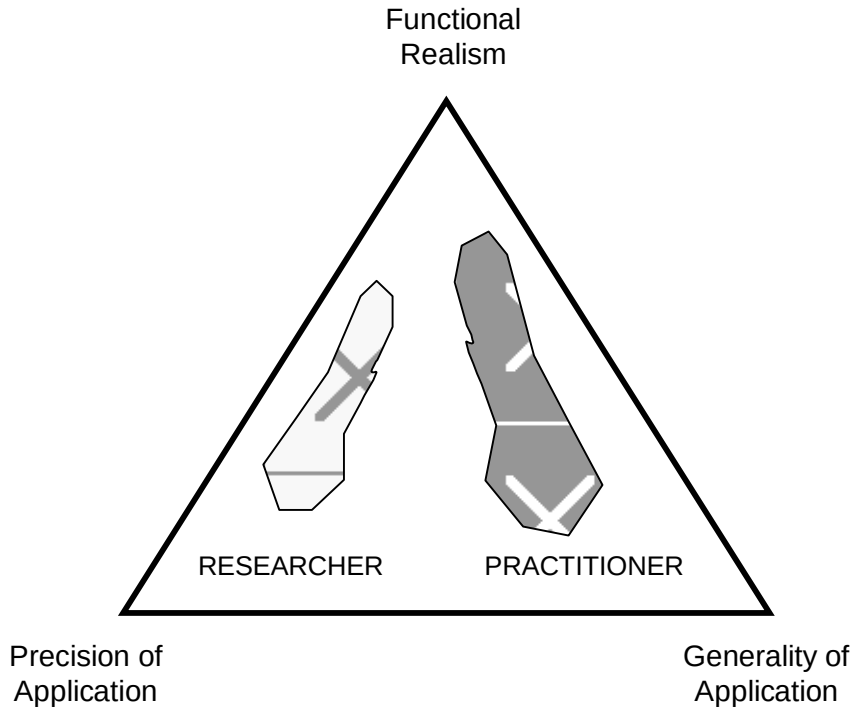


Figure 5 The tradeoff amongst the three properties of a good solution, as seen by researchers and practitioners.

Adaptive Experimental Management: A Framework For Achievement

Adaptive management is becoming more of an alternative in forest management given the uncertainties facing the forest manager. Adaptive management is somewhat of a blend of scientific research and resource management (Nyberg, 1998)[19]. Through observation and evaluation of the ways that human intervention affects managed systems, new knowledge is gleaned from system interactions and productive capacities. While adaptive management employs elements of science and experimentation, it has different goals than those of a research study. Scientists play an important role, but it is the forest managers that must take the lead role.

It is the uncertainty of today that requires managers to be adaptive. Rigid management planning without providing for the opportunity to change as new information reveals itself, is both impractical and unwise in a changing world. It is important that uncertainty be acknowledged, that desirable resource approaches be supported by policies, that careful planning be implemented with full knowledge of possible uncertainties, that monitoring of key

[19] Nyberg, J. Brian. 1998 Statistics and the Practice of Adaptive Management. pp 1-7. In: V. Sitt and B. Taylor (eds.) Statistical Methods for Adaptive Management Studies. Ministry of Forests. Land Management Handbook No. 42.

indicators be carried out, that outcomes be assessed relative to objectives, and that new knowledge be incorporated into future management decision-making.

Researchers have an important role to play in adaptive management by supporting the forest manager: data will have to be collected, analyzed and reports prepared. Working together, the researcher and forest manager will be able to bridge the gaps that so often exist. Apart from this, adaptive management also provides the context within which forest management can be applied in the form of hypotheses (for example, there is no reason to believe the stand development process will be different[20]), allowing research approaches to be tested at the stand and landscape level. Monitoring and feedback are key components to adaptive management and will allow for structured learning rather than managing by default. Feedback during adaptive management can lead to many fruitful opportunities for advancement, mainly from mistakes. In the words of Vilfredo Pareto (cited by Armson, 1984)[21], "Give me a fruitful error anytime, full of seeds, bursting with its own corrections. You can keep your sterile truth to yourself".

As we venture into the realm of intensive forest management with the need to ensure that ecosystem function and integrity remains intact, we will have to be adaptive in our approaches and application of science. There is much to be learned and having opportunities at the landscape level to learn will set the stage to promote sustained collaboration and enlightenment.

[20] Oliver, C .D. and B. C. Larson. 1996. Forest Stand Dynamics. (Updated Version). John Wiley & Sons. NY 520p.

[21] Armson, K. A. 1984. Reforestation and Research: some reflections. Address given at the 75th Annual Conference, Western Forestry Conference, Sacramento, California. December 3-5, 1994.

APPENDIX G

Categorized Priorities (Scope) Identified by Interviewees for IFM Research.

Seemingly Consistent	Seemingly Inconsistent
• What can be gained from implementing IFM? • What effect will IFM have on our forests? • What are the important landscape structures and how will they be altered by IFM? • How will IFM impact the dynamics of pest populations? • Will there be significant interactions between increased growth and pest populations? • How to evaluate the economic impacts of IFM • Broad scale analysis of landscape features and relate to values such as wildlife • Quantify impacts of IFM on a landscape basis • Review the conditions for social acceptability and include First Nation communities • Development of a classification framework for IFM and how the different activities will impact on the landscape • What are the stand level impacts from use of actions such as vegetation control • Asking the right questions is important re: scale, economics and social impacts • How can we approach zonation to make it work? • What are the impacts on soil? • How does IFM fit into the landscape re: genetics, silviculture interaction? • How is wildlife habitat impacted over the long run from IFM? • How are nutrient dynamics altered under IFM and do changes impact on ecological function? • What kind of maximum production can we expect by site type before the system breaks? • What do we really mean by impacts? • What role does adaptive management play in IFM? • Establish long-term study areas through out the province that will allow for greater applicability of results (see Levins, 1966 - McClain) • How much can the landscape be pushed	• Silviculture techniques to implement IFM? • Does the use of improved stock affect biodiversity? • Policy issues that affect IFM implementation • How much can yield be increased and what are the social benefits? • How to allocate land (a policy issue)? • How can IFM emulate natural disturbance? • How can the tenure system be modified to induce investment in IFM? • What needs to be done to get on the Johnson Yield curve? • What can be the array of incentives that the government can offer industry? • Orientations to when, where and how to implement IFM • Should government provide incentives and support, or opportunity? • Develop a practice procedure for zonation • What are the public perceptions of IFM? • Construct yield curves for various silviculture applications • IFM in the mixed woods, overlapping licenses • Growth and yield, definitions, policy • What are the upper limits of IFM? • We need to communicate more: with each other, with the public • The IFM Research Umbrella should play an advocacy role to help dispel myths about IFM • What are the implications to FMA's?

Seemingly Consistent	Seemingly Inconsistent
before values are lost? • What are the impacts if IFM is practiced in a dispersed and concentrated manner across the landscape? • Can we develop indicator species relative to IFM? • What are the impacts on biodiversity resulting from multiple entries? • Can we develop modeling protocols to allow us to project future outcomes? • Does plantation size have an impact on biodiversity? • Increase our knowledge about IFM at the stand and landscape level? Can we model these? • Is IFM sustainable? What are the scale issues? • What is the impact of climate change on forest productivity and how might IFM respond to possible outcomes? • Drivers – ACE (allowable cut effect), economic development • What are the "changes" that could affect IFM (fire suppression, etc.) and how should they considered	

APPENDIX H
WORKSHOP BREAKOUT # 1
SUMMARY

Definition of IFM

- Any investment designed to change fiber production; against what benchmark remains a question (beyond natural yield, regulatory framework of reference for that jurisdiction).
- Its about gaining control of the landscape
- Its about increasing fibre yields
- Planned events over time to achieve management objectives with respect to a future desired forests at various scale to achieve more fibre sooner

Scope of the IFM Research Umbrella

- Focus on practices which have no natural analogue, which are likely to make a significant 'mark' on the landscape
- Spatially-based landscape scenarios, sensitivity analysis
- Need good info going in: yield curves, habitat effects, landscape effects on biodiversity. Identify big info gaps: stand and landscape level effects of chosen practices on biodiversity
- Stand level information may be available – supplement, scale up to the landscape level
- IFM needs to be in the context of comprehensive forest management planning
- Socio-economic trade-offs, policy issues, integrated resource management, land tenure, landscape management – this is the level at which our efforts need to be applied. In what way can we make the best contribution – and make sure it's really linked to something substantive?
- Across the boreal forest – variable jurisdictional models, policy and regulatory frameworks – what are constraints to planning for sustainable forest management? And constraints to the planning scenarios involving IFM and to achieving EFM at the landscape level?
- Scale: small ok, but how big?
- What are the criteria for how much, where, for how long?
- Site selection: good sites or not? (social, economic, biological)
- Drivers – ACE (allowable cut effect), economic development
- What are the "changes" that could affect IFM (climate change, fire suppression, etc.) and how can they considered

Stakeholders

- Canadian
  - Public
    - present generation
    - future generation
  - forest industry (1)
  - aboriginal peoples (1)
  - forest-dependent communities (1)

- non-forest dependent communities
- government – regulators-enforcement, MLA/MPs, others
    - local (1)
    - provincial (1)
    - federal (2)
        - e.g., CFS
- environmental groups
- energy sector (2)
- agriculture sector (2)
- other consumptive users (1/2)
- non-consumptive users (1)
- private land owners
- woodlot association (2)
- tourism & recreation
- researchers (1)
    - university-based (1)
    - technical transfer (1)
    - consultants (1)
- International
    - Certification
    - Tourism
    - FAO-like organizations

- First nations
- Forest Industry
- Non-first nations boreal communities
- Taxpayers
- Other users of the forest (consumptive)
- Other users of the forest (non-consumptive)
- Environmental NGO's
- Forest product consumers (Canadian & International) (ISO certification)

- Government and First Nations are owners
- Industry
- Scientists
- Communities
- Public interest groups

Expectations and Needs of Stakeholders

1. Industry, government, public:

- how much IFM? (area, $investment)
- what IFM? (innovative techniques - intensity)
- where IFM?
- when IFM?
- concern for impacts on e.g., wildlife, biodiversity
- interaction between this land use and other land uses (cumulative impacts, trade-offs with)
- link to Carbon sequestering
- landscape level planning (fuel management)
- need for common language to communicate
- relevance, nature of "product" outputs
- on-going communication and transfer of progress
- industry will be able to drive the nature of the research being done

2. researchers

- need to publish in primary journals
- realistic understanding of workloads, time constraints
- continuity in funding support
- proposal and reporting process rigorous but not onerous
- appropriate patience for research outputs (not premature)
- need for scientists to pass research outputs to an appropriate and effective transfer intermediary
- maintaining an effective forum for interdisciplinary and provider-receiver environment
- need for an integration of projects
- need for more social science expertise

3. aboriginal

- have a role in IFM implementation (employment, economics)
- impact on traditional resource use and cultural values
- and much the same otherwise as industry, government and publics stakeholders

4. non-consumptive users:

- to ensure that there are appropriate protected areas (to be shown that there is an honest and trustful buy-in to the Triad process)

5. forest dependent communities:

- jobs
- hunting access
- recreational access and opportunities
- Northern communities: stability and economic growth
- First Nations: stability, but unique relationship with forest
- Urban communities: wilderness
- From IFM:

- What are risks (economic, health etc)?
- What are the options to reduce risk and their implications?
- Need better info re: IFM practices
- Cost/benefit analysis re: best use of forest land
- Choose scenarios: stochastic gaming tool on alternatives from social, economic and ecological perspective -> best bet practices (with policy and human behaviour) – “niche finder”

APPENDIX I

WORKSHOP BREAKOUT # 2

SUMMARY

Goals & SMART Objectives (bullets) for IFM Research Umbrella
Group 1 1. Develop an understanding of the stand-level impacts of IFM on biodiversity (and fibre yields, maximum possible fibre yields?) 2. Scenario planning/sensitivity analysis (EFM landscape level) of landscape-level biodiversity and fibre yields under various extents and patterns of various types of IFM (i.e. what BEEST is doing now but overlaying IFM & protected areas onto the landscape, expanding to larger landscapes). 3. Scenario planning/sensitivity analysis of socio-economic opportunities, trade-offs and constraints associated with the adoption of the TRIAD approach.
Group 2 1. Develop an approach to assess when, where and how much IFM – what are the acceptable bounds • To create/adapt a coarse-level land use planning tool to assess the social, economic, and ecological trade-offs of different IFM scenarios (6-12 months) • To explore currently available tools to do the previous one (3 months) • To write a white paper on tool, strategies (< 12 months) 2. Understand social, economic and ecological implications and benefits of IFM • Develop a set of metrics to help assess different IFM scenarios at the landscape level ecological, economic, social/cultural 3. Develop new solutions and opportunities to IFM (silviculture, policy)
Group 3 1. To understand the current state of our knowledge of IFM in primarily the temperate and boreal regions of the world. 2. To determine the effect of various IFM activities on biodiversity, fibre production and socio-economic factors, and how these activities compare to natural processes. 3. To ensure their are appropriate linkages between an IMF Umbrella and other (SFMN) research initiatives to enable trade-off analysis, cumulative effects analysis and to allow a scale-up to the landscape level.

Group 4

1. To characterize the extent of current practical application knowledge of IFM techniques, experiences and needs through workshops, interviews, targeted tours, etc.

    - To complete a series of incremental information collection (literature reviews perhaps) that lead to a focused effort over the next 6-12 months.

2. To identify or develop an integrating landscape model to examine trade-offs between these factors under different scenario by year 4.

    - Concurrent with 2.1, to design, adapt or develop a stand level model to estimate IFM impacts, including biodiversity and fibre variables.
    - Undertake a scenario planning exercise to identify alternative futures, knowledge gaps and to set priorities for research.
    - Determine measurable features (indicators?) for the factors by the end of year one.
    - Design operation IFM trials / field experiments and obtain baseline measures by end of year two.
    - Implement operational IFM trials and measure response on going.
    - Complete scenario analyses using integrating model (a. natural conditions, b. complete IFM intensive, c. variations to be defined with key stakeholders).

3. To define and implement appropriate governance and/or advisory groups to ensure coordination within and outside SFMN within next year

.

    - Develop an approach to assess when, where and how much IFM – what are the acceptable bounds
    - To create/adapt a coarse-level land use planning tool to assess the social, economic, and ecological trade-offs of different IFM scenarios (6-12 months)
    - To explore currently available tools to do the previous one (3 months)
    - To write a white paper on tool, strategies (< 12 months)
    - Understand social, economic and ecological implications and benefits of IFM
    - Develop a set of metrics to help assess different IFM scenarios at the landscape level
    - ecological, economic, social/cultural
    - Develop new solutions and opportunities to IFM (silviculture, policy)

CRITERIA FOR ASSIGNING PRIORITIES

All Groups

- Relevant to objectives
- Opportunity for success is high
- Lack of redundancy (other SFMN and non-SFMN research)
- Cost effectiveness
- Position in critical path (need X before you can do Y, Z)
- Fun and you get to go to cool places
- Is it interdisciplinary?
- Strong, integrated group (s)
- Linkage/integration with other research groups
- Integration/collaboration of scientists & clients
- Partnership opportunities
- Ability to leverage resources (people, time, dollars)
- Focus on practices which are likely to occur, likely to have an impact, don't have natural analogues
- Scientifically sound
- Student involvement (SFMN criteria)
- Communication plan

APPENDIX J

WORKSHOP BREAKOUT # 3

SUMMARY

ARCHITECTURE OF UMBRELLA & DELIVERY

- Based upon strong, integrated research group(s)
- Prioritize within the proposal(s) before-hand
- Some level of decision-making power
- Advisory council consisting of industry & government partners (industry, fish & wildlife, forest service)
- Portfolio of proposals developed in conjunction with/pre-screened by (R) AC

Proposal(s) | criteria for priorization | objectives/goals | allocation

Screen #1 Screen #2

See Figure

PERFORMANCE MANAGEMENT

- SFMN criteria (bi-annual reports, progress reports on proposals)
- Communication / tech transfer achievements & products
- Measure against pre-defined ‘products’, ‘milestones’, ‘deliverables’
- Accountability & evaluation
- Credibility
- Agreed to between researchers & client
- Time-frame specific to predefined milestones (reporting as appropriate)