



The Mauricie TRIAD project: ecological, economic, and social considerations in forest management

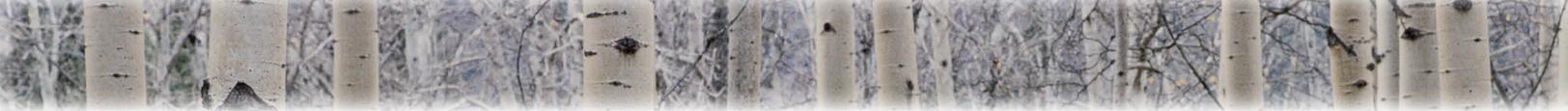
Highlights

- The TRIAD approach to forest management involves dividing the forest into three zones, each with its own outcomes, but with the overarching goals of social acceptability, economic viability, and ecological sustainability.
- The concentration of timber production in a wood production zone allows more of the land base to be set aside in a conservation zone and less intensive methods to be applied in an ecosystem management zone.
- In the Mauricie TRIAD project in central Quebec, the forest was zoned through a multi-stakeholder process backed by scientific recommendations.
- In the Mauricie, studies indicate that the approach may be more socially acceptable, economically viable, and ecologically sound than the status quo (little conservation, traditional clear-cutting, no ecosystem management, etc.).
- Adaptive management and monitoring will be crucial to the future success of the Mauricie TRIAD project.

The forest sector in Canada is going through a difficult transitional period. These difficulties are driven by economic, social, and ecological factors, including increasing energy costs, global competition and concerns about harvesting the last primary forests in the world. Systematic clear-cutting, especially in the boreal forest, has led to the homogenization of the forest, likely rendering it less resilient to current and future disturbances. Ongoing studies investigating the application of the TRIAD approach to forest management in the Mauricie, Quebec indicate that this approach may help us address many of these issues.

What is the TRIAD approach to forest management?

The TRIAD approach involves dividing the forest into three different, but complementary, zones. Although each zone has its own management objectives, they share the overall goals of incorporating economic viability, social acceptability, and ecological sustainability into the forestry sector. In the conservation zone, the goal is to protect native biodiversity, ecosystems, and ecological and evolutionary processes, and to provide a benchmark by which to measure the sustainability of management. In the wood production zone, the goal is timber production. In the ecosystem management zone, the goal is to balance the conservation of ecological structure and function, wood extraction, and other uses such as recreation and extraction of non-timber resources.



The Mauricie TRIAD project

Until recently, discussion of TRIAD forest management was largely theoretical. However, in 2003, an experiment in TRIAD forest management was initiated on an 890,000 ha Forest Management Unit in the Mauricie, central Quebec. Work was immediately begun to incorporate the three zones into the 2008-2013 management plan. The zones were established through a multi-stakeholder process involving a scientific advisory committee, the provincial government, local native communities, residents, the forestry industry, users of the non-timber resources of the forest, and other stakeholders.

Conservation

Potential conservation areas were first identified by the scientific committee. Recommendations were based on the contribution of each area to the overall diversity of the forest. Particular emphasis was placed on rare elements that were once common (e.g., old growth). To reduce the probability that the entire conservation zone would be affected by one fire, recommendations included some fairly large areas separated by relatively large distances. Recommendations were submitted to the provincial government for approval. In the 2008-2013 management plan, 11% of the land base (over 91,000 ha) was set aside for conservation, up from 2% under the management regime in place at the time. This included 18,268 ha already protected, 9,712 ha recommended by the scientific committee, and 63,240 ha suggested by the provincial government (Figure 1). No industrial activity or management is planned for this zone, and natural disturbances should be allowed to occur. Thus, this zone will function as a source of biodiversity and other ecosystem services, a control by which to gauge the state of the rest of the forest, and a legacy for future generations.

Wood production

Areas for wood production were identified next. These were located on sites with high production potential, and included areas already under intensive management. Social concerns were also considered here; areas of high value to native communities, tourism, or other stakeholder interests were excluded. Although under current legislation no herbicides or pesticides are to be used in this or any other zone, efforts were made to keep the wood production zone as far as possible from the conservation zone to minimize edge and adjacency effects. In the 2008-2013 management plan, 20% of the land base was assigned to wood production (Figure 1). In this zone, appropriate silvicultural methods are being used to meet the goal of timber production, including scarification and planting (jack pine, black spruce, white spruce, Norway spruce, and white pine) with and without seeding, pre-commercial thinning, and shelterwood and selection cutting. Experiments are also being carried out to examine the potential of mixed plantations (polycultures) to increase timber production and improve the social and ecological acceptability of plantations. The more productive the wood production zone is, the more of the land base that can be set aside for conservation and the less wood that can be extracted from the ecosystem management zone.

About 3% of the wood production zone (0.6% of the land base) has been set aside for fast-growing plantations because landscape-level modeling indicates their potential importance in maintaining high harvest volumes without increasing overall forest fragmentation. Here, one million exotic larch seedlings will be planted each year, with an expected productivity of up to 8 m³ per hectare per year over 25- to 35-year rotations. Fast-growing hybrid poplars are also being planted. (Care must be taken in selecting hybrids and fast-growing exotics to ensure that these trees cannot undermine the ecological integrity of the surrounding forest through invasion or hybridization with native species.)

Ecosystem management

The remaining 69% of the land base has been designated for ecosystem management (Figure 1). To balance the various objectives of this zone, it is being managed according to a natural disturbance-based management model: harvesting methods are being applied and developed to emulate natural disturbance (fire and insect outbreaks). This method attempts to balance ecological, social, and other

non-timber values with timber values by emulating natural patterns through harvesting. At the stand level, traditional clearcuts are being replaced with variable retention cuts (mean 5% retention, with up to 10% retention in clumps) and partial cuts and 2- to 4-entry multicohort cuts, with retentions of up to 75%. Little thinning and vegetation management is planned for this zone; any treatments applied will favor complexity as much as possible. This will facilitate the creation of complex, uneven-aged stands, which have until now been much more prevalent in natural than in managed systems. At the landscape level, attempts are being made to increase variability in cutblock shape and size, emulating patterns in landscape structure created by natural disturbances. Studies are ongoing to elucidate the patterns created by natural disturbances at both the stand and the landscape levels, so that appropriate silvicultural systems can be further developed and applied.

Setting management goals

To facilitate the formulation of specific ecological goals for the forest management unit as a whole, the scientific committee used gap analysis to compare historical records (indicative of the natural forest) to the current forest. These studies indicated a general decline in old-growth and mature stands, conifer-dominated mixed stands, and some specific conifer species, and a homogenization of the forest in terms of age classes, species composition, and structure. Measures are being taken in all three zones to address these issues. As outlined above, old-growth and mature stands are being set aside in the conservation zone, and their structures emulated with partial cutting in the ecosystem management zone. Conifers are being planted in both management zones. These measures will also help to combat the general homogenization of the forest, as will increased variability in the size and shape of cutblocks.

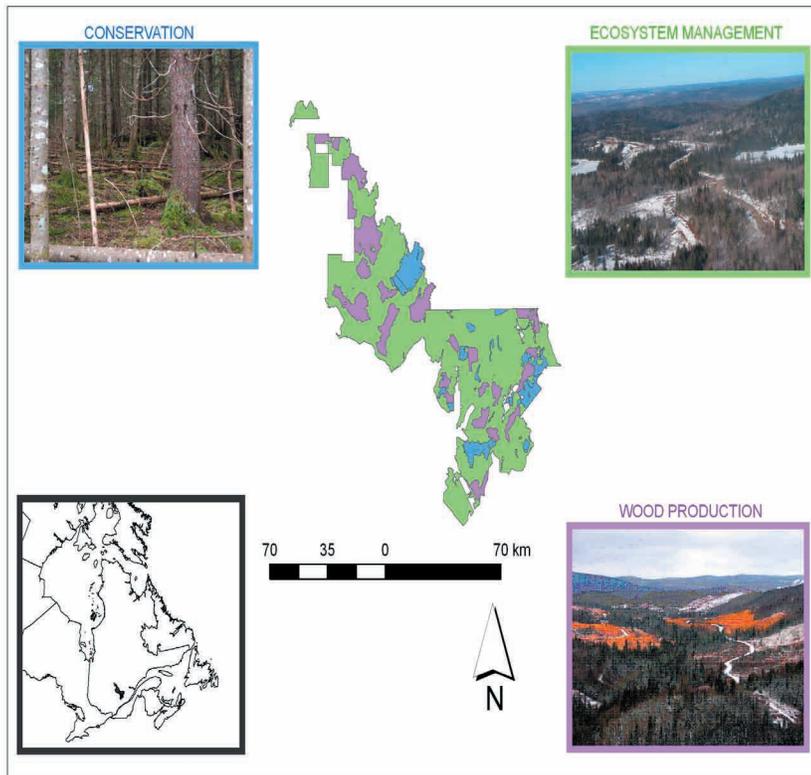
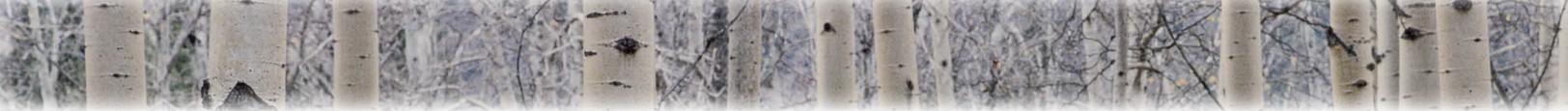


Figure 1. The three zones of the Mauricie TRIAD project (Conservation, Ecosystem Management, and Wood Production). Note that the orange in the Wood Production zone is hybrid larch, the needles of which turn colour in the fall before they drop. Photos courtesy of Claude Beauchesne (Ecosystem Management), Jean Girard (Wood Production), and Nadyre Beaulieu (Conservation).

The importance of adaptive management

In general, although the 2008-2013 management plan is now in place, an adaptive management strategy was built into the project so that emerging knowledge and technology could be incorporated in the future. Social, economic, and environmental monitoring are also crucial to the process of adaptive management. Such monitoring will allow for the project to be continuously assessed and for management strategies to be appropriately adjusted.

This adaptive management strategy will also allow for management to adjust to changing conditions and values. The current distribution of the land base may be appropriate at present given the economic needs of the forestry sector, societal values placed on biodiversity, recreation, employment in the forestry and non-timber extraction sectors, etc., but these needs and values may change. A viable forest management strategy must be able to adapt to these changes.



Furthermore, the chosen distribution of the land base in the Mauricie may not be appropriate to other areas under consideration for TRIAD management, due to differences in values and in the basic structures and functions of the forest. A similar multi-stakeholder approach, backed by solid science, must be incorporated into the planning and implementation of any such zoning project.

Economic, social, and legal considerations

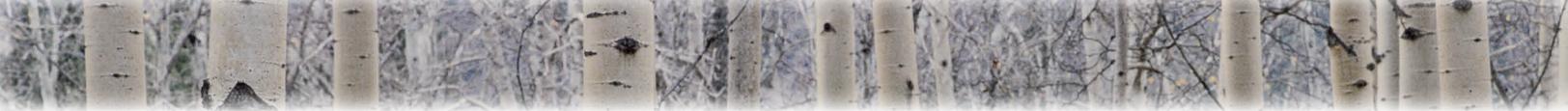
While the three zones were being established, theoretical studies were carried out to examine the potential of the TRIAD approach to meet the overall goals of economic and social viability and ecological sustainability. An eco-efficiency study using cost-benefit analysis predicted a cost savings of 10-15% in implementing TRIAD management over the system in place before 2008 (“status quo”), largely due to reduced transportation costs. A spatially-explicit landscape model predicted that TRIAD management would result in higher harvest volumes than the status quo over the long term (100-150 years), while maintaining more old growth and a landscape structure more similar to that created by the natural fire regime in the area. One social study indicated a preference among foresters, environmentalists, and users of the non-timber resources of the forest in the area for TRIAD management over the status quo. Another such study indicated a willingness of residents and tourists to accept a limited amount of intensive silviculture (10% of the land base) if it were counterbalanced by increased conservation (8%), as it is in the TRIAD scenario applied. These results are bolstered by the general enthusiasm that the project has encountered at various scientific and non-scientific meetings.

Thus, although only time and effective monitoring will tell whether TRIAD management is truly sustainable, social studies indicate a high level of acceptability and economic and ecological modeling studies are hopeful in their predictions. All imply that TRIAD management is a step in the right direction.

That said, the planning and implementation process has not always been an easy one. Agreement between the various stakeholders, the scientific committee, and the provincial government as to the conservation zone has yet to be reached. Specific areas have been set aside (see above), but some of those suggested by the TRIAD scientific committee are still subject to change. Furthermore, several legal processes (derogations) had to be conducted so that the size and spatial distribution of cutblocks and the amount of residual retention in the ecosystem management zone could vary from those specified by provincial regulations, so as to better emulate patterns created by natural disturbance (Table 1).

Specified by provincial regulation	Proposed for the Mauricie TRIAD project
<ul style="list-style-type: none"> • Maximum 3.5 m³/ha of harvestable wood left on a cutover, i.e., generally less than 2% of the total volume 	<ul style="list-style-type: none"> • Variable retention of up to 10% (average of 5%) of the total volume in some cutovers
<ul style="list-style-type: none"> • Maximum of 10% of cutblocks larger than 50 ha in the temperate deciduous forest and 100 ha in the boreal mixedwood forest, absolute maximum of 100 ha in the temperate deciduous and 150 ha in the boreal mixedwood 	<ul style="list-style-type: none"> • No change in the absolute maximum, but one or two large agglomerations of cutblocks (500 ha) to be harvested over 5 years (derogation submitted but not accepted as of 2008, so may apply to the 2013-2018 management plan)
<ul style="list-style-type: none"> • For each area cut, an adjacent area of at least equal size must be left uncut until regeneration in the cutblock reaches 3 m in height and 10 years in age. 	<ul style="list-style-type: none"> • Spatial arrangement of cutblocks based on landscape-level models of natural disturbance rather than strict rules

Table 1. Provincial regulations that had to be set aside so as to better emulate patterns created by natural disturbance in the ecosystem management zone of the Mauricie TRIAD project. Derogations had to be prepared for each case.



It has become obvious that application of TRIAD zoning requires a change in culture. Foresters who were taught to consider timber value above all else are learning to leave high levels of retention in the ecosystem management zone, regardless of timber value. Government officials are accepting the possibility that some of the current regulations may not always be appropriate. Residents and tourists are learning to accept the possibility that conservation interests may be served by carrying out limited intensive silviculture so as to be able to leave a larger area untouched. It is only through this openness that the TRIAD can hope to meet its goals successfully.

Conclusion

Although much work remains to be done, results and experiences with the Mauricie TRIAD project in central Quebec indicate that this approach may help us to manage Quebec's (and possibly Canada's) public forests in a more economically viable, socially acceptable, and ecologically sustainable way. The fact that the approach has been successfully incorporated into the 2008-2013 management plan is a noteworthy accomplishment and a first for Canada, if not the world. The multi-stakeholder adaptive management strategy built into the project provides hope that the project will be able to adapt to changing conditions and values. In the meantime, we have shown how the three zones can be managed for separate priorities, while working together to meet overall ecological goals and gain social acceptability and support. Time will tell whether the TRIAD is truly successful in meeting its goals in this area, but modeling studies predict that it will meet both production and conservation goals better than current forestry practices.

Further reading

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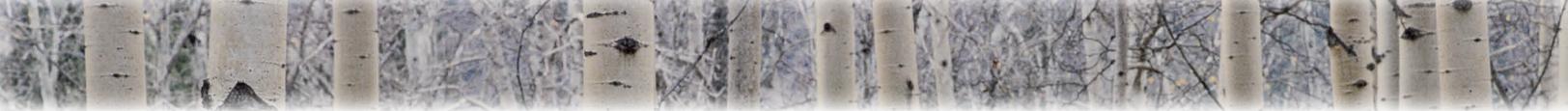
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Management Implications

- The interests of all the users of the forest must be considered in the planning and implementation of any TRIAD forest management plan.
- The process must be adaptive, and monitoring is crucial.
- The optimal proportion of forest allocated to each zone will vary depending on social, economic, and ecological factors.
- Although TRIAD may seem like a radical change from the current management practices, its effects on the landscape will be slow. A long-term commitment from both industry and government are crucial to the success of the TRIAD approach.



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The Mauricie TRIAD project: <http://www.projettriade.ca>.

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