Submission on: Management Alternatives for New Brunswick's Public Forest

Report of the New Brunswick Task Force on Forest Diversity and Wood Supply September 26, 2008

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Executive Summary

Context:

The Scientific Advisory Committee (SAC) to the NB Protected Natural Areas Programme consists of ministerial appointees with expertise on the scientific aspects of protected natural areas and the role native biodiversity plays in maintaining ecosystem function. The committee was invited to provide comment on the *Report of the New Brunswick Task Force on Forest Diversity and Wood Supply* and to provide a scientific rationale for any recommendations made. The focus of the SAC is on the science of conservation biology, so our comments do not include reference to sociological or economic implications outside our expertise.

The SAC hereby presents a list of ten *Principles* that it deems to be essential considerations in maintaining forest biodiversity within a forest management context in New Brunswick. The Committee also recommends an approach which best represents these Principles. While the Committee does recommend a particular scenario, in the interest of maintaining ecosystem services for all New Brunswickers, the SAC urges that the Principles be taken into consideration regardless of the forest management decisions implemented for New Brunswick Public Forests.

SAC *Principles*:

1. Conservation forest in NB must be established on the basis of ecosystem need, using scientific principles. The current area of conservation forest in NB was established on this basis. The total area currently managed for conservation cannot be reduced without jeopardizing biodiversity.

2. There must be a mix of PNAs and conservation forest areas of varying sizes, meeting different objectives in terms of form and function. Although relatively small habitat patches may be sufficient to maintain populations of some species of concern under some circumstances, it is important that a significant proportion of the protected areas be large to meet the needs of many species and to maintain ecological processes.

3. Protecting natural areas is not necessarily favoured over other conservation measures. Where more protected area is provided at the expense of connectivity and other conservation objectives, the overall biodiversity impact on the greater landscape will be negative.

4. Conservation of old forest, especially tolerant mixed wood representative of the declining Acadian Forest must be a priority for conservation. Tolerant mixed wood typical of the Acadian Forest is declining in abundance and requires special conservation objectives, especially old (uneven aged) forests.

5. Spatial/temporal analysis is important. From the perspective of biodiversity, forest management planning should take into account spatial and spatio-temporal dimensions because biodiversity reflects not only absolute area of habitat, but also its configuration, and variations in this configuration through time.

6. Habitat fragmentation leads to biodiversity loss. Fragmentation can be manifest on the landscape via the reduction in patch size and increased isolation of these patches resulting in a loss of habitat and species diversity.

7. Size and extent of clearcuts are more important than absolute area. Emulating natural disturbance is a valuable objective because it will result in a variety of forest-opening sizes and shapes with many residual clumps of standing trees.

8. Lower road density is favourable for maintaining biodiversity. Roads are barriers to movement of some small mammal, amphibian, and invertebrate species, they provide access for invasive species, and other disturbance factors, and can alter water regime.

9. Coarse woody debris, including snags is critical for nutrient cycling in forests and to meet habitat requirements for many species. Coarse woody debris represents a critical component of forest biodiversity, supporting a significant proportion of species in the forest ecosystem; it tends to decrease with intensity of forest management.

10. Management of the forest should incorporate climate change expectations.
Management should favour temperate over boreal species (this will favour late successional species as most boreal species are early successional); black spruce and jack pine are not compatible with predicted climate change scenarios.

Recommendations on scenarios:

Scenario A satisfies the principles listed above to a greater extent than any of the others because plantation area will be reduced to a greater extent than in any of the other scenarios; there will be more conservation forest than other scenarios, resulting in more areas with minimal fragmentation and road density compared with other scenarios. This scenario also produces the greatest amount of old tolerant forest.

Scenario B satisfies most of the principles.

All other scenarios reduce the area of conservation forest below the current amount which was established on the basis of ecosystem need and scientific considerations.

Scientific Basis for Principles and Explanation for Scenario Recommendations

1. Conservation forest in NB must be established on the basis of ecosystem need, using scientific principles.

The current area of conservation forest in NB was established on this basis. The area cannot be reduced without jeopardizing biodiversity. Establishment of more PNAs will not eliminate the need for existing watercourse buffers, wildlife habitat and other areas with a conservation focus.

Total amount of protected forest (Protected Areas; 4% and Conservation Forest; 28%) is presently at 32% of Crown forest. This total is comparable to other jurisdictions. Research in NB has indicated landscape-level conservation is beneficial for certain bird species (Betts et al. 2006). In southern New Brunswick, 10 of 15 species were sensitive to amount of habitat beyond their immediate stand; 6 of 9 species showed increased declines when changes in habitat amount occurred by more than 70% (Betts et al. 2007). Similar results were found for bird species in northern New Brunswick (Betts and Villard, in press). As well, several studies suggest a landscape-level threshold of 30-40% habitat, below which significant fragmentation effects occur, over and above those associated with pure habitat loss (Andrén 1994, Fahrig 1998, Flather and Bevers 2002).

We do not see evidence that a reduction in total conservation forest area is justified. For example, the current amount of Old Spruce Fir Forest habitat is based on minimum viable populations of indicator species and there are inherent risks associated with setting a habitat objective on minimums and not higher. The Task Force report recognizes that a decrease in total conservation area can not be supported: "the four alternatives with 30% or more area designated as conservation forest maintain habitat levels deemed necessary by provincial biologists to maintain viable populations of native vertebrate species and desired populations of selected species" (p. *XV* Executive Summary).

Therefore,

1) we support Alternatives which maintain or increase these minimal levels of protection identified by government and researchers.
2) we do not support a decrease in total amount of land managed for the maintenance of biodiversity, even if there is a trade of conservation forest outside of protected areas to more protected area (eg. Alternatives C-G which raise Protected Area to 10-16% from 4% but decrease total conservation lands from 32% to 18-28%).
3) we do support more protected area because of their degree of protection (relative to conservation forest) and their permanent status with legislated boundaries.
4) we support Alternatives that retain or increase the amount of adjacent forest outside of conservation and protected forest that is managed as close to its natural state, notably:
    a) old forest
    b) harvest treatments based on natural disturbance dynamics

5) and thus do not support practices that create forests further from a natural state, notably:

a) short rotation (eg. 60yr) forestry
b) plantations
c) stand conversion

2. There must be a mix of PNAs and conservation forest areas of varying sizes, meeting different objectives in terms of form and function.
In some circumstances, relatively small habitat patches are sufficient to maintain populations of species requiring special conservation measures. In general, however, to avoid fragmentation effects, it is important that a significant proportion of the protected areas be large (Gurd et al. 2001; Berglund and Jonsson 2005). Water course buffers for example, have a very specific function which dictates the size and form. It is important to avoid considering areas identified for different conservation objectives as being interchangeable.

3. Protecting natural areas is not necessarily favoured over other conservation measures.
Where more protected area is provided at the expense of connectivity and other conservation objectives, the overall biodiversity impact on the greater landscape will be negative. Regardless of the amount of protected area, the majority of the landscape and its associated native biodiversity will still exist outside of protected areas; the intensity of forest management will continue to be the factor having greatest impact on public land biodiversity. Protected areas will not, by themselves, be adequate to maintain biodiversity because population viability and ecological processes occur at extents larger than the size of Protected Areas. The quality of adjacent forest is integral to maintaining biodiversity (Gurd et al. 2001).

4. Conservation of old forest, especially tolerant mixed wood representative of the declining Acadian Forest must be a priority for conservation.
Tolerant mixed wood typical of the Acadian Forest is declining in abundance and requires special conservation objectives, especially old (uneven aged) forests that include cedar and hemlock (Betts et al. 2003). Old Forest, as defined by Dept. Natural Resources, presently is at 49% of Crown forest. Based on enduring features, estimation of potential forest, apparent lack of historical fire clearing practices by First Nations, and historical documentation of forest condition (e.g. Betts and Loo 2002, Perley 1863, Crossland 2006, Lutz 1997, Lorimer 1977), significant areas of New Brunswick forest that were classified as stand replacing for the purposes of the Task Force, exhibited primarily gap replacing dynamics and naturally existed as old forest.

The Task Force reports use of pre 1940 (p.38) as a baseline to establish extent of conversion of forest age and type. This is of limited value because by 1940, much of NB had experienced 100 years of high-grading of selected species that constitute indicator species for mature forest (e.g. removal of old white pine throughout the province and eastern hemlock (Crossland 2006)), clearance for agriculture (the full extent of one-time land clearance is unknown, but much of it was later abandoned), and human-caused fire.

Forest composition resulting from these extensive early disturbances has been interpreted as "natural" giving rise to the impression that stand-replacing disturbance dominated much of the landscape, which would limit the extent of mature forest. Sites in many Ecoregions recently became dominated by boreal species (eg. short-lived Balsam Fir) because of land use practices (Lutz 1997; Crossland 2006; Betts and Loo 2002), again, giving a false impression of frequent stand-replacing events and limited Old Forest.

Based on the consensus that native forest biodiversity of NB is a product of, and adapted to, stand condition and configuration that have existed for several thousand years, the significant reduction of old forest from the majority of the land (i.e. approx. 75%), to its present level of 49% is detrimental to native biodiversity. Only a few forest bird species show a significant preference for mature and old mixed wood stands (Guénette and Villard 2005; Young et al. 2005), but they definitely host a high diversity since they meet the requirements of species associated with either deciduous or coniferous tree species (Guénette and Villard 2005). Untreated old forests in general also play an important role because many species require a high density of large-diameter trees (Guénette and Villard 2005; Edman et al. 2008).

Therefore,
1) we support Alternatives that would retain, and, preferably, increase the amount of Old Forest. The Status Quo scenario will further reduce Old Forest to 34%. Only scenarios A and B retain Old Forest at, or near, the present level of Old Forest, which is already a 30% reduction.

5. Spatial/temporal analysis is important.
From the perspective of biodiversity, forest management planning should take into account spatial and spatio-temporal dimensions because biodiversity reflects not only absolute area of habitat, but also its configuration, and variations in this configuration through time. Effectiveness of protected areas for biodiversity protection requires buffering from intensive management and connection with other valuable habitat patches. The potential for conservation forest to provide buffers and connectivity to the protected areas must be assessed. Protected areas are not actively managed and therefore in the long term may or may not offer the species or age structure required for some functions of the existing conservation forest. Conservation forest is established and reclassified as habitat conditions warrant.

6. Habitat fragmentation leads to biodiversity loss. There is no spatial analysis in the report to assess how each scenario affects habitat fragmentation. Yet, the spatio-temporal arrangement of treatment areas and, consequently, conservation forest can have profound consequences for biodiversity. Fragmentation can be manifest on the landscape via the direct loss of habitat, reduction in size of remaining patches, and increased isolation of these patches resulting in a loss of habitat and species diversity. (Fahrig 1997, Saunders et al. 1991, Sisk and Battin 2002). Fragmentation subdivides biological populations and may prevent movement between patches; the absence of movement between patches may lead to local extinction (Burkey 1995).

Even the largest protected areas have been shown to be inadequate to protect area-demanding species (Newmark 1987; Gurd et al. 2001). In addition, forest management and other human activities result in the fragmentation of mature and old forest habitats, by breaking apart stands that were formerly more contiguous and reducing size of extensive stands. Fragmentation may increase negative edge effects (Driscoll and Donovan 2004), reduce movements of individuals among populations (Robichaud et al. 2002; Gobeil and Villard 2002), and for species with low dispersal ability, increase the probability of local extinction and regional extirpation (e.g. Berglund and Jonsson 2005; Laaksonen et al. 2008).

Primary influences on avian community diversity include the quality, juxtaposition, and connectivity of suitable habitat on the landscape. Fragmentation of forests (Askins et al. 1987, Robbins et al. 1989, Hansson and Angelstam 1991, Flather and Sauer 1996, Fauth et al. 2000; Niemi et al. 2004) has been implicated as a principal threat to many species in the temperate zone (Wilcove et al. 1986) and a primary contributor to the population decline of many North American birds (Askins et al. 1990).

7. Size and extent of clearcuts are more important than absolute area.
Emulating natural disturbance will result in a variety of forest-opening sizes and shapes with many residual clumps of standing trees. Although emulating natural disturbance is favoured, recent research (Crossland 2006) suggests gap replacement of forest in New Brunswick is more important than is assumed for purposes of the Task Force analyses. SAC recommends that the relative proportions of gap and stand replacement forest area be re-evaluated.

8. Lower road density is favourable for maintaining biodiversity.
Roads are barriers to movement of some small mammal, amphibian, and invertebrate species, they provide access for invasive species and other disturbance factors, and can alter water regime (Trombulak and Frissell 2000; Haskell 2000; Forman and Alexander 1998; Greenberg, et al. 1997; Andrews 1990; Lonsdale and Lane 1994). Amphibians are killed in significant numbers on roads having moderate traffic levels (Fahrig et al. 1995; Mazerolle 2004) Run-off from roads causes siltation of streams when extreme weather events occur, if they are poorly constructed. Effects of woods roads are long-lasting because of compaction of soil and changes in the vegetation that ultimately grow on them.

9. Coarse woody debris, including snags is critical for nutrient cycling in forests
Although consideration of coarse woody debris in terms of ecological functioning was not included in the Task Force analysis, it supports a significant component of forest biodiversity and tends to decrease with intensity of forest management. . Many species depend upon snags or downed wood for foraging (Lemaître and Villard 2005), nesting (Poulin et al. 2008), or sometimes for their entire life-cycle (McComb and Lindenmayer 1999). In Sweden, approximately 60% of forest species deemed at risk are dependent on old or dead trees (Roberge 2008). Among other ecological services, coarse woody debris provides substrate for fungi and insects thereby making nutrient cycling in forests

possible (Grove 2002). A significant number of beetle species in NB require coarse woody debris for their survival (Majka and Pollock 2006, Majka 2007a, Majka 2007b) and these species will likely decline in numbers with loss of their habitat.

The term 'plantation' is difficult to apply to future practices as the purposes, form and composition of plantations may well change with time. Proposals for bio-energy from, in part, 'wastewood' left on sites, likely means lower amounts of snags and coarse woody debris in plantation and all treated sites. Debris volumes in existing plantations already are considered significantly lower than those typical of more natural forests (Fleming and Freedman 1998, Frego et al. 2005). A low volume of coarse woody debris is detrimental to some wildlife (eg. herpetofauna Waldick et al. 1999; Red-backed Vole Bowman et al. 2000; bryophytes Ross-Davis and Frego 2002). Research on the ecological value of plantations containing lower debris than present is lacking but undoubtedly would not benefit sensitive species. A maximum of 15% of the landscape in plantation was recommended in the Greater Fundy Ecosystem guidelines (Roberts et al. 2005).

10. Management of the forest should incorporate climate change expectations.
Given predictions of climate change models, management should favour temperate over boreal species (this will favour late successional species as many Boreal species are early successional); black spruce and jack pine are not compatible with predicted climate change scenarios (see Iverson and Prasad 2001).

Recommendations on scenarios:

Scenario A satisfies the principles listed above to a greater extent than any of the others.
Scenario B satisfies most of the principles.
All other scenarios reduce the area of conservation land

Explanation for choices

Scenario A:
Positives points

- From the perspective of conserving biodiversity, phasing out plantations is positive (Betts et al. 2005).
- More conservation forest than other scenarios results in more areas with minimal fragmentation and road density compared with other scenarios.
- More old late-successional forest than other scenarios
- There is an implication in the report that large areas of conservation forest will increase the risk of spruce budworm, but that depends on the species composition of the conservation forest. Mixedwood forest is more resistant to spruce budworm outbreaks than pure softwood, and it protects plantations embedded in it, thus mature mixedwood will actually reduce the risk of spruce budworm outbreak in balsam fir stands (Needham et al. 1999).

Scenario B:

Positive points

- Tolerant mixed wood (of particular concern) is maximized over time; the committee members think it could be higher under other scenarios as well, if the disturbance classification is adjusted to reflect higher gap replacement proportion.
- Area of conservation forest is not reduced from currently existing area

Scenarios C, D, E:
Negative points

- Assumption that reducing conservation forest area can be compensated by increasing protected area, but with an overall loss of conservation forest, is not acceptable. Proposed areas to be protected need the connectivity provided by conservation forest.
- Declining area of old forest
- High proportion of combined planted and spaced forest, both of which have reduced biodiversity value relative to less intensively-managed forest.

Scenario F:
Negative points

- The positive effect of low intensity management over much of the forest land base, is countered by the expected higher intensity of roads.
- Although the amount of old forest habitat is projected to be fairly high, the amount of mixed wood is relatively low.
- Low intensity harvest prescriptions are not explained, making a rigorous evaluation of F difficult.
- Expected to have relatively low snag abundance

Scenario G:
Positive points

- Overall conservation area is at or close to current level
- Plantations would be on productive sites (to reduce area needed for same volume) and close to mills. The proximity to mills will decrease green house gas emissions due to transport and contain the affected landscape to localized areas.

Negative points

- Targeting tolerant mixed wood areas for planting appears to be unacceptable from a conservation perspective(report does not indicate whether the mixed wood area to be cleared is tolerant or intolerant.
- Insufficient old forest
- Small amount of uneven aged forest
- High proportion of clearcut area

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