SUSTAINABLE FOREST MANAGEMENT PLAN

for

FOREST MANAGEMENT DISTRICT 1

(The Avalon Peninsula)

for the period January 1, 2007 to December 31, 2011

July 14, 2006

ACKNOWLEDGEMENTS

Concern for forest resources and the future bring individuals, groups and government departments together to chart the best possible course that can be agreed on in an open, multi-stakeholder approach. Concessions and movements have been made in consideration of all views brought to the table. Appreciation is due to all those who attended and worked toward shared understandings and levels of agreement that could be obtained, whether new members or returning members representing various interests. Appreciation is also due staff of the Department of Natural Resources for the research, mapping, word processing and many other tasks to support the Planning Team and the preparation of this plan. May our efforts result in improved forest conditions.

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1.0 INTRODUCTION

Subsequent to the formation of Forest Management Districts in 1974, forest management planning began in the province in 1975 under the Forest Management Act (1974) . Initially, a forest management plan was prepared for each district using input from government departments only. The process evolved over the following two decades through use of public meetings, questionnaires and other mechanisms up to 1995 when forest ecosystem management planning was attempted through an open, multi-stakeholder, consensus-based process. In order for this process to work, each stakeholder has to accept other stakeholders' points of view as valid and commit to work toward common solutions.

This process produced in 1997 a Forest Ecosystem Strategy Document and a Five Year Operating Plan for District 1 (The Avalon Peninsula) for 1997 to 2002. A second Planning Team similarly produced two similar companion documents for the period 2002 to 2007. These plans guided forest management activities for each period and attempted to influence actions and planning where responsibilities crossed a number of jurisdictions. Inputs from responsible agencies, outside processes, and the results of other related studies and reviews are accepted as inputs into the process.

As society has come to understand more about the holistic, integrated character of forest ecosystems, it is demanding ecosystem management as a replacement for traditional timber or other single-value management. Forests can only be managed as ecosystems if all values are managed under a single, integrated, multivalue and ecologically based plan by a single, agency/organization/collective over time scales that are consistent with the ecosystem processes responsible for resilience and sustainability (Kimmins, 2003). Kimmins further states that the forgoing is one of the pre-requisites for forest ecosystem management.

Hence, while the current Newfoundland situation is not conducive to pure ecosystem management (where the focus of management is on ecosystem health under a single agency), sustainable management (which balances economic, social and environmental considerations) is realistic. Ecologically based knowledge guides environmental concerns in one of the three pillars of the sustainable management approach. This means that a Planning Team attempts to use the best knowledge available from a variety of disciplines and a variety of levels to form an operating plan for sustainable forest management in a particular area.

Cleary and Moores, 2003, in a discussion paper on alternate approaches to forest management planning note that this province [NL] is a leader in Canada with respect to public participation and environmental assessment of forest management activities. The forest management planning process implemented today has been heavily influenced by the requirement for environmental assessment registration of a five year operating plan (Nazir and Moores, 2001).

Cleary and Moores also point out that no other province seeks to achieve consensus through a public consultation process, nor does any [other] province have a requirement for environmental assessment of operating plans. They further state that an effective land use planning process could facilitate planning and decision-making and result in less conflicts and challenges that arise during the forest management planning phase and environmental assessment review. The

reality, however, is that a comprehensive land use planning process is not in place, and resource management activities are distributed over a number of departments with limited co-ordination.

On December 13, 2005 changes in the Forestry Act (Govt of NL, 2005) required the preparation of a Five Year Operating Plan for each management District (based on calendar years rather than fiscal years) in the context of an overall Provincial Sustainable Forest Management Strategy which had been published in 2003. Hence the task of the current planning team is to produce a Five Year Operating Plan for the Avalon Peninsula for the period January 1, 2007 to December 31, 2011.

The Provincial Forest Management Strategy describes a vision of our forests as maintaining a sustainable balance of environmental, economic and cultural values desired by society. It provides the mission, guiding principles and provincial scope. It prescribes sustainable forest assessment, strategic directions and monitoring criteria for sustainable forest management. Inadequacies in the Provincial Strategy are addressed in the current Five Year Operating Plan, and noteworthy detail from previous strategic plans is included in appendices.

A Five Year Operating Plan is prepared for each of the eighteen districts in insular Newfoundland and five districts in Labrador. It sets out information respecting forestry activities in a district and provides for sustained yield forest management consistent with the sustainable forest management strategy for the province. Forestry activities include forest access road construction and decommissioning, timber harvest, silviculture, forest protection, forest management research and monitoring and conservation activities.

Sustainable use is defined as the use of an organism, ecosystem or other renewable resource at a rate within its capacity for renewal. Sustainable forest management is defined as the management of forest resources in a manner that meets the needs of the present without compromising the ability of future generations to meet their own needs.

The current task is probably best seen as the preparation of a sustainable forest management plan in an environmentally sustainable way that takes into account other needs and values. The task is guided by the following vision statement reproduced from the provincial strategy (Govt of NL, 2003):

> ‘The forests of Newfoundland and Labrador will maintain a sustainable balance of environmental, economic and cultural values desired by society. They will provide for viable populations of native species, sustainable yields of forest products and the creation of wealth and employment to support local, regional and provincial economies’.

Inputs into the planning process include such things as the Annual Allowable Cut (AAC) and the Environmental Protection Guidelines (EPG). The determination of the AAC is through a separate process which examines forest description, landbase availability, no-cut buffers, wildlife corridors, protected areas and other factors as outlined in its public review process (Government of NL, 2006). Environmental Protection Guidelines were established based on extensive study, discussion and agreement of agencies responsible for various resources. These inputs and the

planning process produce a document with a blend of scientific and local knowledge which are registered in a lengthy Environmental Assessment review process where agencies, groups and general public can express concerns to be considered by the Department of Environment and Conservation and the proponent.

Most of the important strategies, which were laid out in the previous Forest Ecosystem Strategy Document and which are common to the entire province of Newfoundland and Labrador, are incorporated in this Sustainable Forest Management Plan. Research to address gaps in current knowledge requiring further investigation can be proposed, as appropriate, at the local or provincial level.

1.1 Description of Avalon District and Forest Ecosystem

District 1 is essentially the Avalon Peninsula, east of Come by Chance as described in Appendix 2 : Gazetting of District Boundary. Information on geology, soils and climate is given in Appendix 3. The surface area of the Avalon Peninsula is approximately 969,000 hectares (ha). The 628,300 hectares of Crown land included in intensive forest inventory of the Avalon is broken down, based on satellite imagery and other updates to aerial photography flown in 1995, as follows;

Land type	Area (heacteres)
Water	55,600.00
Forested	162,700.00
Scrub	191,300.00
Bog	95,600.00
Rock barren	26,800.00
Soil barren	81,600.00
Agriculture	2,900.00
Cleared	1,600.00
Residential	1,600.00
Transmission lines	1,300.00
Other	7,300.00
Total crown	**628300**

Forested land accounts for some 57% of the inventoried crown landbase. The forested portion can be further divided into 26% productive forest and 31% scrub, based on its ability to produce ten cubic meters per hectare of timber (if one were to consider a timber volume measure). Appendix 4 contains further information on drainages, peatland and ecological land classification on the Avalon. It is important to note that the productive forested area is less than 20% of the area of the Avalon and that forest operations would occur on less than 2% of the productive forest landbase annually.

An ecosystem can be defined as a group of organisms interacting with themselves and their environment. The forests of the Avalon, indeed as of the province, are part of the larger boreal forest ecosystem. Boreal forest species have evolved over millennia from catastrophic events such as fire, insect outbreaks and wind throw which occur in the Avalon boreal forest in periods of usually less than a century, as evidenced by forest age class distribution.

The growing season in the Central Avalon is the longest in the province at 190 days (Robertson et al, 1993) and soils are better in terms of topsoil depth and finer textures on some parts of the Avalon (Page, 1971; Roberts 1983), than in many parts of the province. This is particularly true in sheltered valleys of the Avalon. While stoniness and rolling topography are two of the limiting factors for agriculture, they are not limiting for coniferous tree growth. Soils are acidic and drainage often poor on fine textured bottom slopes resulting in dense, slow-growing black spruce and balsam fir forests at these sites. At mid-slope conditions with fine textured soils, balsam fir trees on the Avalon have among the largest diameters in NL; however, height is frequently lower, particularly in exposed areas.

The Avalon naturally contains all tree species that occur in insular Newfoundland with the exception of red pine and black ash. The forests however are dominated by balsam fir, black spruce and white birch. Wilton, (1956) reported that white pine on the Avalon was of considerable importance but cutting and disease had reduced this species to a rarity. Eastern larch (juniper) declined throughout eastern North America in the late 1800's (Roberts and Van Nostrand 1995) but is becoming common once again particularly on exposed mineral soils or poorer sites.

Rarely does productive forest extend above the 500 foot (150 m) elevation on the Avalon. Approximately 55 % of the more productive forests, in the terms of growth, occur on mineral soil representing about 10 % of the surface area of the Peninsula (Wilton 1956) notably in the Avalon Forest Ecoregion.

The plant community and its structure largely influence wildlife habitation of an area. While some animals are generalists and can occupy a wide range of habitat, certain seasonal requirements of these species can be habitat specific (e.g., moose wintering areas where suitable combinations of browse and cover are required). A variety of forest age classes can provide increased habitat and sustainability for some wildlife species while others require a specific age class or conditions for maintenance.

Forest types are recurrent patterns of forest vegetation and soils that react similarly to disturbance and silvicultural treatment. Using tree cover, ground vegetation and soil characteristics, accurate projection can be made on forest succession, productivity, wildlife habitat, operational concerns and silvicultural prescriptions including regeneration capability for each forest type.

In 1989, Meades and Moores published a field guide to the Damman Forest types of Newfoundland. The balsam fir forest types of the Avalon are stable (ie. they naturally come back to the same forest type) following cutting, insect infestation and windthrow but, after disturbance by fire, often go to spruce or hardwood forest types. Spruce types generally go to another spruce type following fire, but after cutting to a more open spruce type or heath in the absence of silvicultural treatment. More information on forest types and successional pathways is provided in Appendix 5.

1.1.1 Factors that have Influenced Forest Conditions

The boreal forest, of which the forests of the Avalon are part, have evolved in concert with fire, insects and wind throw which are the main agents that recycle our forests. These agents leave stands regenerating with the same age of trees although these trees can have quite different diameters or sizes as the stand develops. There is generally a mix of forest stands of different sizes and stands of different ages over the landscape. Human interventions in the forest have often ignored natural dynamics, and have left a forest that often does not equate to the natural model. This is quite evident on the Avalon which has sustained the highest human population and therefore the greatest pressure on the forest resources since European contact.

Historically, fire and insect infestation have been the agents that cause widespread mortality in the forest. Since the 1600's over 163 000 hectares have burned involving in excess of twelve hundred fires (Wilton and Evans, 1974). Most of the Avalon has burned at one time or another with the most recent large scale wildfires occurring on the Bay de Verde Peninsula and the Southern Shore in the 1960's. The Spread Eagle fire was the largest fire on the Eastern half of the island in 1999. After a fire, forest regeneration is usually successful; however, repeated burning of certain areas of the Avalon caused a loss of available seed source as well as soil degradation which, combined, resulted in failure of tree regeneration and invasion by ericaceous shrubs and low ground vegetation. Over 80 000 hectares of the Avalon Peninsula that were once forested are currently in heath condition.

Recording of insect outbreaks began in the early 1900's and severe hemlock looper outbreaks occurred in 1920 - 1926, 1968, 1972, 1983 and 1986 (Otvos et al, 1979). The first spruce budworm outbreak was recorded in Bell Island in 1942 and spread to other parts of the Avalon by 1947. A major spruce budworm outbreak occurred between 1978 - 1982 with a high of 69 000 ha of severe defoliation in 1979 (Otvos and Moody, 1978). Parts of the Trinity Shore, the Northeast Avalon, Southern Shore and Central Avalon were most affected. Periodic outbreaks of the hemlock looper have caused balsam fir mortality throughout the Avalon. Severe insect outbreaks generally cause mortality of Balsam fir stands and areas of tree mortality may range in size from 0.25 ha up to hundreds of hectares. Forest regeneration after insect infestation is usually successful and the new stand is generally composed of species that comprised the previous one.

Wind damage occurs periodically dependent on climate factors, amount of mature forest (60 yrs +) and recent forest history. Boreal forest tree species are typically shallow rooted making them prone to wind damage. The most recent severe wind damage occurred in 1994 - 95 with approximately 4650 ha of mature and senescent forest windthrown on the Avalon Peninsula.

The introduction of moose to the province in 1904 has provided us with a remarkable example of population growth in the absence of major predators. From a founding population of only four animals, moose numbers in insular Newfoundland now exceed 100,000. This growth however has not been without growing pains. In the late 1950's it was reported that moose densities in Central Newfoundland had grown to a level whereby they were depleting their food resources to a seriously low level. On the south coast a major decline in the moose population was directly attributable to over browsing of their range. The moose has provided many benefits to Newfoundlanders and is now part of our ecosystem. Moose was first reported on the Avalon in 1941 (Pimlott, 1953). Moose should not be managed as a premier species but as part of the ecosystem. In areas of the Avalon where moose browsing is severely impeding the growth of hardwood, softwood and other native flora, a feedback mechanism should be emplaced to provide those setting quotas with data necessary to ensure a healthy moose population is maintained and that the integrity of the habitat is not compromised. Currently there is a significant lack of hardwoods growing to maturity as their growth is being curtailed at an early age through browsing.

Ecoregion V (Central Avalon) has been spared the ravages of fire that decimated the surrounding landscape because of an excessively moist climate (Meades and Moores 1989). The development of the extensive heath landscape in Ecoregion VI (Maritime Barrens) was precipitated by indiscriminate burning by European settlers.

Human use of the forest has also influenced development through cutting and burning. Fuelwood cutting has been a common practice since European settlers arrived on the Avalon. This common practice involved small clearcut patches, usually less than one acre in extent (Wilton 1956). There was clearcutting of young stands for pitprops from the 1930's to 50's, pulpwood shipped to the AND Company in the early 1950's, clearcutting for pressboard production from the mid - 1950's to 1980 and approximately four million board feet (fbm) per year of lumber produced at that time (the latter largely by selective logging). Much of the early cutting was concentrated along waterways and the reaches of watersheds where water driving was possible. Contractors for Newfoundland Fiberply cut areas in Salmonier, Windsor Lake, Island Pond Ridge, Spread Eagle and other areas of the Avalon. Current lumber production approximates 3.7 million fbm (16 000 m3) per year from timber harvested on the Avalon.

All these natural and human induced events have influenced the forest condition and productivity of the Avalon forest ecosystem. Avalon forests are resilient and regenerate to the original forest after disturbance (Meades and Moores 1989). Using an age-class distribution graph, Figure 1, the forest ecosystem is divided into specific age-classes. As the forest grows it moves to the right into older age classes, until it returns to the first age class following disturbance. The age class distribution is one tool used to capture current forest development patterns.

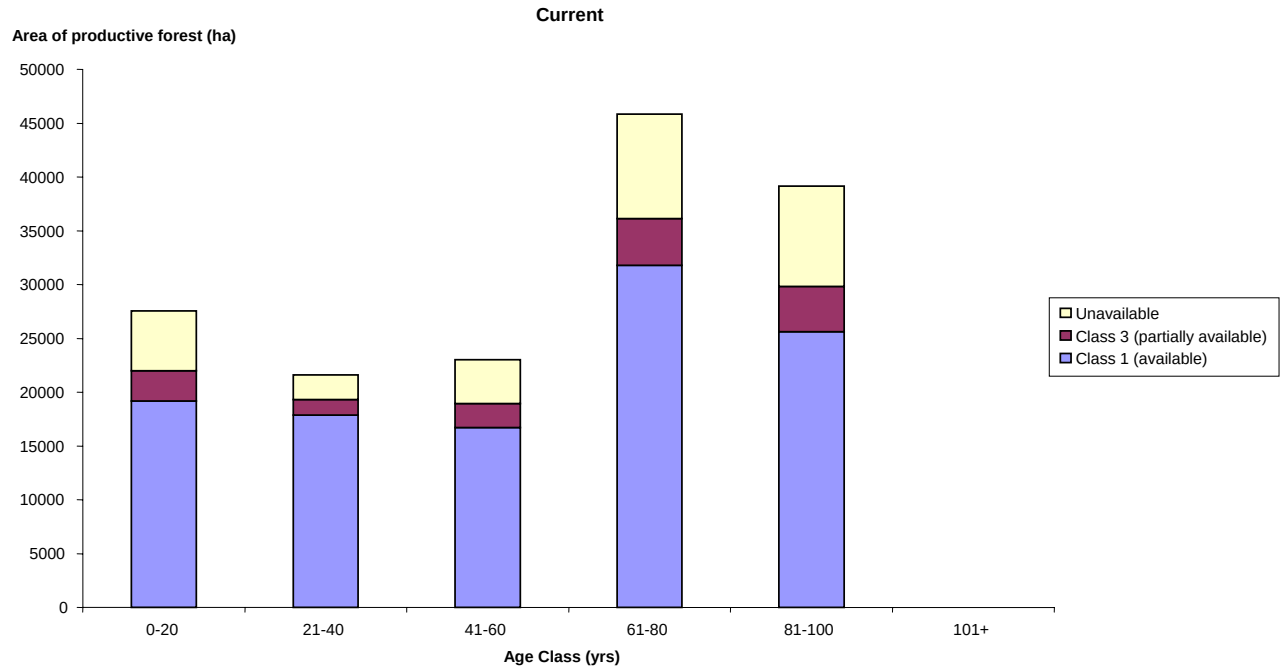


Figure 1. Age class distribution of the Avalon Peninsula Crown Forests.

1.2 Past Activities

Activities of the elapsed portion of the last Five Year Operating plan for April 1, 2002 to March 31, 2007 were conducted in accordance with principle and strategies provided in that plan. Activities are summarized in the following text and tables with more detail provided in annual reports.

The annual allowable cut was established in 2001 as 73,000 cubic meters gross merchantable volume per year. The corresponding net merchantable volume was 55,500 m3/yr at that time. Figures are reported in Table 1 in both gross and net volumes.

Table 1. Crown timber harvest for the plan period 2002 to 2007 [m3 gmv and (m3 nmv)]

Year of Cut	Commercial [g(n)]	Domestic [g(n)]	Total volume cut [g(n)]
2002-03	16,200 (12,100)	49,100 (36,900)	65,300 (49,000)
2003-04	19,800 (14,900)	41,100 (30,800)	60,900 (45,700)
2004-05	29,400 (22,100)	44,400 (33,300)	73,800 (55,400)
2005-06	34,200 (24,000)	50,000 (35,000)	84,200 (59,000)
2006-07*	34,200 (24,000)	52,900 (37,000)	87,100 (61,000)
		Average over five year period =	74,260 (54,020)

where g = gross, n = net, m3 gmv = solid cubic meters gross merchantable volume, and m3 nmv = solid cubic meters net merchantable volume

* projected

Commercial cutting rose over the period as operators provided their own access to remote areas of blowdown, while the decrease in domestic cutting reversed during the past five years to also rise as the cost of other heating rose. The percentage of total cutting that is commercial and domestic is 40% and 60% respectively.

As shown in Table 2 silviculture treatments continued to concentrate on planting and thinning of natural forest regrowth, while scarification began in the plan period to increase the density of hardwood regeneration in attempt to mitigate browsing effects. Thinning is divided into pre-commercial thinning and commercial thinning depending on the size of stems thinned. Decline in levels of funding from various sources reversed during the period ; however, innovative projects continued to be particularly under funded.

Table 2. Silviculture Treatments (ha) 2002 -2007

Treatment year	Planting (ha)	Pre- Commercial Thinning (ha)	Commercial Thinning (ha)	Scarification (ha)	Other (ha)	Yearly Total (ha)
2002-03	11	34	0	0	0	45
2003-04	61	35	0	0	1	97
2004-05	22	25	0	95	1	143
2005-06	109	20	0	217	1	347
2006-07*	228	70	25	200	13	536
Five year total	431	134	25	572	16	1,168

*Based on projected funding and Annual Operating Plan

Table 3 summarizes road construction by the Department of Natural Resources and by private operators over the past five year period. Decommissioning was done by DNR.

Table 3. Access Road Construction and Decommissioning (km.)

Year	New Construction Dept. Natural Res.	New Construction Private Operator	Decommissioning
2002-03	1.5	1.0	1.6
2003-04	0	1.5	2.0
2004-05	0	1.5	1.1
2005-06	1.6	2.5	0.7
2006-07*	3.0	0	4.5
Five year total	6.1	6.5	10.0

* based on projected funding and Annual Operating Plan

Surveys continuing in the plan period included utilization surveys, hare, ptarmigan, creel and rare plant surveys.

Prescribed burning for blueberry production continued however no burning was done for improvement of partridge habitat during the period. Table 4 shows the number of wildfires and area burned in the period. Most fires were contained to less than one hectare in size. The largest fires in the period annually burned in the range of ten to twenty-five hectares each.

Table 4. Wildfire Summary

Year	Number of Fires	Area Burned (ha.)
2002-03	40	37
2003-04	53	50
2004-05	57	30
2005-06	52	115
2006-07*	55	65
Five year total	257	297

* projected

1.3 Overview

District 1, the Avalon Peninsula, is the third largest in surface area on the island of Newfoundland. It contains approximately half the human population of the province and therefore records the most wildfires, human-animal conflicts, complaints on illegal activity and referrals for allocation of Crown land.

Loss of productive forest land to competing land uses (such as cottages, agriculture, residential, roadways, quarrying and other commercial use) on both crown and private land is probably the

greatest threat to forestry. Although differences in the periodically inventoried area preclude direct analyses of losses, it is estimated that withdrawals of forest land to other land uses has been at the level of 1,200 hectares per five year plan period. The rate of forest land alienation may continue to increase in the current plan period considering such things as the proposed forage area expansion of 8,000 to 9,000 hectares, the continued demographic shift in the island's population towards the Northeast Avalon and attempts to satisfy expanding cabin development demands.

The landbase erosion represents a threat not only to sustainable timber and habitat production, but also to the myriad of values people hold of the forest and to the ecological functions that forested land provides. Similarly, resolution of the question of the adequacy of ecological reserves network is an area that requires attention. Another possible threat to the sustainability of the forest is unrestricted timber demand, which could triple to former levels, if uncontrolled access for domestic cutting were to be permitted.

Conversely, opportunities exist for value added timber products and non-timber forest products which can be integrated with sustained timber production. Institution of some form of land use planning or the designation of reserves for forestry and ecological purposes can bring more certainty for the long term. Utilization of woody material currently below merchantability standards can be applied to domestic heating and other energy needs, and simultaneously provide economic opportunity and employment.

The forests are a valuable and renewable natural resource. Sawmillers and other forest operators have contributed to the rural lifestyle and economy of the Avalon for generations, and they require assurance that sustainable forest operations are secured for future generations in balance with environmental and social considerations. These three realities are recognized in the sustainable forest management approach. Sustainable forest management is both a challenge and an opportunity for the present and for the future as reflected in Planning Team discussions.

Large scale topographic maps provide an overview of areas and activities referenced in the text in accordance with the discussions of the Planning Team.

2.0 RESERVES

Forest Ecosystem Strategy Documents of 1997 and of 2002 for the Avalon detail a wide range of resource values and uses which are included as Appendix 6. Wilderness and natural areas are highly valued and must contain a variety of wetlands, representative areas and unique areas. The 2002 Strategic Plan further recognizes that protected areas provide a benchmark to measure and guide management decisions (Planning Team, 2002).

The Avalon Peninsula contains three of the nine ecoregions in Insular Newfoundland, as outlined in Appendix 4. The Provincial Sustainable Forest Management Strategy of 2003 commits the Department of Natural Resources to work with the Department of Environment and Conservation to recommend protected areas that will provide adequate representation of each ecoregion (Govt of NL, 2003). The Natural Areas System Plan under the responsibility of the Department of Environment and Conservation recommends a plan of proposed protected areas for the province.

Jacobs, 2004 on behalf of the 2002-07 Planning Team, wrote the Minister of Natural Resources and the Minister of Environment and Conservation urging them to expedite the Natural Areas Systems Plan and its public review.

The Forest Ecosystem Strategy Plan for Forest Management District 19 Labrador / Nitassinan (Forsyth and Deering, 2003) and the Five Year Operating Plan for Forest Management District 19A / Goose Bay (Forsyth and Deering, 2003) recognize the protection of ecological functions at different planning scales. The Natural Areas Systems Plan is a “coarse filter” which represents the broadest level of protection and is intended to allow for major ecosystem types, habitats and species which utilize large areas.

Areas proposed for forest management activities in this operating plan avoid all existing reserves and reserves currently proposed under the Natural Areas Systems Plan for ecological reserve status, as advocated by the Parks and Natural Areas Division of the Department of Environment and Conservation and the Wilderness and Ecological Reserves Advisory Council. Nevertheless, there is a need to address preservation of natural ecological functioning at the various levels in order to ensure that forest operations are sustainable. Natural retention will ensure networks and corridors of contiguous forested habitat are maintained in the Avalon Boreal Forest.

Levels of protection such as landbase planning, pre-operational surveys, appended principles guiding this plan, and the application of the Environmental Protection Plan are discussed in Section 4 Protection.

An ad hoc sub-committee of the first Planning Team (for the period 1997 to 2002) recommended establishment of a Forest Reserve in the Central Avalon which would allow forest operations and other activities to continue, but restrict construction of permanent roads and cabin development in the proposed area. The proposal received widespread support and was submitted to the Interdepartmental Land Use Committee, ILUC, (Wells, 2000) where opposition from Lands Branch did not allow the proposal to proceed.

In view of removals of forested lands for other land uses as outlined in the previous section, some security of a long term forest landbase is required, not only for timber production, but for wildlife and the myriad of other values and services a production forest provides. As a minimum, areas where forest reproduction methods and silviculture systems have been applied should be reserved as part of a long term forest landbase.

3.0 OBJECTIVES AND OPERATIONS

The concept of sustainable development (including its subset, sustainable resource management) has achieved near universal recognition as a functional and operational principle that provides guidance in formulating decisions within a wide range of management and policy issues (Emmett, 2006). An overall objective of this plan is to manage the Avalon District forest resources for the benefit of all users such that it will provide these benefits perpetually (Planning Team 2002). Operational activity is presented in the following four sections within the overall context of the

Provincial Sustainable Forest Management Strategy and in accordance with the Environmental Protection Plan.

3.1 Allocation of Wood Supply and Harvesting

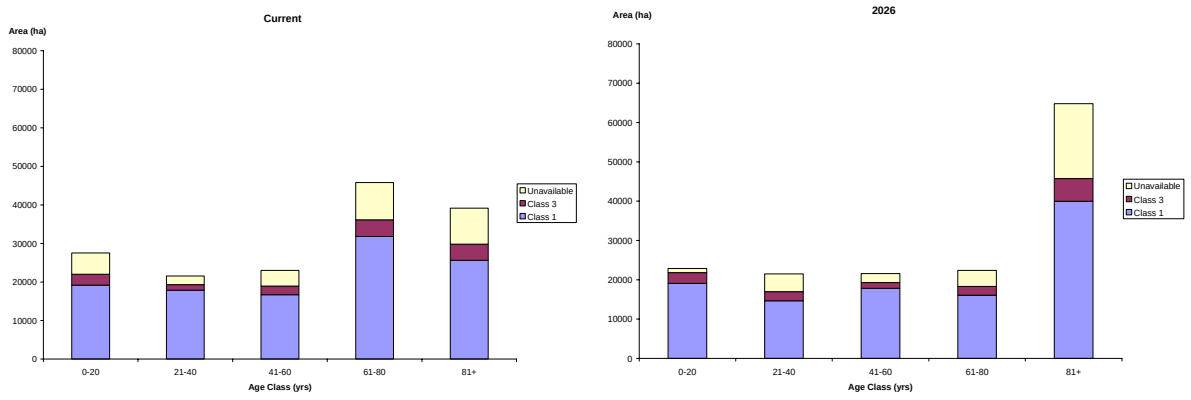
It is a policy of the Government of Newfoundland and Labrador to ensure that timber harvesting in this province is conducted in a sustainable manner (ie. harvesting will not exceed established AACs) (Government of NL, 2006). The term annual allowable cut (AAC) is commonly used to express the quantity of wood that can be cut in a sustainable manner that preserves the young growing forest and allows for harvest of those stands deemed eligible for cutting.

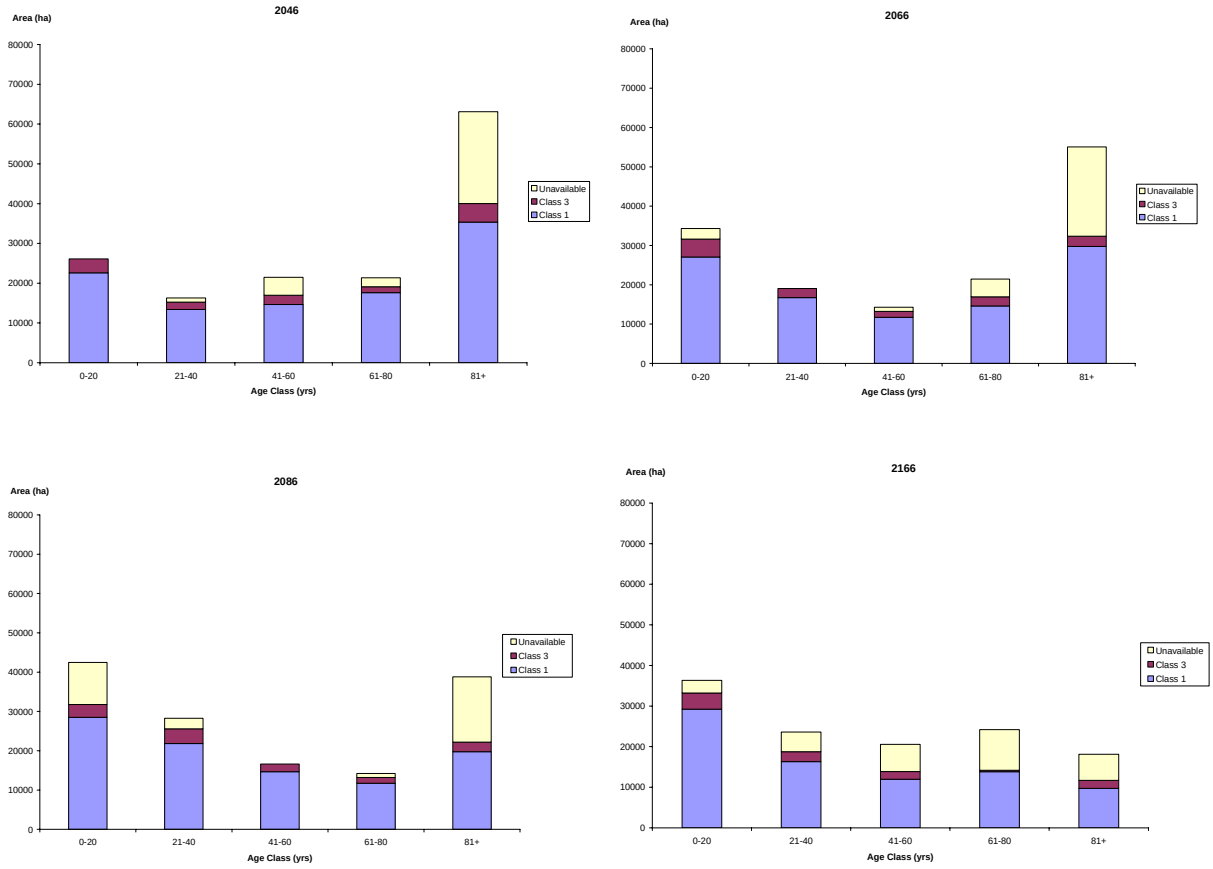
Forest inventory assigns to all forested land a typing that describes its tree species composition, age, height, tree crown density, site quality and the area of individual stands. Each stand follows a growth curve, natural or managed, for that particular classification which projects the volume and associated characteristics over time and allows for harvest or other silvicultural treatment of eligible stands at specified times or conditions.

This sustainable wood supply is determined through use of computer models WOODSTOCK and STANLEY applied on a forest management district basis to project forest development and characteristics over a 160 year period. Other inputs or constraints in the modelling include;

- a minimum of 20% of the forest must be older than 81years +
- operable growing stock no less than twice the level of a five year harvest
- cutting of poor sites not exceeding the proportion of poor sites in inventory
- losses to the production forest landbase in the vicinity of 240 hectares per year
- silviculture treatment levels at sixty hectares annually of planting and forty hectares annually of pre-commercial thinning.

Figures 2(a) to 2(f) show how the forest age class structure develops over time. Harvest of a mature or senescent stand brings it back through natural regeneration or planting to an immature condition (0 to 20 years old or “age class 1”) where it starts to grow back until the next harvest. Similarly each age class moves up and eventually returns to age class 1. Stands that are not cut are cycled though their life by other agents. Although a perfectly regulated age class structure is not obtained, age class imbalances are reduced over the extended period.





Figures 2(a) to 2(f) show current age class distribution and projected age class distributions at 20, 40, 60, 80 and 140 years into the future.

Wood Supply Analysis, Public Review (Govt of NL, 2006) provides further detail on the process, and categorizes AAC's as Landclass I (available for harvest), Landclass III (partially available for harvest) and a hardwood AAC. AAC's were subsequently determined (Cohlmeyer, 2006) for District 1, the Avalon Peninsula to be 52,000 m3nmv/yr (Landclass I), 8,000 m3nmv/yr (Landclass III) and 500 (Hardwoods) m3nmv/yr. If one considers approximately half the Landclass III AAC categorized as partially available due to operational limitations to actually be attainable, the combined current Landclass I, Landclass II and Hardwood AAC's are comparable to the single total AAC calculated for the last period at 55,500 m3nmv/yr.

As outlined in previous sections, timber demand currently approximates the annual allowable cut and is 60% : 40%, domestic to commercial. Appendix 7 contains describes graphically, and in text, information on timber demand since Forest Management Districts were established.

Principles on allocation of wood (included as Appendix 8) relate to the subdivision of the Avalon and to ensuring that cutting does not exceed the maximum sustainable in each zone. Table 5. shows the situation with respect to net and gross Landclass I AAC's specifically in each of thirteen zones which were established based on ecoregion, sub-region, watershed areas used by Environment Canada and geographic divides. Although current harvest is in line with the sustainable level of cutting District-wide, some areas continue to be overcut and require alteration in approach. Landclass III, which is generally in lower volume and extremely remote areas, can provide a minor degree of relief to domestic and commercial operators under specific and

regulated conditions within the prescribed limitations. However, total harvest from all sources must not exceed total the AAC.

Table 5. Average demand (2001 to 2005) and sustainable supply of crown timber by ecoregion and submanagement unit (zone) in Forest Management District 1.

Ecoregion/ submanagement unit (Zone)	Demand (m^3) Domestic (net m^3)	Demand (m^3) Commercial (net m^3)	Total harvest (net m^3)[1]	Total harvest (gross m^3)[2]	AAC (m^3)	Surplus deficit (m^3)
Avalon Forest						
A. Central Avalon North	1,993	127	2,120	2,777	4,394	1,617
B. Central Avalon South	1,223	13,355	14,578	19,097	16,728	(2,369)
Maritime Barrens						
C. Eastern Shore St. Mary's Bay	2,101	0	2,101	2,752	3,238	486
D. Southern Shore	2,657	137	2,794	3,660	4,702	1,042
E. Northeastern Avalon	2,028	948	2,976	3,899	4,163	264
F. Eastern Shore Conception Bay	1,227	727	1,954	2,560	6,167	3,607
G. Eastern Cape Shore	877	0	877	1,149	2,313	1,164
H. Western Cape Shore	1,551	80	1,631	2,137	9,250	7,113
I. Bay de Verde Peninsula West	8,216	720	8,936	11,706	11,717	11
J. Bay de Verde Peninsula East	5,567	253	5,820	7,624	1,927	(5,697)
K. Isthmus	3,615	577	4,192	5,492	9,944	4,452
Eastern Hyper – Oceanic Barrens						
L. Trepassey	1,304	0	1,304	1,708	2,313	605
M. Cape St. Mary's	0	0	0	0	231	231
Totals	32,359	16,924	49,283	64,561	77,087	12,526

1. Net cubic volume of wood before adjustment for poor utilization and under-reporting.
2. Gross cubic volume of wood adjusted for poor utilization and under-reporting.
** volume represents a one time harvest of blowdown that is not used for the AAC calculation. Green volume is significantly lower.

Principles on cutting (Appendix 9) generally apply to domestic and commercial harvesting. However, alterations in cutting patterns, retention of hardwood and other restrictions have been more effectively implemented with commercial operations where pre-harvest plans and monitoring of individual permit holders are in place. Similarly, redirection of cutting to remote areas of blowdown has been more effective with commercial operations.

Estimates of blowdown in the 1990's were in the range of 4,650 hectares, mostly in the Ecoregion V (otherwise known as the Avalon Forest or Central Avalon). Significant amounts of blowdown also occurred on the Southern Avalon, including the Avalon Wilderness Reserve. Estimates of

areas of blowdown still considered operationally usable are in the range of 1,000 hectares, mainly in the Avalon Forest. Consideration should still be given to volume increases to salvage of remote areas of blowdown; however, regular permit volumes in areas of standing timber should not be exceeded.

Silvicultural systems, including cutting, should be geared to even aged stand development, as occurs naturally, and cut sizes in productive forest areas should reflect the naturally occurring stand size distribution as shown in Figure 3 (ie. 50% of stands less than 10 hectares in area). Currently 90% of cutover sizes are less than five hectares in size (Figure 4) which is actually resulting in a more fragmented forest than would naturally be found. Monitoring of cut sizes should also include levels of browsing at different distances from edges with a view to mitigation of browsing on native species.

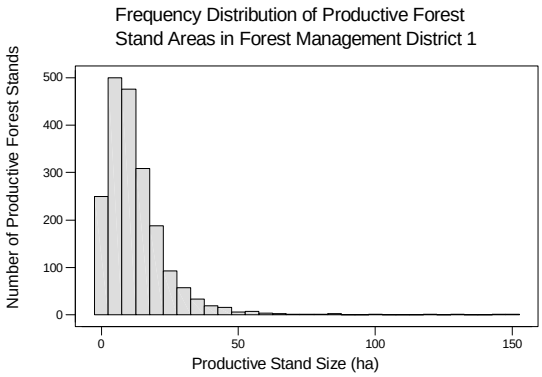


Figure 3. Stand sizes

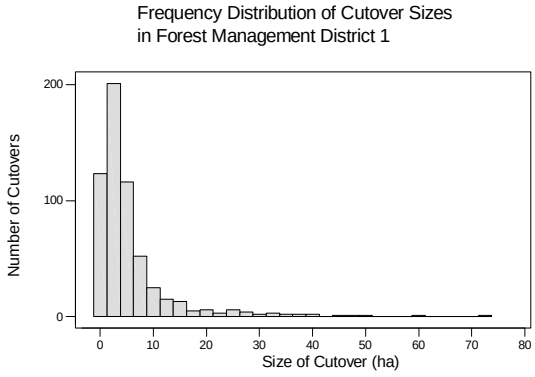


Figure 4. Cut sizes

Table 6 shows cumulative areas of stand sizes by groupings. Cutting at the level of the AAC corresponds to approximately 1,000 hectares per year and, due to natural topography and to

Table 6. Stand size distribution and cumulative area of productive forest.

Stand size (ha)	Number of Stands	Total Area (ha)
0-5	48,378	93,916
5.1-10	5,550	37,903
10.1-15	1,343	16,117
15.1-20	461	7,887
20.1-25	221	4,904
25.1-30	142	3,857
30.1-35	67	2,165
35.1-40	42	1,562
40.1-45	30	1,283
45.1-50	22	1,054
50.1-55	9	472
55.1-60	11	636
65.1-70	4	246
70+	23	2,197

traditional cutting patterns, would be spread over an excess of one thousand stands within scheduled cutting areas. Cutting operations and scheduling of areas for cutting follows principles attached in Appendices 8 and 9. Overview maps 8 and 9 show proposed domestic and commercial cutting areas at 1:250,000 scale, and are available in binders of mapping at the 1:50,000 topographic scale and 1:30,000 covertype scale registered with the Environmental Assessment Division and maintained at the Paddy's Pond office.

3.2 Silviculture

Silviculture systems which emulate even aged conditions are the seed tree, the shelterwood and the clearcut systems. Seed tree and shelterwood are used in areas where there are regeneration problems in getting enough trees back on a site following disturbance and where wind is not a problem for trees which are left. The clearcut method is used where there are adequate amounts of natural regeneration and where wind may or may not be a problem. The forests of the Avalon almost invariably regenerate to an overstocked condition.

Selection cutting is a system applied to uneven aged stands. It requires trees of all ages (not all sizes) or at least three distinct age groups well distributed throughout a stand. Biologically, it is suited to trees that require partial shade to establish, grow or compete and to species that have deep rooting systems able to withstand increased wind on established trees. Selective cutting is a different term (as opposed to selection cutting) used when individual trees are removed from older even aged stands which are basically finished growing and do not have all ages present or species conducive to uneven aged management.

Selection thinning (commercial thinning) is a term used where selected stems are removed from young even aged stands to encourage the growth of the remaining stems. The condition of the growing stems which are left is the primary concern. It must be stressed, though, that after a number of thinnings the stand would be cut if natural mortality of the stand were to be avoided.

Cutting of mature and senescent stands uses trees which would otherwise experience mortality through fire or other agents of disturbance. It is important in cutting that branches and tops of stems which are utilized be left on site, as this is where the trees' nutrients are concentrated. Nutrients which are locked up in the cold soils of Newfoundland become available and cycled more quickly with higher temperatures when tree cover is removed, but nutrients in the soil must be replaced with those from branches and tops which are left to decay.

The biology of boreal overstory species (ie. relatively short lived, prolific seeders, grow best in full sunlight, naturally occur as even aged stands) indicates a silviculture or harvesting system in concert with these attributes is best suited to cutting and renewal of these species. Such a system is clearcutting. Clearcutting is defined as removal of a stand in one cutting with reproduction by small seedlings already on site, by planting or by seeding from adjacent stands. Unfortunately, the appearance of a fresh clearcut is not aesthetically pleasing and, if not applied correctly, other values may not be safeguarded. Systems recommended on the Avalon are a modified clearcut for mature and senescent stands, and a selection thinning for younger, growing stands.

Modifications to a basic clearcutting system include restriction on cut sizes, use of leave trees for nesting, perching and other wildlife purposes, and other green tree retention mainly for seeding purposes where birch and spruce are present. Balsam fir seedlings are established prolifically on the ground before a canopy is removed and species with lighter seeds, such as birch, are dispersed mainly by wind and establish on exposed mineral soil. The forests of the Avalon almost invariably regenerate to overstocked conditions ; however, due to heavy browsing pressure on natural regeneration, scarification trials under seed trees have been attempted to increase hardwood regeneration to densities that will hopefully allow adequate numbers of hardwoods to achieve free to grow condition. The management of prolific balsam fir regeneration and of fir dominated stands is a challenge because fir is the preferred host of a number of native and exotic insects, is heavily browsed by moose and it is highly susceptible to butt and stem rots. Increasing the proportion of other tree species in regenerating stands assists in an integrated pest management approach while increasing forest values.

Silviculture is practiced primarily to ensure all forest sites have adequate regenerating trees following disturbance and that the trees are in a condition to provide optimum growth for fibre and habitat production. Forest stands on the Avalon which regenerate profusely (and have been able to attain free to grow status) are thinned at various stages of development. Pre-commercial thinning (PCT) is done before trees become merchantable, although waiting until height growth attains 3.0 meters appears to extensively mitigate moose browsing. Subsequent thinnings may be done up to an approximate age of forty years after which growth benefits of thinning are greatly reduced.

Sites typically planted have been fir forest covertypes that have burned. However the main reason for planting now is to offset regeneration failure due to browsing. There has been a significant increase in area planted following disturbance on the Avalon. Planted sites can produce higher timber volume yields depending on tree species planted and densities. Judicious planting of species such as white spruce, Norway spruce and Japanese larch can significantly increase timber production. Depending on site conditions, various mixtures of these and native species such as black spruce, eastern larch and white pine are proposed. As white pine blister rust continues to decimate regeneration and often saplings of this species throughout Newfoundland, species such as red pine (which has not been recorded historically on the Avalon) will be included in reforestation programs.

The level of planting on the Avalon now exceeds the level of thinning of natural regeneration, which is almost a complete reversal of the situation just ten years ago. As mentioned in the section on factors that have affected forest conditions, there are an estimated 80,000 hectares of once forested area on the Avalon now occupied by heath. Stratification of this area by land ownership, soil capability, exposure and Canada Land Inventory classification shows areas suitable for trial plantings to be expanded into operational plantings. The point should be strongly reinforced that such plantings and other silviculture work are desirable investments by governments and others to provide immediate employment opportunities in rural areas, future economic benefit (when stands reach maturity) and a myriad of values on the landscape while such stands of trees are growing.

Table 7 shows silvicultural treatments proposed over the five year period while Appendix 10 provides additional detail. Selection thinning, although not successfully undertaken in the last plan period, is again proposed on a trial basis in select domestic cutting areas with the hope of eventually scheduling a portion of the domestic harvest through this means of silviculture treatment. Small operational fertilization trials are scheduled throughout the period. It is hoped that Natural Resources Canada will be able to continue monitoring and will be joined by the Department of Fisheries and Oceans to provide sampling and reporting on possible fertilization effects on terrestrial (forest and wildlife) and aquatic production. Planting and plantation maintenance includes operational planting on heathland as a means of increasing forested area and fibre production, particularly in areas of heavy domestic overcut. Other innovative projects which may not have areas explicitly shown on maps are also proposed for possible funding under silviculture.

Proposed silviculture areas are shown on the 1:250 000 scale topographic map of Overview Map 10 and are available at 1:50 000 and 1:30 000 scale from the Paddy's Pond Office and at the Environmental Assessment Division of the Department of Environment and Conservation.

Table 7. Silviculture Treatments Proposed for 2007-2011 (in hectares).

Treatment Year	Planting	PCT*	CT*	DLT*	SP*	F*	DST*	Other	Yearly Totals
2007	251	50	10	40	200	10	5	12	578
2008	281	50	10	40	200	10	5	-	596
2009	291	50	10	80	150	10	5	-	596
2010	201	65	10	40	150	10	5	-	481
2011	201	85	25	20	150	10	5	-	496
Five Year Totals	1225	300	65	220	850	50	25	12	2747

*PCT – Pre-commercial Thinning, CT- Commercial Thinning, DLT- Diameter Limit Thinning, SP- Site Preparation, F-Fertilization, DST – Domestic Selection Thinning

** Other includes: Yellow Birch Exclosures, Hardwood Management, Plantation Maintenance

3.3 Road Construction and Decommissioning

The Department tenders construction of resource roads in areas of productive forest land which enable access by forest operators and the public for a wide variety of consumptive and non-

consumptive forest uses. Appendix 11 contains standards for roads built for the Department or by private contractors including a standard for roads built with the intent or option of future decommissioning. Since the proclamation of the Forestry Act of 1990, bulldozed skid trails and landings constructed by private operators must be approved by the Department to a standard designated by resource agencies. The Environmental Protection Plan of 1994 also provides explicit guidelines for forest road construction.

Forest cutting by commercial and domestic operators and subsequent silviculture work has concentrated on areas accessed by forest resource roads and in many areas all that can be currently undertaken from existing roads has been completed. In theory a network of operational roads could be constructed from existing access roads. It may be desirable to decommission some roads. Various levels of road decommissioning are considered on a case by case basis. Cutting, roads and silviculture concentrate on areas of damaged and overmature timber first, then mature or healthier areas. Roads for agriculture, cottage development, private roads, public highways and other development should avoid areas of productive forest on the Avalon where possible.

Despite the values and opportunities provided by forest access roads, there has been widespread opposition to their construction, particularly on the Avalon. The opposition is not so much to road design, construction techniques or damage by roads, but often to subsequent uses, increased access to a variety of users, the increased spread of garbage and illegal occupation, and the general loss of the naturalness of the area.

However, it is often recognized that the cycling of the forest is necessary and will occur through one means or another. The objection is mainly not to cutting, but to increased access. It is also realized that no matter what the means of harvest, after a certain extraction distance, road access is necessary. Driving on rivers and ponds is no longer an option. Operators and those opposed to road construction generally agree that forest access roads need not be built to a 20 year standard, that they could be built to a lower standard, and many agree that they should be closed, decommissioned or restored to a condition capable of growing another forest after use.

Trials conducted on road decommissioning in 1997 compared various types of construction equipment in terms of the quality and cost of road decommissioning. Findings were that a mid-sized excavator gave preferred results in terms of ground disturbance and ability to restock the site. Cost was approximately $1,000 per kilometer of operator constructed road decommissioned (Butler and Sharron, 1998).

Appendix 12 contains principles on forest access road construction and decommissioning. Restriction of access while operations are ongoing in an area and various levels of decommissioning are proposed on an individual road basis.

Table 8 shows proposals for construction, re-construction and decommissioning over the five year plan period. It is anticipated that only a fraction of road proposals will actually be funded

and that the actual ratio of road constructed to road decommissioned will approach 1:1. It is recognized that the central Avalon is of particular interest to several stakeholders and that monitoring of activity in this area is critical.

Table 8. Proposed Road Activity 2007-2011

Year proposed	Code*	Length (km)	Location	Activity	Stream crossings
2007	RC-4	2.5	Hanging Hill	Construction	1
	RD-12	5.0	Tower Road	Decommissioning	1
	RD-7	2.4	Tower Road	Decommissioning	1
	RR-4	5.2	Hanging Hill	Re-construction	2
2008	RC-8	2.0	Spread Eagle Peak	Construction	1
	RD-10	3.6	Hender's Road Extn.	Decommissioning	0
	RR-5	2.6	Shoal Bay Road	Reconstruction	1
2009	RC-9	1.5	McGrath's Pd.(Placentia)	Construction	0
	RC-12	2.0.	Spread Eagle Peak	Construction	0
	RD-6	1.8	Joyce's Trail	Decommissioning	2
2010	RC-10	2.0	Level Pond (Penny's Pit)	Construction	0
	RD-9	2.0	Witless Bay Country Pd	Decommissioning	1
2011	RC-11	1.0	Patrick's Path	Construction	1
	RD-10	3.7	Kirk's Ridge	Decommissioning	1
Totals	RC = Road construction = 11.0 km.				
	RD = Road decommissioning = 18.5 km.				
	RR = Road reconstruction = 7.8 km.				

* Coding and carried-over proposals follow that of last plan

The construction technique will continue to allow the option of future road decommissioning. Unless otherwise specified, decommissioning is by replacement of soil and overburden, planting and denial of vehicular access to the former roadbed. Stream crossings greater that five meters would be by Bailey or other sectional or portable bridge. The construction or removal of a culvert or bridge requires approval under Section 11 of the Environment Act.

Locations of road activity are shown on the 1:250,000 topographic map of Overview Map 11, and 1:50,000 and 1:30,000 scale maps available with the Environment Assessment Division and the Paddy's Pond office. Skid trails will continue to be reclaimed as necessary to enable natural revegetation or planting.

3.4 Surveys

Surveys are usually done to determine the presence or quantity of particular values such as timber, habitat or sensitive values in an area or to determine the regeneration status or utilization on an area that has been harvested or otherwise disturbed. The data obtained are used as input to develop plans and to make necessary adjustments to the existing plan during its execution. Surveys are to be conducted in all major areas scheduled for harvest in preparation of a pre-harvest plan. Values are to include such features as moose sheltering areas, salmonid habitat and rare lichen. In areas which have been harvested, regeneration surveys will continue to determine silviculture requirements such as planting or thinning. Similarly utilization surveys will be continued to determine the extent of utilization and impact on supply/demand projections. Key areas are the Northeast Avalon, Central Avalon, Bay de Verde West, Carbonear Watershed and other areas of the Bay de Verde East zone.

4.0 PROTECTION

4.1 Water Supply Areas

Guidelines for forest operations within Protected Water Supplies are as described in the Environmental Protection Plan for Ecologically Based Forest Resource Management (Govt of NL, 1998) which specifies standards for road construction, buffers, stream crossings, fuel handling and storage and other activity. There are fourty-one domestic cutting areas, six commercial cutting areas, one road reconstruction and one road extension which either partially or completely overlap water supply areas or portion of a water supply in the five year period.

Any activity in a protected water supply area requires approval under Section 10 of the Environment Act. To this end, a detailed four page application is required by Water Resources Division requiring information on activity, location, size, access, stream crossings and other particulars. Approvals would be necessary before any pre-harvest plan could be recommended or activity begins, and conditions of the environmental approval would be binding on all activity in a protected or unprotected water supply area.

4.2 Habitat Protection

Habitat conservation, preservation and provision affect the viability and success of our flora and fauna. Areas are designated sensitive for a number of reasons as outlined in the Environmental Protection Plan.

For some species such as moose, hares and caribou the maintenance of certain habitat types

within a geographic range will provide adequate yearly habitat. For other species such as great-horned owls, bald eagles and salmon with definite affinities for particular sites detrimental intrusion into these sites should not be allowed and any activity in the vicinity would be conducted as per the Environmental Protection Guidelines (Appendix 13). With flora, the successful reproduction of native plants following disturbance determines management actions during this planning period. It is impossible to manage on a species by species basis. However, by maintaining a variety of habitat types and ages, the species that need successional habitats (e.g. grouse) and high floral diversity will have adequate cover. Concentration of cutting on senescent stands and blowdown puts stands in successional pathways and age classes that would occur with natural disturbance.

Known locations of raptor nesting sites have been provided by the Wildlife Division and will continue to be updated. Any management activities shall be directed away from sites where specific raptor activity is occurring, and operations shall maintain a minimum buffer on the nest site of 800 m during nesting season and 200 m during non-nesting periods. As well activities in the vicinity shall be conducted at non-nesting times.

Aquatic and marshland habitat requires adequate buffering to ensure maintenance of integrity. Aquatic habitat buffers are specified in the Environmental Protection Plan for Ecologically Based Forest Management which has been approved by the Department of Fisheries and Oceans. In addition, stream crossings will avoid spawning areas (see Jones and Winter, 1995). Wetlands and associated riparian habitats are enriched sites that support high biodiversities of valued ecosystem components, such as waterfowl, passerine birds, moose (seasonally) and other species. The protection of sensitive habitats is as agreed to with fisheries or wildlife biologists in the agencies responsible and who designate these sites.

Field staff laying out harvest blocks will ensure that a minimum five meter buffer is maintained around bogs and a minimum standard twenty meter buffer on regular waterbodies. Due to the natural topography, stand sizes, and the occurrence of "non-productive" forested areas on the Avalon, connectivity is maintained through the mosaic of uncut areas of forest cover naturally occurring across the landscape.

Riparian buffers contribute to local biodiversity by supporting species dependent on riparian habitat but upland sites may contribute equally or greater to local biodiversity (Doucet, 2006). In sensitive areas where additional riparian habitat is required, the standard twenty meter buffer is expanded in consultation with biologists of the agencies that have designated the sensitive wildlife area. Landbase mapping additionally removes buffers, steep slopes and other areas of particular concern from the portion of the landbase eligible for forest operations.
Throughout the District, field staff ensure that coarse woody debris is being left on harvested sites. Snags and a number of hardwood and softwood trees preferably in clumps, are left to ensure structural heterogeneity and also additional seed source after cutting. Cut sizes follow the historical distribution of disturbances sizes.

Principles on cutting and on road construction and decommissioning (Appendices 9 & 12) and the Environmental Protection Plan for forest operations further address habitat protection. “Pre-harvest planning” done for all commercial cutting on the Avalon will be expanded to “pre-operational planning” to include all silviculture and forest access road activity as well as a sampling of domestic cutting areas.

The successful reproduction of a new forest stand following cutting or other disturbance is pivotal to the maintenance of habitat throughout the District. Today’s young forest is tomorrow’s shelter for moose or future lichen forest. As well, reproduction following disturbances generally increases biodiversity. In many parts of the Avalon, however, successful reproduction of a biodiverse forest is impinged by various herbivores which utilize young shrubs and trees, often to the detriment of biodiversity.

This is of vital importance to the Avalon Forest Ecoregion where balsam fir, yellow birch and white birch are climax tree species, but successful growth all three are severely limited or precluded by moose. Monitoring of exclosures constructed in 1997 to examine herbivory indicates that squirrels and avifauna may also be contributing to fir decline. Size of disturbed areas and other factors should be investigated in relation to herbivory and effects on natural succession, and recommendations made to various agencies.

4.3 Biodiversity

Biodiversity is the wellspring of life. The Provincial Sustainable Forest Management Strategy of 2003 accepts the Canadian Biodiversity Strategy’s definition of biodiversity as ‘the variety of species and ecosystems and the natural process of which they are part’. The provincial strategy goes on to establish key biodiversity issues pertaining to managing forest ecosystems in the province and sets goals, indicators and actions that will be monitored and reported on through an established process.

As mentioned in the preceding section, herbivory by introduced species is affecting natural succession and native biodiversity. Forest practices should not impinge biodiversity, but do have the potential to, where not applied properly on the ground.

Two management actions that have the potential to impact diversity are planting and pre-commercial thinning. No herbicide treatments are planned for the next five years. Planting in the District will be where there are insufficient young trees to form a new stand. As an example, Mitchell’s Brook in St. Mary’s Bay was burned in 1985 and had not successfully regenerated. Productive areas in this burnover were planted with varieties of native species (larch and spruces) grown from local seed sources.

The provincial strategy does allow for judicious planting of non-native trees and notes that over 95% of seedlings planted are of native species. Introduced species used in nursery production

and reforestation programs have been present on the island for a significant number of years and have been proven non-invasive. Planting of such exotic species did not occur on the Avalon in the last plan period, but could be considered in operations currently proposed.

Pre-commercial thinning of young forest stands will strive to maintain tree and shrub diversity. Conservation Officers and silviculture staff they supervise are instructed to ensure that the relative species composition of the treated stand is the same as the pre-treatment stand. In many sites on the Avalon, hardwoods are favoured over softwood in crop tree selection. As well, field staff will ensure that untreated blocks are left in areas scheduled for thinning so that comparisons can be made.

Within Management District1 white pine is an extremely rare species. Preliminary observations of the few stands and isolated white pine that remain indicate that healthy young pine regeneration is poor to absent. However, the preservation of white pine is clearly identified in the Provincial Sustainable Forest Management Strategy. White pine blister rust continues to jeopardize natural regeneration and the success of the white pine gene preservation garden at Paddy's Pond. Cultural operations, such as pruning and fungicide application, continue against blister rust in the gene preservation garden. Planting of healthy white pine seedlings continues in mixtures planted operationally, while cutting of natural white pine on Crown Land is not permitted.

Within the forest, stand biodiversity is maintained by having a mosaic of age classes and stand types. As forest stands age, the compliment of flora and fauna within that stand changes. For example, arboreal lichens, terrestrial mosses and bryophytes increase in abundance as stands age but are virtually absent in a young stand. The Provincial Sustainable Forest Management Strategy incorporates the objective that 15 – 20 % of the total productive forest within a district be older than 80 years, as projected through a 160 year planning horizon. Analysis of the projection on the Avalon shows that the proportion greater than 80 years will not fall below 20% on Crown land over this extended planning horizon. By ensuring we have a mosaic of forest stands types and ages on the landscape, we will maintain diversity of flora and fauna.

4.4 Wildfire

Wildfire protection continues to be primarily through ground crews with aerial support. As mentioned in the section on past activities, most fires have been contained to less than a one hectare burn size on the Avalon. Trained forest fire ground crews are stationed at five locations on the Avalon (Cape Broyle, Heart's Desire, Paddy's Pond, Salmonier and Whitbourne). Regular staff at all locations in the District have experience and training in wildfire suppression and investigation. Preventative patrols and effective public information remain major tools in fire prevention, as most fires on the Avalon are still human caused with 16% through illegal burning.

Despite the use of prescribed burning in other parts of the Province, this technique has not widely been used for forest site preparation or reforestation on the Avalon. Although it may be considered in the plan period, there is none suggested at present. It is anticipated that prescribed burning will continue to be practised for Agriculture and may be re-investigated for berry production for wildlife purposes. Staff will continue involvement in training techniques, review of burn plans and other assistance in these areas.

5.0 MONITORING AND RESEARCH

5.1 Monitoring Using Criteria

The purpose of monitoring is to evaluate the actions of the management agency, resource users and the forest itself, and to compare the results of evaluations against objectives and operations stipulated in plans. An annual meeting and field trip will be held in the fall of each year of the plan to review district operations for the year and to propose any modification deemed necessary. At the provincial level, criteria developed by the Canadian Council of Forest Ministers and associated provincial values will be monitored. Criteria are listed in the Provincial Sustainable Forest Management Strategy as; conservation of biological diversity, maintaining healthy forests, conservation of soil and water resources, forest ecosystem contributions to global ecological cycles, multiple benefits to society and accepting society's responsibility for sustainable development. There are eighty-three indicators associated with the six criteria specified in the CCFM document. The Provincial Sustainable Forest Management Strategy provides detail on criteria and provincial values that will be monitored. Monitoring that is done provincially should be reported on at a District level basis where possible. Provincial partnerships and liason are maintained with:

- Parks and Natural Areas on adequate representation of ecoregions,
- Wildlife Division on wildlife habitat including habitat supply modeling, species at risk and biodiversity assessment,
- Water Quality Division on the impact of forest management actions on water quality and quantity,
- Forest Engineering Research Council on soil rutting, compaction and minimizing ground disturbance,
- Corner Brook Pulp and Paper Company on use of infrared aerial photographs to assess ground disturbance,
- Canadian Forest Service, Western Newfoundland Model Forest and Sir Wilfred Grenfell College of Memorial University of Newfoundland on estimates of carbon storage for the forests of the province,
    - Canadian Forest Service and the Pest Management Regulatory Agency on natural virus development for insect control,

- Canadian Forest Service, Memorial University of Newfoundland on integrated pest management,
- Newfoundland and Labrador Forestry Training Association on value-added sectors,
- Memorial University of Newfoundland regarding socio-economic analysis

in order to report on and monitor criteria. In addition to criteria monitored provincially, the district through its Paddy's Pond office will continue to provide updates on numbers of domestic permits, volumes cut annually by domestic and commercial operations by zone; access road construction decommissioning and reconstruction; number of fires and areas burned; land referrals; insect and disease; and surveys undertaken. Annual reports will continue to be posted on the Planning Team site and updates provided at the annual field visit and meeting of the Planning Team.

5.2 Research

Science provides information for the decision making process. Information is used to define boundaries, options within boundaries, consequences of those options, and to evaluate the effect of the chosen options and to manage risks at biologically and socially acceptable levels. The scientific understanding of forests should influence management policies. It is important to understand that fundamental to management is the recognition that the management of natural processes is based on incomplete knowledge. The most difficult thing is to balance biological science with social science and with the philosophical views of how society values renewable and non-renewable resources. To obtain balance, the desired outcomes and goals are determined through the established democratic and institutional process. It is extremely difficult to obtain consensus on all aspects of the plan between diversified interest groups (Bajzak and Roberts, 1998). It is important to fill knowledge gaps to assist in management decisions and monitoring of the plan.

5.3 Proposed Research

The management process requires reliable input data to forecast the development of dynamic units over a long period of time. The basic unit of the 'forest stand' is defined as "a group of trees, occupying an area of any size, which together develop through their various life stages in a specific and predictable manner". Within an administrative area forests contain many distinct stands, each at different stages of development. The administrative unit can be very large or small, therefore, a proper classification and mapping system must be developed and applied which reflects the natural occurrence of the forest at a particular level. As described in Appendix 4, there is a system of various levels of mapping units from the very general to very detailed to

identify spatially uniform areas based on geomorphology, soil, vegetation, climate, water, and fauna. The lowest level of this system is the 'ecoelement' which represents uniform forest stands, the basis of detailed forest planning. To date the Avalon Peninsula Forest District area has only been mapped to 'ecoregion' and 'eco-subregion' levels with uncertain boundary lines. Some detailed information is given on the various forest types (ecoelements) in the Forest Site Manual (Meades and Moores, 1989), however, these units are not mapped and 'growth curves' used for them should be more substantially supported. Some suspected errors in the Site Manual, concerning the definition of some forest types, their distribution and site ecology must be investigated and updated. The establishment of levels between Ecoregion and Ecoelements with the necessary corrections is proposed. Applying the developed classification, the Avalon Forest Ecoregion (Central) area should be mapped (using aerial and satellite imagery, existing land capability maps and ground observations) at each level. In addition yield curves should be produced by important Damman forest types. This should involve the analysis of previously collected data (including measurements of permanent sample plots). These yield curves are only useful to express the developmental pattern of a particular forest stand concerning wood production for harvest. In order to evaluate the dynamics of the forest for other uses (wildlife habitat, recreation, etc) other expressions of stand development must be established. This would require research carried out by other scientists in related disciplines.

The use of the forest ecosystem on the Avalon Peninsula is very diversified. The long-term effect of the various uses is not known which is essential for proper management planning. In order to obtain information on these effects, reserve areas with no interventions what so ever should be studied as well as other areas having various levels of interventions (research areas). Extreme care must be exercised in choosing and delineating these areas with careful well-developed experimental designs. The forest ecological land classification and mapping will provide a basis for this undertaking.

Other trials and research recommended in the District would include continued monitoring of a small portion of a headwaters fertilized to test aquatic and terrestrial responses, a study on the extent and mitigation of browsing by introduced herbivores particularly in relation to disturbance size, a study of songbird usage in relation to different harvest and silviculture intensities, research into carbon cycling for monitoring purposes and a study on partial removal in wider stream buffers subsequent to preliminary results from similar trials done elsewhere in NL. Alternate uses of forest products (such as burls, specialty craft woods/products, wild mushrooms and plants for medicinal uses) should also be investigated.

5.4 Baseline Measurements

Baseline data on air temperature and humidity, soil temperature, and of stream chemistry have been collected in the Salmonier Nature Park. It is proposed that comparative data be obtained (monitored) in selected harvested and silviculturally treated areas, and in reserves. The water chemistry measurement would be done in periodic (seasonal) sampling. The temperatures and

humidity would be recorded using inexpensive dataloggers. The measurements provide quantitative data for monitoring the effect of harvest and silviculture in comparison with uncut and untreated areas.

5.5 Amendments and Revisions

Any amendments proposed to the plan which require Environmental Assessment will be simultaneously circulated to consensus Planning Team members and to the Department of Environment. Other amendments which are submitted to Forest Ecosystem Management Division for consideration, will be posted on the website. Appendix 14 contains a list of Planning Team members and Appendix 15 a list of meetings and field trips.

6.0 EDUCATION

Education of the public concerning sustainable forest management activities is a very important part of the planning process and the execution of the plan. The awareness and appreciation of modern forestry practices should be promoted. There are various programs in existence and development by the Provincial Department of Natural Resources the Western Newfoundland Model Forest and other groups. These should be supplemented by various activities carried out within the Memorial University Teaching and Research Forest at Paddy's Pond. An interpretation trail was already established to demonstrate the effect of no interventions and different forestry interventions on some forest types. A plantation arboretum of various species is also in existence. Typical understorey flora and the forest structure can be viewed as well as soil profiles. The changes in soils with slope and drainage properties and different humus characteristics will also be demonstrated. A summary of the proposed management activities on this woodlot is presented in Appendix 16.

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Appendix 1 : Glossary

Anadromous - Fish which breed in freshwater but live their adult life at sea.

Annual allowable cut - The amount of wood that can be harvested in perpetuity or the regulated amount of wood that can be harvested in one year.

Anthropogenic - Pertaining to or caused by humans.

Avifauna - The birds of a given region, considered as a whole

Biodiversity - The overall diversity of life at genetic, species and ecosystem levels.

Canopy - A more or less continuous cover of branches and foliage formed collectively by adjacent tree crowns.

Clearcutting System - Removal of the entire stand in one cutting with reproduction by small seedlings already on site, by planting or by seeding from adjacent stands. (One Planning Team Member thought a clearcut should be defined as any area of forest land that is cleared that has the diameter of twice the height of the nearest tree.)

Commercial Cutting - Cutting under permit any form of timber for sale or barter.

Decadal - of or pertaining to a decade

Demographic - of or relating to the science of vital and social statistics of a population

Detritus - agents resulting disintegrating animal and plant material before decomposition to basic nutrients.

Domestic cutting - cutting under permit any form of timber for a person's own use and not for sale, barter or gift.

Ecoregion - A climatic region defined by a unique combination of vegetation or plant distribution patterns.

Ecosystem - a group of organisms interacting with themselves and their environment.

Ecosystem management - management of the ecosystem with the sustainability or health of the system as the focus

Ericaceous - Plants belong to the heath or heather family.

Eutrophication - the bringing to a state (usually of a lake) characterized by an abundant accumulation of nutrients that support a dense growth of plant and animals, the decay of which depletes the shallow waters of oxygen in the summer.

Evapotranspiration - The volume of water evaporated and transpired from soil and plant surfaces per unit of land area.

Evenaged - A forest or stand with no or relatively small differences in tree ages.

Environmental sustainability - Actions are undertaken to ensure that they do not inhibit the long-term health, vitality and biodiversity of an ecosystem. We do this by moderating our needs and desires in order to accommodate the environmental limitations.

Ex situ - Referring to genetic conservation strategy means specific measures to conserve biodiversity such as seed banks, seed orchards or arboreta.

Ferro - Having iron content.

Fibric - Organic soil material of weakly decomposed fiber.

Fluvoglacial - Of material moved by glaciers and subsequently sorted and deposited by streams flowing from melting ice.

Folisol - A group of soils in the Organic order not saturated for more than a few days a year.

Forbs - A seed plant that lacks woody tissue other than a grass or sedge.

Fragic - Soil generally with high density.

Gleyed - Soil development under conditions of poor drainage resulting in dull greyish soil colors.

Humus - Highly decomposed organic soil containing little fiber.

Humisol - A great group of soils in the Organic order that are saturated for most of the year.

In situ - Referring to the genetic conservation strategy means within existing protected areas and reserves

Integrated - An operation that segregates a variety of products.

Integrity - The ability of the ecosystem to maintain a wide variety of ecological processes.

Landclass I - Forest land capable of producing sixty cubic meters per hectare at rotation that is operable and available for harvest and upon which mitigations are applied in forest operations in order to safeguard non-timber values.

Landclass III - Forest land capable of producing sixty cubic meters per hectare at rotation that is, due to operational constraints, partially available for harvest and, where harvesting is possible, mitigations are applied in forest operations in order to safeguard non-timber values.

Landscape - All the natural features such as fields, hills, forests and water that distinguish one part of the earth's surface from another.

Litter (leaf litter) - The uppermost layer of the forest floor, essentially the freshly fallen or slightly decomposed material.

Mineral soil - A soil consisting predominantly of mineral matter.

Moraine - An accumulation of earth, generally with stones carried and finally deposited by a glacier.

Non-productive – In the timber sense, this means forest stands not capable of producing sixty cubic meters per hectare gross merchantable volume of wood at rotation age.

Old growth - Generally the oldest of the existing forest.

Operable growing stock – the volume of timber above specified age or volume thresholds

Partial cutting - Tree removal other than clearcutting.

Peneplain - Replaced by the term "erosional surface". Generally flat ancient surface produced by subaerial weathering and subsequently raised by tectonic uplift.

Pluton - Large scale massive igneous intrusion generally greater than ten square kilometers.

Potential Evapotranspiration - Water loss that will occur if at no time there is a deficiency of water in the soil for use of vegetation.

Resiliency - The natural ability of an ecosystem to rebound after disturbance.

Riparian - of, pertaining to, or situated or dwelling on the bank of a river or other body of water

Sedge - A grass like plant with solid stems growing in tufts in marshes.

Seed tree system - Cutting of mature trees from an area except for a number of desired seed bearers.

Selection system - An unevenaged silvicultural system where trees are removed individually over a large area each year.

Selection thinning - Removal of individual trees from an evenaged stand where the condition of the trees left for the final felling is of primary importance.

Selective cutting - Removal of the best trees in a forest. In evenaged conditions this leads to forest degradation.

Senescence - The plant growth phase from full maturity to death.

Shelterwood system - An evenaged silviculture system in which, in order to provide a source of seed or protection for regeneration, the old crop is removed in two or more cuttings.

Silvicultural system - A process whereby forests are tended, harvested and replaced.

Silviculture - The art and science of growing forest crops.

Striae - Usually straight more or less regular scratches on a rock surface, produced by glacial abrasion and generally parallel to glacial flow.

Substrate - The materials making up the stream bed, usually described as bedrock, boulders, cobble, gravels, sands, and silt.

Sustainable forest management - management of forest resources in a manner that meets the needs of the present without compromising the ability of future generations to meet their own needs.

Sustainable use - The use of an organism, ecosystem or other renewable resource at a rate within its capacity for renewal.

Toposequence - The relationship between soil and vegetation types considered to be primarily due to relief.

Trail cutting system - Method of harvesting timber such that slash and piles of wood are aligned to permit extraction equipment to travel on slash and not bare ground in retrieval of wood and forwarding to roadside.

Turbidity - A measure of suspended solids or roiled sediments in water.

Ubiquitous - present everywhere or being everywhere at the same time

Unevenaged - A stand or forest consisting of three or more distinct age classes intermingled intimately on the same area.

Adapted from the following sources:

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- Forest Site Classification Manual - Meades and Moores
- Glossary of Terms in Soil Science - Agriculture Canada
- Glossary of Terms Used in Timber Harvesting and Forest Engineering - Stokes et al
- IUCN
- The Forestry Act Amended 1994 and Regulations 163/93 Cutting of Timber
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- Webster’s Ninth New Collegiate Dictionary - Merriam-Webster

Appendix 2 : Gazetting of District Boundary

NFLD. REG. 72/79

Schedule

Forest Management Area No. 1

Avalon

All Crown Land within the following area: "Commencing at a point at the mouth of the Come-by-Chance River; thence following the Come-by Chance River in a generally Northerly direction to its intersection with the Newfoundland and Labrador Hydro transmission line; thence following the said transmission line in an Easterly direction across the Trans Canada, Route 1, continuing for approximately 8,300 feet (2,529.8 meters) more or less until it intersects another transmission line running a North-South direction; thence following this second transmission line in a generally Southerly direction for 400 feet (121.9 meters) more or less to a point where it intersects a stream; thence following the stream in a generally Northeasterly direction to the mouth of the stream which empties into the salt waters of Bull Arm in Trinity Bay; thence following the coastline in a generally Southeasterly direction to the most Southerly point in Dildo Arm; thence following the coastline in a generally Northeasterly direction to a point known as Grates Point; thence following the coastline in a generally Southerly direction to the most Southerly point in South Arm in Holyrood Bay; thence following the coastline in a generally Northeasterly direction to a point known as Cape St. Francis; then following the coastline in a generally Southerly direction to a point known as Mistaken Point; thence following the coastline in a generally Westerly and Northerly and Southerly direction to a point known as Cape Pine; thence following the coast line in a generally Northerly direction to the most Northerly point of Colinet Harbour; thence following the coastline in a generally Southerly direction to a point known as Cape St. Mary's; thence following the coastline in a generally Northerly direction to the point of commencement and including all offshore islands except those in Placentia Bay.

Appendix 3 : Geology, Soils and Climate of the Avalon Peninsula

Geology

The Avalon Peninsula is commonly described physiographically as an area of rolling uplands interspersed with small plateaux. Uplands extending up to about 300 m ASL, and rarely over 400 m ASL, characterize the Bay de Verde, and St. John's Peninsulas, and the Cape Shore and southern Avalon areas. Plateaux between 100 and 150 m ASL are common in some parts of the Avalon Peninsula, particularly the southern Avalon. These areas have previously been described as erosional surfaces or peneplains (Twenhofel and MacClintock 1940). The largest area of lowland extends northward from St. Mary's Bay. The relationship between bedrock geology and physiography is highlighted by the numerous northeast to north-northeast alignment of many of the coastal fjords, particularly on the western side of Conception Bay. This direction is consistent with the axes of major folds and faults.

Considering bedrock geology, the eastern Avalon Peninsula is underlain by a succession of late Precambrian volcanic and plutonic rocks that are exposed in an anticlinal dome, which extends southward from Conception Bay. These are the oldest rocks in the area. They are overlain on all sides by successively younger, marine, deltaic and fluvial sedimentary rocks. In the western Avalon Peninsula, younger, late Precambrian volcanic rocks occur immediately below and within the fluvial sedimentary units. A less extensive suite of latest Precambrian plutons locally intrude the volcanic and marine sedimentary assemblages.

Cambrian to earliest Ordovician shales, limestones, sandstones and rare volcanic flows are preserved in outliers in several areas of the Avalon Peninsula. They rest unconformably on different parts of the late Precambrian stratified succession and on plutonic rocks.

Early Silurian and Devonian mafic intrusions are emplaced into Cambrian rocks in the southwestern part of the Avalon Peninsula and represent the youngest exposed rocks in this part of the Avalon Zone.

Considering Quaternary geology, it is likely that the Avalon Peninsula was completely glaciated during the last glacial period, and maintained glacier cover until around 9000 years BP. The pattern of ice flow is complicated. There was a main dispersal centre at the head of St. Mary's Bay which flowed radially outward. However, the spines of the sub-peninsulas also maintained independent glaciers from which flow was also radial. These smaller centres became dominant as the main ice cap melted. The pattern of ice flow is shown by glacial striae on rock surfaces.

Glacial sediment is generally thin across the Avalon Peninsula and composed of locally derived material. Thicker sediment is found north of St. Mary's Bay. It commonly takes the form of

parallel ridges of sediment aligned perpendicular to the last direction of ice flow. These Rogen moraines were formed at the base of a glacier moving northward towards Conception Bay. Areas of glaciofluvial sand and gravel are found within many of the major valleys, although sediment is commonly thin.

Surficial geology maps for the Avalon Peninsula are available at 1:250 000 and 1:50 000 scales and a detailed discussion of the surficial geology of the Avalon Peninsula in Henderson (1972).

Soils

Most of the existing soils on the Avalon Peninsula are derived from glacial and fluvoglacial deposits from the last glaciation. Organic deposits, shore deposits, and tracts of alluvium along streams compose the remaining soil building parent material. Steepness of slope largely determines susceptibility to erosion. These conditions have combined to produce soils of a wide variety of fertility.

Under cool, humid climatic conditions mineral soils produced from local parent materials are stony podzols which are generally thin, full of fresh rock fragments, and strongly acidic. Often they are of low fertility with a gray leached top layer and yellow brown subsoil. Widespread accumulations of vegetative matter in various stages of decomposition form soils of muck and peat. The soils of the Avalon have been mapped and classified into forty-three different soil series (Herringa 1981).

Climate and Climate Change

The Management District lies at the Southeast corner of the Province generally between 46^{o} 35' and 48^{o} 10' latitude and 52^{o} 40' and 54^{o} 15' longitude. The climate is typically maritime with temperature extremes moderated by the surrounding ocean. Mean summer (JJA) temperatures are 12 - 14^{o} C with winter (DJF) temperatures averaging -4^{o} C. Precipitation ranges from 1100 to 1600 mm and is well distributed throughout the year. Potential evapotranspiration is 475 to 500 mm per year. Frost free days on the Avalon range from 100 to 160 per year and the vegetative growing season (summation of degrees above 5^{o} C each day) is 900 to 1200 per year. These summary data are based on the 1961-90 period of climatic “normals”, which is the averaging period in current use in Canada. Such averages do not reflect interannual and decadal-scale variability. For example, winter snowcover on the Avalon is highly variable and this has effects on streamflow, soil moisture and soil temperature. Nor do the data reflect trends or recent extremes. Globally, the decade of the 1990s was the warmest in over a century. On the other hand, warming over northeastern Canada and the northwest Atlantic over the past 5 decades was less than occurred in central and western regions, a pattern that will likely persist.
Climate change studies reported by the Intergovernmental Panel on Climate Change (IPCC) provide strong and convincing evidence of global climate change as a result of human activities. Increased levels of greenhouse gases are projected to cause warming through the end of the

century, particularly in middle and high latitudes, with winter and nighttime temperatures increasing the most. Precipitation is generally expected to increase in middle and high latitudes, but increased evapotranspiration will mean lower soil moisture in most areas of the continent. Variability and extremes of weather events, such as winter storms and tropical cyclones, are expected to increase. Impacts on boreal forests in general are expected to be significant as reported below (IPCC, 1996);

- Impacts of anthropogenic climate change are likely to be greater on boreal forests than temperate and tropical forests.

- An increase in fire frequency and pest outbreaks is likely, resulting in decreasing average age, biomass, and carbon store.

- At its southern boundary, boreal coniferous forest is likely to give way to temperate zone pioneer species or grasslands.

- Northern and altitudinal forest limits are likely to advance slowly into areas occupied by tundra.

- Where water is not limiting, net primary productivity is likely to increase in response to warming, partly mediated by increased nitrogen mineralization.

- There may be a net loss of carbon from the ecosystem because of associated increases in soil organic matter decomposition.

To go much beyond such general statements would require a level of precision that climate models do not have. Likely scenarios could be applied to the region including past experience and knowledge of the local climate and climate-forest relations. Tentative scenarios could include;

- increasing year to year variability in snow fall

- possible longer dry periods in the summer

- likely more frequent blowdown events

There is uncertainty in climate models and a high probability for disruptions to the current forest ecology over the next few decades.

Appendix 4 : Descriptive Information on Drainages, Peatland and Ecological Land Classification of the Avalon

The five major drainage divides are included with more detailed water resources information on overview maps included in Figure 1 attached. As a result of the geology of the Avalon, ground water flow systems are closely tied to surface water systems. Although Northwest Brook is the only river longer than 20 miles (32 km), on the Avalon, several streams are between 16 and 32 km long. Many larger rivers originate from chains of ponds which tend to follow circuitous routes before flowing directly to the coast. There are twenty-one scheduled rivers for Atlantic salmon fishing on the Avalon.

Biological production in streams is based on a combination of internal/external nutrient and energy pathways. Stream side vegetation has a strong influence on both since they are so tightly linked to surrounding terrestrial events. Small streams in forested regions receive much of their materials from the surrounding terrestrial ecosystem; detritus in the form of needle and leaf litter, twigs and branches, forms the major energy base for consumer organisms. In highly shaded headwater streams, algae production is often low and yields only a small and seasonally variable contribution to the overall energy budget. As streams enlarge further downstream, sufficient light penetrates the forest canopy and consumer populations can take advantage of both particulate detritus and algae (Toews and Brownlee 1981).

Widespread bogs in many parts of the Avalon act as sponges to absorb heavy rainfall and to moderate runoff. The evolution of peatlands on the Avalon has been mainly influenced by the wet maritime climate. Morphologically they are mostly blanket peatlands. Dwarf shrub-*sphagnum* bogs occur primarily in the forested parts of the Peninsula and acquire nutrients mainly in the form of precipitation. Sedge-*sphagnum* bogs receive groundwater from surrounding upland soils and are more often in association with heathland, barren or scrub. Fen deposits are most often found in areas where more nutrient rich soils are located. Fen vegetation is meadow like and distinguished from bog vegetation by the presence of more exacting plant species such as dwarf birch, rose, and more sedge and grass species (Pollett 1986).

A hierarchical framework of ecological land classifications has been recognized for some time in most jurisdictions as a means of stratifying the earth into progressively smaller areas of increasingly uniform ecological units. In Canada, the Canadian Ecological Land Classification System as depicted in the following table, provides for seven levels of examination or organization based on ecological principles.

Considerable work was done on forest site classification in Newfoundland from 1956 to 1967 by A. W. H. Damman and subsequently by Meades and Roberts (1992) which resulted in the identification of nine ecoregions for insular Newfoundland as represented in Figure 2. Bajzak

and Roberts published in 1996 an article dealing with the use of ecological land classification in support of forest management based on work begun in 1994 in the Roddickton area. The intent was to provide all levels of ecological land classifications and applications for forest management. Denes Bajzak and Bruce Roberts undertook preliminary work with Ed Woodrow of Agriculture and Agri-food Canada to develop the ecodistrict and lower levels on the Avalon based on landscape level soils mapping, vegetation pattern and fauna. A preliminary ecoregion, ecodistrict and soil landscape map has been published by Agriculture and Agri-food Canada and will be used as an input into the National Ecological Land Classification System which will be applied to the ecoregions of the Avalon on a priority basis. Meanwhile forest inventory data will be used in the subdivision of ecoregions in relation to topographic features. Excessively wet soil or relatively sensitive sites which will require modification in operations are to be designated in more refined work. As work progresses, each level of the region will be more clearly defined. This information will be included in revisions of the plan as it becomes available.

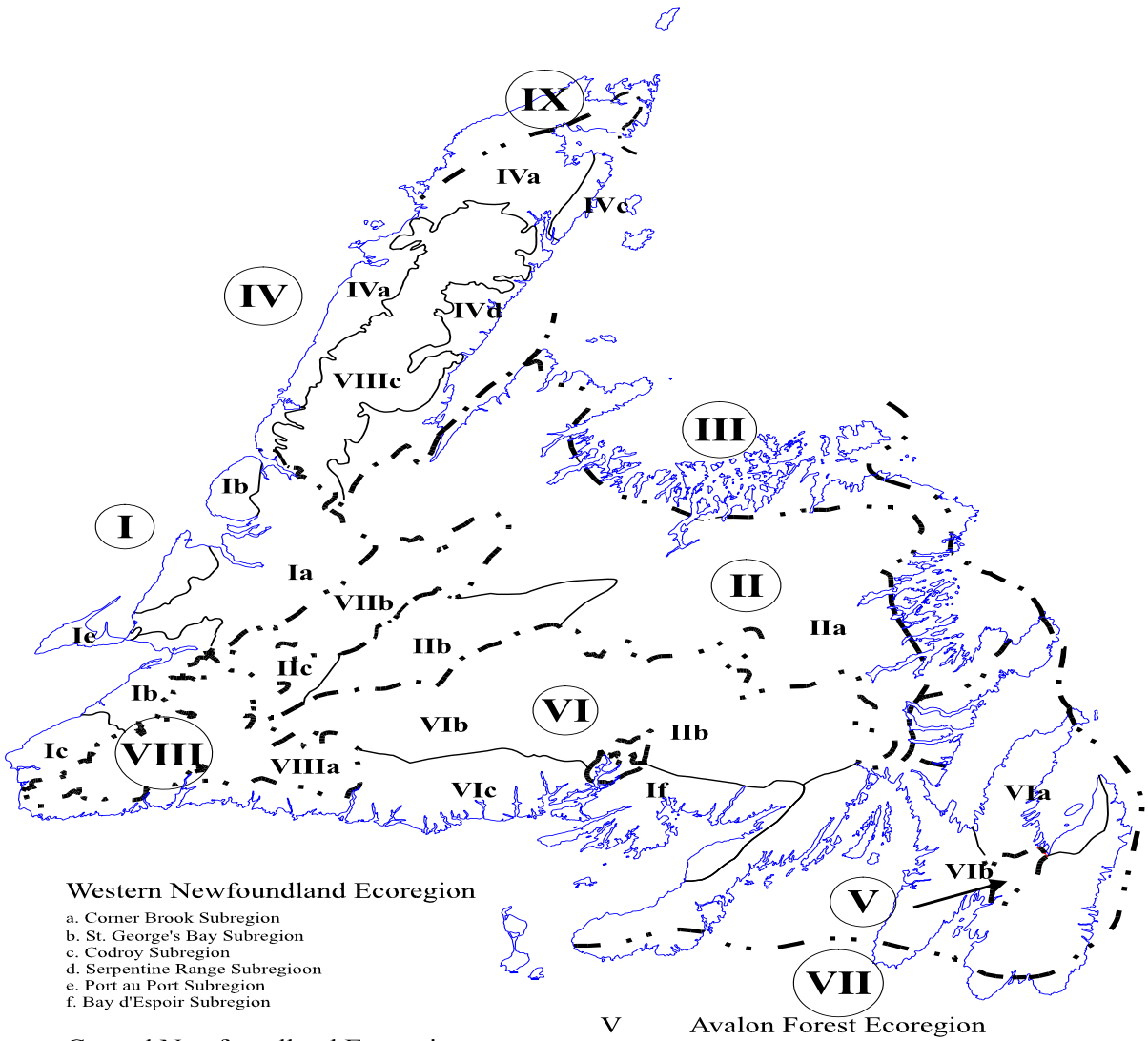
Canadian Ecological Land Classification System

Level	Description	Common Map Scale
ECOZONE	areas of large land masses representing very generalized ecological units, based on the consideration that the earth's surface is interactive and continuously adjusting to the mix of biotic and abiotic factors that may be present at any given time (e.g. Boreal Shield);	1:50 000 000
ECOPROVINCE	areas of the earth's surface characterized by major structural or surface forms, faunal realms, vegetation, hydrology, soil, and climatic zones (e.g. Island of Newfoundland);	1:10 000 000 1:5 000 000
ECOREGION	a part of the ecoprovince characterized by distinctive ecological responses to climate as expressed by vegetation, soil, water, and fauna (e.g. Avalon Forest Ecoregion).	1:3 000 000 1:1 000 000
ECODISTRICT	a part of ecoregion characterized by a distinctive pattern of relief, geology, geomophology, vegetation, water and and fauna;	1:500 000 1:125 000
ECOSECTION	a part of the ecodistrict throughout which there is a recurring pattern of terrain, soil, vegetation, water bodies and fauna;	1:250 000 1:50 000

ECOSITE	a part of the ecosection having a relatively uniform parent material, soil, hydrology, and chronosequence of vegetation;	1:50 000 1:10 000
ECOELEMENT	a part of ecosite displaying uniform soil, topographical, vegetative and hydrological characteristics.	1:10 000 1:2 500

An ecoregion is a geographic unit defined by a unique combination of vegetation toposequence, vegetation structure, floristic composition or plant distribution patterns and climate. The three ecoregions found on the Avalon Peninsula (with their corresponding number under Damman's mapping) are:

1. The Avalon Forest Ecoregion (Ecoregion V)
2. The Maritime Barrens Ecoregion (Ecoregion VI)
3. The Eastern Hyper-Oceanic Ecoregion (Ecoregion VII).



I Western Newfoundland Ecoregion
- a. Corner Brook Subregion
- b. St. George's Bay Subregion
- c. Codroy Subregion
- d. Serpentine Range Subregioon
- e. Port au Port Subregion
- f. Bay d'Espoir Subregion

II Central Newfoundland Ecoregion
- a. Northcentral Subregion
- b. Red Indian Lake Subregion
- c. Portage Pond Subregion
- d. Twillick Steady Subregion

III North Shore Ecoregion

IV Northern Peninsula Ecoregion
- a. Coastal Plain Subregion
- b. Beaver Brook Limeston Subregion
- c. Northern Coastal Subregion
- d. Eastern Long Range Subregion

V Avalon Forest Ecoregion

VI Maritime Barrens Ecoregion
- a. Northeastern Barrens Subregion
- b.. Southeastern Barrens Subregion
- c. South Coast Barrens Subregion
- d. Central Barrens Subregion

VII Eastern Hyper-Oceanic Barrens Ecoregion

VIII Long Range Barrens Ecoregion

VIX Strait of Belle Isle Ecoregion

Figure 2. Ecoregions and subregions of Insular Newfoundland

A subregion is a division within an ecoregion with differences not significant enough to constitute a separate ecoregion. The Maritime Barrens Ecoregion of Newfoundland has four subregions, two of which are located on the Avalon;

i. Northeastern Barrens Subecoregion (Dammans VI A)
ii. Southeastern Barren Subecoregion (Dammans VI B)

The Avalon Forest Ecoregion represents a sheltered outlier within the more open and exposed Maritime Barrens Ecoregion. Pure stands of balsam fir with a significant mixture of white and yellow birch dominate this region. The excessively moist climate and ribbed moraine topography give this small ecoregion its uniqueness. Aspect appears to be a significant factor controlling forest composition and growth. Fragic Ferro-Humic Podzol soils give way to gleyed ferro-humic podzols in south facing slopes. (Meades and Moores 1989).

The Maritime Barrens Ecoregion has the coldest summers with frequent fog and strong winds. Winters are relatively mild with intermittent snow cover particularly near the coastline. Subregion A (Figure 2) has lower fog and somewhat higher temperatures than subregion B. In subregion A alpine species and yellow birch are absent and soils of orthic humo-ferro podzols grade to fibric humisols as slopes are descended. Subregion B has frequent heathlands but good specimens of yellow birch. Typic folisol grades to peaty gleyed humic podzols as soils are examined going down slope.

The Eastern Hyper-Oceanic Barrens Ecoregion includes the extreme southern part of the Avalon Peninsula and the northwest coast near Bay de Verde. Elevation is less than 200 m with the extreme oceanic climate precluding the development of forest other than balsam fir tuckamoor (*krummholz*). Forest stands can be found in the more sheltered valleys of the ecoregion. Rock barren is common throughout.

More detail on climate and wildlife for each ecoregion is available in the publication “Natural Regions of Newfoundland and Labrador” prepared for the Protected Areas Association (Meades 1990).

Appendix 5 : Forest Types and Successional Pathways

Forest types are recurrent patterns of forest vegetation and soils that react similarly to disturbance and silvicultural treatment. Forest types correspond to ecoelements of the national land classification system. Vegetation is used as an indicator of difference in soil moisture and fertility. Using tree cover, ground vegetation and soil characteristics, accurate projection can be made on forest succession, productivity, wildlife habitat, operational concerns and silvicultural prescriptions including regeneration capability for each forest type.

In 1989 Meades and Moores published a field guide to the Damman Forest types of Newfoundland. They differentiated to the level of thirty-three forest types grouped under six major categories (additional detail on each available in Meades and Moores (1989)) which follow:

1. Balsam fir forest types (balsam fir is the climax tree species throughout most of insular Newfoundland, replaced naturally by black spruce only on extremely wet and on dry nutrient poor types).

2. Black spruce forest types (with deep raw humus layer of feathermoss).

3. Black spruce fen types (open black spruce forests with a lush understory of sedges, forbs and ferns. High in fertility but wet).

4. *Kalmia*-black spruce forest sites (open structure and nutrient poor soils over a wide range of moisture conditions).

5. Hardwood forest types. (With the exception of very unstable substrates, hardwoods do not form a stable forest type in Newfoundland. Birch and aspen because of their light seed can take over better sites where softwood regeneration has failed and form the stand for a couple of rotations until softwood overtakes the site).

6. Hardwood thickets and heath types. (These may be of varying stability and may take several rotations before going to softwoods. Heath can also be a stable type).

The balsam fir forest types of the Avalon are stable (i.e., regenerate to the previous stand type) following cutting, insect infestation and windthrow but after fire often go to spruce or hardwood forest types. Spruce types generally go to another spruce type following fire, but after cutting to a more open spruce type or heath in the absence of silvicultural treatment. Tables and diagrams below from page 2.5 of Meades and Moores (1989) show the range of successional pathways for the various forest types under different types of disturbance.

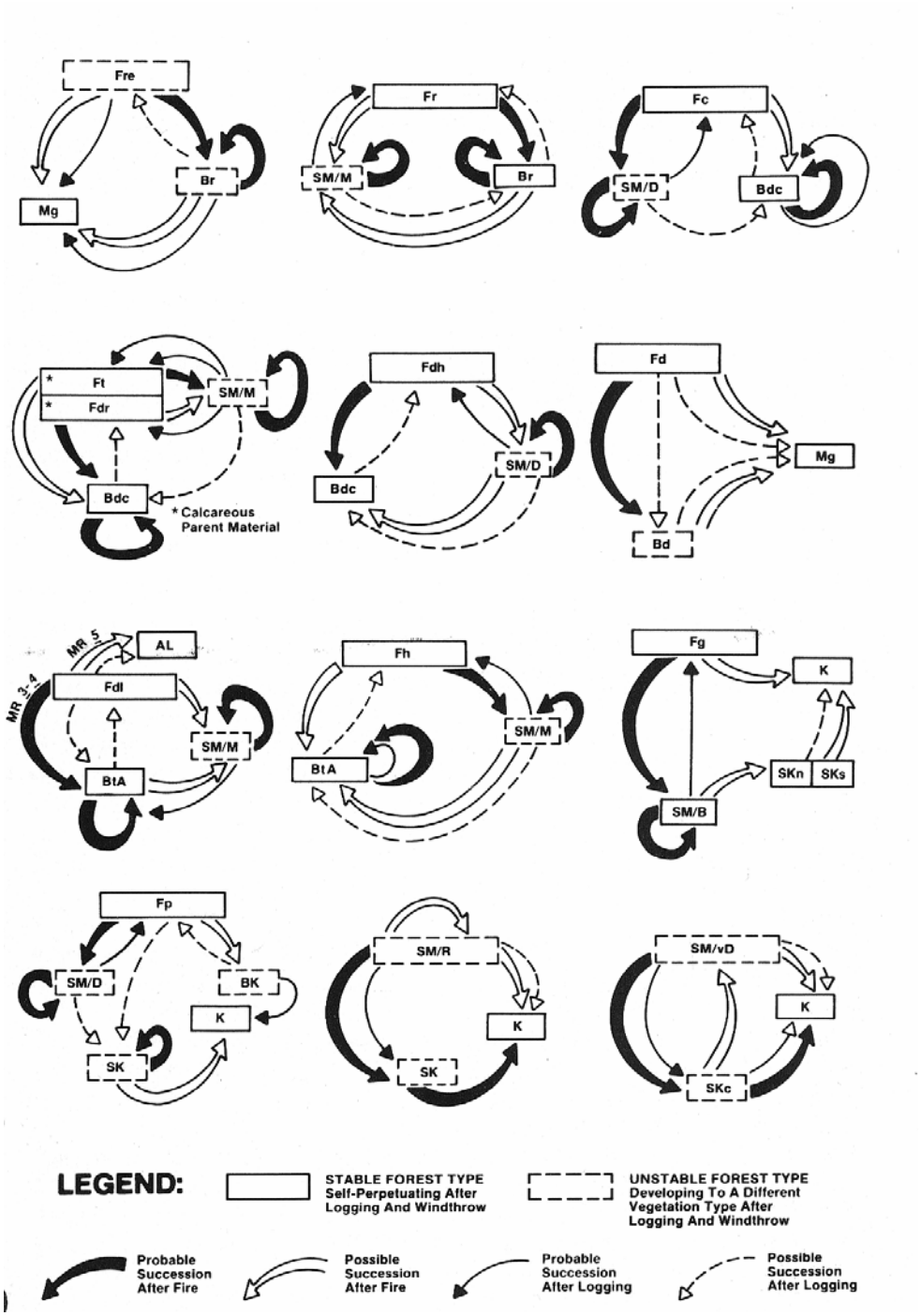


Figure 2. Successional Pathways after Disturbance

Appendix 6 : Resource Values and Uses

The forests of the Avalon are a source of many values and uses. Some are consumptive (such as timber, wild meat, or berries) whereby goods are removed from the forest. Some are transformative (such as hydroelectric production, mining and aggregate production, cabin development and urbanization) whereby forest land is valued for other uses. Others are non-consumptive (such as hiking, photography or canoeing) and unless occurring in extremely high concentration cause little impact on the forest. Consumptive and transformative uses have higher impact on the environment and require regulation to proceed within sustainable limits or within the ability of the ecosystem to maintain itself.

There are intangible spiritual or intrinsic values which the forest provides such as tranquility, fulfillment, or the comfort or just knowing that the forest is there. These intangible values are more difficult to define, but are often deeply held and must be acknowledged. Wood cutting also has intangible values associated with it, including exercise and fitness, the contribution of spending time in the woods to mental well-being, the continuance of a long-established Newfoundland cultural tradition, the contribution to self sustainability (by making a person less dependent on others or on money for heat) and, in general, contributing to maintaining the rural, outport way of life.

Commercial wood cutting, in addition to some of the intangible values listed above, has extrinsic values, in that it contributes to gainful employment. As such, it also contributes to the economic sustainability of small and large communities. Other economic values from the forest include ecotourism.

Some values of the forest relate to the vital functions of the ecosystem (such as water purification or the production of oxygen).

Not all values of the forest fall neatly within the above categories of transformative, consumptive or non-consumptive, or of intrinsic and extrinsic. For example, appreciation of historic resources is partly intrinsic, but may involve the transformation of former forest land. Gathering from the forest, which is often intrinsically satisfying, may be either consumptive or non-consumptive, depending on the circumstances.

The range of values and uses identified are included in the following list:

(i) Employment and economic development
- Sustained timber harvesting and sawmilling
- Tourism
- Ecotourism
- Silviculture

(ii) Aesthetics
- Sights and sounds
- Beauty

(iii) Intrinsic
- Boiling up
- Spiritual
- Rebirth
- Sense of ownership
- Satisfaction

(iv) Water quality and quantity
- Fish and fish habitat
- Water regulation and purification
- Domestic water supplies
- Hydro-electric production
- Freshwater aquatic life
- Aquaculture
- Industrial usage
- Recreation

(v) Processes
- Nutrient cycling
- Regeneration
- Oxygen production
- Successional patterns over landbase
- Biodiversity

vi) Recreation
- Hunting
- Fishing
- Canoeing
- Cabins
- Berry and mushroom picking
- Hiking
- Biking
- Photography

(vii) Wildlife
- Preservation of populations
- Habitat
- Recreational and commercial hunting
- Trapping
- Wildlife watching

(viii) Wilderness or natural areas
- Wetlands
- Reserves
- The integrity of the environment
- No garbage

(ix) Timber
- A crop to be sustained
- Domestic cutting
- Christmas trees and wreath potential

(x) Agriculture potential

(xi) Minerals and aggregate

(xii) Historic resources

(xii) Urbanization

(xiii) Scientific research and
Environmental education

Expansion on each grouping or item follows.

(i) Employment relates to maintenance of individual livelihoods and the generation of wealth or earnings to contribute to the local or provincial economy. The resources listed as providing employment are renewable when occurring within certain limits. Some activities such as timber harvesting are of long standing while others such as ecotourism are relatively new industries and like all elements of tourism hold great potential for organized growth and economic development. Employment also relates to the well being of individuals, families, and community life.

(i) Aesthetics deals with things of beauty. While beauty may be in the eye of the beholder and therefore many of its aspects philosophical, few would find disagreement with the appealing sound of a babbling brook or the view of a vast expanse of intact forest. Conversely vast areas of blowdown, a recently clearcut area or a rutted forest floor are not appealing sights, particularly if occupying a dominant portion of the landscape. The human senses are enhanced by forest sounds (birds, leaves, wind), smells (vegetation, fresh air) and by the variety of views near and far.

(iii) Intrinsic values are the intangible values that make something what it is. The essential nature of something is often spiritual such as the feeling of rebirth after walking in the woods or the satisfaction of enjoying a boil up. The knowledge that something, such as the forest exists or that a sense of ownership of it exists is of tremendous satisfaction to many people.

(iv) Water Resources Division has identified about 263 river basins on the Avalon including coastal areas drained by very small streams. These can be grouped into sixty-six drainage basins as identified in the Water Resources Atlas of Newfoundland (Water Resources Division 1992). The natural waters of the Avalon tend to be soft, slightly acidic and low in most constituents except iron and manganese. Color and turbidity levels tend to be elevated. These characteristics make the water generally good for domestic purposes, although elevated color and turbidity are aesthetic concerns (Acres 1987). Eighteen municipal water supplies on the Avalon are from groundwater while 53 are surface water supplies. The balance comes from thousands of personal wells. Overview Map 1 shows municipal

water supply areas.

The Avalon Peninsula is fortunate to have not only an abundant supply of water, but to have it fairly evenly distributed throughout the year. The chief reason for the even distribution of water on the Avalon is that winters are milder than in most other locations on the island. Consequently, winter precipitation is often in the form of rain, rather than snow. In addition snowmelt frequently occurs as several small events during the winter and spring, rather than as one large spring runoff (Acres 1987). Additional information on water quality and stream flows for particular rivers is available in the literature cited.

Fish habitat means spawning grounds and nursery, rearing, food supply and migration areas upon which fish depend directly or indirectly to and carry out their life processes. The forests and watersheds (fish habitats) of the Avalon Peninsula are so intricately bound in what has been described as the Avalon "Forest Ecosystem" that it is inconceivable, at least in biological terms, to consider one as an entity apart from the other. The same biological and physical conditions that produce healthy, productive forest lands also create some of our most productive fish habitats.

There are in excess of 100 river systems which wend their way through the forests of the Avalon. The fish species which inhabit these systems are: brook, brown, and rainbow trout, Atlantic Salmon, Eels, Arctic Char, smelt, whitefish, occasional shad and alewives and sticklebacks. Many of these species have both sea run and landlocked populations, often within the same watershed. The most sensitive system (in general terms) on the Avalon are scheduled salmonid systems (see Overview Map 1) and sea run systems. The most sensitive habitats are usually spawning and headwater (especially for Atlantic Salmon) areas. Spawning areas for fish consist of gravels on stream bottoms ranging in size from "pea size" for smaller trout to "fist size" for larger salmon and sea trout. Another component of fish habitat required by anadromous fish species to complete their life cycle is access (fish must be able to migrate to their spawning, headwater, food, supply, etc. areas and to the sea). Adequate stream flow, food supply, rearing areas, clean, well oxygenated water, cover, and pool and riffle habitats are other components of fish habitat required by both anadromous and stream resident species. (Walsh 1996).

Forests play an important role in regulating fish habitat through interception of rainfall, evaporation, transpiration, storage of snow, stabilization of banks, deposition of material and shading of streams. Water temperatures between 12^{o} and 14^{o} are preferred by young salmon with temperatures in excess of 24^{o} being lethal (Toews & Brownlee 1981). Careful planning and a knowledge of fisheries values can significantly avoid or reduce potentially detrimental effects of timber harvesting such as by the use of buffers and harvesting a minor fraction of a watershed at a time. The stability of stream discharge is also related to

the amount and quality of vegetation including forest vegetation and bogs which save water and regulate stream flow.

Watershed profiles and stream habitat surveys are available for various rivers. Watershed principal characteristics, food availability, access to the sea, water fertility, reproductive capacity and success, and the level of predation and harvest are other factors that influence fish populations.

There are approximately sixty dams in current usage on the Avalon, fifty of which service fourteen hydroelectric plants which were constructed on the Avalon between 1908 and 1959. Locations of dams and generating facilities are available from the Water Resources Atlas.

(v) The forest ecosystem performs many functions which are values in themselves. Most noticeable of these would be oxygen production which would be greater in vigorous growing trees with large crowns (branch area) than in decadent trees where biomass production is decreasing. Nutrient cycling is also important and is accelerated after disturbance which provides warmer temperatures to the forest floor. The regulation of water flow and quantity has been previously mentioned, while forest succession or indeed having a forest landbase for regeneration and a variety of species and life is, in itself, necessary for ecosystem processes to be carried out.

(vi) Recreation is a broad term and encompasses a range of activities enjoyed by Newfoundlanders. Most traditional activities have a consumptive element such as hunting, salmon fishing, trouting, snaring or berry picking; while camping, hiking, cottaging or canoeing were generally associated with these. More modern activities include photography, bird watching, mushroom picking, Nordic skiing, mountain biking, snowmobiling and water skiing. There are many combinations or variations of these which are enjoyed in the great outdoors. Overview Map 2 shows cabin development areas, approved all-terrain vehicle trails, and hiking trails from Lands information. The most developed canoe routes are in the Central Avalon area. They are the safest for family canoeing, as the majority are flatwater routes consisting of series of ponds and gullies, joined by short portages. The rivers such as the Colinet and Rocky River may also be used but are only suitable after an inch or so of rain.

(vii) There is a variety of native and introduced wildlife on the Avalon valued for non-consumptive as well as consumptive uses. There are twenty species of land mammals found on the Avalon. Of these, the hoary bat, eastern chipmunk, black bear and caribou occupy only a portion of the peninsula as shown by Meades, 1990. Caribou winter range, calving area and year round range are shown on the map of Overview Map 3 attached. Currently, Inland Fish and Wildlife Division estimate Avalon (Southern Shore) caribou at

570 animals based on a 2005 survey, Cape Shore caribou at 1400 animals based on a 2000 survey and Bay de Verde at 100 animals based on a 1995 survey. The Avalon moose population (areas 31 to 36 and 44) is estimated at 12,500 animals based on surveys done between 1995 and 1998 (Barney, 2006). Overview Map 3 also shows sensitive waterfowl habitat, waterfowl stewardship areas, ptarmigan enhancement areas and raptor nesting sites. Areas used seasonally by moose as shelterwood areas have changed considerably from those of 1974, depending on the availability of crown cover and browse.

In addition to big and small game hunting, trapping of beaver and other furbearers occurs under licence throughout the District. There are recreational and economic opportunities associated with the existence, viewing and harvest of wildlife species, but the continuance of viable populations is the major concern. To the extent that these populations must be maintained, intervention in the development of the forest must ensure a continuous and adequate flow of habitat with desired attributes for wildlife species.

(viii) Wilderness or natural areas are highly valued and must include a variety of wetlands and representative as well as unique areas. Overview Map 4 shows the location of protected areas in District 1 including provincial parks, ecological and wilderness reserves, wildlife reserves and others. This map also shows ecoregion boundaries.

(ix) Timber production was seen as a value to be sustained and enhanced through silviculture for a variety of products including domestic and commercial sawlogs and fuelwood as well as Christmas trees and wreaths, among other uses**.** Direct employment in the forest sector employs an estimated two hundred persons on the Avalon Peninsula alone. Overview Map 5 shows forest landclasses and alienations on the Avalon Peninsula. It is recognized that timber production is one aspect of a number of varied products and uses of the forest, and must be done in combination with these other products and uses (eg. with Christmas tree production on some productive sites throughout the District). It is strongly recommended that steps be taken to strengthen the long term security of the (Central) Avalon Forest which is key to the well being of the District 1 forest industry. The (Central) Avalon Forest is central to the protection of the integrity of the proposed Ecoregion V reserve and protects the water quality and hydrology of part or all of at least three of the largest sea run trout and salmon rivers on the Avalon Peninsula. A Forestry Reserve proposed to the Interdepartmental Land Use Committee was rejected by ILUC due to concerns on restriction of cabin development. Consideration of the area of the proposed Forestry Reserve was to have been included as part of a Land Use/Management initiative by the Lands Division which did not materialize. If a forest reserve or land use management area were created in the Central Avalon area of District 1, all commercial operator/sawmillers in District 1 would have equal opportunity to access allocations specified on permits in areas which may be designated for timber harvest.

(x) Agriculture is an expanding and diversifying industry on the Avalon and is seen by many as a potential value or use of forest land. Overview Map 6 attached shows Agriculture Development Areas, and Blueberry Management Unit boundaries. Some agriculture roads are shown on base mapping and others located using Global Positioning Systems. Mapping of farm locations is currently available on 1:50 000 scale mapping. Despite the fact that agriculture removes area from the productive forest, it creates a different habitat (particularly at its edges) and it must be considered at the landscape level as long as the health and functions of the ecosystem are not compromised. If agricultural expansion is not possible or desirable adjacent to existing farm operations, agricultural development at a distance from existing sites must be considered. It is recognized that in order to be viable, Christmas tree farming must be conducted on suitable sites (i.e., sites with deep fertile soils, low exposure, good drainage, access and with lower browsing potential or fenced). Where possible, Christmas tree farming will be encouraged on existing private and leased lands, abandoned agricultural land and public utility right-of-ways. However, where these lands are unavailable or unsuitable, Christmas tree farming will be considered on all classes of suitable forest lands. The industry will not be encouraged to expand beyond sustainable market levels.

(xi) Minerals and aggregate resources are values which when developed generally remove small areas of the landbase for varying lengths of time. However, with proper development and rehabilitation, areas can be returned to the forest landbase and the long-term impact on the forest ecosystem minimized

Mineral exploration and aggregate extraction are very active in District 1. In February, 2006, there were 1319 mineral claims staked within the District covering an area of 32,,795 ha. The focus of exploration activity has been gold and base metals (mainly copper). Aggregate extraction is increasing yearly with a total of 168 quarry permits issued within the district in 2004 and production of approximately 406,000 tons reported (Kirby, 2006). Some cutting will be required in connection with mineral exploration and development activities. Relevant approvals are required including cutting and other permits.

At present there are no producing mines within the District. However, the pyrophyllite mine at Long Pond, Manuels shipped approximately 35,000 tonnes of stockpiled pyrophyllite in 2005. Monthly updates on the number of mineral claims in good standing is available on the Department of Mines and Energy website at http://www.gov.nf.ca/mines&en/mqrights/mineralrights/stm. Areas of mineral potential are shown on Overview Map 7.

Geologically there are many points of interest on the Avalon as outlined in the Travelers Guide to the Geology of Newfoundland and Labrador (Coleman-Sadd and Scott 1994). Mistaken Point fossils are the oldest Metazoan fossils known in Canada, and some of the

fossils are unknown anywhere else in the world. This site is protected under the Wilderness and Ecological Reserves Act as Mistaken Point Ecological Reserve.

(xii) Historic resources are of irreplaceable value to the Province's history and culture with educational and tourism potential. The Historic Resources Division is aware of over fifty sites in District 01 which represent various cultural groups including the Maritime Archaic Indians, Dorset Eskimo, Recent Indian, Beothuk and some of the earliest European settlements on the Eastern seaboard (Drake 1996). Many of these sites have been located on the coast in part because relatively little interior archaeology has been conducted on the Avalon Peninsula. The site at Russell's Point in Blaketown is a good example of use of interior resources. Archaeologically sensitive sites are known on the Avalon and are being further researched. Historic Resources Division will be reviewing forestry activity proposed at the operational level rather than showing maps of sensitive areas in the strategic document.

(xii) Urbanization is an expanding form of land use on the Avalon, and is seen by many as a potential value or use of forest land. The St John's urban area has grown particularly rapidly over the last number of years. The expansion of the municipal boundaries of the city is a reflection of this trend. Moreover, despite a stagnant or decreasing population in many of the more rural parts of the Avalon, forest land is also being taken up outside the St. John's area, if in smaller amounts.

(xiii)Scientific research and environmental education are particularly important as they relate to the continually increasing understanding of native ecosystems and imparting this knowledge through formal education of our youth and continuing education of the general population. The MUN Woodlot and the Brother Brennan Center contribute to environmental education on the Avalon while research is conducted by a number of agencies involved with natural resources.

Appendix 7 : Timber Demand

The oldest and greatest demand on the forest resource of the Avalon Peninsula is the supply of wood needed for fuel and building purposes. Domestic use of wood fulfils requirements for heating homes, building homes, stages and boat building, just to name a few. The commercial harvesting of wood has a long history on the Avalon as well. Wood from the Salmonier valley was exported overseas before World War II and the central Avalon was extensively harvested during the 1940's and 1950's. Current commercial operators harvest sawlogs, firewood and pulpwood which the latter of which is exchanged for sawlogs and birch fuelwood and all provide economic stimulus to the Avalon and to the island as a whole.

Historic quantification of wood demand for the Avalon as a whole is not easily determined. Suffice it to say that demand has decreased since the days when all homes, boats, and stages were built with local timber. As an example, in the 1930's and 40's fishermen on the Southern Shore would in some instances travel three hours by horse “in the country” to obtain their yearly supply of wood. The demand by commercial operators has as well decreased since the days when 250 men would spend the winter cutting timber through the Colinet River valley. The inception of the Avalon Forest Management District however allows for tracking and monitoring of wood cutting since the mid 1970's. The volume of wood harvested domestically on the Avalon Peninsula since 1977 is staggering (Figure 11(A)). In 1982 alone, over 200 000 m^3 of wood was harvested for fuelwood and sawlogs. Since this peak there has been a general downward trend. However this does not negate the fact that since 1981 the annual domestic harvest has been greater than 100 000 m^3 for a significant period which has put a serious strain on the resource and affected sustainable supplies of wood. Since its peak in 1982, the number of domestic permit holders (Figure 11(B)) has trended downwards due to out-migration and a decreased reliance on wood as a heating source. A reversal of this downward trends has occurred in the last three years due, in large part, to increases in other home heating costs.

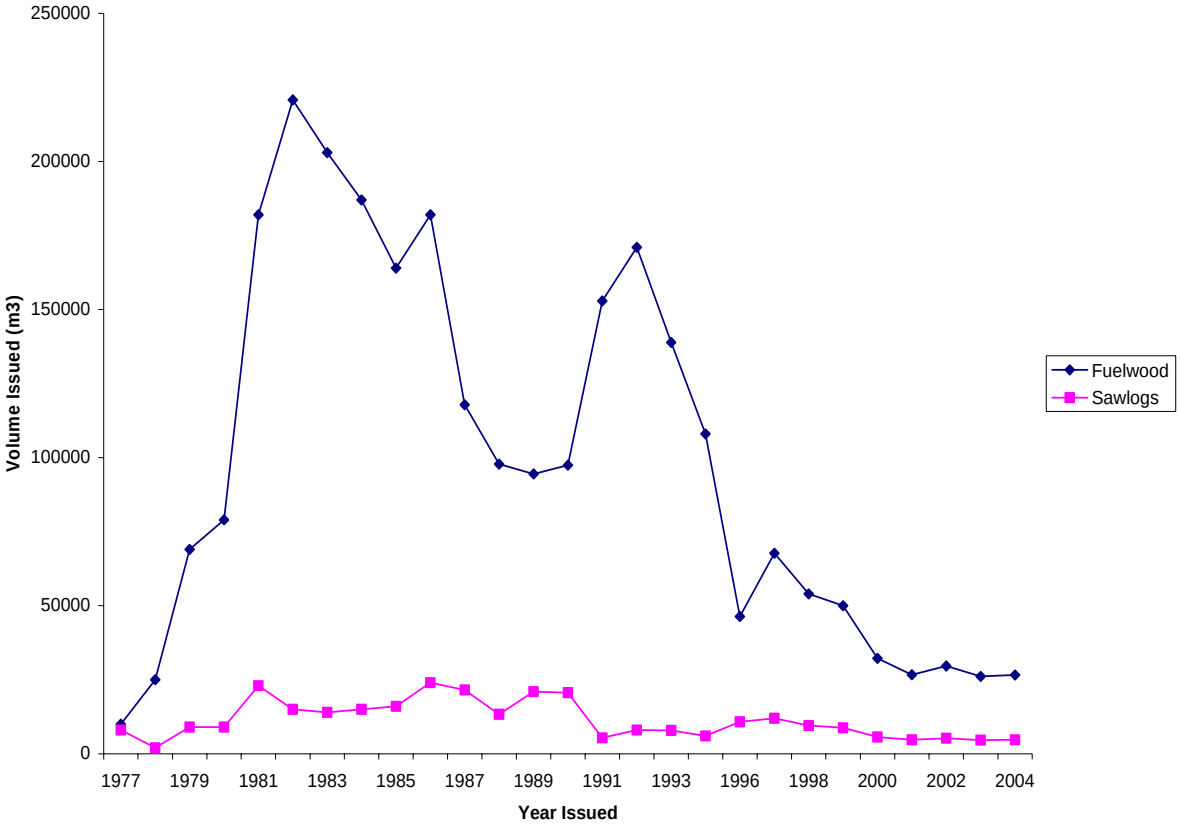


Figure 11(A) Volumes harvested by domestic cutters from 1977 to 2004 by product type

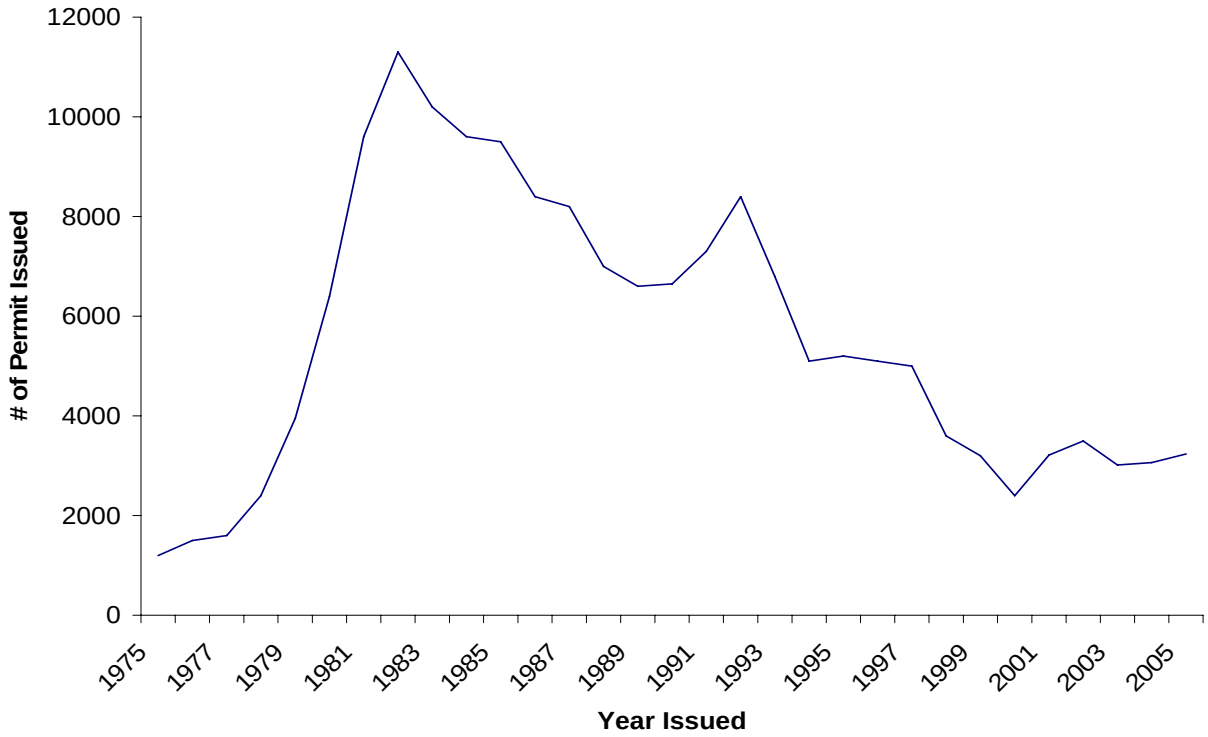


Figure 11(B) Number of domestic cutting permits issued from 1975 to 2005 in District 1.

In addition to a variety of management practices over the last two decades, the volumes issued on individual permits have been reduced to bring the harvest to the sustainable level throughout the District. Domestic cutting (Figure 12) currently accounts for 59% of the total harvest of the District.

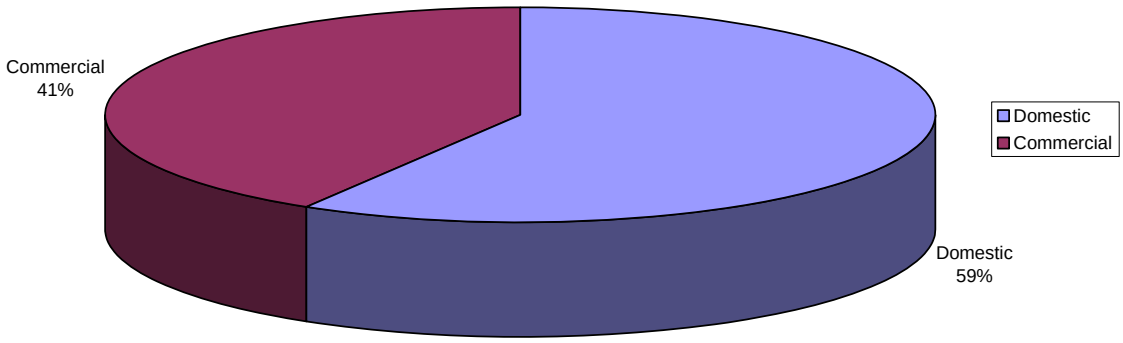


Figure 12 . Proportion of District harvest shown as domestic and commercial

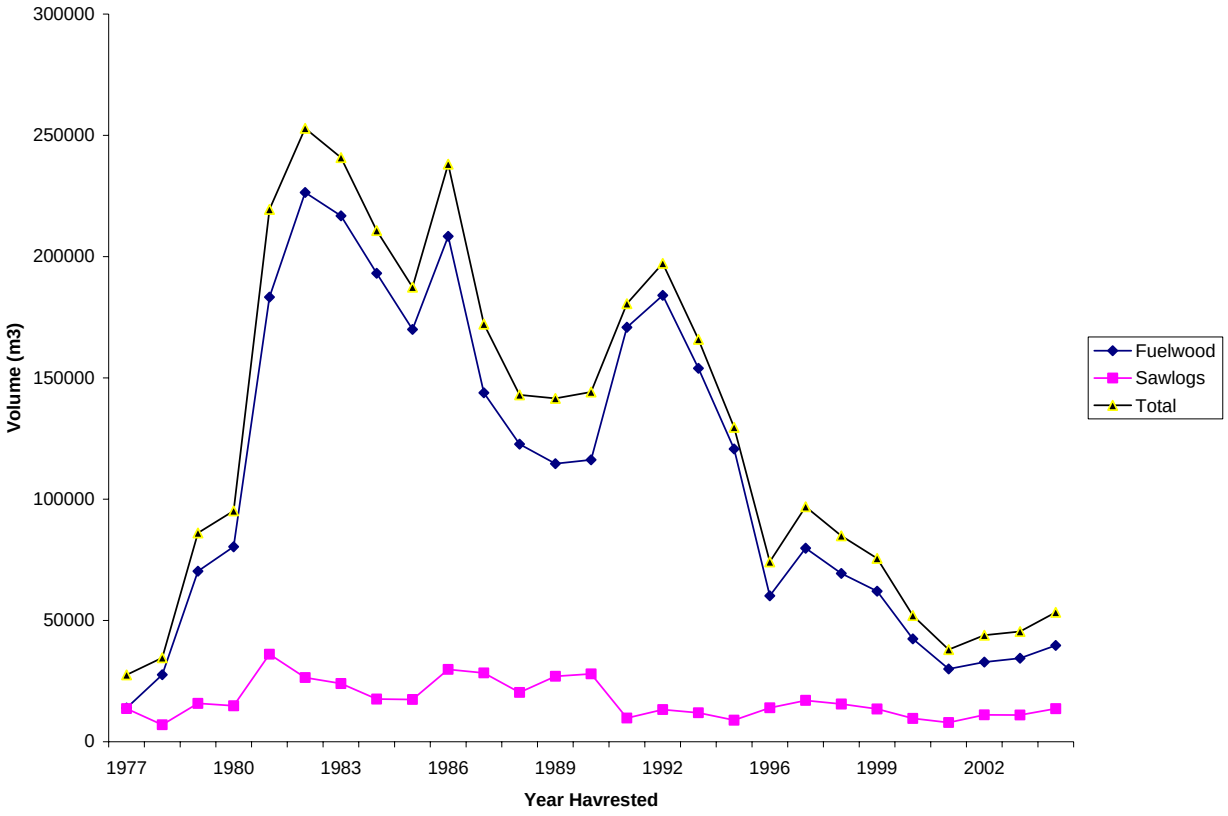


Figure 13. Total timber harvest in District 1 (Commercial and Domestic).

The commercial harvest of wood on the Avalon has followed a fluctuating path since 1976 (Figure 14 (A)). The numbers of commercial cutting permits and sawmill licences, continue to follow a downward trend (Figure 14(B)). In accordance with regulations, commercial cutting permits are required where any timber is cut that is not for a person's own use (which means commercial cutting permits are required for such things as transmission line maintenance or geological exploration). Hence, of the approximate commercial cutting permits issued, about 70 would be engaged in the harvest of timber as the primary commercial activity, with permit volumes ranging from 10 to 2,500m3 annually. About half are below the 100 m3 level per year. Timber harvest generally concentrates on the production of fuelwood, sawlogs and lower quantities of pulpwood. Commercial operations have generally maintained a production level corresponding to historical levels on the Avalon. Whereas commercial harvesting accounted for approximately half the total volume of timber harvested prior to the 1970's, it currently accounts for 41 % of the harvest on Crown Land in the District (Figure 12).

Figure 14 (A). Volumes harvested by commercial cutters annually from 1977 to 2004 by product

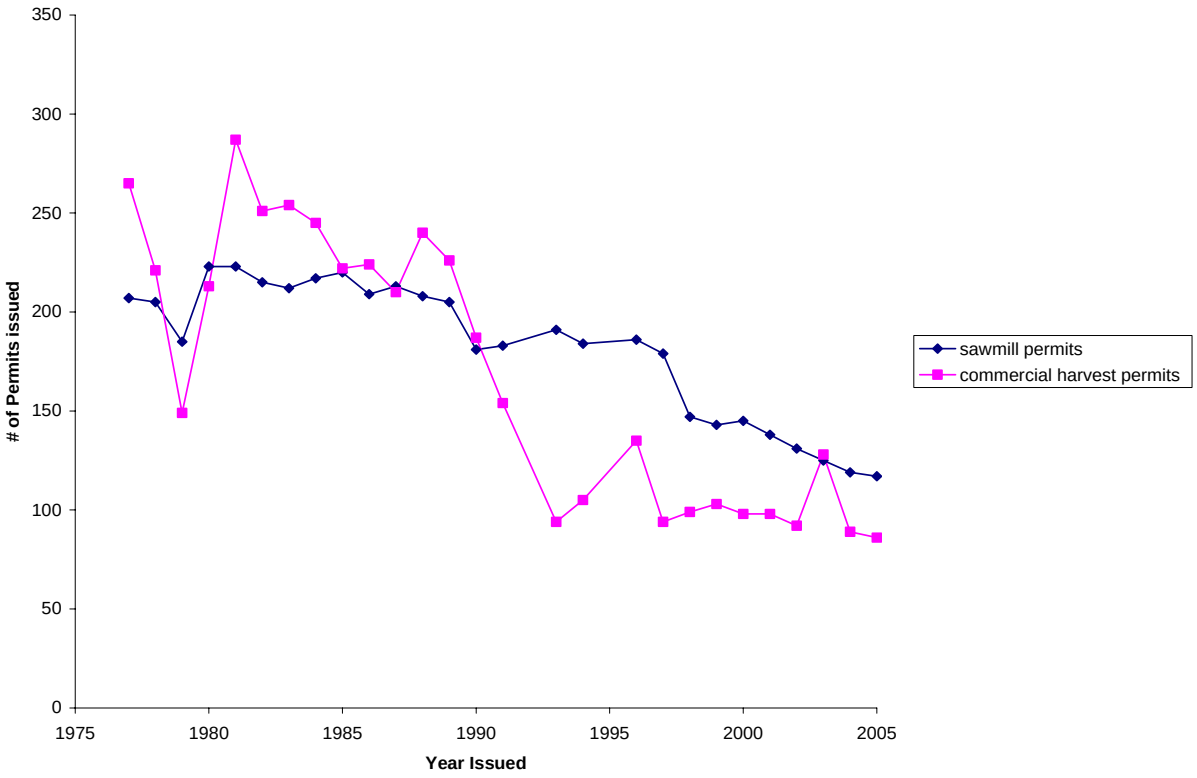


Figure 14.(B) the number of commercial cutting permits and sawmill licences issued from 1977 to 2005.

Note : (14A) does not include cut from private land.

The demand for local forest products ranges from rough sawn dimensional lumber, dressed finished lumber, fuelwood to wood for furniture and craft construction (Figure 13). In St. John's alone, over 10, 200 households purchased fuelwood in 1995 (Trelawney 1995). Currently white birch and burnt wood from central Newfoundland are being sold on the Avalon which indicates that the market for fuelwood is not being satisfied by local operators. Attempts to increase the proportion of hardwoods in regenerating forests is, in part, to address future hardwood lumber and fuelwood demand.

Appendix 8 : Allocation of Wood Principles

1. Refinement of the maximum sustainable yield (AAC) calculation by ecoregion/subregion to determine specifically the forest conditions throughout the Avalon. Ecoregions and subregions may be further subdivided into areas such as; Northeast Avalon, Southern Shore - St. Mary's Bay, Central Avalon, Bay de Verde Peninsula, Trinity Shore and Conception Bay South.

2. The cut is to be brought within the maximum sustainable yield in all zones.

3. For domestic permits, the number of permits and volume per permit are to be reduced in zones that are overcut relative to the sustainable level.

4. Commercial wood volume allocations have been frozen since the 1970's. This freeze shall continue but a reduction in allocation shall not be recommended at this time in areas that are not overcut. In areas of overcut, any reduction should be spread in proportion to the current split in domestic and commercial allocations. However, commercial cutters can acquire the remainder of their allocation in other areas that are not overcut. Where redirection in commercial cutting operations occurs, operators will have the option of moving to zones of a surplus or of lesser reduction. Reduction will be recalculated on the basis of supply/demand.

Appendix 9 : Principles on Harvesting

While domestic harvesting and commercial harvesting vary in scale and equipment used, a number of principles are common to all harvesting. Monitoring of harvesting operations is an important component of any activity to ensure compliance with agreed principles. The following principles apply to all timber harvesting unless noted specifically as being applicable to only domestic or only commercial harvesting;

1. Patch cuts or variable size clearcuts preferred to large clearcuts. The size of the patch cut is to be determined by the area in question as it relates to the ecology of the area.

2. Portable bridges to be used for small streams in a manner to prevent significant environmental damage.

3. Doing as many things as temporary as possible so as to minimize impact in harvesting.

4. Commercial operators use high flotation tires, boogie wheels or similar equipment or use the "trail cutting system" where feasible**,** so that machines may travel on a bed of boughs to reduce site disturbance.

5. Using irregular boundaries (edges) rather than straight boundaries on cut strips or other cutting areas in concert with the local environment and good ecological principles.

6. Wetter sites could be harvested under conditions that would minimize environmental damage.

7. In certain situations using wider buffers on waterways (the width depending on age, regeneration, slope, wetness and sensitivity of soil, sensitivity of wildlife and fish habitat) in which a partial cutting could occur with no extraction equipment buffers and in consideration of guidelines from other jurisdictions as identified in a pre-harvest plan. The intent is to reduce timber losses to blowdown and retain the integrity and maintenance of the buffer.

8. Cut sizes would reflect the naturally occuring range of disturbances and historical stand size distributions (ie. 50% of cuts would be less that ten hectares, and 90% of cuts less than 25 hectares in size. Larger modified clearcuts may occur in instances of burnt wood, insect-killed areas or areas of blowdown in consideration of landscape occurrence and design, forest age classes and habitat requirements.

9. Between clearcut areas an area of intact forest shall remain in consideration of landscape occurrence and design, forest age classes and habitat requirements. These areas shall not be disproportionate to the area harvested. This would apply in areas where road decommissioning is not scheduled.

10. Areas left between clearcut blocks shall not be harvested until the clearcut areas have regenerated to provide adequate habitat.

11. An annual pre-harvest plan be devised by the commercial cutting permit holder in consultation with District 01 staff and for domestic cutting areas by District 1 staff in consultation with local groups that shall include but not be limited to:

    (a) delineation on an aerial photograph, (or a good photocopy of one) and/or on a forest stand type map the area that shall be harvested by the operator for that season

    (b) delineation of areas not to be harvested within the main cutting block boundary

    (c) delineation of riparian or wetland buffers and the width of said buffers in concert with item 7.

    (d) type of machinery to be used for harvesting and wood extraction that would minimize environmental damage

    (e) approximate time frame in which the block shall be harvested

    (f) approximate number of seed trees and/or snags that shall be left per hectare

    (g) the general location of main extraction routes.

12. Cutting shall not occur beyond the sustainable harvest in sections of the District.

13. Refinement of cutting areas so that immature stands are excluded from said areas.

14. On a trial basis, the determination of wood volume in cutting blocks and the number of permits issued for the area based on the volume estimate. This would apply mainly to domestic cutting areas.

15. To priorize areas of burnt wood, insect killed or blowdown for harvesting.

16. On a trial basis, more aggressively promote the encouragement of selection thinning to determine the feasibility of domestic wood cutters using this silvicultural system.

17. A program for domestic and commercial harvesters to raise awareness about leaving riparian buffers, various harvesting techniques, encouraging patch clearcutting, selection thinning in younger stands and the need for leaving snags and/or suitable seed/wildlife trees.

18. Not more than 30% of the productive forest area within a watershed can be recently disturbed. Any combination of forest fires and harvesting areas less than seven years old that exceeds the 30% threshold would require harvesting be postponed.

Appendix 10 : Proposed Silviculture Activities.

Summary of Silviculture Operations For the Period April 1, 2007 To March 31, 2011

Year	Location	Treatment	Area(ha)
2007			
1.	Tower Rd.	Planting	200
2.	Quirk's Ridge	Site Preparation	200
3.	Glover Rd., Hanging Hill	PCT	50
4.	New Melbourne	Heathland Planting	50
5.	Fox Marsh	Yellow Birch Exclosures	5
6.	Fox Marsh	Hardwood Management	5
7.	Paddy's Pond	Plantation Maintenance	1
8.	TCH/Mun Arbo	Plantation Maintenance	1
9.	Island Pond Ridge	Sel.thinning/DLT	40
10.	Clam River Road Rec	Planting	1.5
11.	Seal Cove Pond	Dom. Selection thinning	5
12.	Hender's /Tower Rd.	Commercial Thinning	10
13.	Hender's	Fertilization	10
14.	Avalon	Skid Trail Reclamation	N/A
15.	Avalon	Moose Exclosures	N/A
16.	Avalon	Domestic Harvest Planning	N/A
17.	Avalon	Erioderma Research and Inventory	N/A
18.	Clam River	River Habitat Restoration	N/A
19.	Avalon	Peatland Restoration	N/A
20.	Avalon	Illegal Cabin Location	N/A
21.	Avalon	Criteria and Indicators	N/A
22.	Avalon	Information and Education	N/A
23.	Avalon	Roadside Improvement	N/A
24.	Avalon	Soil Stabilization	N/A
			578.5
2008			
25.	Quirk's Ridge	Site Preparation	200
26.	Quirk's Ridge	Planting	200
27.	Seymr's Gull/Country Pond	PCT	50
28.	New Melbourne	Heathland Planting	80
29.	Tower Road Rec.	Planting	1.0
30.	Fox Marsh	DLT	40
31.	Hender's	Commercial Thinning	10
32.	Heart's Content Barrens	Dom. Selection Thinning	5
33.	Hender's/Tower Rd.	Ferilization	10
			596

Summary of Silviculture Operations For the Period April 1,2007 To March 31,2011(cont.)

Year	Location	Treatment	Area(ha)
2009			
34.	Quirk's Ridge	Planting	200
35.	Big PD.Valley/Joyces Trail	PCT	50
36.	Fox Ponds	Site Preparation	150
37.	Road Reclamation 2008	Planting	1.0
38.	Heart's Content	Heathland planting	90
39.	Island Pond Ridge	DLT	40
40.	Fox Marsh	DLT	40
41.	Glover Road	Dom. Selection Thinning	5
42.	Commercial thinning 2008	Fertilization	10
43.	Fox Marsh	Commercial Thinning	10
			596
2010			
44.	Fox Ponds	Site Preparation	150
45.	Fox Ponds	Planting	150
46.	Fox Marsh	PCT	50
47.	McGrath's Pond	PCT	15
48.	Joyce's Trail Road Rec.	Planting	1
49.	Mobile	Heathland Planting	50
50.	Backside Pond	Dom.Selection Thinning	40
51.	Broad Cove	Planting	10
52.	Fox Marsh	Fertilization	10
53.	Red Head Cove	Dom. Selection Thinning	5
			481
2011			
54.	Fox Ponds	Planting	150
55.	Fox Ponds	Site Preparation	150
56.	Fox Marsh	PCT	50
57.	Ryan's Pond	PCT	50
58.	Seymour's Gullies	DLT	20
59.	Argentia/Placentia	Heathland Planting	50
60.	Fox Marsh	Commercial Thinning	10
61.	Turk's Cove	DLT	10
62.	Country Pond Road Rec.	Planting	1
63.	Tower Road/Hender's	Dom. Selection Thinning	5
64.	Fox Marsh	Commercial Thinning	15
			511
		Total Five Years	**2762.5**

Appendix 11. Resource Access Road - Classification Standards and Specifications

	Road Class					
	A	B	C-2	C	C1	D
Design Load and Speed	(Loaded tractor trailer) @55kph	@50kph	(Loaded tandem pallet) (30 kph)			Single Axle 3 metric tones or less at 25 ph
Road width, drop off to drop off	9 m	7.5 m	6.0 m	5.0 m	4.0 m	3.5 - 4.5 m
Max. grade	6%	8%	10%			15%
R.O.W. width	30 m	20-30 m	20 m			15-20 m
Min. sight dist.	150 m	120 m	90 m			45 m
Max. change of grade (blind hill limitations)	0.6 m in 20 m	0.8 m in 20 m	1.0 m in 20 m			–
Min. depth of ditch	1.0 m	0.6 m	0.6 m			0.3 m
Surface material (type and depth)	Min. 15 cm of AASHO class A-1-b or better	Granular, no stones larger than 10 cm in the top 30 cm	Granular, no stones larger than 15 cm in the top 30 cm			Granular, no stones larger than 15 cm in the surface
Design load	(Loaded tractor trailer) @55 kph	@50 kph	(Loaded tandem pallet) (30 kilometers per hour)			(Single axle) 3 metric tones or less @ 25 kph
Fill slope	2:1	11/2 :1	11/2 :1			–
Cut slope	2:1	11/2 :1	11/2 :1			-
Stream width culvert to bridge conversion point	3.5 m	3.0 m	3.0 m			2.5 m

Contractor Built Roads ---- Classification Standards And Specifications*

	Main Trunk	Spur Road	Temporary Road	WinterRoad
Road Width	5.5	3.5 - 4.5 m	3.5 - 4.5 m	5.0
Max. Adverse Grade	10%	15%	15%	10%
R.O.W. Width	20 m	15 m	10-15 m	15 m
Min Sight Dist.	90 m	45 m	45 m	45 m
Min. Depth Of Ditch	0.6 m	0.6 m	0.6 m	0.3 m
Surface Material	Granular, no stones larger than 15 cm in in top 30 cm	Granular, no stones larger than 15 cm in top 15 cm	Granular, no stones larger than 15 cm top 15 cm	Granular
Design Load / Speed	@30/kph	@30/kph	@30/kph	@30/kph
Fill Slope	1.5 : 1	1.5 : 1	1.5 : 1	-----
Cut Slope (back slope)	1.5 : 1	1.5 : 1	1.5 : 1	-----
Stream Width Culvert To Bridge Conversion Point	3.0 m	3.0 m	3.0 m	3.0 m

More detailed Construction Specifications are available upon request.

Appendix 12: Principles of Road Construction and Decommissioning

Main points in the forest resource road strategy are;

1. Any road, temporary or permanent, that would be built would be to approved environmental standards (e.g., as stated in the Environmental Protection Plan of 1994).

2. Any main road would be built by the department to a standard capable of regular truck traffic. In areas where there was no objection to road construction and where desirable from a sustainable forest management point of view (eg. no illegal occupation or other damaging activities) roads could be maintained.

3. Where there are sensitive or particular values to be protected, access by a main road would be restricted while forest operations in the areas were on going; and after forest operations in the area were completed for a period. Various levels of decommissioning may be decided on a case by case basis.

4. Three standards of decommissioning will be attempted. Firstly, old skid trails may be rehabilitated to a state whereby natural succession may occur again on the right of way as shown possible by a trial conducted by a private operator in 1999. Secondly, existing forest access roads that are built to a C standard and would be too costly to put back in a completely natural state may be blocked off to stop highway vehicular traffic. Thirdly, operator built access roads (generally D class or lower) or roads built by the Department with the option of decommissioning may be rehabilitated to a state whereby natural succession may again occur on the right of way. Information on decommissioning will be included in Environmental Assessment and ILUC procedures.

5. No main forest resource road would run on a continuous course parallel to the main channel of a river, if the topography slopes consistently towards the river. All roads shall be constructed in accordance with existing guidelines (ie. Fish Habitat Protection and other guidelines).

6. Temporary extraction routes less than 2 km in length would be constructed by commercial operators (sawmillers) to a standard that would be environmentally acceptable, and such road would be decommissioned immediately after satisfactory inspection of the harvesting areas for cutting and silviculture requirements. It must be noted though, that if part of an area is scheduled for harvest now and another part of the area for several years later, decommissioning may not be complete for a number of years. In such cases, the road will be blocked in a way sufficient to exclude motor (highway) vehicles.

7. As a Planning guideline, for every kilometer of road constructed, a kilometer of existing road will be decommissioned. The operational plan will invoke a program to identify roads that are unnecessary and these will be reclaimed/decommissioned. Such decommissioning will not be contingent upon new road construction. The operational plan will also identify regions where there will be no new roads.

8. Although the intent of this section is to address resource roads, it was felt a statement should be made on extraction on cutting areas. It is recognized that no matter what type of extraction equipment is used, repeated passes over the same extraction trail will wear away the soil sometimes to bare rock. Repeated passes on one trail is preferable to the use of numerous trails, but reclamation of the trail has to be undertaken by the operator and approved by the responsible authorities.

9. When road building, precautions and modifications have to be taken to ensure all values are safeguarded. Examples would be from standard engineering practices (Beattie, Thompson and Levinel, 1983 ; McCubbin, Case and Rowe, 1985 ; Scruton et al, 1997 ; FEIS, 2001) such as using filter fabric and rock check, to landscape design techniques in layout of roads avoiding tops of ridges, keeping construction off more productive sites, or native seeding around ends of culverts or decommissioning roads. Biological surveys should be incorporated into the design/location process for any new road.

10. Road construction should be conducted during the summer months or generally dry periods. Road use and construction should be restricted during periods of road weakness, fire hazard or wildlife vulnerability.

11. As with access roads, all terrain vehicle trails for timber extraction would have to be located in specified environmentally acceptable locations and be subject to decommissioning (removal of any constructions).

12. Roads in sensitive areas should be constructed by the Department of Natural Resources.

13. Roads to be decommissioned should be built to the lowest possible accepted standard taking into account reasonable environmental protection. In effect they should be created so they can self reforest with a minimal amount of roll up required.

14. Decommissioning to a completely impassable standard will not be considered on the sole access route to an approved cabin or on traditional access routes which pre-date 1970. The type of road would depend on the agreement to access the areas as well as the type of traffic and duration of the operation in the area. A blanket policy again cannot be applied throughout the District, but the type of road must suit the area, the purpose and the concern.

Appendix 13 : Environmental Protection Guidelines

ENVIRONMENTAL PROTECTION GUIDELINES
FOR
ECOLOGICALLY BASED FOREST
RESOURCE MANAGEMENT
(STAND LEVEL OPERATIONS)
November 1998

ENVIRONMENTAL PROTECTION GUIDELINES

"Forests are interconnected webs which focus on sustaining the whole, not the production of any one part or commodity. Trees, the most obvious part of a forest are critical structural members of a forest framework. However, trees are only a small portion of the structure needed for a fully functioning forest." (Hammond, 1991).

This ecologically based approach to forest resource management requires that resource managers shift their focus from managing components of the ecosystem to managing the three-dimensional landscape ecosystems that produce them. Primary concern becomes the maintenance of landscapes and waterways as complete ecosystems because the only way to assure the sustained benefit of forest values, now and in the future, is to keep them and all their parts in a healthy state. This is the foundation for an ecologically based approach to forest management. It means that everyone attends to the conservation and sustainability of ecosystems instead of sharply focussing on the productivity of individual or competing resources which has been our traditional mode of operation.

The Newfoundland Forest Service is committed to the concept of forest ecosystem management which is captured in the twenty-year Forestry Development Plan (1996-2016) vision statement:

"To conserve and manage the ecosystems of the Province which sustain forests and wildlife populations and to provide for the utilization of these resources by the people of the Province under the principles of sustainable development, an ecologically-based management philosophy, and sound environmental practices".

There are five strategic goals in the twenty-year Forestry Development Plan (1996-2016) which provide the foundation upon which ecologically based resource management will be developed.

1. Manage forest ecosystems so that their integrity, productive capacity, resiliency, and biodiversity are maintained.

2. Refine and develop management practices in an environmentally sound manner to reflect all resource values.

3. Develop public partnerships or networks to facilitate meaningful public involvement in resource management.

4. Promote adaptive ecosystem management and conduct research that focuses on ecosystem processes, functions, and ecosystem management principles.

5. Establish and enforce conservation and public safety laws with respect to managing ecosystems.

The environmental protection guidelines provide specific “on the ground” tasks for loggers and gives management direction to planners. Individually, the guidelines appear as specific rules; however, when implemented collectively they will facilitate ecologically-based forest resource management.

1.0 GENERAL GUIDELINES

These guidelines are generated from impacts described in the literature and from discussions with resource managers. As new information and management techniques become available the guidelines will be changed to reflect this improved information base. Consequently, the guidelines will be reviewed on an annual basis to incorporate any necessary changes. The “General Guidelines” apply to all forestry activities (i.e., silviculture, harvesting, road construction). These guidelines form Schedule IV of the Certificate of Managed Land. They are conditions of Crown commercial permits and they form the basis for the voluntary compliance program.

1.1 Planning

1. The location and type of all waterbody crossings must be submitted to the Department of Environment and Labour and the Department of Fisheries and Oceans. Certificates of Approval are required from both departments for waterbody crossings. A waterbody is defined as any water identified on the latest 1:50,000 topographic map. Appropriate protection is still required for streams greater than 1.0 m in width (at its narrowest point from the high water mark) not found on the 1:50,000 topographic map.

2. All waste disposal sites require a Certificate of Approval from the Minister of Government Services.

3. Excessive bulldozing is not permitted and no more than 10% of the total forest within an operating area can be disturbed. In situations where specific operating areas require more than 10% disturbance to capture available timber, the operator is required to rehabilitate the area to reduce the total net disturbance to the 10% maximum. Where disturbance has been excessive, a rehabilitation plan will be developed with the Forest Service District Manager. Disturbance is defined as per the Ground Disturbance Survey Guidelines developed by the Newfoundland Forest Service.

4. When an archaeological site or artifact is found, the *Historical Resources Act* requires that all development temporarily cease in the area and the discovery be reported to the Historical Resources Division (709-729-2462).

   The Historic Resources Division will respond immediately and will have mitigation measures in place within seven days as agreed to by the Historical Resources Division and the operator. Forestry activity can then continue.

   The Historic Resources Division will be contacted during the preparation of five-year operating plans to determine the location of historic resources and appropriate mitigation measures will be designed. These measures will include such things as buffer zones and modified operations or surveys.

5. Should an oil or gas spill in excess of 70 litres occur, the operator must make every effort to first, contain, and second, clean up the spill after reporting the spill to the appropriate authorities:

   Government Services Centre
   Spill Report Line
   (709) 772-2083 or 1-800-563-2444

6. The Parks and Natural Areas Division will be contacted during the preparation of five-year operating plans. Where operations are within one kilometre of provisional and ecological reserves, wilderness reserves or provincial parks, modified operations maybe necessary.

7. In areas where caribou utilize arboreal lichens during the summer and/or winter, and terrestrial lichens during the summer, a minimum amount of lichen forest must be maintained for the caribou. Forestry activity will be designed in consultation with the Wildlife Division where this situation has been identified.

8. Areas identified as containing rare and/or unique flora (through literature review) are to be protected from forestry activity by avoiding these areas.

9. Where mature stands of timber for moose shelter and moose yards are required, they will be identified in consultation with Wildlife Division.

10. The impacts of forest operations on pine marten have been an ongoing issue. Until appropriate guidelines are developed for pine marten habitat, forestry activities within high density pine marten areas and dispersion areas required for pine marten recovery will require consultation with the Wildlife Division.

11. During the preparation of five-year operating plans, areas identified as “Sensitive Wildlife Areas” in the Land Use Atlas require consultation with the Wildlife Division prior to any forestry activity.

1.2 **Operations**

1. A 20-metre, treed buffer zone shall be established around all water bodies that are identified on the latest 1:50,000 topographic maps and around water bodies greater than 1.0 metre in width that do not appear on the maps. Where the slope is greater than 30% there shall be a no-harvest buffer of 20 m + (1.5 x % slope). All equipment or machinery is prohibited from entering waterbodies; thus, structures must be created to cross over such waterbodies. Every reasonable effort will be made to identify intermittent streams and they will be subject to this buffer requirement. The District Manager of Forest Ecosystems is permitted to adjust the specified buffer requirements in the following circumstances:

- the no-cut, treed buffer can exceed the 20 meters for fish and wildlife habitat requirements.

- a 50-metre, no-cut, treed buffer will be maintained around known black bear denning sites (winter) or those encountered during harvesting. These den sites must be reported to the Wildlife Division.

- no forestry activity is to occur within 800 metres of a bald eagle or osprey nest during the nesting season (March 15 to July 31) and 200 metres during the remainder of the year. The location of any raptor nest site must be reported to the Wildlife Division.

- all hardwoods within 30 metres of a waterbody occupied by beaver are to be left standing.

- a minimum 30-metre, no-cut, treed buffer will be maintained from the high water mark in waterfowl breeding, moulting and staging areas. These sites will be identified by the Canadian Wildlife Service and/or the Wildlife Division.

2. Heavy equipment and machinery are not permitted in any waterbody, on a wetland or a bog (unless frozen) without a Certificate of Approval from the Department of Environment and Labour and without contacting the DFO area habitat coordinator.

3. No heavy equipment or machinery is to be refuelled, serviced, or washed within 30 metres of a waterbody. Gasoline or lubricant depots must be placed 100 metres from the nearest waterbody. All fuel-storage tanks (including JEEP tanks) must be registered with

the Department of Government Services and Lands and installed in accordance with the *Storage and Handling of Gasoline and Associated Products Regulations.* Fuel storage within Protected Water Supplies are more stringent. Please refer to "Guidelines for Forest Operations within Protected Water Supplies" for more information.

4. Used or waste oil shall be collected either in a tank or a closed container.

5. Above ground storage tanks shall be surrounded by a dyke. The dyked area will contain not less than 110% of the capacity of the tank. The base and walls of the dyke shall have a impermeable lining of clay, concrete, solid masonry or other material, designed, constructed and maintained to be liquid tight to a permeability of $25L/m^2/d$. There shall be a method to eliminate water accumulations inside the dyke.

6. Wherever possible, place slash on forwarded trails while forwarders are operating in an area. Skidding timber through any waterbody (as defined in Section 1.2.1) is prohibited.

7. Any forestry operation that directly or indirectly results in silt entering a waterbody must be dealt with immediately (A government official must be notified within 24 hours). Failure to comply will result in the operation being stopped.

8. Woody material of any kind (trees, slash, sawdust, slabs, etc.) is not permitted to enter a waterbody. Woody material on ice within the high water floodplain of any waterbody is prohibited.

9. To minimize erosion and sedimentation, waterbody crossings shall:

    i) have stable approaches;
    ii) be at right angles to the waterbody;
    iii) be located where channels are well defined, unobstructed, and straight;
    iv) be at a narrow point along the waterbody;
    v) allow room for direct gentle approaches;
    vi) have all mineral soil exposed during bridge construction and culvert installation seeded with grass.

10. Garbage is to be disposed of at an approved garbage disposal site. Prior to disposal it must be contained in a manner not to attract wildlife. All equipment is to be removed from the operating area where operations are completed.

11. Where safety is not an issue, a minimum average of 10 trees or snags per hectare (average on a cut block) or a clump of trees is to be left on all sites (harvesting and silviculture). Preference will be given to trees over 50 cm dbh.

2.0 TIMBER HARVESTING GUIDELINES

2.1 Planning

1. There will be corridors to connect areas of forest that will not be harvested (isolated stands within cutovers are not considered forested areas). These corridors connect wildlife habitat, watersheds and minimize fragmentation. Acceptable corridor vegetation includes productive forest areas (all age classes) and softwood/hardwood scrub. These corridors do not have to be continuous (i.e., breaks in vegetation are permitted) and will be determined in the five-year operating plan and identified in the annual work schedule.

2. Complete utilization of harvested trees is required. (Complete utilization is harvesting trees to a top diameter of 8 cm and stumps to a height of 30 cm). The District Manager can modify the stump height requirement to accommodate snow conditions. Where markets exist, non-commercial tree species that are harvested should be brought to roadside. This will be determined in consultation with the District Manager.

3. Preplanning is required on all forest operations (Industry/Crown) at the request of the District Manager (for Industry) and the Section Head i/c Management Planning (for Crown). Preplanning will include:

    - boundaries of protected water supplies (if applicable);
    - existing and proposed access roads;
    - skid trails and landing locations;
    - areas sensitive to erosion;
    - buffer zones around water bodies;
    - approved stream crossings;
    - fuel storage locations;
    - wildlife corridors.

4. Harvesting is not permitted within caribou calving areas from May 15 - June 15 (calving period). Harvesting is not permitted within post-calving areas from June 15 to July 31. These areas will be identified by the Wildlife Division.

5. Harvest scheduling should be modified during the migration of wildlife (e.g., caribou) and during temporary wildlife concentrations (e.g., waterfowl staging). Wildlife biologists will identify the areas of concern, and in conjunction with district or company foresters, aid in the modification of forestry operations.

2.2 Operations

1. When skid trails and winter roads are to be constructed, soil disturbance and impacts on waterbodies are to be minimized. The operator will use culverts and/or log bridges depending on the conditions. The objective is to minimize erosion and sedimentation, to avoid restricting streamflow, and to ensure fish passage in fish-bearing streams. Erosion control measures (e.g., laying down brush mats and the construction of diversion ditches for water run-off) are to be maintained while the skid trail is in use. All temporary crossings are to be removed at the end of the operating season unless the District Manager agrees to extend the life of the crossing for more than one season.

2. A minimum 50-metre, no-cut buffer is to be left between operations within approved cabin development areas.

3.0 FOREST ACCESS ROADS GUIDELINES

3.1 Planning

Forest access roads, borrow pits and quarries shall avoid:

i) wetlands, deltas, and floodplain or fluvial wetlands;
ii) terrain with high erodibility potential;
iii) known sensitive wildlife areas such as;
- calving grounds, post calving areas, caribou migration routes, caribou rutting areas, and winter areas,
- waterfowl breeding areas and colonial nesting sites,
- established moose yards by one kilometre,
- eagle and osprey nest sites,
- where site conditions and engineering permits, main haul roads should be one kilometre from permanent water bodies and all other roads by not more than 100 metres,
- endangered or endemic species or sub-species of flora or fauna and other areas to be determined by qualified authorities;

iv) known sensitive fish areas such as:
- spawning and rearing grounds;

v) historically significant areas such as:
- archaeological sites;

vi) existing reserves such as:
- parks (municipal, provincial, national);
- wilderness areas and ecological reserves;

- rare and endangered plant sites and habitats.

2. With respect to borrow pits and quarries, the operator shall:

   i) minimize the number of new borrow areas opened for construction and/or maintenance;
   ii) use existing borrow areas whenever practical;
   iii) be in possession of a valid quarry permit from the Department of Mines and Energy prior to aggregate extraction activities;
   iv) not locate pits and quarries in sensitive areas as identified by planning processes.

3. Forest access roads will not obstruct wildlife migration routes. The following guidelines will be followed to ensure the road is as unobstructing as possible:

   i) roads should be of low profile (less than 1 m above the surrounding terrain);
   ii) slash and other debris shall be removed;
   iii) the slope of ditches and road banks should not exceed 1½ horizontal to vertical.

4. Culverts and bridges are to be installed in accordance with the manufacturer's specifications and the specifications attached to the Certificates of Approval received from the Department of Environment and Labour and from the Department of Fisheries and Oceans. Culvert ends will be properly riprapped.

5. Where road construction is to occur around identified waterfowl breeding, moulting and staging areas, the Canadian Wildlife Service is to be consulted.

6. Road construction is not permitted within any buffer zone except with the permission of the District Manager.

7. When a skid trail is on steep ground and is no longer in use, cut-off ditches and push lanes must be created. The frequency will be determined by the District Manager.

8. When disturbance is over 10%, the conditions in 1.1.3 will apply.

9. There shall be no bulldozing of standing merchantable timber or poor utilization of merchantable softwoods and hardwoods during cutting of the right-of-way.

10. Excavations required for the construction of piers, abutments or multi-plate culverts shall be completed in the dry. (Where exceptions occur, consultation with District manager is required).

11. On a site specific basis, roads can be decommissioned and/or rehabilitated as directed by the District Manager. Decommissioning is defined as barring access; rehabilitation means to re-vegetate the road.

3.2 Operations

1. A "no-grub" zone of 30 metres of undisturbed ground vegetation must be maintained around any water body crossing to minimize the damage to the lower vegetation and organic cover, thus reducing erosion potential. Manual clearing at waterbody crossing sites should be used to remove or control vegetation. Right-of-way widths at waterbody crossings should be kept to a minimum.

2. Fill materials for road building must not be obtained from any waterbody or from within the floodplain of any waterbody.

3. Trees are to be felled away from all waterbodies, and slash and debris should be piled above the high water mark so that it cannot enter waterbodies during periods of peak flow.

4. Equipment activity in water crossing areas is to be kept to a minimum. Whenever possible, any work is to be carried out from dry stable areas.

5. Unnecessary side casting or backfilling in the vicinity of waterbodies is not permitted. Where topographical constraints dictate that the roadbed must be constructed adjacent to a waterbody, road slope stabilization is to be undertaken at the toe of the fill where it enters the water (an area where active erosion is likely). The placement of large riprap or armour stone is recommended in such areas.

6. Side casting must be carried out in such a manner that sediment does not enter any waterbody.

7. Where borrow pit or quarry activity is likely to cause sediment-laden run-off to contaminate a waterbody, sediment control measures such as filter fabric berms or sedimentation ponds are to be installed. Contact is to be made with the District Manager prior to construction where such conditions exist.

8. Stabilize cut banks and fill slopes in the vicinity of waterbodies.

9. When using ditches, especially on long slopes, baffles and culverts are to be used at frequent intervals.

10. When constructing ditches near streams, the ditch itself is not to lead directly into the stream.

11. Keep ditches at the same gradient as the road.

12. In side hill and similar areas, install ditches on the uphill sides of roads to intercept seepage and run-off.

13. Borrow pits are to be located 50 metres from the nearest waterbody.

4.0 SILVICULTURAL PRACTICES AND FOREST REGENERATION GUIDELINES

4.1 Scarification

1. Select scarification methods best suited for preparing the area for planting and for minimizing ground disturbance.

2. Where slash is piled into windrows, ensure the windrows are placed where slash cannot be washed into streams at peak flooding conditions.

3. To minimize erosion, do not direct scarification equipment straight down slope.

4. Where safety is not an issue, a minimum average of 10 cavity trees or snags per hectare, or a clump of trees, will be left on all sites.

5. Whenever possible, white pine regeneration will not be disturbed.

4.2 Planting

1. Landings will be stabilized through seeding (grass) or planting at time of plantation establishment.

4.3 Pre-commercial Thinning

1. Where possible, do not carry out pre-commercial thinning in important wildlife areas during the periods of birth and/or hatching. These areas and times will be identified by the Wildlife Division.

2. Where white pine regeneration is present, the District Manager will determine how the pine will be thinned.

3. Trees cut will not be felled into waterbodies.

5.0 FOREST PROTECTION GUIDELINES

1. A pesticide application licence must be obtained from the Department of Environment. This licence will determine planning and operational requirements.

6.0 GUIDELINES FOR FORESTRY OPERATIONS WITHIN PROTECTED WATER SUPPLY AREAS

The primary function of a protected water supply area is to provide the public with an adequate quantity of safe and good quality water on a permanent basis, to meet its present and future demands. Any other activity within water supply areas is considered secondary, and if permitted, must be strictly regulated and monitored to ensure that the water supply integrity is not threatened and the quality of the water is not impaired.

In Newfoundland, forestry operations are permitted in protected water supply areas on a limited and controlled basis provided the proposed operations have no, or minimal, water quality impairment potential.

The following permits and approvals are required prior to the beginning of forestry operations within a protected water supply area:

1. Approval of the forest operating plan by the Newfoundland Forest Service.

2. Approval of the forest operating plan by the provincial Department of Environment and Labour and issuance of a Certificate of Approval under *Section 10* of the *Department of Environment Act*.

3. Quarry permits from the provincial Department of Mines and Energy for all borrow areas and ballast pits on unalienated Crown lands and alienated Crown land (i.e., leased and licenced land).

4. Stream crossing permits under *Section 11* of the *Department of Environment Act* and from the federal Department of Fisheries and Oceans.

5. Other permits or approvals as required by natural resource management and regulatory agencies.

6.1 Planning

1. Prior to beginning any work, a forest operating plan must be prepared and approved by the Newfoundland Forest Service and the Department of Environment and Labour, and a Certificate of Approval must be obtained under *Section 10* of the *Department of Environment Act* for site specific activities such as road construction, commercial harvesting, silvicultural operations, and other activities associated with forestry operations.

2. In addition to the information normally contained in a forest operating plan, the plan must include maps to show:

- the boundary of the protected water supply area;
- existing and proposed access roads;
- proposed harvesting areas;
- areas sensitive to erosion;
- buffer zones around water bodies;
- approved stream crossings;
- proposed landing and skid trail locations;
- proposed fuel storage locations;
- peatland and other wetlands;
- nearby communities;
- other relevant information.

The plan must also contain a written section describing the harvesting techniques to be used, the equipment required for the operation, and the schedule of the operation.

3. Locate roads to avoid all waterbodies and areas of sensitive terrain.

4. The forest operating plan must identify an Operations Manager who shall have the responsibility for ensuring that the special protection measures are followed. The Operations Manager is responsible for co-ordinating clean-up efforts in the event of a fuel or oil spill.

6.2 Forest Access Road Construction

1. A "no-grub" zone of 30 metres of undisturbed ground vegetation must be maintained around any waterbody crossing to minimize the damage to the lower vegetation and

organic cover, thus reducing the erosion potential. Manual clearing at waterbody crossing sites should used to remove or control vegetation. Right-of-way widths at waterbody crossings should be kept to a minimum.

2. Clear-cutting up to the perimeter of any waterbody is not permitted. In all areas where road construction approaches a waterbody, a buffer zone of undisturbed vegetation must be maintained on both sides of the right-of-way using the buffer zone criteria outlined in section 6.6.

3. Fill materials for road building must not be obtained from any waterbody or from within the floodplain of any waterbody.

4. Provide adequately designed and constructed drainage ditches along forest roads to allow for good road drainage.

5. Take-off ditching can be used on both sides of the road, or in conjunction with culverts, to divert the ditch flow into the woods or into stable vegetated areas above the no-grub zones. Where take-off ditches are unstable or cannot be constructed, the use of check dams and settling basins in the ditches is required until the ditches become stabilized.

6. Trees are to be felled away from all waterbodies, and slash and debris should be piled above the high water mark so that it cannot enter waterbodies during periods of peak flow.

7. Equipment activity in water crossing areas shall be kept to a minimum. Any work will be carried out in dry, stable areas.

8. When working near sensitive areas such as streams or lakes, road building operations causing erosion or siltation are to be followed as per section 1.2.7.

9. Unnecessary side casting or backfilling in the vicinity of water bodies is not permitted. Where topographical constraints dictate that the roadbed must be constructed adjacent to a water body, road slope stabilization is to be undertaken at the toe of the fill where it enters water, an area where active erosion is likely. The placement of large riprap or armour stone is recommended in such areas. Contact is to be made with the District Manager prior to construction when such conditions occur.

10. Side casting must be carried out in such a manner that sediment does not enter any waterbody.

11. Maintenance support sites must be located outside the protected water supply area.

6.3 Forest Access Road Stream Crossings

1. Stream fording is prohibited in protected water supply areas.

2. All stream crossings, whether culverts or bridges, require written approval under *Section 11* of the *Department of Environment Act.*

3. The operator must comply with all terms and conditions of a Certificate of Approval for stream crossings.

6.4 Harvesting

1. Harvesting or other heavy equipment will not be used on wetlands or bogs.

2. Steep areas with high potential for erosion should not be harvested.

3. Wherever possible, skid trails should run along contours and never cross wetlands and waterbodies.

4. Landings will be few in number with a maximum size of less than 0.25 ha. All landings should be located at least 100 metres from a waterbody.

5. In sensitive areas prone to erosion, equipment must have wide tires, or harvesting must occur during the winter when the ground is frozen.

6. Harvesting equipment shall not enter a buffer zone or any waterbody without permission of the District Manager.

7. The operator must implement erosion control and rehabilitation measures in areas where soils have been unduly disturbed by harvesting activity. In addition to general erosion control measures presented in other sections of these guidelines, the following should also be considered in protected water supply areas:

    - undertake contour furrowing;
    - construct diversion ditches to lessen the possibility of forming new drainage channels;
    - seed or plant areas that are difficult to stabilize by other means;
    - plough or rip prior to seeding any surfaces which have been compacted.

6.5 Buffer Zones

The Newfoundland Forest Service on unalienated Crown land and the appropriate company on leased, licenced, private or charter land will provide the operator with a map indicating the harvesting area and no-cut treed buffer zones, and will ensure that the operator is familiar with the boundaries.

No forestry activities are permitted within the following buffer zones.

Water Body	Width of Buffer Zone
1. Intake pond/lake/reservoir	A minimum of 150 m
2. River intake	A minimum of 150 m for 1 km upstream and 100 m downstream
3. Main river channel	A minimum of 75 m
4. Major tributaries/lakes/ponds	A minimum of 50 m
5. Other water bodies	A minimum of 30 m

6.6 Fuel/Oil Handling and Storage

Fuel storage and the operation of fuel storage equipment is regulated by the *Storage and Handling of Gasoline and Associated Products Regulations (1982)* under the Department of Environment and Lands Act. According to the regulations, the owner or operator of a fuel storage system must submit a Schedule "A" Storage Tank System Application to the Department of Environment. The applicant must be in receipt of a Certificate of Approval for the system before the system is used for fuel storage. Section 9 of the above Act states: "*No owner or operator shall directly or indirectly cause pollution of the soil or water by causing, suffering or permitting leakage or spillage of gasoline or associated products from a storage tank system or vehicle."*

In addition to the above regulatory requirements, the following guidelines are to be followed:

1. Bulk fuel is to be stored outside the protected water supply area. f fuel must be stored in the protected area, it must be in the least sensitive area and be approved by the Water Resources Management Division of the Department of Environment and Labour.

2. Fuel must be stored in self-dyked, above-ground Jeep Tanks which have been approved by the Department of Environment and Labour.

3. A maximum of seven days fuel supply can be stored within a water supply area.

4. Refuelling must not take place within 100 metres of a waterbody.

5. Daily dipping of tanks and weekly reconciliations are mandatory. Visual inspection of the dykes and the surrounding area must be carried out daily and inspection records must be maintained.

6. Each unit must be fitted with a locking valve system for the elimination of water inside the outer tank. The valve must be closed and locked except to drain precipitation.

7. Each person involved with fuel handling must be cautioned that any spillage is to be cleaned up immediately.

8. Each person involved with fuel storage must exercise extreme caution when refuelling equipment.

9. All waste materials and waste oil on the site must be collected in enclosed containers and removed to an approved site at least weekly.

10. Contaminated soil or snow must be disposed of at an approved waste disposal site.

11. Any spill in excess of 70 litres must be reported immediately through the 24- hour Spill Report Number (709-772-2083) or the Government Services Centre (1-800-563-2444).

12. All self-dyked Jeep Tanks must be located at a minimum distance of 500 metres from any major waterbody.

13. A fuel or oil spill clean-up kit must be kept on site within the protected area to facilitate any clean-up in the event of a spill. This kit must include absorbent pads, loose absorbent materials such as dried peat, speedy-dry or sawdust, and a container such as an empty drum for recovering the fuel or oil. If there is a bulk fuel storage facility within the protected area, the clean-up kit must include the following list of fuel or oil spill clean-up equipment:

- Fire pump and 100 metres of hose
- Two hand operated fuel pumps
- Six recovery containers such as empty drums
- Four long handled shovels
- Two pick axes
- Ten metres of containment boom
- Twenty-five absorbent pads
- One hundred litres of loose absorbent material.

When any fuel spill occurs, stop the fuel flow immediately. This may entail repairing a leak, pumping out a tank, or shutting off a valve. If fuel or oil is spilled onto soil, dyking may be necessary. If fuel or oil enters water, absorbent booms or barriers such as fencing or netting with loose absorbent or straw must be used to contain the spill. If necessary, culverts may be blocked off by earth or wooden barriers to contain the fuel or oil provided the threat of flooding is addressed.

All recovered fuel or oil must be stored in containers. Contaminated soil must be removed and placed in containers for transport and disposal. Extensive soil removal may cause problems such as erosion and the subsequent siltation of waterbodies; therefore, the affected area must be backfilled and sloped and revegetated as required by the Department of Environment and Labour.

Recovered fuel or oil should be reused or collected by a waste oil company for recycling. Oily debris and contaminated soils must be disposed of at an approved waste disposal site with the approval of the disposal site owner or operator. Contact must be made with the appropriate regional office of the Department of Environment and Labour before disposal.

6.7 Support Service and Structures

1. Storage of any type of pesticide, chemical or other hazardous material is prohibited within a protected water supply area.

2. Dormitory camps, garages or any other structures are prohibited within a protected water supply area.

3. The establishment of new sawmills is not permitted in protected water supply areas.

4. Wherever possible, toilet facilities must be provided in all work areas.

5. Garbage cans must be located in all work areas and garbage is to be collected regularly and disposed of at an approved waste disposal site outside the protected area.

6.8 Silviculture

1. Chemicals are to be used within a protected water supply area only under the approval of the Division of Water Resources.

2. Scarification must be minimized and restricted to the trench or spot types.

3. If scarification leads to erosion or sedimentation of small streams or water bodies, scarification operations must be suspended and remedial measures must be taken.

6.9 Abandonment

When forestry operations in a protected water supply area have been completed, an abandonment plan for the area should be developed. This will involve input from the Newfoundland Forest Service, the Community involved, and the Water Resources Management Division of the Department of Environment and Labour. In general, the purpose of the plan is: (i) to ensure that the post-harvest conditions do not lead to water quality impairment, and (ii) to discourage activities or use of the area that could lead to water quality impairment.

An important question will be whether access roads will remain open. This will be decided on a case-by-case basis in consultation with the municipality, Water Resources Management Division and the operator. Issues such as the rehabilitation of cutover areas, landing sites, skid trails, and the abandonment of roads are to be discussed during the consultation process to control post-harvesting environmental impacts and activities.

The following are recommended precautionary measures if roads are to be closed to control post-harvesting access to the area:

- Use water bars (trenches 8-10" deep dug across the road) to intercept and deflect surface roadside ditches rather than have it flow into a waterbody. Water bars can be placed 500 metres apart in gentle to moderate terrain (up to 10% slope), but should be no more than 150 metres apart in terrain greater than 10%. In most cases, it is sufficient to limit water bars to one kilometer on each side of a stream crossing.

- Road-side ditches should flow into the woods or into stable, vegetation covered areas.

- Stable bridge abutments and erosion protection works at crossings need not be removed.

- Bridge decking, culverts and other easily removable structures should be transported out of the watershed area.

- All disturbed areas of river banks will be stabilized and seeded:

6.10 Monitoring and Inspection

1. Forestry operations approved under Section 10 of the Department of Environment Act will be inspected from time to time by the staff of the Water Resources Management Division to ensure the operator's compliance with the environmental protection guidelines and the terms and conditions of the approvals.

2. In case of an oil spill, the sedimentation of a water body, or any other water quality impairment related issue, the operator might be required by the Department of Environment and Labour to undertake water quality monitoring to assess the extent of the damage and to select appropriate mitigative measures to correct the harmful conditions.

3. Any water quality impairment problem should be reported to the Water Resources Management Division.

7.0 PROCESSING FACILITIES AND SUPPORT SERVICES GUIDELINES

1. If possible, use previously disturbed sites (e.g., borrow pit).

2. Minimize the size of the area cleared for the establishment of any camp, processing or support structures. Wherever possible, these facilities should not be established within 100 metres of a waterbody.

3. All sumps containing effluent from a kitchen or washroom facility must be properly treated on a daily basis in compliance with Department of Health regulations.

4. Sewage disposal must be carried out in compliance with the Public Health Act.

5. A permit to occupy is required for Crown Land developments.

6. Facilities will not be located within known sensitive wildlife areas. These areas will be identified by the Wildlife Division.

7. A permit is required for a firearm.

8.0 PLANNING AND MUNICIPAL AREA GUIDELINES

1. Timber harvesting, resource road construction, silviculture, processing facilities, and support services are developments under the Urban and Rural Planning Act. Where these activities occur within a planning area boundary or within 400 metres of a protected road, a development permit is required before any activity takes place.

2. Consultation with the planning agency (usually municipality, but also the Development Control Unit of the Department of Municipal and Provincial Affairs) is to be made at the planning stage so that regulatory requirements can be made known and taken into account. This should occur three months before the desired commencement of the development and the permit obtained about one month before the development is to start.

Appendix 14 : Planning Team Members and Participants

Consensus Planning Team Members are listed in order of decreasing number of meetings where that interest was represented and show the designated Consensus Giver in the upper line. The level of agreement is extracted from Ground Rules (Gradient of Agreement).

PARTICIPANT	REPRESENTING	LEVEL OF AGREEMENT
Clarence Porter	Sawmiller /	Endorsement
Darlene Porter	Foxtrap Forest Products	Endorsement
Bill Clarke	Natural Resources	Endorsement
Rod Hillyard	Natural Resources	
Reg Garland	Crown Lands	Endorsement
John Kennedy	Crown Lands	
Pat O'Keefe	Industry, Trade and Rural Devel.	Agreement with Reservation
Allan Stein	Natural History Society of NL	Agreement with Reservation
Keith Lewis/Gene Herzberg	Natural History Society of NL	
Adrian Tanner	East Coast Trails Association	Endorsement
Ed Delaney	East Coast Trails Association	
Denes Bajzak	Self	Endorsement with Minor Point of Contention
Kevin Fowler	Sawmill Operator	Endorsement
Dennis Mercer	Self	Endorsement
Brenda Moriarity	Department of Fisheries and Oceans	Endorsement
Natasha Walsh	Paul Garland Forest Products	Endorsement
Paul Garland	Paul Garland Forest Products	
Sian French	Parks and Natural Areas	Endorsement
Keith Brown/Paul Taylor	Parks and Natural Areas	
Ian Goudie	Self	Formal Disagreement Absolution
Chris Hogan	Protected Areas Association	Formal Disagreement Absolution

Garry James	Self	Endorsement
Brian Kerr	Self / Marine Institute	Endorsement
Eric Salter	Self	Endorsement
Dick Whitaker Myles Whitaker	Self/ Farmer	Endorsement
Gordon Cooper	NL Wildlife Association	Endorsement
Stan Tobin	NLEA Inc.	Endorsement
Keith Lee	Preserve Valley Assoc.	Endorsement
Greg Phillips Rick Phillips	Colliers ATV Association Colliers ATV Association	Endorsement
Bruce Roberts	Canadian Institute of Forestry	Endorsement
Christine Doucet	Wildlife Division	Endorsement

Others who participated, the interest represented and number of meetings;

John Howley	Crown Lands	8
Charlie Vokey	Traditional Wood Harvesters Assn.	5
David Cheeks	Natural Resources	4
Peter Hearns	Natural Resources	3
Bob Brake	Crown Lands	2
Claude Bishop	Self	1
James Bornemann	University of New Brunswick	1
Bill Collins	Natural Resources	1
Tom Clarke	Self	1
Basil English	Natural Resources	1
Shears Mercer	Concerned Cabin Owner	1
Brian Murphy	Self	1
Craig Pendergast	Self	1
Sara Wallace	University of New Brunswick	1

* Gradient of Agreement goes from Endorsement (I like it) to Endorsement with Minor Point of Contention (Basically, I like it), to Agreement with Reservation (I can live with it), to Abstain (I have no opinion), to Stand Aside (I don't like this but I don't want to hold up the group), to Formal Disagreement:Majority (I disagree with it but I will go with the majority), to Formal Disagreement:Absolution (I disagree strongly and want to be absolved of responsibility for implementation) to Oppose (I would veto this proposal if I could).

Appendix 15 : List of Meetings and Field Trips

January 25, 2006	Stakeholder meeting to form Planning Team, Lavrock
February 15, 2006	Planning Team Meeting Lavrock
March 8, 2006	Planning Team Meeting Lavrock
March 22, 2006	Planning Team Meeting Lavrock
April 8, 2006	Field Trip Salmonier and area
April 12, 2006	Planning Team Meeting Lavrock
April 26, 2006	Planning Team Meeting Holy Cross School
May 10, 2006	Planning Team Meeting The Wilds
May 18, 2006	Filed Trip Fox Mash and Whitbourne area
May 23, 2006	Forestry Reserve Sub-committee Meeting, Paddy's Pond
May 24, 2006	Planning Team Meeting Lavrock
May 29, 2006	Forestry Reserve Sub-committee Meeting, Paddy's Pond
June 7, 2006	Planning Team Meeting Lavrock
June 21, 2006	Planning Team Meeting Lavrock

Appendix 16 : Summary of Management Plan for MUN Woodlot

The Memorial University of Newfoundland woodlot has an area of approx. 1,000 ha. and is held under Crown lease and administered by the Faculty of Engineering and Applied Science. The woodlot has supported teaching and research at the University for nearly 30 years. In 1994 a management plan was prepared which was based on a recent intensive forest inventory.

The management strategy contains the following objectives:

1. Develop the eastern section of the forest as an experimental /education area.
2. Develop the western section of the forest as a working woodlot.
3. Develop interpretation trails throughout the entire area to view a variety of conventional and experimental forestry activities and their relationship to the environment.
4. Identify reserve areas which are to remain undisturbed.

The planning priorities were identified as follows:

1. Develop a core road system throughout the working portion of the woodlot.
2. Encourage public visitation once the interpretation trails and the primary road has been constructed into the central portion of the woodlot .
3. Implement a range of demonstration forest management activities.

Present activities:

1. An interpretation trail was constructed to view the various types of forest stands including stand in natural stages of development, an arboretum, a plantation of a small clear cut area, insect damaged trees, pre-commercially thinned stands at different stocking levels.
2. A 0.8 km hauling road was constructed to remove wind thrown trees.
3. Fallen trees were removed from several small areas.

Planned activities:

1. Identify various ecosystems by signs around the interpretation trail, highlighting forest types, soil and other natural resources.
2. Extend the interpretation trail .
3. Establish a parking and a picnic area near the trail.
4. Continue to remove wind fallen trees.
5. Implement the prepared management plan for the west side of the woodlot.

ADDENDA

Harlequin Enterprises
17 Waterford Bridge Road
St. John's, NL, A1E 1C5

July 4, 2006

Forest District 1 Five-Year Management Plan Planning Process

I am registering my consensus level as **Formal Disagreement: Absolution**. I disagree strongly with some of the content of the District 1 (Avalon) Five-Year Forest Management Plan that arose from this process, and do not wish to be seen as partly responsible for its current contents. I believe that the District 1 Planning Process was not balanced, and largely ignored the potential contribution that participants - especially non-industry participants - could have made.

I wish to clarify why I have taken a strong position of disfavour for the process and the resulting plan, and attempt to synthesize my comments in these areas of subject matter:

1. **Ground Rules:**
Facilitation of the meetings did not follow the process outlined in the ground rules.

2. **Guiding Formalities:**

The approach did not follow the Provincial Sustainable Forest Management Strategy 2003.

3. **Planning Process:**
There was no actual planning done, and certainly not ecological forest planning.
Sustainable Forest Management Planning was ignored.

4. **Lack of Integrated Resource Management:**
There was interference from other government departments, significant lack of participation/ contribution from other resource agencies, and no attempt to integrate Resource information.

5. **Lack of Adaptive Management for Endangered Species**
There was a notable failure to consider and plan for conservation of listed species (endangered and other species at risk).
I detail these deficiencies below.

Sincerely,
Ian Goudie, Ph.D.
Ecologist

Details of Deficiencies
in
Forest District 1 Five-Year Management Plan Planning Process 2006
Ian Goudie, Ph.D.

1. Facilitation of the meetings did not follow the process outlined in the ground rules

The Ground Rules provided a gradation of eight "Levels of Agreement" that itself was misleading because only three of the categories constitute agreement, while one abstains and four are levels of disagreement.

The Ground Rules state: "*Agreement on specific Plan sections are interim pending consensus on the whole Strategy Document and completed Five Year Plans*". Although the ground rules were provided and discussed at the beginning, they were never adhered to, because as issues became debated it was never approached formally to canvas the table in an official way to register everyone's Gradients of Agreement. This would have been very helpful. In fact, in most cases the approach was to terminate debate without any formal closure, and in most cases the topic was never discussed again, resulting in no net change to the plan or its contents. The planning team was not given the opportunity to return to the each section in the context of the whole interim plan in order to re-assess their agreement or disagreement: that is, there was no review of the final document.

The facilitation was such as to lead participants towards an us-versus-them stigma, when in fact for many of the contentious topics (e.g. the need for true ecosystem-based planning) there was a wide spectrum of views in the room. There was a clear need to form subgroups to address a number of areas properly and this was never pursued.

Overall, the facilitator did not behave in an independent manner but appeared to have only Forestry's agenda on his mind: to proceed through the previous 5-year plan, with a series of minor edits and revisions, to achieve an Operating Plan.

2. The approach did not follow the promised guidelines of the Provincial Sustainable Forest Management Strategy 2003

At the initiation of the District 1 Five-Year Plan planning process, participants were promised that the process would be guided by the Provincial Sustainable Forest Management Strategy 2003 public document. That document notes very clearly that:

"…Ecosystem-based guidelines will be developed for each ecoregion in the province …. Creating a link between district plans and ecological management objectives….." (

"…provide for sustained-yield forest management …consistent with the sustainable forest management strategy…" p.45).

Such guidelines were never presented or discussed, and all attempts to open the process into a true ecosystem-based approach were thwarted by the Forestry representatives.
I presented to the planning team the state-of-the-art guidelines for ecosystem-based planning developed by The Silva Forest Foundation (Hammond 2002), guidelines that have already been applied to Forest District 19 in Labrador to develop a very progressive five-year Forest Operating Plan. This approach was thwarted and avoided by the forestry representatives who claimed it was "not possible" for District 1.

Much confusion, and avoidance of the required "*Ecosystem-based guidelines,"* was imposed on the process by avoiding a clear definition of sustainability for the context of "sustainable forestry". After much insistence, the IUCN definition was included as: *The use of an organism, ecosystem or other renewable resource at a rate within its capacity for renewal.* The IUCN treatment further clarifies the definition to emphasize that *"…environmental sustainability actions are undertaken to ensure that they do not inhibit the long-term health, vitality and biodiversity of an ecosystem. We do this by moderating our needs and desires in order to accommodate the environmental limitations."*

All participants acknowledge and agree that the resource must also sustain the economic and social aspects, but the importance of the definition is that economic and social goals are supported only to the degree that the forest resource can renew itself – otherwise, obviously, it is ***un***sustainable.

In a 10 May 2006 letter from the former Minister of Natural Resources and a correspondence to the ecosystem manager from a Senior Manager, there is no clarity provided on what this "sustainable forest management strategy" really is, and I am left with a sense that senior managers and beaurocrats of the Forestry Branch are imposing an 'old school' approach on the attempted contemporary forestry district planning process. In other words, I concluded the process feeling that there was an agenda to avoid true sustainable forest management, and I must state that this IUCN definition is inseparable from real ecosystem-based management, in other words, sustainable forest management is the same as ecosystem-based forest management.

3. There was no actual planning

Despite having been invited to participate in a "planning process," what emerged was not planning. By definition, planning should be about bringing state-of-the-art resource information to the table and developing various conservation and management strategies from this information. Instead, there seemed to be no interest in integrating new and existing information. With some insistence, guest speakers were brought in to present resource information to the planning group, and for other resource material, information was displayed in an abstract way on wall maps. Yet some of this critical resource information was never integrated into the plan itself.

Examples of this deficiency are:

(i) At a landscape level in the district, it is important to assess management and conservation actions at a watershed level. Ideally, extraction activities should be balanced across watersheds within a sustainable context of maintaining a minimum of 50% of watershed in a natural state. A map of watersheds was displayed but nowhere was forest inventory, proposed harvesting operations, and other resource interests integrated into this context.

(ii) Some invited resource agencies presented some very current and insightful information on integrated resource management -particularly retention of riparian buffers and upland habitats to sustain landscape-level habitats to maintain corridors and wildlife species diversity. Some of these areas were grossly ignored in the report, particularly the extensive information supporting minimum buffers of 100m around important riparian areas for birds. In fact, this recommendation was scorned, and we were told that it "wouldn't work here." There is also a need to integrate more substantial buffers for salmon-spawning habitats.

(iii) The pattern was to refuse to attempt any progressive and prudent planning, and maintain the status quo. To this end, there appeared to be an agenda to respond only to existing designations of specific areas of 'no harvest,' and to minimum policy guidelines imposed by other provincial agencies - e.g., only 20m buffers for riparian areas. In many cases these measures will not be able to protect the biodiversity of the Avalon Boreal Forest Ecoregion.

Sustainable Forest Management Planning was Ignored

Despite its own policy to the contrary, the Department of Natural Resources is insisting on forging ahead with an outdated approach to forest management termed the Annual Allowable Cut (AAC). While at face value, this approach appears to "alienate" landbase in other uses or designations before generating potential yields, it does not allow for interactive development of a sustainable or ecosystem-based plan, because a truly sustainable plan must first define the interconnected areas of boreal forest necessary to maintain integrity of the forest ecosystem, and therefore to be excluded from harvest. This is not necessarily limited to proposed and/or existing protected areas or to any future systems plan.

4. Interference and Lack of Integrated Resource Management

There was a considerable lack of information on resources of interest that needed to be integrated within the Five-Year Plan. There were no discussions/strategies/actions to identify and/or obtain and integrate such resource data. Some examples include: the extent of spawning habitats for Atlantic salmon in the upper watersheds of major scheduled rivers, the abysmal lack of data on raptors nesting in the district (only 2 eagle nests shown), distribution and extent of enriched and extensive wetlands (e.g., fluvial floodplains, beaver ponds).

Some resource agencies present at the table did not provide a helpful role in the planning process, but rather appeared to have an agenda to stymie the process whenever possible. This was especially evident where there was overall consensus to designate a "forest reserve" in order to secure the long-term forest land base to ensure maintenance of a forest ecosystem. Other participants and I felt that all agencies should be helping to guide such fundamental land-base needs through their respective departments/legislation rather than interfering with the planning process.

5. Failure to Consider and Plan For Conservation of Endangered Species

Species listed under Federal and provincial endangered species legislation occur in the forest management district, but were not considered in any way during the planning process. In particular, the globally rare Boreal Felt Lichen (*Erioderma pedicullatum*) occurs in many locations, at least in the northwestern and northern portions of the Avalon Boreal Forest, where two proposed ecological reserves (Ripple Pond and Lockyer's Waters) have interim protection from commercial logging. Nevertheless there are other areas where the species occurs, some of which are slated for commercial logging. Other areas have not been surveyed to ensure the species is not present. This forest is also the best remaining Avalon habitat for the lynx, a species that is dwindling in numbers on the Avalon Peninsula. Despite an Endangered Species Act now in effect in the province, there was no discussion or consideration of an adaptive management approach to address the very important issue of species at risk.

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Bill Clarke
District Manager – FMD 1
Forest Resources
P.O. Box 13036, Paddy's Pond
St. John's, NL A1B 3V8

12 July 2006

Dear Bill:

On behalf of the Protected Areas Association of Newfoundland and Labrador, I wish to thank Forestry Branch for the opportunity to participate in the development of the latest Operating Plan for District 1. Forestry Branch is to be commended for engaging the public in the difficult task of consensus-based planning.

As the planning process is now complete, I wish to outline my concerns with the draft plan and process. My main criticism of this plan is that it is very difficult to assess how proposed activities will affect the long-term ecological health of the forests of the Avalon, and resident flora and fauna. Given this uncertainty, the Protected Areas Association cannot support this plan's implementation.

The 1990 Forestry Act, 1998 Environmental Protection Guidelines for Ecologically Based Forest Resource Management and the 2003 Provincial Sustainable Forest Management Strategy frame the task of "sustainable forest management" for the province. The Newfoundland Forest Service has adopted the Canadian Standards Association definition of sustainable forest management as: "to maintain the long-term health of forest ecosystems while providing ecological, economic and cultural opportunities for the benefit of present and future generations" (Provincial Sustainable Forest Management Strategy 2003, 1). The Provincial Strategy also states, "Managing forest ecosystems for a multitude of values requires an ecological foundation and framework for planning and implementation. The ecological basis for management decisions will ensure the sustainability of the province's forest ecosystems, while deriving economic and social benefits" (45).

This approach to sustainable forest management – an approach that is grounded in an ecological foundation and framework – is strongly supported by the Protected Areas Association. The Provincial Strategy outlines the steps it will take to develop an ecological framework in order to guide preparation of operating plans, such as the development of "ecosystem-based guidelines for each ecoregion in the province … creating a link between district plans and ecological management objectives" and advancing understanding of natural forest disturbance regimes. Unfortunately, ecosystem-based guidelines have not yet been developed. In the absence of ecosystem-based guidelines, development of the FMD 1 operating plan was guided by the prescriptive approach set forth in the 1998 Environmental Protection Guidelines for Ecologically Based Forest Resource Management. These guidelines, I would argue, are simply not robust enough to satisfy the ecological objectives of sustainable forest management as they set no targets for sustaining ecological values.

After reviewing the plan, I contend that ecological management objectives need to be much more clearly and precisely specified. As well, the potential negative impacts of forestry activities on those

ecological management objectives need thorough analysis. What population level and/or habitat quality targets, for example, should be maintained for the *vulnerable* Boreal felt lichen over time? How will proposed forestry activities impact this species, either positively or negatively? What targets should be set for the maintenance of populations of forest-dwelling species such as song-birds, furbearers, large mammals, etc.? The only "firm" sustainability target that has been explicitly defined in the Operating Plan relates to economic values of the forest – the Annual Allowable Cut. There are no "firm" thresholds or target ranges set however, for the maintenance of any ecological value, nor analysis on how proposed forestry activities might affect those values. The absence of discussion on the impacts of proposed forestry activities on the recovery of the Boreal felt lichen is of particular concern as this species is protected under the provincial Endangered Species Act.

Moreover, there is little evidence in the Operating Plan of implementation of an *active* adaptive management approach, a key component of sustainable forest management. There was reporting on the Canadian Council of Forest Ministers criteria and indicators carried out over the course of the last planning period, but there is no analysis in the current Operating Plan as to the impacts of past forestry activities on ecological values, and subsequent changes to activities which will be required to minimize similar impacts in the future. The Operating Plan also suggests that in future reporting will be carried out only on a provincial scale. It would be a mistake if district-scale reporting were abandoned altogether. For monitoring and reporting to have real meaning and value, it is best carried out at a scale where management decisions are being made – i.e. the district scale (Wright *et al.* 2002, Woodley *et al.* 1998).

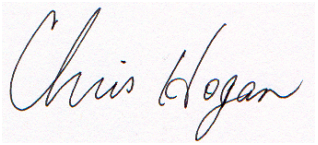
Without clearly defined ecological objectives and management targets, and a tight feedback loop of monitoring, reporting, and assessing the impacts of past activities, it is very difficult to determine whether the proposed Operating Plan can be judged as ecologically sustainable.

The Protected Areas Association strongly urges Forestry Branch to accelerate completion of the proposed ecosystem-based guidelines. As well, in order to approach consistent implementation of provincial forest policy at a district level, consideration might also be given to the development of a "template Operating Plan", which could outline the general approach to preparing an operating plan, as well as the required content.

As a point of clarification on section 2.0 Reserves, it should be noted that the Natural Areas System Plan is not simply a coarse geographic scale plan, but is rather designed to protect the province's biodiversity through establishing a network of protected areas on three different spatial scales: Component 1 - large landscape (>1000 km2); Component 2 – medium scale (~50 – 1000km2); and Component 3 – localized scale (<50 km2). Credit should be given to Forestry Branch for setting a moratorium on cutting within candidate protected areas such as the proposed Ripple Pond Ecological Reserve and Lockyer's Waters Ecological Reserve until a final decision on boundaries can be made.

In conclusion, I would encourage Forestry Branch to thoroughly review the public planning process for developing district operating plans. My experience in this planning team was that this was a highly antagonistic, conflict-ridden process, whereby problems were rarely resolved, and mutual understanding of opposing viewpoints rarely attained. The six month time period to complete the plan created a sense of urgency that limited opportunity for thorough exploration of issues. I appreciate that opposing viewpoints are certain to clash in a multi-stakeholder process, but nevertheless, I think there is opportunity to improve this planning process so that it better meets the needs and expectations of participants.

With best regards,



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