INTRODUCTION

This Five Year Operating Plan is one of the first of its type that reflects the new legislated planning requirements of the Newfoundland Forest Service. In the past, there were five major planning documents; Provincial Sustainable Forest Management Strategy, District Strategy Document, Five Year Operating Plan, Annual Operating Plan, and Annual Report. This new planning framework has eliminated the District Strategy Document; however, its former contents are now split between the Provincial Sustainable Forest Management Strategy and the Five Year Operating Plan. Sections that are Provincial in scope such as carbon, global warming and criteria and indicators are now included in the Provincial Sustainable Forest Management Strategy while sections that are more descriptive or depict local conditions such as values, forest characterization and ecosystem description are moved to the Five Year Operating Plan. Linkages between strategies from the Provincial Sustainable Forest Management Strategy and on the ground activities in the Five Year Operating Plan will be provided where applicable.

Another major change is the creation of eight planning zones on the Island which are based loosely on ecoregion location. Districts that share common ecoregion characteristics are combined to form these zones. Districts 17 and 18 are combined to form Planning Zone 8. The requirement for submission to the Newfoundland Forest Service and for environmental assessment is one Five Year Operating Plan for each owner in each zone. The past requirement was one Five Year Operating Plan by each owner in each district. In this zone there will be two separate submissions by the Crown and Corner Brook Pulp and Paper Limited. Throughout this Five Year Plan, references will be made to Districts 17 and 18 individually but when combined they will collectively be referred to as Planning Zone 8 or the zone. The planning team for this zone is located in Plum Point. Planning team format and structure will be discussed in a later section.

This document will try to fully integrate presentation of information and discussion for Corner Brook Pulp and Paper Limited limits in the zone, where possible. This will be done by combining statistics and other information from each district and reporting for the zone. Tables

and figures will be constructed such that information for individual districts will be available if a breakout is required. Discussion and information will be presented separately for each district where required based on unique and distinct differences in scope and content. The more descriptive sections of this plan will be generic in nature and give information for all ownerships in the zone as well as some broad comparative statistics. In this way the reader will get a better overview of the entire zone in the context of all ownerships.

Finally, this document will attempt to build on previous documents and on efforts of previous planning teams. Information will be updated as required or new sections will be added if any new information is available. Sections from previous documents will be included if they are still relevant, even if they were not discussed by the current planning team.

Section 1 Description of the Land Base

1.1General

1.1.1 Location

Planning Zone Eight encompasses Forest Management Districts 17 and 18 (Figure 1). It extends from Gros Morne National Park in the south to include all of the Northern Peninsula. Major towns located within the zone are Parsons Pond, Port Saunders, Port au Choix, Roddickton, and St. Anthony. District 17 is administered from Port Saunders while District 18 is administered from Roddickton with a depot in St. Anthony.

1.1.2 History

The natural resources of the zone have played a major role in the well being of the residents. Since the earliest settlement, the forest and fish resources were the mainstay of the economy. Generally, settlement occurred around the coastal areas where the fishery was prevalent. Initially the forest was used as a source of fuelwood as well as construction materials for houses and fishery related items (stages, lobster pots, boats etc.). Sawmills developed to supply the local demand for lumber and construction timber and there was a small export market for pulpwood. In the zone, logging towns such as Hawkes Bay, Main Brook and Roddickton developed as a result of the lumber industry and pulp and paper mill in Corner Brook. Today pulpwood and pulp chips are shipped to the mill in Corner Brook. As well, there are two major sawmills in Roddickton that produce lumber for both the local and export market.

1.1.3 Ownership

There are two major ownerships in the zone; Crown and Corner Brook Pulp and Paper Limited (CBPPL), Figure 2. While there are CBPPL timber limits in District 18, they have been exchanged to the Crown until 2019. For this reason all of District 18 will be treated as Crown

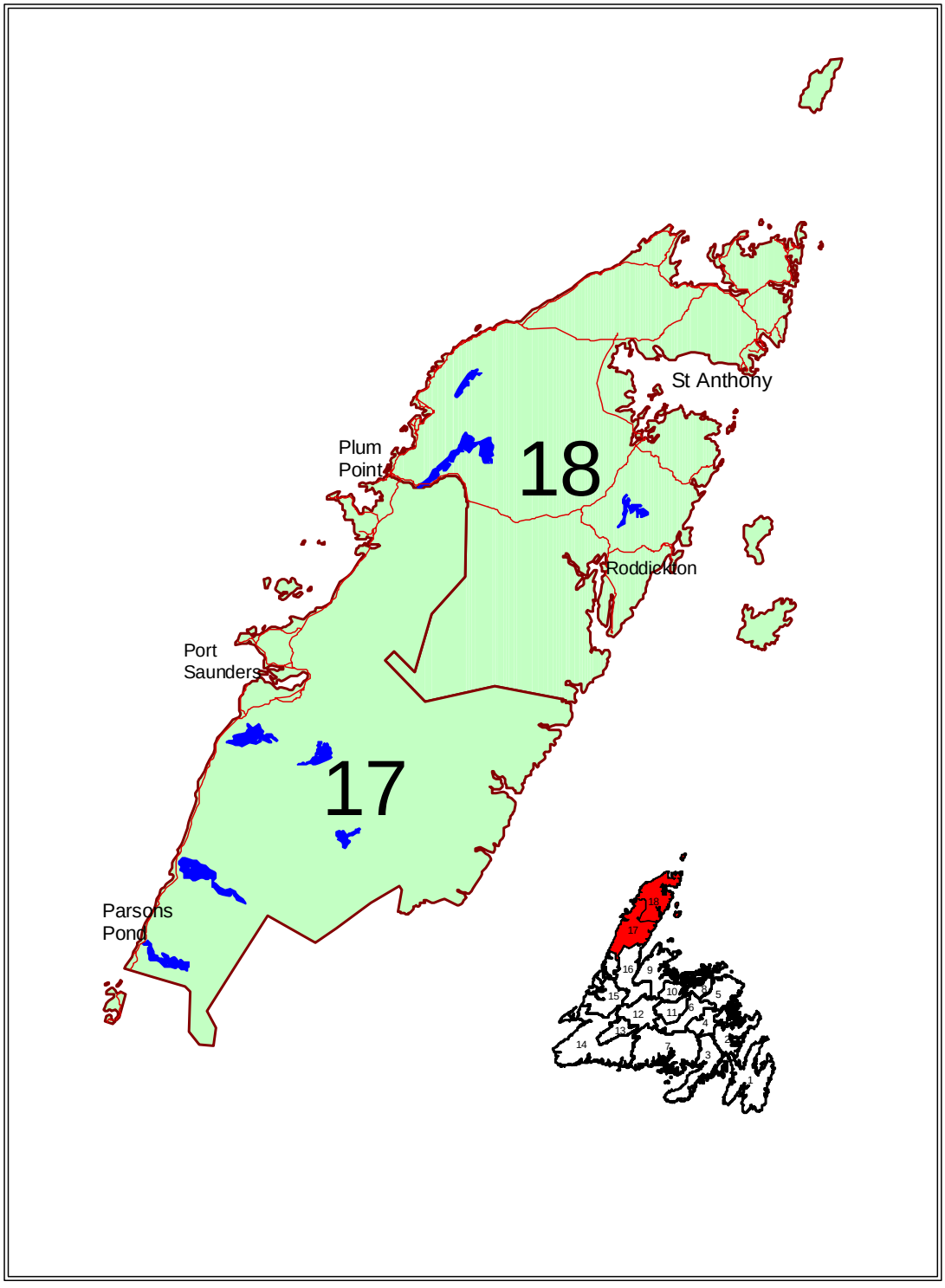

Figure 1. Location of Planning Zone 8

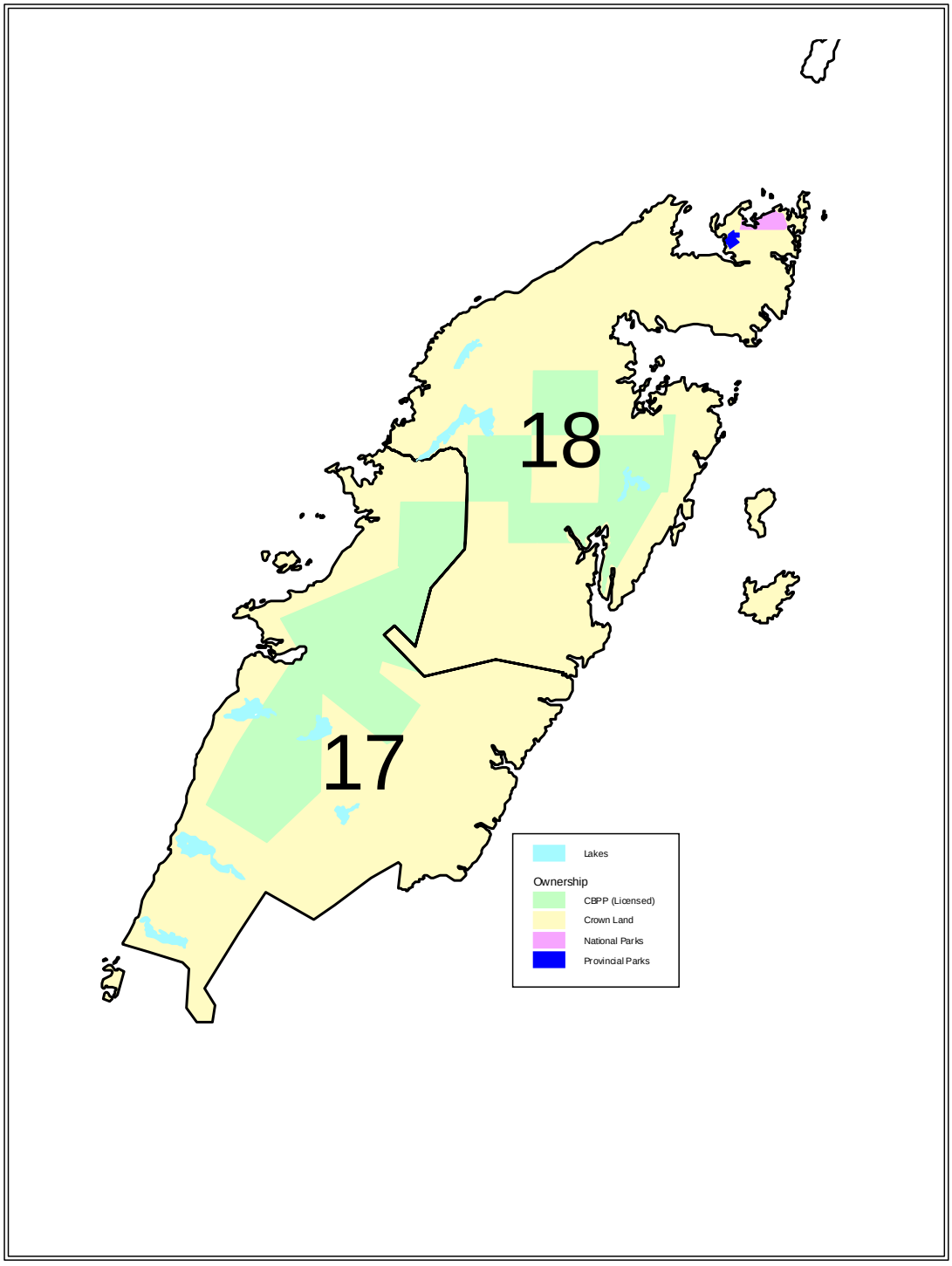

Figure 2. Ownership map for Planning Zone 8

land for this plan. In District 17, the ownership breakdown is approximate two thirds Crown and one third CBPPL.

1.2 Physical

1.2.1Topography and Hydrology

The two dominant topographic features of the zone are the rolling coastal plain and the Long Range Mountains (Brown, 1979). The coastal plain rises from the Gulf of St. Lawrence and continues eastward until it reaches the base of the Long Range Mountains. It varies in width from a few kilometers in the south to 40 kilometers in the north and extends in a north-south axis along the western side of the zone broken only by the Highlands of St. John. This plain is of a gentle rolling nature, reaching a maximum elevation of less than 200 meters. North of the Long range mountains lies a gently rolling sheltered lowland dominated by calcareous parent material. It is on the plains and sheltered lowlands that a large portion of the forestry activity within the zone takes place. Although officially termed mountains, the Long Range is more accurately a plateau. It rises abruptly from the coastal plain to elevations of 600 metres, then forms an eastward dipping plateau that extends unbroken to the eastern shore of the Great Northern Peninsula where it forms a steep rugged coastline. The two most striking topographic features of the Long Range Mountains are the numerous deeply incessed glacially carved valleys, in many cases occupied by lakes, that interrupt the sheer western face and the several narrow steep sided valleys, eroded by the easterly flowing rivers, found on the plateau. Due to its exposed nature, the plateau supports little area of commercial forest except in the river valleys. Where trees have established, they are usually of a stunted, wind deformed nature known as tuckamore. The extreme northern part of the zone is characterized by extensive areas of coastal bog and barrens.

The two major topographic features present have given rise to separate hydrographic patterns. The flat coastal plain is characterized by large shallow lakes with broad slow moving rivers that drain large watersheds. The east-west orientation of these watersheds creates a barrier to the orderly development of a road network necessary for intensive forest management. The major

watersheds in this category are; Parsons Pond, Portland Creek, River of Ponds, Torrent River, Castor's River, St Genevieve River, Main Brook, Beaver Brook, Northeast Brook, and Salmon River.

The other hydrographic pattern is present on the high plateau of the Long Range Mountains. Here there are few large lakes, the rivers being narrow and fast moving with narrow watersheds. The major watersheds of this nature are the Cat Arm River, Little Harbour Deep River ,Soufflés River, Hooping Harbour, Northwest Brook and Cloud River.

1.2.2 Geology

The geological evolution of the Great Northern Peninsula is said to begin with the rocks of the Long Range Mountains. This complex of igneous and metamorphic rocks, dominated by granite and granitic gneiss are the oldest rocks on the Island aged at approximately 950 million years (Fleming, 1971). Other components of the Long Range Mountains include various types of schist's, amphibalite and unseparated intrusions. The rock of the Long Range Complex were formed or deposited during the precambrian period.

The coastal highland area is composed of rocks from the Cambrian and Ordovician periods. They include shale, sandstone, slate, greywack, limestone, conglomerate and basic volcanic rocks. Conche Peninsula and Cape Rouge Peninsula, which protrude from the coastal highland, consist of rocks from the carboniferous period and make up the Anguille Group. These rocks include conglomerates, sandstones, siltstones, shales, dolomite, slate, conglomerate and basalt.

Both the coastal plain and White Hills massive were formed during the Ordovician period. The coastal plain consists of limestone, dolomite, quartzite, sandstone and shale, while the White Hills is made up of periodite with lesser occurrences of pyroxenite, dunite and talcarbonate alterations of mafic to ultramafic rocks.

Rocks forming the base of the coastal plain north of Portland Creek were formed during the Cambrian and Ordovician Periods when the Great Northern Peninsula was the slightly submerged eastern margin of the North American Continent. The sedimentary deposits formed into sandstone, limestones, dolostones and carbonate rocks. The sequence of deposit has been deformed very little and is termed autochthonous. South of Portland Creek the bedrock is of a different nature having been deposited in a deep water environment and consists of sandstones, thin bedded limestones and shales, and limestone conglomerates. The sequence of deposit of these rocks is highly deformed and they are found on top of the autochthonous sequence. This inconsistency leads to the hypothesis that the rocks were formed some 65 kilometers to the east of the Great Northern Peninsula and moved in mass, by gravity, to their present location.

1.2.3 Soils

Damman developed a very detailed description and location for all the soil types in the zone.

In District 17 the most productive forest sites occur on the coastal plain. These soils are of several types; (1) orthic podzol soils of varied texture, usually with the parent material being a mixture of sandstone and limestone tills, (2) relatively deep nutrient-poor soil with non--calcareous tills as parent material; on these sites, moderately well-drained slopes with sandy loam to loam texture soil are more productive than the well-drained loamy sands to sandy loams, and (3) excessively drained, loamy or silty sands with a non-calcareous till as parent material. The largest concentration of these productive sites is found between Portland Creek and Hawkes Bay.

Large areas of poorly drained peat bogs are also found throughout the coastal plain. Because of their excessive moisture and accumulation of organic material these sites have a very low productive capability. Along the east coast of the Great Northern Peninsula productive sites are

usually shallow lithosolic soils. Because of exposure and their shallow nature these sites have only a moderate capability.

On the higher elevations of the exposed Highlands of St. John and Long Range Mountains the terrain consists of rock and soil barren which have little or no forest capability.

District 18 was glaciated during the Pleistocene period and a layer of glacial till consisting of calcareous (calcium and limestone) and non-calcareous (shale, slate and sandstone) sediment make up the majority of parent material. The most common soil type is well drained podzol. Other less common soil types found throughout the district are gleysols, regosols and organics.

The most productive calcareous soils occur in the central lowlands between Ten Mile Lake and Coles Pond. For the most part, these are fairly deep tills of varying texture underlain by limestone. The most productive non-calcareous soils occur on well drained, loamy sands to sandy loams.

The northern part of District 18 is almost completely covered by organic soils with predominately open ombrotophic peat bogs and contains very little productive forest sites.

1.2.4 Climate

The prevalent weather system affecting the zone is the maritime system. This weather mass has a moderating effect which results in cool summers and relatively warm winters. The warmest month is July with a mean temperature of 13^{o}C and the coldest month is January with a mean temperature of -9^{o}C. Rainstorms and high wind are frequent in the fall. The length of the vegetative season decreases rapidly along the northern peninsula, ranging from 150 days in Bonne Bay to 100 days at Cape Bauld (Hare, 1952). The annual precipitation averages 90 - 115 cm. which includes approximately 320 cm. of snow.

1.3 Ecosystems

1.3.1 Forest Ecosystems

An ecosystem is a community of interacting and interdependent plants, animals and microorganisms, together with the physical environment within which they exist (adapted from Perry, 1994). It is important to remember that within an ecosystem the interactions between the biotic and abiotic components are at least as important as the component themselves. Another critical characteristic of ecosystems is their overlapping boundaries. While each is definable in time and space, and distinguishable from adjacent ecosystems, each is intimately integrated with other local ecosystems. Additionally, each local ecosystem is nested within increasingly larger ecosystems. The scale at which an ecosystem is viewed is contingent on the species or abiotic characteristic under consideration. While planet Earth represents the ultimate global ecosystem, complex ecosystems also exist under fallen logs and rocks.

A forest ecosystem, as the term implies, is an ecosystem dominated by tree cover. At the coarsest level, the forests of Planning Zone 8, like all forests on the island, form part of the boreal forest ecosystem. The boreal forest is a green belt which spans much of the northern hemisphere. It stretches from the Atlantic shores of Scandinavia through Russia, across Alaska, through the mid latitudes of Canada until it reaches the Atlantic Ocean again in Newfoundland and Labrador. One of the distinguishing characteristics of the boreal forest is the phenomena of periodic, catastrophic stand replacement natural disturbances such as fire and insect outbreaks which typically give rise to uniform, even aged forests dominated by a few tree species.

The tree species which characterize the Canadian boreal forest include black spruce, white spruce, balsam fir, eastern larch, trembling aspen, white birch and jack pine. All of these, with the exception of jack pine, commonly occur on the Island. However, by far the dominant species are black spruce and balsam fir; together they represent more than 90 percent of the growing stock on the island. Spruce is most abundant in north central Newfoundland where a climate characterized by relatively dry, hot summers has historically favoured this fire-adapted species.

In western and Northern Newfoundland the climate is somewhat moister and fires are far fewer in this region resulting in the ascendance of balsam fir, a species which is poorly adapted to fire.

1.3.2. Ecoregions and Subregions

Damman 1979, defined ecoregions as areas where comparable vegetation and soil can be found on sites occupying similar topographic positions on the same parent material, provided that these sites have experienced a similar history of disturbance. Thus, an ecoregion cannot be defined in isolation from the physical landscape, but vegetation toposequence, vegetation structure, floristic composition, and floristic distributions can provide the primary criteria. According to Damman, nine ecoregions are represented in Newfoundland. Each of these is further divided into subregions (also known as ecodistricts) All of the Newfoundland ecoregions and subregions contain many of the same ecosystem variables. It is the dominance and variance of these variables (e.g., vegetation and climate) that determine their classification.

Figure 3 depicts Planning Zone 8 relative to Damman's ecoregion classification system. The Northern Peninsula Forest ecoregion encompasses the majority of the area in the zone. The Long Range Barrens Ecoregion encompasses half of District 17 and one fifth of District 18. The entirety of the Strait of Bell Isle Barrens ecoregion is located in District 18.

Table 2 depicts the percentage of the ecoregions and subregions that are represented in the zone. It describes each ecoregion and subregion as a percentage of the total in the Province as well as the relative importance within each District and in both Districts combined. For example, District 18 contains 100 percent of the Northern Coastal Subregion of the Northern Peninsula Forest Ecoregion in the Province. As well, 17 percent of the District is located within this subregion. The following is a detailed description from (Meades, 1990) of each ecoregion and subregion in both Districts.

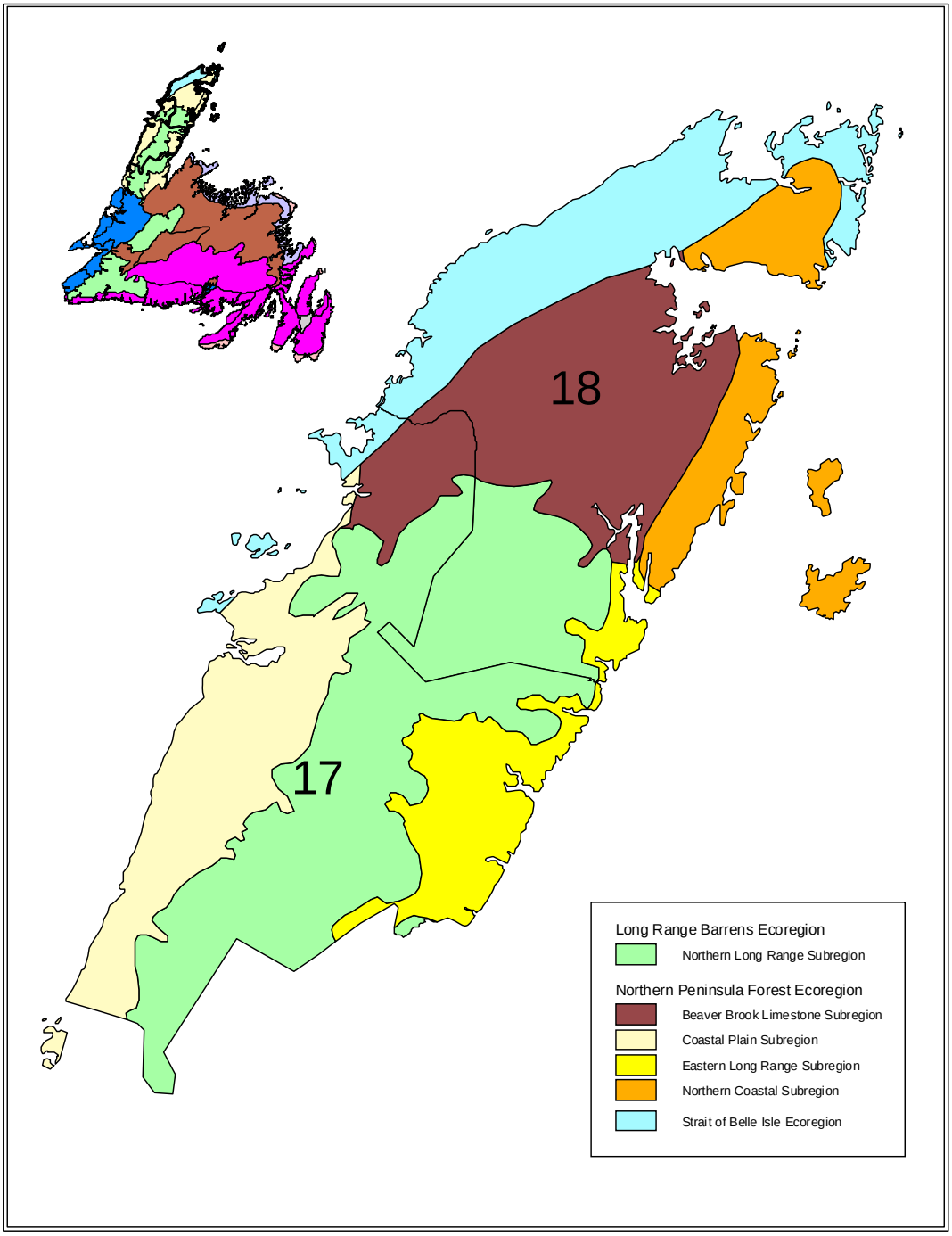

Figure 3 Ecoregions and subregions of Planning Zone 8.

Table 1. Percentage of ecoregions and subregions in Planning Zone 8.

Name of Ecoregion and Subregion	Total Area in Province (ha)	Percentage of Total Area in Districts			Relative Percentage of Ecoregion and Subregion in Districts		
		17	18	Total	17	18	Combined
Long Range Barrens							
Northern Long Range Subregion	689562	44	17	65	47	18	33
Northern Peninsula Forest							
Eastern Long Range Subregion	268059	38	6	44	16	3	9
Beaver Brook Limestone Subregion	255016	17	83	100	7	34	20
Coastal Plain Subregion	224658	81	0	81	28	0	14
Northern Coastal Subregion	107117	0	100	100	0	17	9
Strait of Bell Isle	188910	7	93	100	2	28	15

1.3.2.1 Northern Peninsula Forest Ecoregion

This ecoregion differs from most other forested parts of the Island by the shortness of the growing season, 110-150 days compared to 145-170 days for other areas. The frost-free period is comparable to most other areas and somewhat better than in central Newfoundland. Precipitation is lower, but, because of low summer temperatures and a shorter growing season, soil moisture supply is probably adequate at most times. The soils are comparable to those of western Newfoundland. Limestone underlies most of the region, with acidic rocks more common on the eastern side of the Peninsula.

Balsam fir is the dominant forest cover except at high elevations (300-400 m) on the eastern side of the peninsula where black spruce appears to be a natural component of the stands. There is very little fire history in this ecoregion. White pine, red maple, yellow birch and trembling aspen are conspicuous by their absence. There are approximately 100 species of plants that are excluded from this ecoregion presumably because of the difference of climate. One of the most conspicuous changes is the replacement of speckled alder by green alder, satiny willow and balsam willow in swamps. Also tall shrubs such as mountain-holly, wild raisin and rhodora are

sparse or lacking in the scrub bog-border forests. Silviculturally, they are similar to Western Newfoundland with hardwoods rather than ericaceous shrubs being the most common brush problem on under stocked cutovers. Skunk currant, swampy red currant and red-osier dogwood appear to be a much more conspicuous component of seral vegetation on cutovers. Raspberry is also very abundant in the early years of succession.

1.3.2.1.1 Eastern Long Range Subregion

This subregion includes the productive but inaccessible forest on the eastern slopes of the Long Range Mountains up to 450 m elevation. It extends from Cat Arm in the south to Canada Bay in the north. It extends farther inland in the south to include the Little Cat Arm and Soufflés River watersheds before narrowing to a thin coastal strip. The forests tend to be somewhat open balsam fir-black spruce mixtures. The tree line decreases towards the northern end of the subregion.

1.3.2.1.2 Coastal Plain Subregion

This subregion encompasses the flat coastal plain and the western lower slope of the Long Range Mountains from St.Pauls north to Squid Cove. The coastal plain is occupied mostly by low plateau bogs. Forests are restricted to the slopes of the mountains and an area on glacial till near Hawkes Bay.

1.3.2.1.3 Northern Coastal Subregion

This subregion extends as a narrow coastal strip from Canada Bay in the south to Hare Bay in the North. This subregion is climatically the least favorite because of the coldness of the surrounding ocean water. Vegetation consists of exposed, rocky dwarf shrub barrens with local areas of poor forest. Serpentine barrens occur on the White Hills near St. Anthony.

1.3.2.1.4 Beaver Brook Limestone Subregion

This subregion contains the productive forests in the sheltered lowlands north of the Long Range Mountains. This is the most climatically favoured subregion in the Northern Peninsula Forest

Ecoregion. Limestone underlies most of this area and rich, calcareous fens are common. Ombrotrophic bogs are limited to the northwestern part of the subregion. It covers the entire Central Lowland from Ten Mile Lake in the west to Coles Pond in the east. This area is characterized by very gently rolling topography, with a variety of soil and bedrock types. The area has an abundance of underground brooks and sink holes, which have been eroded in the limestone substrate. Some of the most prominent are Under Ground Hole and Browsey Hole.

1.3.2.2 Long Range Barrens Ecoregion

This ecoregion comprises the highlands extending from the southwestern coast to the northern part of the Northern Peninsula. It consists of three distinct units, the Southern Long Range, the Buchan's Plateau-Topsails, and the Northern Long Range subregions. They are separated by areas of more or less continuous forest.

Fire is of little importance and has played no role in the formation of these barrens. There are large areas of exposed bedrock in this ecoregion which are acidic in nature.

Cool summers and cold winters are typical of this ecoregion. The mean daily temperatures are relative low therefore the vegetative season is short. Snowfall can exceed 5 m and drifting is extreme throughout the winter. Snow cover is permanent throughout the winter and persists through to late spring. Western and southwestern facing slopes are severely exposed due to the prevailing winds from this direction.

This ecoregion contains mainly barren vegetation with shallow ribbed fens and tuckamore dominating the landscape. Sheep laurel heath is the predominant dwarf shrub vegetation with pink crowberry dominated Empetrum heath covering exposed areas subject to active erosion. Arctic alpine vegetation i.e. (*Diapensia* and *Loiseleuria*) is common on all highlands and exposed sites. In areas with persistent now cover, snow bank species such as moss heather, mountain sorrel and dwarf bilberry are common.

Forests dominated by balsam fir occur only in deep sheltered valleys on the northwest side of the Long Range Mountains and the Cloud River valley basin. The Cloud River Valley is a large, forested depression in the Long Range Mountains and is one of the most scenic locations on the Northern Peninsula.

Extensive areas of tuckamore, mostly of black spruce less than one metre high, occur on slopes and in valleys, but are absent from hill summits. Speckled alder is completely absent being replaced by sweet gale along brooks. Mountain alder is common on wet and dry sites but does not form alder swamps. Shallow peatlands, patterned fens and slope bogs cover extensive areas. While northern and Arctic-alpine plant species are widespread, southern coastal plain species are absent.

Two major caribou herds, supporting year round populations, occur in this subregion, with the Northern Peninsula herd being located in the zone. Arctic hare is mainly restricted to this ecoregion.

1.3.2.2.1 Northern Long Range Subregion

This subregion encompasses the central portion of the Great Northern Peninsula from Gros Morne National Park in the south to Cross Country Road in the north and includes the Highlands of St. John, which is the coldest part of the island. The best developed snow bank vegetation occurs in this subregion. Mountain alder thickets are characteristic on alluvial soils in deep valleys. Many northern plant species occur in the forested valleys.

1.3.2.3 Strait of Belle Isle Barrens Ecoregion

The Straits of Belle Isle Ecoregion is a narrow strip of land which extends north along the western coastline from the northern part of St. John's Bay in the south to the community of St. Anthony. It is an undulating plain, predominately less than 47 metres in elevation, and only very locally rising to elevations of 60 metres. The southern section has a hummocky topography, but towards the north it becomes flatter (Damman, 1963). It widens gradually toward the north and extends across the Peninsula at Hare Bay. The area is characterized by barren, undulating

topography, with extensive bogs that contain many small ponds. The entire area was glaciated during the Pleistocene period and there are numerous raised beaches caused by the submergence of the costal plain. Due its flat topography and poor drainage, this area contains many bogs with a network of small scattered ponds.

1.4 Ecosystem Dynamics

1.4.1 Ecosystem Condition and Productivity

1.4.1.1 General Characteristics

Landscape patterns determine the variety, integrity, and interconnectedness of habitats within a region. These landscape patterns are a direct result of the relationship between physical landforms and soils, disturbance history, and relationships among various species that make up the ecosystem communities. These factors, while listed separately for clarity, are unavoidably interrelated. Landscape patterns play a pivotal role in determining the current conditions and health of forest ecosystems. These variables are evaluated in terms of productivity, stability and resilience.

Another important role determining the condition of a forest is change. Forests are an ever evolving entity, resisting stagnation, and constantly moving through their cycles of life, death, and renewal. The process of change over time is the essence of nature itself. It has been nature's underlying storyline since time began, and will continue to be until time ends.

The main forces of change in our natural forest ecosystems are disturbance and succession. A definition of disturbance would indicate that it initiates a change in a community structure which often ends up in the replacement of one set of species by another. However, replacement is not always the end result (e.g., a species like black spruce is aided in germination by disturbances like forest fire).

Disturbances range from the fall of a single tree, to the destruction of thousands of hectares by forest fires. While disturbances may be very destructive, they can often rejuvenate ecosystems and diversify landscapes.

Succession involves changes in both community composition and in the ecosystem structure and process. Succession is the orderly change whereby the dominant species is replaced by another species, then another etc. until a new dominant species establishes a relatively stable community.

1.4.1.2 Zone Specific Characteristics

As with other parts of the Newfoundland and Labrador's boreal forest, those of Planning Zone 8 have evolved in concert with a history of fire, insect attack and subsequent wind throw. Human intervention in this forest has been extensive and widespread with a resultant significant impact on current landscape patterns. The forests of the zone have been subject to many of the natural and human induced events that have shaped forests across Newfoundland. Natural disturbances such as insect-infestation and wind throw appear to be the two dominant factors that recycled the forest before the advent of large scale forest harvesting. Natural wildfires have not played a major role because the cool maritime climate of the zone has minimized the conditions necessary for their occurrence however, human caused fires have occurred. The start of commercial harvesting early in this century by groups such as Saunders and Howell and later Bowater's began the shift from a forest driven by natural disturbances to one that is dominated by harvesting.

Commercial and domestic harvesting has subsequently displaced natural disturbances as the dominant forces that recycle the forests of the zone. Although natural disturbances still occur on an annual basis, harvesting is the major disturbance type in our forests. The commercial harvesting has evolved since its beginnings whereby wood was cut by bucksaw next to river systems, hauled by horses to the water and then floated downstream to awaiting mills. Today commercial harvesting utilizes rubber tired off road vehicles, an extensive road system and

tractor trailers to move wood to mills and markets. The disturbance to forest soils following commercial harvesting is greater than that following insect outbreak but successful regeneration of these stands is not comprised by the harvesting technology. Skid trails and landings are the two areas where regeneration is problematic but with proper silviculture techniques these areas can be put back into a near natural condition.

Domestic harvesting of logs and firewood is a long standing tradition among the communities of the zone. This type of harvesting involves local residents creating small clearcuts to obtain their yearly supply of wood. It generally occurs close to communities and during the winter months. Along the western cost of the Peninsula, many small domestic sawmills are located throughout the countryside. These sawmills operate in winter and lumber is hauled out to the respective communities. As with commercial harvesting forest regeneration after domestic harvesting is generally adequate however many domestic cutting areas are remote and become subject to heavy moose browsing. In the Straits area and near Roddickton moose have halted the growth of young trees and these sites are not easily accessed for planting purposes.

The current state of the forests in the zone could be considered good when looking at those areas that were harvested years ago. Recently however, the successful natural regeneration of harvested and in some instances insect killed stands has not been proceeding along its previous course. The extraordinary growth of the moose population, in those management units comprising District 18 and the northern portion of District 17 has lead to some instances of over browsing of habitat. Currently, the tree planting program in the zone has been partially aimed at restocking harvested sites with tree species (i.e., black and white spruce) that are not used by moose, to compensate for the loss of young balsam fir trees through moose browsing. Although this is a zone wide problem it is more pronounced in certain areas (e.g., St. Anthony burn, Camp 18) and is a concern that needs to be addressed. Through browsing by moose, many hardwood shrub and tree species are not successfully growing to maturity which is altering the process of natural forest succession.

The following sections will discuss each of these concepts in more detail as they relate to the ecosystems of Planning Zone 8. For the most part this section will be descriptive and explanatory in nature. Specific examples of strategies and linkages to the Provincial Sustainable Forest Management Strategy will be detailed in subsequent sections.

1.4.1.1 Productivity

Productivity is the accrual of matter and energy in biomass. In simple terms, primary productivity is the sum total of all biomass produced through photosynthesis. Secondary productivity occurs when this "primary" biomass is ingested and is added to that organism's biomass. Since secondary productivity is directly dependant on primary productivity, it is this primary productivity component that drives the system.

The level of primary production is dependant on the ability to produce biomass. This in turn is dependent on landscape features, soil, climate etc. In general terms, the more productive (ability to grow trees) a site is, the higher level of primary productivity. For example a forested stand would have a higher primary productivity than a bog or a good site would have a higher potential than a poor site.

Overall, the landscape in Planning Zone 8 has approximately 33 percent productive forest. As well, the relative proportion of site types is 15 percent good, 60 percent medium and 25 percent poor with a mean annual increment (MAI) of 2.3, 1.7, and, 1.0 m3/ha/yr respectively. The distribution of productive sites across the landscape and range of productivity within these sites is largely dependent on landscape patterns, climate, and soils.

The more productive areas of the zone occur in the lowlands of District 17 and the areas with calcareous soils in District 18. These areas have deeper soils and less exposed bedrock. The landscape patterns are more consistent and the growing season is longer. In the northern part of District 18 the soils are mainly organic and in the central part (hills) of District 17 the soils are

shallower with bedrock at or near the surface. The terrain in much rougher and the growing season is shorter.

In practice, it is nearly impossible to measure the amount of biomass produced in an ecosystem, or the energy consumed in the process. However, in the Provincial Sustainable Forest Management Strategy, criteria and indicators to monitor productivity have been identified. One method outlined is tracking mean annual increment in m3/ha/yr by tree species by ecoregion. This can be readily measured over time and manipulated through silviculture treatments or affected by poor harvesting practices which increase soil compaction. An example of secondary productivity is the number of moose per unit area. One must also recognize the forests inherent biological limits however, when attempting to measure or manipulate site productivity.

1.4.1.2 Resilience

Ecosystem resilience reflects the ability of the ecosystem to absorb change and disturbance while maintaining the same productive capacity and the same relationships among populations. Healthy forest ecosystems maintain their resilience and adapt to periodic disturbances. The renewal of boreal forest ecosystems often depend on these disturbances. Resilience is characterized by the forest's ability to stabilize vital soil processes and maintain succession whereby the system is returned to a community composition and the productivity level is consistent with the ecosystems physical constraints. To a large degree, a forest ecosystems' resilience is controlled by properties such as climate, parent soil, topography and flora.

The potential for populations to recover from low levels following disturbance by having adequate regeneration capacity and a balanced distribution of forest types and age classes provides a reliable measure of resilience at the landscape level. Indicators include the percent and extent of area by forest type and age class and the percentage of disturbed areas that are successfully regenerated. Resilience is determined by measuring and monitoring these

parameters. Forest activities must be carefully planned to not upset the natural balance and lower an ecosystem's resilience.

The ability of forest stands to regenerate themselves demonstrates their resiliency in the face of harvesting or some other natural disturbance. An example of lowered resiliency following natural disturbance is near the St. Anthony airport where wildfire that killed all the standing trees and on the poorer sites killed all the young trees that were on the forest floor of the mature stand. Natural regeneration on this area is slow or non-existent even 30 plus years after the burn. Another example is harvesting on the more fragile sites where steep slopes and shallow soil over bedrock increase the potential of site degradation beyond repair.

1.4.1.3 Stability

Nature is constantly changing and going through the unending processes of disturbance, growth, senescence, and decay. Therefore, stability of a forest ecosystem does not refer to one fixed position without variation. Ecosystem stability is more accurately defined as the maintenance of ecosystem changes within certain boundaries and the functional continuation of important potentials and processes such as energy capture.

There are three levels of stability; species stability, structural stability, and process stability. Species stability is the maintenance of viable populations or meta-populations of individual species. Structural stability is the stability of various aspects of ecosystem structure such as food web organization or species numbers. Process stability is the stability of processes such as primary productivity and nutrient cycling. To put stability in perspective, it must ensure that the system does not cross some threshold from which recovery to a former state is either impossible, (extinction) or occurs only after long time periods or with outside inputs (e.g. loss of topsoil).

Some indicators of stability which can be monitored are: area of forest converted to non-forest use, area, percentage and representation of forest types in protected areas, percentage and extent of area by forest type and age class, and change in distribution and abundance of various fauna.

These indicators can be measured and monitored to ensure stability is maintained and to evaluate the impact, if any, of forest activities on ecosystem stability.

1.4.1.4 Disturbance Regimes and Successional Patterns

There are four main driving forces that cause disturbance in the boreal forest. As stated in section 1.4.5, harvesting accounts for the majority of disturbance in the zone and occurs on a regular and consistent basis. Fire and insect damage are the other two major disturbances and occur on a more irregular or cyclic basis. With the exception of a major atypical windstorm, wind throw usually occurs after a stand is weakened by some other agent like insects. For this reason successional patterns after insect damage and wind throw will be discussed together. The following is a brief synopsis of successional patterns after each major disturbance type by forest type and site type.

1.4.1.4.1 Harvesting

Regeneration patterns in the black spruce type after harvesting is mainly back to the black spruce type especially on the poorer sites. The component of balsam fir regeneration increases as the sites get better. There is substantial regeneration failure in this forest type with average not sufficiently restocked (NSR) rates of approximately 20 percent. Another general trend is that the poorer the site quality the higher the NSR rate. These sites would be candidates for planting with white or Norway spruce.

In the balsam fir types, regeneration success back to balsam fir is much higher averaging 65 percent. Regeneration rates to balsam fir are higher on the medium sites and fall off somewhat on the poor and good sites. There is also some regeneration to black spruce and white birch types. Regeneration failure is relative constant across all ecoregion types at 25 percent.

Regeneration pattern in the mixed wood types is generally back to mixed wood that is dominated by balsam fir. There is also a component of white spruce regeneration after harvest on these

mixed wood types. There is a higher component of white birch regeneration after harvesting in types that had a higher percentage of hardwood before harvest. As well, the better the site class the more hardwood regeneration. Regeneration failure on the mixed wood types is variable across site types and ecoregions depending on local conditions but averages 20 percent.

There are few pure hardwood stands in the zone. Harvesting of these sites has only recently been occurring with the development of a value added hardwood industry therefore regeneration patterns are unknown. Anecdotal evidence from domestic cutting in these types indicates that they will regenerate to mixed wood types dominated by balsam fir and white birch.

1.4.1.4.2 Fire

White birch is the most prolific regeneration species after fire across all forest types, site types and ecoregions within the zone. It regenerates as pure stands or in combination with black spruce. Balsam fir is conspicuously absent after fire because most advanced regeneration in the under story is killed by the fire. Black spruce and white birch regeneration is somewhat correlated with the amount present in the pre fire stand. Generally, the higher the component of these species in the original stand, the higher the percentage of regeneration to these species. In mixed wood stands a higher component of white birch is present after fire. Fire in pure hardwood stands can sometimes regenerate back to pure white birch stands in certain areas. Regeneration failure after fire is on average 55 percent across all forest types and is higher as sites get poorer.

1.4.1.4.3 Insect

Balsam fir is highly susceptible to insect attack from the hemlock looper and spruce budworm whereby black spruce is hardly impacted by these insects. For this reason, stands with a high component of balsam fir are more susceptible to insect attack and subsequent wind thrown.

Mature balsam fir types usually regenerate to balsam fir or to balsam fir hardwood mixtures.

Disturbance by insect kill in young balsam fir stands can cause succession to white spruce. Regeneration patterns in mixed wood types usually depend on the type of mixture. If black spruce is a component then it will persist and form part of the new stand. Otherwise balsam fir and balsam fir/hardwood mixtures regenerate after insect attack. Regeneration failure occurs approximately 20 percent of the time but can be significantly higher if pure stands of immature balsam fir are killed.

1.4.2 Biodiversity

Biodiversity is a term used to describe the variety of life on earth. A basic definition of biodiversity includes the variety of animals, plants and microorganisms that exist on our planet, the genetic variety within these species and the variety of ecosystems they inhabit.

Some scientists estimate the total number of species on earth between two and 100 million, however, the best estimate is considered to be within the range of 10-30 million. This is remarkable considering only 1.4 million species have actually been given names. The largest concentration of biodiversity on the planet is found in the tropical areas of developing countries. Small areas of rainforest often contain species that are found nowhere else on earth. Mishandling even small tracts of land could lead to extinction of several species, one of which may hold the key for the prevention or cure of some disease.

While the boreal forest does not have the extent of biodiversity that some of the equatorial regions possess, Canada does have just over 70 000 species of plants, animals, and micro organisms in its boreal and other forest regions. An equivalent number remain un-described or unreported by science. While the boreal forest has less diversity of large plants than many other forest regions, it has greater biological diversity in some micro organisms. For example, the boreal forest has fewer tree species than the tropical rainforest but 500 times as many mycorrhizal fungi. Despite the large number of organisms contained within the boreal forest, only five percent are actually plants and vertebrates. The other 95 percent remain largely

unrecorded and unstudied. As a result, we need to conduct more surveys and studies and manage with caution so that species are not inadvertently disturbed.

Biodiversity provides such essential services for humans as climate control, oxygen production, purification of freshwater supplies, and carbon dioxide removal from the atmosphere, soil generation, and nutrient cycling. Without the species that provide these processes, humanity would be unable to survive.

There have been several international initiatives during the 1900's directed at developing strategies to protect Earth's biodiversity. Canada signed the *United Nations Convention on Biological Diversity* in 1992 at the Rio de Janeiro earth summit. All governments at both the federal and provincial level have agreed to meet these objectives through implementation of the 1995 *Canadian Biodiversity Strategy: Canada's Response to the Convention on Biodiversity.*

The three components of biodiversity are species diversity, genetic diversity, and ecosystem diversity.

1.4.2.1 Species Diversity

Species diversity describes the overall range of species in a given area or ecosystem. Species are groups of animals, plants, and micro organisms capable of producing fertile offspring. Species extinction is the most dramatic and recognizable form of reduced biodiversity; habitat loss the most drastic in terms of far reaching effect. The prevention of species extinction is a key factor in the conservation of biodiversity. Changes in species population levels indicate the potential for serious changes in ecosystem integrity.

1.4.2.2 Genetic Diversity

Genetic diversity describes the range of possible genetic characteristics found within and among different species. Hair and eye colour, weight and height, are examples of genetic diversity found

in humans. Genetic diversity within species is the foundation of all biodiversity. Assessing genetic diversity does not mean tracking every gene in the zone's forest. Responsible planning should design and implement measures which maintain or enhance viable populations of all forest vegetation species and which use the genetic diversity of commercially important species to a maximum benefit. The genetic diversity of commercially important species can also be managed to increase economic benefit from some portions of the landscape while allowing other portions to provide greater social and ecological values. Genetic diversity is the basis by which populations (flora and fauna) can adapt to changing environmental conditions.

1.4.2.3 Ecosystem Diversity

Ecosystem diversity describes the range of natural systems found throughout a region, a country, a continent, or the planet. Wetlands and grasslands are examples of ecosystems in Canada. A complex and intricate mix of plants, animals, micro organisms and the soil, water, and air they occupy create virtually limitless ecosystems around the world.

A forest interspersed with barrens, marshes, lakes and ponds provides for diversity across the landscape. Each ecoregion in the province should have representative areas protected which displays the diversity where such exists. These areas can serve as a benchmark from which to measure and guide management decisions. These representative areas protect the integrity of the ecoregion and are vital for guiding management actions. As benchmark areas, they will illustrate the multi-species mosaic that planning actions must maintain. Representative and protected areas will be discussed in more detail in Section 4.

1.4.2.3.1 Old Growth Forests

Old growth forests are valued for their contributions to society in the sense of heritage, culture, aesthetics, and spirituality. Old-growth forests may be defined from both a process and a structural point of view. From a process perspective, old-growth forests are defined as forests whose disturbance regime is dominated by gap dynamics. The process of gap dynamics is

characterized by small- or micro-scale disturbance (usually < 200 m^2) of the mature forest canopy. Trees die standing, snap off or are blown down, creating a hole in the canopy. The death of a single stem or a few stems releases available growing space (increased light, water and nutrient levels). In time, this growing space is occupied by tree regeneration, usually a result of released advance regeneration or recruitment from buried or dispersed seed.

When viewed from the perspective of forest-level disturbance, it may be stated that old-growth forests are common in areas not prone to recurrent or periodic stand replacing disturbance from fire, insects or wind. In situations where stand-initiating events are rare, then old-growth will tend to dominate. The disturbance forces which would naturally recycle mature forests are absent and therefore forests will tend to grow to the old-growth stage. Old-growth forests are thus composed entirely of trees which have developed in the absence of stand replacing disturbance.

Old-growth balsam fir-spruce forests occur in Management District 17, principally in the Little Cat Arm watershed. These forests exhibit all the classic characteristics attributed to old-growth forests. Balsam fir, black spruce and white spruce all possess the ability to germinate under a closed canopy, to persist as a seedling bank (advance regeneration) for decades, often in a suppressed state, and to respond to increases in light and soil nutrient levels associated with the death of canopy trees. Regional climatic factors create the shortest growing season for any forested ecoregion on the Island. The short, cool growing season has probably been instrumental in minimizing the outbreak of forest fires and insect epidemics. The lack of large-scale, stand-replacing disturbance for long periods of time (how long we do not know) combined with the ability of fir and spruce to act as small-gap specialists have created ideal conditions for the development of old-growth boreal forests.

The occurrence of old-growth forests on the Island of Newfoundland is unknown. Except for the old-growth research conducted in the upper Main River watershed, empirical definitions of old-growth according to forest types and edaphic conditions are not available. Furthermore, the frequency of natural forest disturbances and their role in shaping landscape level forest

composition and structure of the Island's forests are little understood. However, given our general knowledge of the historic occurrence of fire, insect and wind disturbance in Newfoundland's forests, as well as recognition of a century of logging activity across the Island, it is reasonable to assume that primary old-growth forests on the Island are not common. Therefore, the extant old-growth forests in District 17 represent important landscape-level biodiversity for the zone and for the Island of Newfoundland. For this reason this area has been proposed for protected status.

As stated, specific examples of on the ground actions in support of these concepts will be presented throughout the plan.

1.5 Forest Characterization

1.5.1 Land Classification

Table 3 displays the land classification broken down by ownership and district for Planning Zone 8. The total mapped land area in the zone is approximately 1.12 million hectares. There are also around 60,000 hectares in District 17 and 93,000 hectares in District 18 that are not mapped but will be during the next inventory cycle. There are four basic categories that currently represent how the land is classified; productive, non productive, non-forest and fresh water. The ratios across ownerships in each district are fairly consistent with some minor variations. Individual break outs by district and owner are shown in Table 3. Figures 4 and 5 displays the relative percentages of each major land class category in each district with all ownerships combined.

In general, District 17 has 35 percent of its total mapped land area in the productive forest category while District 18 has 30 percent. The higher the percentage of productive forest generally means that the forest is more contiguous and not as fragmented by bog, scrub and water. This has implications for harvesting and road building costs which are generally higher when the forest is more fragmented. Another point is that the Forest Service is now classifying

scrub by site, height and density class as new inventories are completed. This information will be invaluable in determining which scrub area are marginally productive or can meet some other non-timber objective.

1.5.2 Age Class

Individual tree ages in a stand can all be the same after fire or planting however, in most cases the ages vary. Foresters describe ages in terms of age classes which generally encompass 20 years. The age classes present in the zone are regenerating (age class 1, 0-20 years), immature (age class 2, 21-40 years), semi-mature (age class 3, 41-60 years), mature (age class 4, 61-80 years), and over mature (age class 5, 81-100 years), (age class 6, 100-120 years), (age class 7, 120+ years). The combined age class distribution in each district for the entire productive forest is shown in Figures 6 and 7. In general terms, the more balanced the age class distribution in a district, the higher the potential even flow sustained yield of timber can be because continuous timber supply is limited by the age class with the lowest area. The age class structure for Districts 17 and to a lesser extent District 18 are typical of that of the island with an abundance of area in the young and old age classes with a dip in the intermediate age classes. Age class

Table 2 Land classification by district and ownership in hectares for Planning Zone 8.

Land Class	Ownership				Total		
	Crown		CBPPL				
	17	18	17	18	17	18	Total
disturbed	1574	3138	3947	0	5421	3138	8559
age class 1	16100	20607	19124	0	35224	20607	55831
age class 2	8761	21632	7487	0	16248	21632	37880
age class 3	10768	18832	7715	0	18483	18832	37315
age class 4	11877	15117	7942	0	19819	15117	34936
age class 5	11350	12503	3864	0	15214	12503	27717
age class 6	16431	29638	16525	0	32956	29638	62594
age class 7	52114	36898	8303	0	60417	36898	97315
Total Productive	128885	158371	74907	0	203792	158371	362163
softwood scrub	160715	166097	43298	0	204013	166097	370110
hardwood scrub	2058	1928	959	0	3017	1928	4945
Total Non-Productive	162773	168026	44257	0	207030	168026	375056
rock barren	22132	26408	8200	0	30332	26408	56740
soil barren	17923	18531	9593	0	27516	18531	46047
bog	39410	88057	13846	0	53256	88057	141313
cleared land	586	1271	209	0	795	1271	2066
agriculture land	380	1	0	0	380	1	381
residential	650	1668	48	9	698	1668	2366
right of ways	256	530	85	0	341	530	871
miscellaneous	457	666	470	0	927	666	1593
Total Non Forested	81804	137133	32432	0	114236	137133	251369
Fresh Water	42761	69700	19247	0	62008	69700	131708
Total All Classes	416223	533321	170842	0	587065	533321	1120386

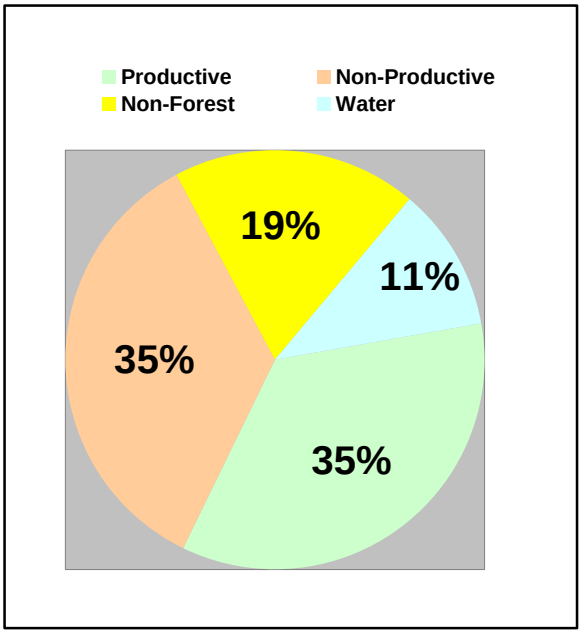

Figure 4 Land class breakout for all ownerships in District 17

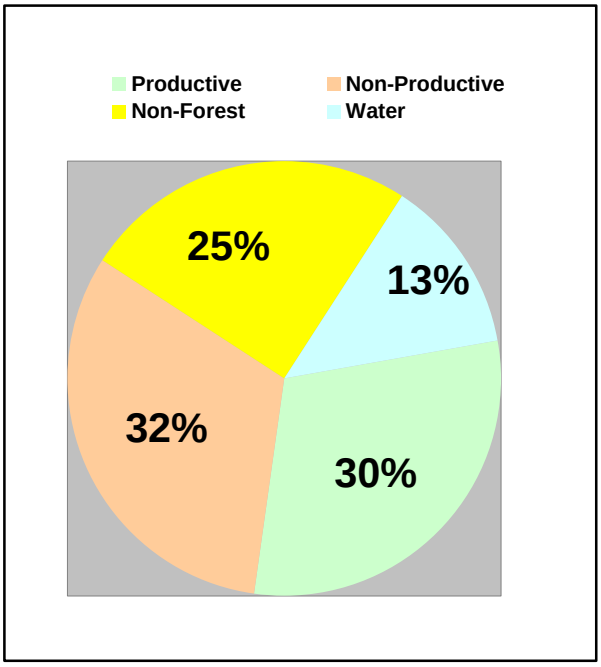

Figure 5 Land class breakout for all ownerships in District 18

structures by owner and district will be discussed in more detail in each pertinent five year plan. The age class structures for Crown land in Districts 17 and 18 as well as strategies to rectify any imbalances or impacts on wood supply of poorly structured age classes will be presented in Section 3 of this plan.

1.5.3 Site Class

The productive forest in the zone is further sub-divided along a gradient of productivity ranging from poor to high site class. The site class is determined through air photo interpretation supplemented with field checks and is based primarily on the sites ability to produce timber. Site capability is determined on a number of factors some of which include soil fertility, moisture regime and geographic (slope) position. Generally the balsam fir and softwood hardwood working groups occupy the better sites in the zone. The black spruce working groups dominate the very dry and very wet areas that are of poorer site quality.

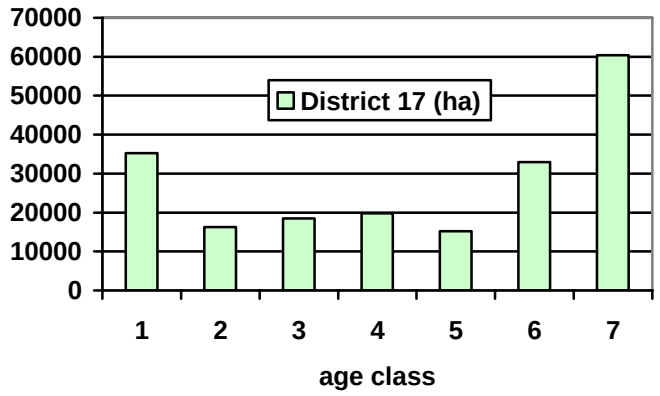

Figure 6 Age class distribution for all ownerships in District 17

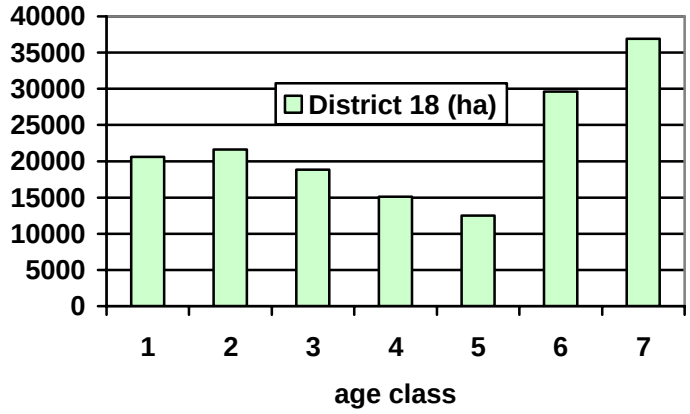

Figure 7 Age class distribution for all ownerships in District 18

The distribution of area of all ownerships combined by site class for each district is shown in Figures 8 and 9. This percentage distribution holds relatively true for individual ownerships with the exception of District 17 whereby the Crown has a higher proportion of poor sites and CBPPL has a higher proportion of goods sites. On average, good sites are capable of producing > 2.3 m3/ha/yr, medium sites 1.7 m3/ha/yr, and poor sites 1.0 m3/ha/yr.

1.5.4 Species and Working Group

Working group describes the dominant tree species present in a forest stand. This species may occupy 100 percent of crown closure of a stand or may be present in association with other species. The working group designation describes the stand in general terms based on the prevalent species whereby species composition describes specifically, the relative proportion of each individual tree species that make up a stand.

In the zone, the softwood working groups dominate, accounting for over 90 percent of the productive forest. Balsam fir (bF) is by far the most prolific, accounting for 76 percent of the

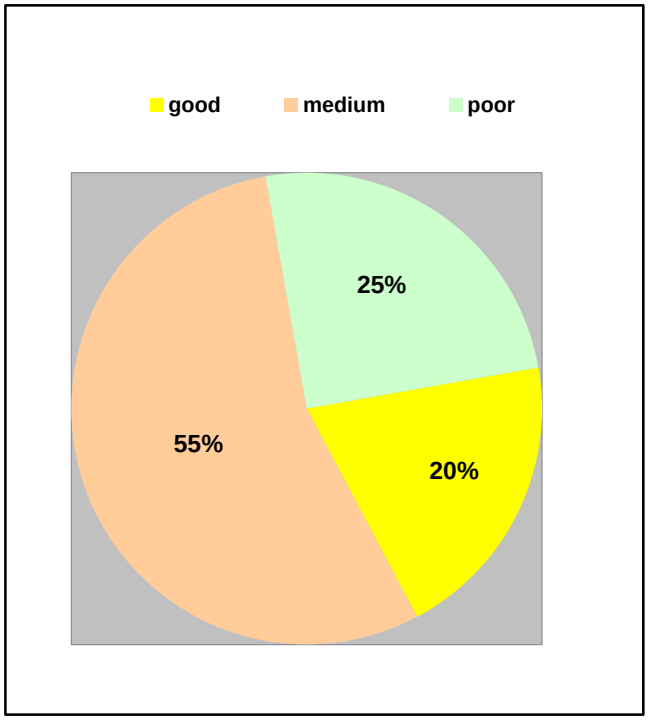

Figure 8 Site class breakdown for all ownerships in District 17

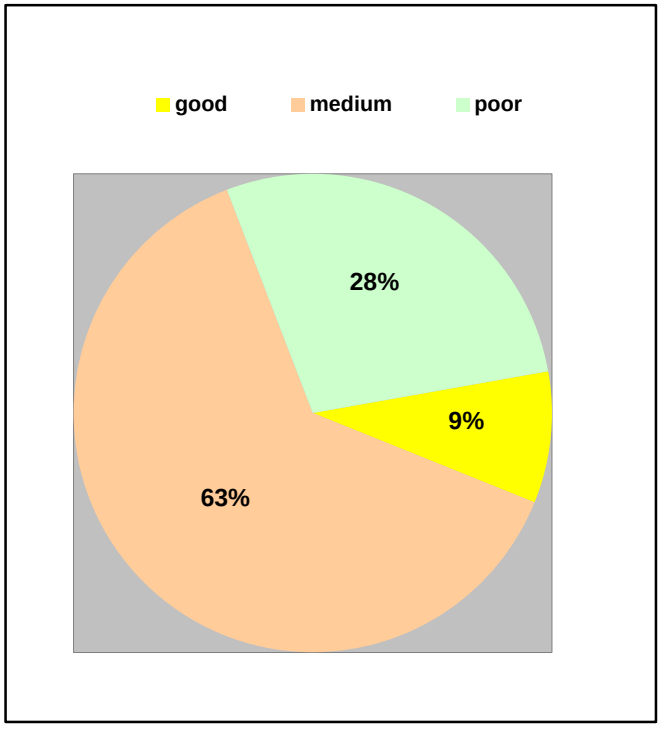

Figure 9 Site class breakdown for all ownerships in District 18

working groups in District 17 and 85 percent in District 18 (Figures 10 and 11). Balsam fir can occur in pure stands or in association with one or more of black spruce, white spruce, white birch, or larch in varying species compositions. The black spruce (bS) working group is the second most abundant accounting for 8 percent in each District.

As with balsam fir, black spruce can occur as pure stands or in association with other species listed above. Softwood hardwood working groups occupy seven and two percent of the productive forest area in Districts 17 and 18 respectively. This working group occurs as varying mixtures of fir, spruce, and birch. The hardwood softwood (hS), and white birch (wB), white spruce (wS) working groups occupy less than five percent of the productive forest in both districts. Approximately five percent of the productive forest is classed as disturbed (DI). Disturbances include harvesting, which accounts for most of the total, insect damage, fire, wind throw, and flooding. The relative percentages hold true for all ownerships in both districts.

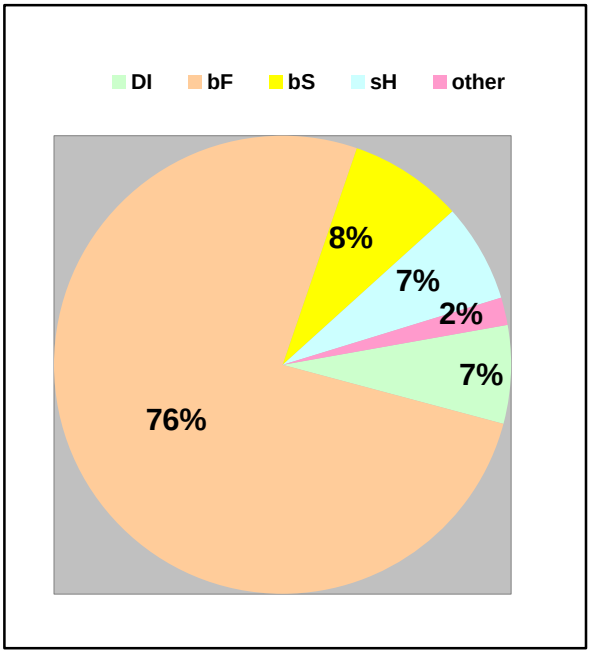

Figure 10 Working group breakdown for all ownerships in District 17

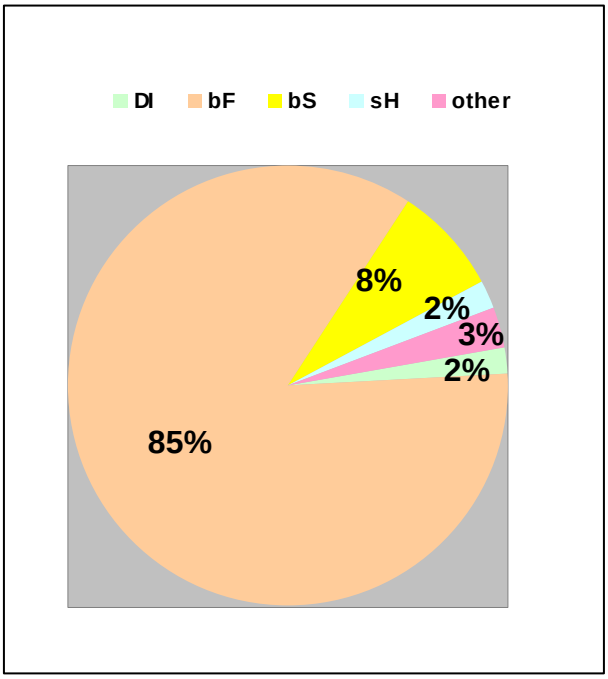

Figure 11 Working group breakdown for all ownerships in District 18

1.5.5 Forest Disturbances

In the past 20-25 years approximately 54, 000 ha have been disturbed by some means on Crown land and CBPPL limits in the zone. Harvesting has accounted for the largest portion of this disturbance at approximately 15, 000 ha. Insect damage has occurred on over 12, 600 ha with 34 percent in light (0-25 percent mortality), 17 percent in moderate (26-50 percent mortality), 20 percent in severe (51 -75 percent mortality) and 29 percent in extreme (76+percent mortality). Fire has disturbed only 230 ha on Crown land and there has been over 1 800 ha of mortality due to blow down. This usually occurs after another disturbance (like insect damage) has weakened a stand. It should be noted that these areas are not mutually exclusive and there is overlap between disturbances. (i.e. insects may have killed a stand, followed by salvage harvesting and then perhaps fire).

Historical records indicate that there have been major hemlock looper infestations in 1962, 1972 to 1976, and 1986 to 1989 which caused extensive mortality on all ownerships in the zone. In the late 1980's and early 1990's an aggressive salvage operation was undertaken by Corner Brook Pulp and Paper to try and capture insect mortality. Operations were focused in the East River, River of Ponds, Brian's Pond, Belburn's Pond and Northeast Pond areas.

The most recent infestation of hemlock looper is in the northern portion of the zone in the Plum Point area. This infestation started in the Doctors Brook area and moved north and east. There has been considerable mortality resulting from this infestation. New pulpwood standards at the local mills have limited the window of opportunity to salvage dead timber to one to two years. As a result, not all mortality has been salvaged for commercial purposes however domestic cutting in these areas will limit timber losses. This infestation is now in decline due to an aggressive protection program in the past few years.

Aerial application of insecticides has been used regularly as a management tool to control insect pests of balsam fir. In more recent years chemical insecticide use has been dropped in favour of the more environmentally benign bacillus thurengiensis (BT), a naturally occurring, and biological control agent. Despite the use of insecticides, the hemlock looper and spruce budworm continue to pose a significant threat to the forests of the zone due to the dominance of balsam fir.

Section 2 Past Activities

2.1 District 17

2.1.1 Overview

As stated in the introduction, there has been a change in the planning process and requirements for the province by combining ownerships for certain districts into planning zones. To do this it was necessary to change the start and end dates of some existing five year plans so that they could be synchronized for the new planning process. The five year plan for District 17 was

extended by 0.75 years to facilitate this change therefore reporting of past activities will be for a six year period.

There was significant activity in District 17 from 2002 to 2007. There was over 297,000 m^3 harvested both domestically and commercially on Crown Land, and 329,035 m^3 on CBPPL limits. Crown Domestic harvest was distributed throughout the district and occurred mainly near the coast. Commercial harvest was more concentrated, occurring near Batteau Barrens, East and West Blue Ponds, East River, Mooney Block, north of Doctors Brook, and Squid Cove.

There were 6,194 hectares silviculturally treated on Crown limits and 1,556 hectares on CBPPL limits, 46 km of access roads built on Crown limits and 48 km built on CBPPL limits and approximately 18,000 hectares were treated with insecticide.

All areas harvested in the past six years can be viewed in context with proposed activities on the operating area maps in Appendix 3.

2.1.2 Harvesting

Table 3 summarizes the total harvest by CBPPL in District 17 and compares it to the AAC for the six year period which encompasses two different AAC periods.

There was an under harvest of the AAC on CBPPL limits. An explanation of Class 1 and Class 3 landbases can be found in section 3.4.2.

2.1.2.1 Commercial

Crown Operators harvested approximately 185, 000 m3 of softwood commercially in District 17 in the last plan period which represents approximately 62 percent of the harvest. This total represents a ratio of 52% pulpwood, 47% sawlogs, and 1% fuelwood. Around three percent of

the commercial harvest was fuelwood from non AAC sources on the commercial thinning projects.

Table 3. Summary of softwood harvest in District 17 by CBPPL (2002 to 2007)

AAC Source	Total Harvest (m3)	AAC (m3)
CBPPL Class I and Class III AAC's	**329,035**	**464,800**

Note: table includes estimates for 2007

2.1.2.2 Domestic

There was almost 112, 000 m3 of softwood harvested domestically in District 17 at a ratio of 6% sawlogs, 94% fuelwood. In addition, approximately 35, 000 m3 of hardwood was harvested during the period. It is expected that the domestic demand will remain constant at 1,100 permits/year. Volumes harvested as birch or landing and cutover cleanup from approximately 100 permits on CBPPL limits in District 17 are not listed in the total.

2.1.3 Silviculture

Table 5 summarizes the completed silviculture treatments for the past planning period and compares to those proposed. There was a modest pre commercial thinning program was significantly reduced and a more aggressive planting program. The switch to gap or fill planting

Table 4. Summary of Silviculture Treatments on CBPPL limits in District 17 (2002 to 2007)

Treatment Type	Area Completed (ha)
Pre Commercial Thinning	269
Planting	1,287

is becoming more popular because it increases stocking on the marginally stocked areas and increases the spruce content which is less susceptible to insect attack and moose browsing. The herbicide was done to remove competing vegetation from site in preparation for planting. Less planting was done than was proposed because area was proposed on Industry limits but was not completed.

2.1.4 Road Construction

Table 6 summarizes the roads built during the period and compared to those proposed. There were 48 km built by the CBPPL during the period to access commercial timber out of the 130 km proposed. This difference was caused by the major reduction in the harvest from District 17 that occurred after 2005.

Table 5. Summary of access roads built on CBPPL Limits in District 17 (2002 to 2007)

Roads Proposed (km)	Roads Built (km)
130	48

2.1.5 Natural Disturbance

2.1.5.1 Fire

District 17 has had a very infrequent fire history due to its long winters with abundant precipitation. Over the past planning period there have been few fires with only 19 being recorded. There were only 19 ha of productive forest burnt which indicates a very aggressive and effective fire protection effort.

2.1.5.2. Insect

There has been infrequent insect activity in the district over the past planning period. There have been approximately 200 ha defoliated by the hemlock looper mainly in 2005. There was a small treatment program of approximately 18000 ha with bacillus thurengiensis (BT) in 2002, 2003 and 2004 mainly as a result of the infestation in 2001. Populations of this insect are being closely monitored since a large portion of the district is comprised of highly susceptible balsam fir.

2.2.6 District 18

2.2.1 Overview

There has been significant activity by the Crown in District 18 from 2002 to 2007. All CBPPL limits in District 18 are under exchange to the Crown. There was nearly 523, 000 m3 of timber harvested on Crown land during the period. A total of 6,857 ha were silviculturally treated, 95.5 km of access road was built or re-constructed, and 36,000 ha were treated for insects in the last planning period.

All areas harvested in the past planning period can be viewed in context with proposed activities on the operating area maps in Appendix 4 of the Crown Plan.

Section 3 Timber Supply Analysis

3.1 Introduction

The Province reviews its timber supply every five years in order to account for any changes in forest land base, growth rates, and management strategies. This schedule is consistent with the Forestry Act, 1990, which established management by Forest Management District and mandates that a wood supply analysis be completed every five years. The result of this analysis is a new set of Annual Allowable Cuts (AAC's) for each Forest Management District. These AAC's are defined as the maximum annual rate at which timber can be harvested at a sustainable level indefinitely into the future (in reality, the AAC figures are applicable for a period of 160 years into the future and not infinity). Annual allowable cuts must be calculated on a District basis, however when "rolled up" provide us with the annual allowable harvest level for the island.

3.2 Guiding Principles and Policy Direction

The key underlying principles that guided this analysis were: (i) the AAC must be sustainable; (ii) the level of uncertainty (risk) associated with the AAC must be minimized by using empirical information wherever possible; (iii) there must be conformity between information and assumptions used in the analysis and actions and decisions taken on the ground; (iv) the analysis must be consistent with other forest values and objectives; and (v) the timber supply calculation must consider economic factors, not solely the physical supply of timber.

In concert with the policy of establishing sustainable timber harvest levels, Government policy requires that harvesting not exceed the established AAC's. Likewise, Governments policy is to optimize forest industry opportunities from the sustainable fiber supply. Government also requires consultation be conducted during the timber analysis. In this analysis, public input was achieved through the District Managers and, in some cases, planning teams. The forest industry was consulted directly throughout the process. As well, there was a 30 day consultation process whereby a draft of the gross AAC's and methodology was published on the Government web site for public review and comment.

3.3 Factors Affecting Timber Supply

The forests of insular Newfoundland are very variable in terms of age distribution. Typically, there are significant amounts of mature/over-mature forest and regenerating forest, and limited intermediate aged forests. This imbalance is not unusual in a boreal forest where cyclic catastrophic disturbances are common. Figure 7 illustrates this age class imbalance.

The insufficient amount of intermediate age forest on the island is one of the most important factors influencing AAC's therefore it is the basis for many of our forest management strategies. Essentially, we are employing a matrix of measures designed to fill the gap in our age structure. These range from an aggressive forest protection program to keep the mature and over-mature stands alive as long as possible so that they can be harvested before they collapse naturally, harvesting programs that attempt to exclusively target the oldest stands first in order to minimize the harvesting pressure on the naturally weak intermediate age classes, and thinning of the regenerating forest so that it becomes operable at an earlier age.

Another important aspect of the Province's forest that poses a challenge to forest managers is the natural fragmentation of the resource. The Province's landscape is carved by many ponds, bogs, rivers, streams, and rock outcrops resulting in relatively small pockets of timber scattered across the landscape. This makes the determination of an economic timber supply very challenging given that each stand has unique economic characteristics.

Arguably the most important factor affecting present and future AAC's is land base. The land base available for forest activity is constantly being eroded by other users. There is an approximate correlation between AAC and land base in that a one percent loss of land base represents a one percent drop in AAC. It is important therefore that we minimize loss to the forest land base and continue to explore ways to grow more volume on the existing land base to mitigate this loss.

3.4 Timber Supply Analysis

In 2003, the Forest Service began another review of the provincial timber supply which was completed in March of 2006. Consistent with Department's vision, the analysis was structured to determine sustainable timber supplies while respecting a multitude of social, economic and environmental objectives. Timber supply, in this context, refers to the rate at which timber is made available for harvesting on a sustainable basis.

The determination of supply (represented as AAC's) involved the use of computer models that forecast the sustainability of possible AAC levels. These models require three basic inputs. First, a description of the current state of the forest (forest characterization and availability), second, the growth rates associated with the current forest, and third, the management strategies applied to the forest. To arrive at these basic inputs requires careful and detailed consideration of a broad range of both timber and non-timber values. More specifically, the following was considered in determining the sustainable timber supply.

3.4.1 Forest Characterization

To get a current description of the forest resource (or stock), the Province has invested significant resources into creating and maintaining a Provincial Forest Inventory. District 18 has a new forest inventory and although the last inventory for District 17 was done in 1995, the estimate of forest stock is kept current through an update program which is conducted each year to account for all natural and man-made disturbances such as fire, insects, and harvesting, and any enhancement programs such as tree planting and pre-commercial thinning. Also, each stand in the forest inventory is updated to reflect any yield changes that may have occurred since the previous inventory update.

3.4.2 Land Availability

The updated Forest Inventory was reviewed and classified at the stand level on the basis of the availability of each stand for harvest. The classification system consists of two broad classes; Class 1 - available for harvest under normal conditions, and Class 3 - has restrictions for

harvesting due to economic constraints. The Class 3 has been further subdivided into a) can be harvested with reasonable economic restrictions (expensive wood) and b) highly unlikely to be harvested under current economic conditions. Only the former portion of Class 3 is used to calculate an AAC for that category. The categories associated with the portion of Class 3 land, which are deemed unavailable for harvest, incorporates a broad range of timber and non-timber values. These values include:

3.4.2.1 Non-Timber Related

Consideration of these non-timber values had a direct impact on Provincial AAC's. It is obvious that as the amount of productive forest land available for timber management drops, so too will the AAC. With the current restrictions, the AAC land base (area where harvesting operations can occur) is only 17% of the total landmass on the island or 66% of the total productive forest land base. In any one year, less than 1% of the productive forest land base is influenced by harvesting operations.

3.4.2.1.1 No-Cut Buffer Zones

The Province has guidelines that require all water bodies (visible on a 1:50,000 map sheet) be given a minimum 20 meter (from waters edge) uncut buffer. In addition to these legislated water buffers, District Ecosystem Managers, in consultation with Planning Teams, have increased buffer zone widths beyond the 20 meter minimum to protect special values such as; salmon spawning areas, cabin development areas, aesthetic areas, wildlife habitat, outfitting camps, etc.

3.4.2.1.2 Pine Marten and Caribou Habitat

Habitat specialists are working in consultation with industry to ensure adequate habitat will be available for the pine marten and caribou into the future. This work is examining the quantity and quality of habitat as well as the connectivity of habitat. The team is also looking at how this arrangement of habitat would change over time. Once the marten and caribou Habitat Suitability Index models are fully operational, results can be incorporated into our land base designation process.

3.4.2.1.3 Wildlife Corridors

As part of the evaluation process for harvesting plans, wildlife specialists recommend no-cut corridors to ensure the many species of wildlife have sufficient cover to move around the landscape. These corridors are temporal in nature and have little impact on timber supply. Both this section and the previous work toward achieving Value 1.3, Wildlife Habitat, of the Ecosystem Diversity Element of Criterion 1, Biodiversity, in the *Provincial Sustainable Forest Management Strategy.*

3.4.2.1.4 Protected Areas

All established and proposed protected areas are removed from the AAC calculations.

3.4.2.1.5 Watersheds

For each Forest Management District several of the major watersheds were digitized and captured within the forest inventory. These watersheds were added to the database in order to address any concerns about forest management within these watersheds and to permit the Forest Service to report on proposed activities within the watershed over time. This is in line with Value 3.1, Water, of the Soil and Water Element of Criterion 1, Biodiversity, in the *Provincial Sustainable Forest Management Strategy.*

3.4.2.2 Timber Related

Compounding the effect of downward pressure on the AAC, the Department also reduces the AAC's by taking into account other potential losses of timber:

3.4.2.2.1 Insect/Fire/Disease Losses

The Department reduces AAC's to account for anticipated future losses resulting from insects, disease and fire using historical information.

3.4.2.2.2 Logging Losses

Surveys of recent harvested areas are conducted each summer throughout the Province to determine the quantity and quality of fiber remaining. The estimates from these surveys are used to reduce the available AAC.

3.4.2.2.3 Operational Constraints

Areas that are inaccessible (surrounded by bogs or hills), timber on steep slopes, and low volume stands are removed from the Class 1 AAC calculation up front. Also, significant adjustments are applied to the Provincial Forest Inventory for stands deemed operable in the timber analysis but left unharvested within operating areas. The reasons for this are linked to the character of Newfoundland's forests; low volume, steep slopes, rough terrain, and excessively wet ground conditions etc.

Again, all these timber and non-timber related issues are applied directly in the AAC calculation to ensure harvest levels do not exceed the sustainable level. With the introduction of new values and the broader application of current values, the pressure on future AAC's will continue to increase. These factors and their impacts on timber supply will be further discussed in section 3.5.

3.4.3 Growth Forecasting

A key requirement for forecasting future wood supply is an understanding of how forest stands grow and develop through time. That is, as a forest stand develops, how much merchantable (i.e. harvestable) volume does it carry at any given point? These yield forecasts (referred to as yield curves) are required for each type of forest stand (called a stratum) comprising the forest under consideration. In Newfoundland there are dozens of distinct forest strata for which separate yield curves are required. These are defined by the tree species in question (e.g., balsam fir, black spruce), the site quality (e.g., good, medium, poor), the geographic region (e.g., the Northern Peninsula, Western Newfoundland) and other factors likely to affect yield.

Yield curves are a key element in a wood supply analysis. In fact, the validity, or "usefulness", of the wood supply analysis is determined by the truth, or "correctness", of the yield forecasts. While there is no way of predicting with certainty how stands will actually grow in the future, care must be taken to ensure that the yield projections used are realistic and reasonable. Respecting the sensitivity and importance of these forecasts, the Newfoundland Forest Service has directed a large portion of its resources and time into developing realistic yield curves. Two growth models were used, one for projecting stand development under natural conditions and the other for projecting growth under managed (i.e., silviculturally enhanced) conditions. Tree and stand development data generated from the Forest Service's Forest Inventory Program were used to make stand growth predictions. These projections were then checked against empirical data from thousands of temporary plots established throughout the Island. If the projections varied from the real life evidence, the curves were adjusted to make them more accurate.

In this analysis, yield curves were developed on an ecoregion basis. As well, special yield curve sets were developed for defined geographic areas with demonstrated uniqueness. These included areas where chronic insect activity is ongoing and areas that have unique growth characteristic such as the Main River watershed.

3.4.4 Management Strategies

With the current state of the forest described and the yield forecasts developed, the next step was to design a management strategy for each sector of the forest. The key objective was to maximize long term AAC while at the same time taking into account other forest values. This involved developing strategies that minimize fiber losses, and enhance forest sustainability.

3.4.4.1 Harvest Flow Constraints

An even-flow harvest constraint was used in the analysis to maximize the sustainable harvest level. This strategy produced the maximum even flow harvest but resulted in less than optimum economic use of the forest resource. If no even flow constraint is used and harvest levels are permitted to fluctuate in response to market value, the overall economic potential of the forest

will increase. However, the lower economic potential is offset by stability in mills and employment. This is in line with Goal 1 of Value 5.1, Commercial Timber, of the Economic Benefits Element of Criterion 5, Economic and Social Benefits, in the *Provincial Sustainable Forest Management Strategy*.

3.4.4.2 Spatial Analysis

A major improvement in this wood supply analysis is the introduction of manual harvest scheduling. In 2001, the harvest scheduling was an automated process where the software picked the stands to be harvested over the 25 years based on user supplied criteria. While, the 2001 approach was an improvement over previous wood supply analysis were no harvest scheduling was done, the software used cannot realistically know all the operational restrictions within a forest management district. In the manual process used, the on the ground conditions that restrict harvesting are accounted for when a spatial harvest schedule is defined. The proposed harvest schedule is then played back through the modeling software to see if it is sustainable and see if non-timber objectives are met. In most cases, this harvest scheduling has to go through several cycles before an acceptable harvest schedule could be found. The spatial arrangement of areas for timber harvesting is especially challenging in this province because of the natural fragmentation of our forests. This model provided forest planners with the ability to mimic realistic timber harvest schedules based on current practices and to identify other forest stands that are not as accessible for harvesting.

Manual harvest scheduling has several major benefits. First, it fosters the long term sustainability of our AAC's by mimicking current harvest practices and accounting for actual on the ground conditions that delay or restrict the harvesting of stands. These restrictions, which were previously unaccounted for, may have made our past AAC's higher than was realistically sustainable. Secondly, the mapped 25 year harvest schedules build credibility into the forest management process. A common misconception is that the Province is running out of wood and soon will not be able to support existing forest industries. Every stand that will be harvested over the next 25 years must already be in the second (20-40 years old) or third (41-60) age class and

can be easily identity and highlighted on the harvest schedule maps. Being able to see the wood that will be harvested in the future will help reassure people that the resource is being used in a responsible manner. Next, harvest scheduling will help integrate the management of other forest resource values into timber management planning. All forest values can be typed directly to discreet forest areas, and these forest areas can be the link that allows the many different forest values to be managed simultaneously. The forested areas needed for each resource can be mapped and potential conflicts can be addressed before they become an issue. Finally, the harvest schedule maps developed for the wood supply analysis can be a starting point for the 5 year planning process, especially the first two periods. The harvest schedule maps, if done correctly, can help reduce the work of the 5 year planning process. One point to note is that harvest scheduling is only done for the Class 1 land base. The Class 3 AAC, for the most part, is opportunistic at best and is harvested only if extra effort is applied. It is not scheduled because of the uncertainty of obtaining extra funding for access and harvesting.

3.4.4.3 Planning Horizons

Given the Province's commitment to long term sustainability of our forest resource, timber supplies were projected 160 years (equivalent to two forest rotations) into the future to ensure actions and strategies applied today will result in a sustainable forest in the future. Long term planning is fundamental in timber supply forecasting.

3.4.4.4 Operable Growing Stock Buffer

The Province imposed an operable growing stock constraint in the analysis to ensure the sustainability of calculated timber supplies. The constraint imposes a condition that in any period there must be a minimum operable growing stock of two times the harvest level on the landscape. In other words, for every hectare that is harvested another harvestable hectare must exist on the landscape. The requirement for a growing stock buffer is based on a number of factors. First, several of our non-timber objectives are not explicitly accounted for in our planning process and therefore will require a growing stock buffer to achieve them. Second, we

are unable to follow optimum harvest schedules explicitly due to operational restrictions on harvesting. Third, the Province is not willing to assume high risk with the sustainability of the timber supply. For these reasons a growing stock constraint of two times was used. This constraint was used in concert with harvest scheduling to help map out a reasonable harvest for the next 25 years.

3.4.4.5 Old Forest Targets

Consistent with our ecosystem policy, the Province introduced into the analysis an old forest target that at least 15 percent of forests be older than 80 years. This was designed to provide a course filter approach to maintaining representative forest structure. It ensures the presence of certain amounts of old forest across the landscape into the future. With advances in modeling, this target can now be tracked across a district rather than a single ownership. This has resulted in this strategy being less restrictive than the last analysis. As well, an attempt has been made to connect these areas across the landscape for the first 25 years in the form of 81+ corridors. This is in line with Value 1.1, Representative Landscapes, of the Ecosystem Diversity Element of Criterion 1, Biodiversity, in the *Provincial Sustainable Forest Management Strategy.*

3.4.4.6 Operability Limits

Operability limits are the time windows in which forest management actions such as harvesting can be undertaken within forest stands. Stand growth development as measured in stand merchantable timber volume and individual piece size of trees determine a stands readiness for harvest. In some young stands, one can have acceptable harvest volumes, but still have trees that are too small to harvest. In the 2006 wood supply analysis both stand volume and tree size were used to determine the earliest age when a stand could be initially harvested. In addition to determining the absolute earliest age a stand can be harvested, it was recognized that not all stands on the same site develop exactly the at the same rate. A small portion of a stand will develop faster; a small portion will lag behind; with the bulk of the stand type representing the average condition. Therefore, the first operability limit was staggered by 5 year intervals with the 10 percent, 60 percent, and 30 percent assigned to each availability class.

The ending operability limits or the last age in which a stand can be harvested before it becomes too old to harvest is solely determined on a minimum stand volume of between 60 to 80 m3/ha, after which that stand does not have enough volume to make it economical to harvest. It should be noted that while the operability limits define the extreme end points of when stands can be harvested, very few stands are ever harvested at these extreme points. In order to meet other non-timber objectives and in order to maximize the total volume of wood harvested the model schedules stands to harvest somewhere inside the operability limit window.

3.4.4.7 Silviculture

Silviculture is one of the main forest management tools available to forest managers when they are analyzing the many different future forests that are generated using the wood supply modeling software. The silvicultural actions used in the 2006 analysis include; 1) precommercial thinning of balsam fir, black spruce, and softwood hardwood stands, 2) full plant of any areas that do not regenerate naturally with either white spruce, black spruce, or Norway spruce, and 3) gap planting of either black spruce or balsam fir stands with either white spruce or black spruce. Gap plant is the filling of "holes" within stands that have inadequate natural regeneration of either balsam fir or black spruce.

3.5 Inventory Adjustments

One of the limitations of the current wood supply model is its inability to account for volume depletions outside of what is reported for harvesting operations. The model produces a gross merchantable volume (GMV) figure which needs to be adjusted to account for volume losses as a result of; fire, insects and disease, timber utilization practices and the presence of stand remnants. In previous analyses the lack of province wide digital stand information, the absence of computer tools and the small number of people involved with the wood supply analysis, resulted in a high degree of uncertainty around values derived for each depletion. It was recognized that a need existed to study each component more intensely and to expand the time

frame and staff responsible for such an analysis. Such was the task of the Forest Engineering and Industry Services Division whose staff, over a seven year period, completed an analysis of the individual components.

3.5.1 Fire

An estimate of productive area loss as a result of fire was based on an analysis of the historical fire statistics maintained by DNR. The fire deduction for both domestic and commercial operations in District 17 and District 18 is 0.9 and 0.6 percent respectively.

3.5.2 Insects

An aerial mortality survey was completed on areas with historically high insect infestations. This information along with a GIS analysis of areas salvaged enabled DNR to determine the amount of productive area lost to insect mortality each year. These numbers were in turn reviewed by district managers and adjustments were made for local conditions. The insect deduction in District 17 is 3.0 percent for domestic and 6.0 percent for commercial while in District 18 this deduction is 2.0 percent for domestic and 4.0 percent for commercial.

3.5.3 Timber Utilization

Information for this adjustment was derived from a series of intensive on-the-ground surveys which measured the amount of wood remaining on cutovers following harvesting. This wood was comprised of solid merchantable wood (logging losses) and wood with inherent cull (butt/heart rot). Surveys were conducted province wide on all tenures over a five year period. Information was analyzed by harvesting system and season. The utilization deduction for Districts 17 is 10.5 percent for domestic and 11.5 percent for commercial while in District 18 it is 16.9 percent for domestic and 12.8 percent for commercial.

3.5.4 Stand Remnants

Following harvesting operations, small fragments of stands often are left for a variety of reasons (operational constraints, low volume stands, terrain conditions). These often result in the

inability of the operator to achieve volumes predicted by the computer models. A series of surveys were conducted across the province and the results analyzed to determine the amount of productive area attributed to remnants. The stand remnant deduction for both Districts is 5.0 percent for domestic and 10.0 percent for commercial.

The total inventory adjustment for District 17 is 19 percent for domestic and 28 percent for commercial while in District 18 it is 25 percent for domestic and 27 percent for commercial.

3.6 Results

3.6.1 District 17

Table 6 summarizes the result of the timber supply analysis for CBPPL Limits in District 17.

Table 6 Annual Allowable Cut results for CBPPL Limits in District 17 (2006-2010).

	Aspatial Gross (m3)	Spatial Gross (m3)	Spatial Net (m3)
Class I Softwood	101,747	95,415	71,500
Class 3 Softwood	8,183	8,183	6,100
Total Softwood	109,930	103,598	77,600
Hardwood	16,195		12,120

CBPPL and the Crown have a Hardwood Transfer Agreement in place for FMD 17, which allows the Crown to manage all hardwood in the District.

3.6.1.1 Sensitivity Analysis

In the 2001 timber supply analysis, a number of new management objectives like, reserve of operable growing stock, 81+ forest targets, and operability limits were introduced. Since these were new, a significant effort was put into sensitivity analysis to determine the impact of these objectives. The more sensitive objectives were thoroughly evaluated and subcommittees were formed to gather more information to refine any assumptions used. These refined assumptions were used as a basis for this analysis therefore little sensitivity analysis is needed.

The silviculture targets used were 250 hectares of planting and 50 hectares of thinning. While doing maximum silviculture would give an increase in AAC, operational and monetary constraints render this option unrealistic. Similarly, increased yield would give a higher AAC, but current yield curves have been constructed using the best available data so a further increase in unwarranted. Lowering the operability limits would also increase the AAC. This would represent a significant and unwarranted risk however, if stands situated at the lower end of operability are not operationally ready when queued for harvest.

The 81+ target was not constraining for this analysis. The 15 percent target was maintained or exceeded for the full analysis period. The harvest scheduling was the most constraining objective. This is due mainly to the natural fragmentation of our forest and to the limitations in baseline data when describing the forest. This limitation is due to the way we describe the forest into 20 year age classes and the way the model uses 5 year age classes. A major initiative is required for the 2011 analysis to describe the forest into 5 year age and condition classes particularly at the lower operability limits.

There have been improvements to the inventory adjustments from the last analysis particularly in utilization. Since these adjustments are used to convert from gross to net AAC there is a direct relationship e.g. a one percent drop in inventory adjustment represents a one percent gain in net AAC. For this reason a significant effort will be made to keep this adjustment to a minimum.

3.6.1.2 Forest Composition and Structure Change

A positive advancement with the use of computer models is the ability to track the forest through time. This ability allows the user to evaluate the effects of management activities on the structure of the forest at any point in the simulation period. For this analysis, age and species composition through working group was tracked at three time intervals 1. time 0 (current forest) 2. time 25 (after the 25 year harvest schedule) and 3. time 160 (at the end of the simulation period).

Changes in total forest age on CBPPL limits in FMD 17 for the total simulation period can be found in our Sustainable Forest Management Plan which is available through our website at www.cbppl.com.

Section 4 Values

4.1 Guiding Principles of Sustainability

There are five guiding principles of overall sustainability; environmental, economic, political, social, and cultural sustainability.

Environmental sustainability looks directly at ecosystem health, both now and in the long run. Ecosystem health is determined by such factors as ecosystem integrity, biodiversity, productive capacity, and resiliency as previously discussed. The five year operating plan must ensure that these factors are intact or there would be very few values left to manage.

Economic sustainability demands that forest resources be managed and distributed efficiently and equitably among the stakeholders, within the capacity and limits of the forest ecosystem. Economic development has been given top priority by government. This will probably remain the case until the economy improves. However, economic development should not proceed without the incorporation of the other factors into the decision making process.

Political sustainability refers to the goals and management objectives being applicable, administrable, and practical. These goals and objectives must then maintain these qualities well into the future with the aid of public input and support.

Social sustainability means fairness and equity to all stakeholders. The forest management strategy should not jeopardize the basic needs of the public; therefore, public involvement and awareness, participation, and decision-making clout are a necessity.

Cultural sustainability is attained by applying Newfoundland's culture to the planning process. A forest management strategy cannot be successful without allowances within the strategy for traditional access and use of the land. For generations, many of Newfoundland's public has had free range in our pristine wilderness, a fact that can not be ignored when planning for the zone.

All are key interlocking components and each must be maintained if sustainable development is to be achieved.

4.2 Value Description

The forest ecosystems of the zone provide a wide range of values to different individuals and groups. These include consumptive values such as timber products, hunting, trapping, sport fishing, and berry picking, and non-consumptive values like skiing, snowmobiling, hiking, and bird watching. Also, there are intrinsic and intangible values such as a feeling of wilderness and peace which some people describe as spiritual. Although difficult to spatially describe or quantitatively measure, these spiritual values are considered to be a product or an accumulation of all values. Other values such as water quality, parks and protected areas etc. provide for the protection of the forest ecosystems which can enhance the other values listed above.

Many of the values in the zone were identified by this or previous planning teams. Presentations of pertinent information on each value by knowledgeable individuals or

groups provided stakeholders with relevant information to make informed decisions. Other values, while not specifically outlined by the planning team, are also identified and discussed to provide a more complete description of the range of values found in the zone. The following represents a framework for characterizing values in a clear and consistent manner. This approach consists of three components:

Characterization

• Description: Why the value is important, types of activities, intensity, spatial extent, employment, etc.
• Data in support: Statistical references.

Critical Elements

• Forest Features: Elements at risk from harvesting or enhanced by harvesting (viewscapes, adjacency to water, mountains, habitat, wilderness ambiance, road access, etc.)

Guiding Principles

A guiding principle is defined as "a fixed or predetermined policy or mode of action". These 'modes of action' would be implemented in the five year plan in the form of:

1. policies that should be in place to protect or enhance the resource value;

2. methods for negotiation or inclusion of other stakeholders in resolving potential conflicts;

3. special management provisions/strategies - such as buffer zone consideration, temporal operating periods, modified harvesting, or a best management policy; and/or

4. models and/or forecasting strategies to determine economic contribution, biodiversity impact, or community sustainability

Each individual value was discussed both at the strategic and operational level. Strategic level information (characterization, critical elements, and guiding principles) are the focus of discussion in this section. They provide a mechanism to resolve conflicts that might arise

throughout or after the five year planning process. Where possible, the physical location of the value on the landscape (operational level) was also identified during the discussion of each value. This will help facilitate the preparation of later sections of this plan by identifying potential areas of conflicting use early into the process.

In many instances, the EPG's **(**Appendix 1**)** form the guiding principles for a value. Quite often the spatial extent or location of all values is not known (e.g., raptor nests). Specific guidelines are still listed in order to provide a direction or course of action when and if these values are encountered.

4.2.1 Biotic Values

4.2.1.1 Big Game

4.2.1.1.1 Moose

Characterization:

Moose are not native to the island. A pair was introduced to Gander Bay in 1878 and two pairs were introduced to Howley in 1904 (Northcott, 1980). Today, moose are distributed throughout the Island and the population is estimated to be about 125 - 140,000.

Currently, moose are managed on an area/quota system in the province. The Island is divided into 50 management areas and license quotas are set annually for each area. Quotas are set based upon the management objective for each area (i.e., whether it is desired that the population increase, decrease or stabilize). Generally, if an area has too high of a moose population, managers will increase quotas to bring down the population in order to prevent damage to the habitat. However, if the habitat is in good condition, and the area could support more animals, future quotas may be increased. Portions of moose management areas 1, 2, 3, 3a, 39, 39a, 40 and 45 are located within the zone.

Critical Elements:

Harvesting is not expected to have a negative impact on moose populations in the zone because moose prefer the early seral stages of a forest and generally do well in areas after harvesting.

4.2.1.1.2 Caribou

Characterization:

Caribou is the only native ungulate species on the island (Northcott, 1980). Biologists estimate that prior to the railway being built in 1898 the population on the Island was approximately 100,000 animals but by 1930 the population had declined to about 2,000 animals (Murphy and Minty 1993). Between 1980 and 2000 the number of caribou has increased considerably on the Island with a population estimated at 70,000+ animals. In the past few years however populations have declined significantly with Planning Zone 8 being no exception. Portions of caribou management areas 69 and 76 are located in the zone. Core caribou areas one to five are located in the zone representing the St. Anthony, Northern Peninsula and Gros Morne caribou herds.

Critical Elements:

Given that there is limited information about the distribution, movements, and habits of caribou in the zone, it is hard to determine what impact timber harvesting will have on these animals. Past studies have shown that forestry activities in the immediate vicinity of calving areas during the calving period have an impact on caribou populations. Recent studies and anecdotal information has indicated that the harvesting restriction zone around caribou calving zones may be significantly larger that first thought. It has also been shown that as roads are constructed and access is improved into remote areas, there is generally an increase in the number of animals which are killed due to road-kill and poaching. The abundance and distribution of arboreal lichens has also been shown to impact caribou populations.

4.2.1.1.3 Black Bear

Characterization:

The black bear is native to the Island and is found in forested areas (Northcott 1980). Currently, the number of black bears occurring on the Island is not known (due to difficulty in conducting a census) but is crudely estimated to about 6 - 10,000 animals (Christine Doucette, Pers. Comm.). Portions of black bear management areas 1, 2, 3, 3a, 39, 39a, 40 and 45 are located within the zone.

Critical Elements:

- den sites for winter hibernation;
- forest cover

Guiding Principles:

Big Game Management Strategy (moose, caribou and black bear)

Management of big game species in the Province is accomplished by a planning process in which a Big Game Management Plan is prepared annually by the Inland Fish and Wildlife Division (IFWD) of the Department of Tourism Culture and Recreation. This process takes into consideration information provided by the public and wildlife and forestry staff. Each year the IFWD reviews all relevant data, such as recent census work, information provided on license returns, and jawbone or skull data and makes decisions on types and numbers of licenses of each species in each management area. Management of big game in the zone will continue to be addressed through this process.

Environmental Protection Guidelines

Moose

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

Caribou

Because the caribou population is in decline, the IFWD in conjunction with forestry division, and the pulp and paper companies has identified critical caribou habitat areas and have developed guidelines for forestry activities within these areas. These guidelines are located in a document produced by IFWD entitled *Forest Management Guidelines for Woodland Caribou for the Island of Newfoundland.* Highlights of these guidelines are:

- Plan primary roads and road corridors to avoid traditional winter and calving grounds.
- Avoidance of sensitive periods will still be applied to all herds.
  Operators should avoid an area during i) calving period – May 15 – July 30; ii) wintering period – December 1 – April 30; iii) If caribou are encountered in an area operators should avoid disturbance or harassment of caribou, and contact the Wildlife Division.

- within the core areas a harvest strategy should occur that maintains 75% of overmature (80+ years) forest (based on 2005 forest resource inventory).
- Operators should avoid an area if caribou are present during calving/post-calving or wintering seasons and return to operations when caribou move out of the area. If large groups (20+) of caribou are encountered at any other time operators should avoid disturbance or harassment of caribou, and contact the Wildlife Division for direction on how to proceed.

Bear

A 50-metre, no-cut, treed buffer must be maintained around known bear den sites (winter) or those encountered during harvesting. Den sites must be reported to the IFWD.

4.2.1.2 Furbearers

Characterization:

Ten species of furbearers occur in the zone; lynx, red fox, beaver, otter, muskrat, short-tailed weasel, red squirrel, mink, coyote, and pine marten (will be discussed in more detail in next section). Of these, red squirrel, mink and coyote are not native.

Critical Elements:

- forest cover for protection;
- water quality maintenance;
- riparian buffer zones along aquatic areas;
- snags and coarse woody debris (denning, nesting sites, etc.)

Guiding Principles:

Fur Bearer Management Strategy:

Recommendations concerning the management of furbearer species are developed annually, upon consultation with provincial trappers, Newfoundland and Labrador Trappers Association, general public, and departmental staff. Like the small game management plan, the fur management plan reviews the status of each fur bearer species annually and addresses the season dates and lengths, and if necessary closure of areas (or no open season). Management of all fur bearing species in the zone will continue to be managed through this process.

Environmental Protection Guidelines:

To protect beaver habitat, all hardwoods within 30 metres of a waterbody occupied by beaver are to be left standing during harvesting operations.

4.2.1.3 Endangered Species

4.2.1.3.1 Pine Marten

Characterization:

Before 1900, marten ranged over most of the forested areas of the island (Bergerud, 1969) but, unfortunately, today is listed as an endangered species by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). Habitat loss, predation, disease and accidental trapping and snaring are thought to be the primary reasons for the marten population decline in Newfoundland.

Since the initiation of the live-trapping program, it has been revealed that the Main River watershed to the south of District 17 is a high-density marten area (on the island) and densities

are comparable to those found in the Little Grand Lake and Red-Indian Lake areas. Marten have also been recorded in isolated pockets of District 17 near Daniels Harbour. Furthermore, it is important that some remnant stands of old growth (80+) forests be left throughout the zone and provision made to have connectivity (i.e., unbroken corridors of forest) between such stands. To accomplish this, a landscape approach to habitat management was initiated by the Forest Service in 1999. This involved working with stakeholders to identify critical or potential marten habitat, locating possible corridors, and identifying areas which would not be cut in the near future. This initiative has been ongoing since that time. To identify all factors affecting marten survival, stakeholders from the Forest Service, IFWD and the paper companies sit on a recovery team for Newfoundland marten. The purpose of this team is to set short-term and long-term population goals for the species, and to recommend ways in which they may be accomplished. The Team is now in the process of identifying critical and recovery marten habitat and determining which forest activities can take place within these areas.

Critical Elements:

- sufficient habitat to support a viable population of marten;
- areas of known marten populations remain closed to snaring and trapping

Guiding Principles:

The basic unit for evaluation will be home range size for male (30 km^2) and female (15 km^2).

All forest types can be considered marten habitat if they meet the following requirements:

- sufficient habitat to support a viable population of marten;
- core marten areas remain closed to snaring and trapping
- 70% or greater of that unit must be suitable habitat;
- 40% or greater of the unit should have trees greater than or equal to 9.6m in height;
- The remaining portion of the 70% (30% or less) should have trees between 6.6 and 9.5m;
- 50% of the unit should be contiguous; Stands will have to be within 50 m of an adjacent habitat to be considered contiguous.
- A qualifying stand will have to be within 150 m of another stand or habitat patch to be considered as habitat.
- minimum patch size equals 20 ha;
- basal area requirement equals 40 m^3/ha (~18 m^2);
- hardwood stands (insect kill, wind throw) will be considered where crown closure is greater than or equal to 30%;
- Softwood scrub that meets the minimum requirements (6.5 m) will be considered habitat. Where height is not known, softwood scrub within 50 m and adjacent to a qualifying stand is considered as habitat

As stated, critical and recovery pine marten habitat is being or has been identified. The development and evolution of the marten habitat suitability model in recent years has been a useful tool in identifying potential marten habitat and evaluating impacts of harvesting on this habitat and resultant changes to population levels. Continued development and refinement of this model will provide more a reliable means of evaluating impacts of harvesting on marten habitat in the future. Pine marten is also being evaluated as part of an ongoing biodiversity assessment project (BAP). The Forest Service is a cooperative partner in this project and progress is closely monitored. There is also ongoing research into a variety of aspects of marten dynamics through the Model Forest, Canadian Forest Service, and University of Maine. Recommendations resulting from any of these ongoing initiatives will be incorporated into harvesting prescriptions as required.

4.2.1.3.2 Harlequin Duck

Characterization:

The eastern North American population of harlequin duck was listed as endangered in Canada in 1990; however in May of 2001 the status was changed to special concern. In Newfoundland these birds breed along clear, turbulent rivers, in Labrador and on the Northern Peninsula. These birds winter along the east coast at Cape St. Mary's. In District 17, harlequins are present in Doctors Brook and the upper reaches of the Torrent River.

Critical Elements:

- Buffered rivers near or around waterfowl breeding, moulting, and staging areas.

Guiding Principles:

CWS recommends that a 100 metre buffer zone be left on any river where harlequins are found. On all other stretches of these rivers, a treed buffer of at least 30 metres should be maintained for other waterfowl species utilizing the area. This is in agreement with the Department's Environmental Protection Guidelines which state that a minimum 30 metre no-cut treed buffer will be maintained from the high watermark in waterfowl breeding, moulting, and staging areas.

4.2.1.3.3 Rare Plants

Characterization:

"For those interested in rare and unusual plants, the island of Newfoundland has been called the best kept secret in North America (Hermanutz, 2000). The island's west coast is especially diverse, with more than 200 plant species assigned as provincially rare (Hermanutz, 2000). The western side of the Great Northern Peninsula with its cool moist climate, strong prevailing winds and shallow limestone soils rich in calcium support a vast array of rear vascular plants from

northern arctic alpine plants to the more southerly Appalachian species. Two of the most notorious are Long's braya (Braya longii) and Fernald's braya (Braya fernaldii). Braya species are small plants (about 8 cm in height) which bloom in white flowers and are a member of the mustard family. They are restricted to the Straits of Belle Isle Ecoregion, which is characterized by tundra like vegetation, extremely cold winters, extreme exposure and shallow calcareous soils.

Longs braya inhabits limestone barrens and may be found in turfy areas of loose limestone gravel. It has been listed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) as endangered in this province. Currently, there are only four known populations located at Yankee Point, Shoal Cove East and Sandy Cove. The Sandy Cove Site has two populations which have been separated due to disturbance.

Fernald's braya inhabits limestone barrens and may be found in turfy areas of loose limestone gravel. It has been listed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) as threatened in this province. Currently, there are nine known locations from Point Riche to Burnt Cape.

Critical Elements:

- Quarrying and road construction
- All Terrain Vehicle traffic also poses a potential threat in some areas.

Guiding Principles:

- To ensure that rare and endangered plant species present in the district due not become extinct because of forest management operations.
- To identify and protect rare plant habitat
- To educate Department personnel and the public on the locations and importance of rare plants.
- Identify and update all rare plant sites on GIS forestry data base
- Ensure that areas containing rare plants are marked and posted

4.2.1.3.4 Other Species

Other species, particularly the red crossbill, are currently listed as endangered. The Newfoundland Forest Service currently has a representative that sits on the recovery team for this species. Any recommendations on modified forestry activities, if any, for this species will be developed with input from all members and followed by the Forest Service.

4.2.1.4 Water Resources

Characterization:

The protection of water resources has emerged as a major issue in recent years both nationally and provincially. Events such as the E.coli 0157 outbreak in Walkerton, Ontario, our own Triahlomethane (THM) controversy, and numerous incidents of giradiasis in community water supplies have heightened public awareness on water issues. While much of the current focus is directed toward drinking water, it is also recognized that an equal importance must be attached to waters which have other beneficial uses. Human impacts both locally and globally have the potential to impair water for future uses.

In Planning Zone 8, water is used beneficially for numerous purposes. Most communities within the zone have water supplies. Twenty one of these supplies are protected under the province's Protected Water Supply Program. Recreational waters within this zone are used for activities such as fishing, boating and as a water supply source for numerous cabin owners.

Human activity on the land has the potential to alter water quality and water quantity. Commercial forest harvesting is the predominant activity and occurs throughout the zone. Hydroelectric development has resulted in several river diversions. There is a vast array of roads associated with the harvesting and traditional access routes as well as newly constructed roads which dissect the unit. Mining operations within the zone are limited to mostly small quarrying operations associated with road construction. Some exploration activity for hydrocarbons, dimension stone and base metals has occurred sporadically throughout the region.

Critical Elements:

Forest management activities such as road construction, use and maintenance, timber harvesting, and silviculture have the potential to substantially alter the quality of water draining from watersheds as well as other defining characteristics such as stream hydrology, sediment loadings, stream characteristics, and aquatic discharges from municipalities. Careless storage and handling of fuels by industrial and recreational users, stream diversions and agricultural operations are other examples.

Guiding Principles:

There are numerous protective measures listed in the Environmental Protection Guidelines under the broad categories of road construction, stream crossings, road abandonment, fuel oil handling and storage, support services and structures, harvesting, silviculture, and protected water supply areas. The EPG's are listed in their entirety in Appendix 1 and specific guidelines under the above sections can be found there.

4.2.2 Human Values

4.2.2.1 Timber Resource

Characterization:

One of the major resource values of the forest ecosystem is the harvesting of timber to provide forest products. Historically timber has been harvested since the first inhabitants settled in the zone. Initial uses were mainly domestic in nature to supply timber to build houses, fishing sheds and equipment and for heating and cooking. With the increase in population, more commercial uses have arisen to supply lumber and pulp and paper products. The zone supports an annual allowable cut (AAC) of both softwood and hardwood on Crown land of 78, 400 m3 in District 17 and 132, 500 m3 in District 18, and 71,500 m3 on CBPPL limits in District 17.

Domestic harvesting still provides fuelwood to heat many homes and sawlog material for residential house construction in the zone. In fact, the latter domestic use is one of the reasons why this Province has the highest rate of home ownership in the country. There are approximately 1,100 permits issued on Crown land in District 17 and 1,700 permits in District 18. Approximately 120 domestic permits are issued on CBPPL limits in the zone as well. Commercial activity accounts for over 62 percent of all harvest by the Crown in the zone. There are on average 93,000 m3 of timber harvested commercially for sawlogs and 97,000 m3 harvested for pulpwood in District 17. In District 18 there are 151,000 m3 of timber harvested for sawlogs and 175,000 m3 harvested for pulpwood each year. Commercial activities provide many jobs in harvesting, sawmilling, trucking, pulp and paper manufacturing and related spin off industries for local residents. There are in excess of 210 direct jobs created by the industry with an estimate of nearly twice that many in spin off industries.

Silviculture treatments are important to the forest resource of the zone because they ensure a vigorous and healthy forest is maintained. Forest renewal activities are critical because they ensure that the productive land base is maintained by planting areas that are not sufficiently restocked. Forest improvement activities help improve and enhance the growing stock which can reduce harvest cost, enhance forest product options and increase sustainable timber supply. There is approximately $400000 spent on silviculture in the zone each year creating more than 40 seasonal jobs.

Timely access to timber is critical to planning any forestry operations. Primary, secondary and tertiary roads form an integral part of operating areas and are used after timber extraction is completed for recreational purposes. In excess of $500,000 is spent to construct forest access roads each year in the zone.

Protection of the forest from various disturbances is also a major characteristic of resource management. Because of the long insect history in the zone, protection through integrated pest management techniques is an important activity. While fire has not been a major disturbance, protection is still critical since a large fire can potentially be devastating. Protection of other resource values through modification of activities and enforcement is also important.

Critical Elements:

The overall objective is to ensure the AAC is maximized while taking into account other resource values and conducting environmentally sound operations. This is achieved by

- maintenance or enhancement of productive land base
- planting of non-regenerating areas
- minimizing loss of land base to other users
- minimize losses to fire, insect and disease
- timely access road construction
- enhancement of younger age classes through thinning to correct age class imbalance
- maintain both a sawlog and pulpwood industry in the zone through timber exchanges

Guiding Principles:

- enforcement of forestry act, regulations, guidelines and policies
- minimize loss of productive land base through spatial and temporal compromises and continuous dialogue with other resource users
- education (staff, public, operators)
- aggressively conduct silviculture, access road, and protection activities
- implement best management practices. The *Environmental Protection Guidelines for Ecologically Based Forest Resource Management* outline courses of action and mitigative measures for forest activities. These EPG's are outlined in their entirety in Appendix 1 with some highlighted subject areas listed below.
    - garbage disposal
    - fuel storage
    - mineral soil exposure
    - buffer requirements
    - road and bridge construction

- silviculture and harvesting activities

4.2.2.2 Agriculture

Characterization:

There is only one major commercial agriculture facility located in Daniels Harbour; however, there are hundreds of subsistence farming plots scattered throughout the zone. The vegetables grown on these plots are used to supplement food requirements during the winter months. There are also several pastures and areas designated for hay production.

The wild berry industry (bakeapple, partridgeberry and raspberry) plays a significant role in the economic picture for the zone. While there is no actual record of production, thousands of kilograms of berries are harvested annually. There is at least one jam producer in District 18 who purchases berries and produces jams on a commercial basis.

Critical Elements:

Surveys indicate that approximately five percent of the soils in the province are suitable for agriculture. It is not possible to identify and plan all sites for future agriculture use and often there is a conflict with other land uses particularly forestry because these sites are of high growing capability. Although a suitable land base is the first critical element necessary for a successful agriculture operation, markets and the interest of individuals are also prime factors in the development and location of future farms. In the spirit of managing the ecosystem for multiple benefits, provisions should be given for the agriculture industry to expand if suitable lands can be found that do not adversely affect the available AAC...

Guiding Principles:

Lands designated for forest management can include areas with high potential for agriculture. Consequently, the forest landholders will work with the Department of Agriculture to determine

if opportunities exist for an exchange between agriculturally viable forest areas with unsuitable agriculture land within the Agriculture Development Areas.

The agriculture leasing policy initiated in 1976 ensures that new or existing land allocated for agriculture continues to be used for agriculture. The leases have no provision for fee simple grants and must be used exclusively for agriculture purposes

The following will provide guidance for the development of agriculture within the zone:

- Home gardening leases should be confined to areas already developed for this activity.
- Increases to agriculture leases should be adjacent to existing leases.
- New agriculture leases should include a business plan approved by the Agrifoods Division of the Dept. of Natural Resources.
- Wood harvested on agriculture leases shall be completed under a crown cutting permit.
- Where possible, existing commercial forest operators should be encouraged to work with farmers to clear new land for development.

4.2.2.3 Mining

Characterization:

There is very little mining activity in the Zone. Aurion Minerals started two small open-pit marble mines near Croque and Coles Pond in the late 1980's. In 1995, they sold their claims to Industrial Fillers a subsidiary company of Pluess-Stauefer, which is the second largest marble mining company in the world. There was also open pit zinc mine which operated near Daniels Harbour in the 1980's but it has since closed. There are a number of active aggregate and quarry leases located throughout the zone. These are usually for very small areas which can be rehabilitated; thereby, minimizing their impact upon the forest ecosystem.

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Critical Elements:

To minimize the impact of mining and mineral exploration upon the forest ecosystem while providing a source of aggregate material.

Guiding Principles:

- Ensure that quarries and open-pit mines are rehabilitated
- Ensure that the organic overburden is stockpiled and stored in a manner so that it can be used to rehabilitate the site.
- Maintain updated maps of mineral potential and mineral claims at the district office. Update maps on a yearly basis
- Maintain updated maps of aggregate and quarry areas.
- Avoid planning silviculture activity in areas adjacent to mines or quarries.
- Every attempt will be made to extract timber harvested as part of mining exploration and development.
- If timber can not be feasibly extracted using conventional means then timber shall be piled so that it may be extracted during winter months by snowmobiles.
- Non-compliance with exploration permits will be passed to the District Manager and then submitted to Mines Division, Dept. of Natural Resources.

4.2.2.4 Historic Resources

Characterization:

The provincial archeology office (PAO) is the agency responsible for the management and protection of archaeological sites and artifacts in Newfoundland and Labrador. This program is carried out under the Historic Resources Act which ensures that developments with potential to have adverse impacts on historic resources are investigated and monitored by a qualified archaeologist through archaeological impact assessments.

Archaeological sites are non-renewable resources and play a vital role in understanding our heritage. It is important to professionally record as much information as possible at an

archaeological site in order that one may fully understand its history. In order to do this properly the site must not be disturbed. Very often, archaeological sites are small, spatially bounded units; therefore protecting these resources usually do not have an adverse impact on forestry activities.

Archaeological surveys have been carried out in several areas within the zone over the past 20 years. Many areas still remain to be surveyed so there is potential for other historic resources to be found in the zone. Archaeology is very important for our tourist industry. Archaeological excavations and interpretive sites draw thousands of visitors each year to this province. The preservation and interpretation of archaeological sites will continue to benefit the tourism industry in this province for years to come. Thousands of tourists from all over the world visit our archaeological sites each year and the numbers continue to increase, i.e. Ferryland alone saw 16,500 visitors in 2000.

Sites at Port au Choix and Lanse au Meadows have been and continue to be important archaeological sites in the zone.

Guiding Principles:

Any project involving land-use has the potential to adversely impact historic resources; therefore it is important that the Provincial Archaeology Office be involved at the planning stage in order to ensure that mitigative measures to protect historic resources are developed at the earliest possible time.

In order that known archaeological sites and potential unknown sites are protected from forestry activities buffer zones will be necessary in some areas whereas archaeological assessments may be required in others. Known archaeological sites must be avoided and buffers will be required around them. Buffers will also be required along all rivers and ponds, as well as long the coastline where there is potential for archaeological resources to be found.

Occasionally there are accidental discoveries made of historic resources. In the event that this does happen, activities should cease in this area and contact be made immediately with the Provincial Archaeologists at 729-2462.

4.2.2.5 The Greater Gros Morne Ecosystem

Characterization:

The primary role of Canada's national parks is to maintain ecological integrity. Although enshrined in policy for many years, this role has recently been given prominence in legislation by the passing of the Canada National Parks Act in October 2000. The Report of the Panel on Ecological Integrity of Canada's National Parks (February 2000) noted that parks all across the country (including GMNP) are under threat from stresses both within and outside the national parks. Ninety percent of forested parks are under stress from external forestry activities.

The primary challenge for national parks in maintaining their ecological integrity is that most parks are part of larger ecosystems and the area set side for the parks is not large enough to protect the full integrity of that ecosystem. Large-scale changes on the landscape surrounding parks can isolate the park ecologically creating an "island". Parks Canada must work with adjacent land managers in striving to achieve its mandate.

Biodiversity goes beyond the range of wildlife and plant species to include the range of habitats and landscapes. Loss of special habitats such as the old-growth forest and associated species may impair the ecological integrity of GMNP in ways that are not currently understood. While ecological integrity has prominence regarding the management of national parks, legislation and policy dictate broader responsibilities for national parks. These include providing opportunities for Canadians and others to have high-quality experiences in a natural setting. Currently, 61 percent of GMNP is classified as Zone II - Wilderness. The northern portion of this zone borders on District 17 however minimal forestry activity takes place here. The Long Range Traverse, a 3-4 day hike within GMNP, currently has a reputation as a high-quality wilderness experience

due to its remoteness and difficult access. The presence of the endangered Newfoundland pine marten has been noted in the northern and southern areas of the park.

Critical Elements:

- to maintain ecological integrity.
- to maintain native biodiversity and natural processes.
- to maintain viable wildlife populations

Guiding Principles:

The long-term effect on the park's ecological integrity can rarely be isolated to one cause and is more often due to the effects of many activities. For that reason it would be important to assess the cumulative environmental effects of all activities as part of the forest management planning process.

- maintain species composition as well as the age structure and ecological functions of the various forest-types across the landscape over the long term.
- maintain proportion of interior forest (mature forest >250 m from an “edge”)
- maintain landscape connections between the park and the surrounding landscape. This would require effective, permeable movement zones between populations and/or critical habitats.
- manage and operate according to the precautionary principle, particularly as it relates to species at risk.
- ensure landscape characteristics are maintained that allow marten to achieve their habitat requirements at the landscape scale. This could mean ensuring forest management practices allow for a continuous distribution of marten habitat and home ranges to the park boundary. A conservative approach that preserves future options should be adopted until the marten guidelines are fully developed.

4.2.2.7 Parks and Protected Areas

Characterization:

The mission statement of the natural areas program is to protect in an unimpaired condition, large wilderness examples of provincial ecoregions including their natural processes and features and rare natural phenomena, so as to preserve the diversity and distinctiveness of the Province’s ecologically sustainable future for the benefits of present and future generations.

Protected areas in the province are of many types. The *Wilderness and Ecological Reserves Act* enables the Province to establish the following; wilderness reserves (Component 1), ecological reserves (Component 2) and ecological reserves (Component 3). Component 1 reserves are defined using the critical habitat of high level, wide ranging species i.e. caribou. They generally cross ecoregion boundaries, protect complete systems and are large (> 1000 km2). Component 2 reserves protect representative samples of ecoregions (not included in Component 1 reserves) and are mid-sized (50-1000 km2). Component 3 reserves protect exceptional natural features, such as, rare species or areas of unusual biological richness and are generally small (< 10 km2).

The benefits of protected areas are to preserve biodiversity, provide areas for scientific research, provide opportunities for environmental education and provide standards against which the effects of development can be measured.

Protected areas in the zone include: Gros Morne and Lanse au Meadows National Parks, Port au Choix Historic Site, Watts Point and Table Point Ecological Reserves, Underground Hole and Browsey Hole. Proposed protected areas are St.Pauls, Spirity Cove, Highlands of St John, Little Cat Arm, Cloud River, Mare Cove, Boiling Brooks and Hare Bay.

Critical Elements:

- preservation of biodiversity
- maintenance of protected area integrity
- maintain natural processes and features

Guiding Principles:

- only allow traditional (hiking, berry picking, hunting etc.) activities, educational activities and scientific research within protected areas provided that they do not compromise the integrity of the reserve
- prohibit all forms of <u>new</u> development such as mining activity, hydroelectric projects, forestry activity, agriculture activity, roads and trails and cabins and new structures.

4.2.2.8 Outfitting

Characterization:

The outfitting industry has been an integral component of the tourism industry on the Northern Peninsula since the early 1900's. This region has always been a popular hunting and fishing destination because of the pristine environment and abundance of fish and wildlife species. There are 21 hunting and sport fishing businesses with 40 base lodges and out camps in the zone. These businesses bring in 600 clients annually, 95 percent of which are non-residents. There is $4.4 million generated annually from hunting and $0.5 million from fishing which create 160 part time rural jobs. There figures were presented to the planning team by Todd Wight of the Newfoundland and Labrador Outfitters Association. It should be recognized that the outfitting industry provides this revenue to the Province each season and has the potential to do so indefinitely.

Over the past 10 years, a significant number of traditional hunting and fishing facilities have diversified into the non-consumptive areas of the tourism industry. Such activities include but are not limited to: snowmobiling, dog sledding, kayaking, canoeing, nature viewing, hiking, and wildlife photography. The ability to diversify has positively impacted the viability of outfitting operations and as such, increasing numbers of operators are considering these opportunities. Diversification can lengthen seasons of operation, increase and lengthen employment, and reduce dependency on a single sector of the tourism industry. Pristine wilderness settings are necessary for many of these types of diversification.

Critical Elements:

Remote outfitting camps are dependent on their remoteness. Forest access roads inevitably impact the ability of a camp to maintain its remote status. Increasing accessibility through increased access roads can also lead to increased hunting and fishing pressures in a given area. This can in turn lead to decreased success rates of tourists. This is of particular concern since Newfoundland is often the hunting destination of choice due to success rates upwards of 80

percent. An increase in access roads also tends to lead to increased cottage development that in turn can have an impact on both remoteness and game availability.

Removal of large areas of forest has the immediate effect of reducing big game habitat, particularly winter cover, although this impact has been poorly studied (particularly in remote areas). Forest harvesting also has the ability to impact travel corridors, bear denning areas, and caribou feeding and calving areas.

While clients of big game and fishing outfitters are primarily interested in hunting or fishing experiences, they also show a great respect and admiration for pristine conditions and a healthy looking landscape. The landscape view experienced by clients plays a large role in leaving a lasting impression of the province. The view also has a direct impact on repeat client bookings and recommending the destination to others. Viewscapes become even more important once outfitters begin diversification into non-consumptive tourism activities. With these activities, there is no trophy to bring home and that which is taken away is that which has been experienced by the senses (i.e. sights, sounds, smells, etc.).

Guiding Principles:

In some cases it may be necessary to leave no harvest buffer zones around outfitting camps that are agreed to by all parties involved. Buffer zones can be difficult to negotiate due to varying ranges of activity from operator to operator.

- consideration should be given to restricting access to roads or decommissioning roads and bridges after harvesting is completed. This will reduce the possibilities of increased hunting pressure. When roads are in use actively for harvesting purposes, access to hunters should be restricted or limited.
- harvest in the winter whenever possible. Winter roads are less passable in summer and fall and will help to reduce traffic.
- construct new roads as far away from existing outfitting camps as possible. The benefits of this are obvious. Harvesting should be restricted around hunting and fishing camps during their season of operation. At these times, harvesting should occur as far away as possible from outfitters.
- forest operations should be carried out in compliance with existing regulations

-efforts should be made to ensure that the integrity of the view from outfitter cabins is maintained when conducting forest operations.

4.2.2.9 Recreation

Characterization:

The Great Northern Peninsula has outstanding scenery, interesting topography, and opportunities for viewing wildlife and flora in a natural setting. These elements represent a small list of reasons why the zone is used extensively for recreational purposes. Hiking, skiing, canoeing and snowmobiling are major recreational activities in the area. Non-timber recreational values are expected to play an increasing role in forest management practices.

Canoeing and kayaking on the many rivers, the hiking trails, numerous ski and snowmobile trails, and excellent hunting, fishing and adventure tourism areas highlight some of the recreational opportunities in the zone.

Critical Elements:

Wilderness

Backcountry recreational activities are dependent on the existence of natural pristine wilderness areas. The temporary alteration of this pristine wilderness through forest harvesting practices may result in a decrease in these recreational activities for some period of time.

***A**ccessibility*

An increase in forest access roads will inevitably increase the amount of accessibility to remote areas. This in turn will increase the amount of traffic in an area (both vehicular and pedestrian) and may decrease the value of the experience for many recreational activities.

Viewscapes

The majority of individuals who are involved in recreational activities are concerned about viewscapes. Many of the recreational activities occur because of a particular viewscape. The destination for many individuals is a result of the viewscape in that particular region.

Guiding Principles:

To prevent negative ecological effects and to ensure a positive experience, access and levels of recreational activities can be monitored. Public surveys can be used to measure the experiences and the levels of recreation occurring in the zone.

Wilderness

Forest operations should avoid wilderness areas where high concentrations of recreational activities occur. If operations are necessary, stakeholder meetings could prevent conflicts through temporal scheduling.

Limiting Accessibility

Decommissioning of forest access roads could be a possible option when harvesting operations are completed. Harvesting should be conducted using winter forest access roads where possible. Winter roads create less traffic and require less effort to decommission.

***V**iewscapes*

In areas where high concentrations of recreational activities occur, aesthetic views should be maintained using landscape design techniques where possible, when conducting forest operations. This is especially relevant in areas where the recreational activities are occurring because of the aesthetic view. Reforestation of areas with high aesthetic values should occur without delay in returning the site to a forested condition.

4.2.2.10 Tourism

Characterization:

The tourism industry in Newfoundland and Labrador is based on our natural and cultural resources. Protection of these resources is critical for our industry to survive and grow**.** We

currently have the resources to compete internationally with tourist destinations; however, competition for the international traveler is high in the tourism marketplace. The tourism industry in Newfoundland and Labrador has experienced significant growth since 1997.

There are many excellent tourist destinations in the zone. Gros Morne and Lanse au Meadows, National Parks, Port au Choix Historic Site, and iceberg and whale watching in St Anthony are examples of the more prominent tourist attractions.

Critical Elements:

- viewscape
- accessibility
- wilderness ambiance
- remoteness

Guiding Principles:

Work with GMNP and tourism operators to implement strategies to minimize the visual impact of harvesting operations on the aesthetic values associated with viewscapes. By bringing together GMNP, CBPPL, NFS, and the tourism operators, strategies will be discussed, negotiated, and implemented to provide a balance between harvesting and the values associated with tourism. If required, the Forest Service, CBPPL, local Town Councils, Parks Division and other relevant groups will get together to examine the viewshed issues where applicable in the zone. As well, the connectivity committee will examine issues in relation to GMNP.

Section 5 Public Consultation Process

5.1 Planning Objectives

In recent years, there has been a shift from single resource management to a more comprehensive technique of forest ecosystem management. In its attempt to provide the greatest good for the greatest number of people for the greatest period of time, sustainable forest management (SFM) must be balanced in light of social, economic, and environmental issues. In the context of SFM

this shift has resulted in a move from the traditional focus of timber management to incorporate non-timber values into the management planning framework. Another term that has become closely associated with SFM is “sustainable development.” Sustainable development, or in this case “sustainable forests”, not only takes into account the social, cultural, economic, and environmental benefits of the present, but those of future generations also.

The Forestry Act of 1990 outlines its approach as providing a "continuous supply of timber in a manner that is consistent with other resource management objectives, sound environmental practices, and the principle of sustainable development."

In the 1995 Environmental Preview Report the Newfoundland Forest Service proposed an adaptive management planning process. This process has three objectives.

1. Establish a productive planning framework to include all stakeholders. An effective planning framework must have information and issues defined at the beginning of the process.
2. Learn more about forest ecosystems while they are being actively managed (i.e., adaptive management). Adaptive management incorporates strategies which help us to learn about the forest ecosystem and to deal with uncertainties.
3. Establish an ecosystem approach to forest management which integrates the scientific knowledge of ecological relations and limits of growth with social values. This will help to attain the goal of sustaining natural ecosystem integrity and health over the long term.

Adaptive management makes decisions based on input from all the stakeholders involved, and it establishes a continuous learning program. The adaptive approach allows us to communicate, share information and learn about forests being managed. This sharing of information, both old and new, then provides the flexibility necessary to adjust to changes and to set new goals**.** Such interaction is an absolute necessity for a subject as complex as an ecosystem.

5.2 Planning Framework

As previously stated, this plan is being written for Crown Land and Corner Brook Pulp and Paper limits in planning Zone 8 and not a specific district. With previous planning processes there were planning teams set for each district. A strategy document was prepared for the entire district and separate five year operating plans were prepared for each owner within the district.

With the change to planning for the zone, it was decided to the combine planning teams for each district into a single team which would meet in one central location at Plum Point.

5.3 Planning Team Participation

An initial advertisement was placed in local and regional newspapers, notices were posted in prominent locations in most communities in the zone, and an extensive email to potential interest groups and individuals was done to inform potential participants of an initial meeting in Plum Point. A listing of all invitees and the interest group they represent is listed in Appendix 2. The initial meeting was designed to inform attendees of the change in the planning framework as a result of the new legislation, the ground rules for participation, and to form the new planning team for the Zone. Attendance at these meetings was extremely poor therefore a second contact, mostly by telephone and email, was done in an attempt to boost attendance. This resulted in increased attendance at subsequent meetings and the planning team was formed. A list of planning team members and their affiliations is shown in Appendix 2. Planning team membership is not restricted to those listed and is open to anyone who wants to join the process at any time.

As outlined in the timber supply analysis section, harvest scheduling was used to identify, on maps, where harvesting should take place for the next 25 years. These maps were posted early in the planning process and in each subsequent meeting and gave particular emphasis to harvest areas in the next 10 years. These maps are also available on CBPPL's website at www.cbppl.com. Each meeting focused on a particular value or values, so the maps were available to identify any particular area of conflict when the values were discussed. In this way, areas where conflicts exist were identified immediately and any remedial action or process to mitigate this conflict could be put in place right away. Representatives from the Tourism Branch were unable to attend the meetings so a complete list of maps which showed potential roads and stands to be harvested were sent to that branch.

Changes to harvest areas or processes to follow to resolve conflicts, where possible, were ongoing throughout the planning process and are reflected in the final operating areas presented

in this plan. These changes or modifications to areas or processes that were established will be discussed in later sections.

Section 6 Management Objectives and Strategies

6.1 Harvesting

As previously stated, the forest in the zone is part of the boreal forest which is characterized as being disturbance driven resulting in the formation of relatively even aged stands. The clearcut silvicultural system most closely emulates this natural disturbance pattern and therefore is the most preferred method employed for harvest. The size, shape, arrangement and juxtaposition of clear cut areas vary across the landscape depending on localized topography and terrain conditions. A modification of the clearcut system takes place in domestic areas whereby the cuts are relatively small and disbursed resulting in the creation of a range of age and development classes.

6.1.1 Commercial

Section 3 outlines in some detail the general approach for the timber supply analysis and specific results and sensitivity analysis for both districts in the zone. The model used to calculate the wood supply is a maximization model which outlines a specific course of action and timing of such actions to maximize timber production. The harvest schedule indicates the specific forest strata to be harvested and the timing of such harvest. The districts must follow this schedule as closely as possible in order for the AAC to remain valid.

In general, the oldest timber that is in the worst condition and losing volume fastest is targeted as first harvest priority. Younger stands that have been damaged by insects and disease may also receive high priority. Once managed stands are eligible for harvest, this priority may change in some cases to allow for a faster rotation on good sites that are silviculturally treated.

Specific commercial strategies are as follows:

- utilize irregular cut block sizes that follow contours and natural boundaries where possible
- consider maintenance of unharvested corridors between harvest blocks to act as wildlife travel corridors
- vary buffer widths to protect other values (i.e. larger buffers on salmon rivers)
- where possible, utilize winter harvest on wet and sensitive sites
- maintain current size and distribution of clear cuts
- use landscape design techniques to mitigate viewshed impacts on areas of concern
- keep losses through timber utilization to a minimum (< 6 m3/ha)

6.1.2 Domestic

The harvest of domestic fuelwood and sawlogs occurs from four main sources in the zone; from designated domestic cutting blocks on Crown land, from cutover clean up on Crown and Industry limits, and from landing and roadside clean up on both Crown and Industry limits, and from hardwood harvest on Industry limits. For the designated cutting blocks, the harvest scheduling and priorities apply, however it may not always be practical to follow. Domestic cutting blocks are generally established near communities where concentrations of timber that is eligible for harvest exist. Mixed within these blocks may be timber that normally would not be scheduled for harvest in the planning period. Ideally, each individual domestic cutter would be issued their own cutting block which would ensure harvest of optimal stands. This is not practical however and domestic cutters are allowed to cut anywhere within the designated area provided that immature timber is not harvested. For this reason, the optimal harvest schedule may not always be followed in domestic areas. Utilization of cutover residue, dead timber and scrub areas which are not part of the timber supply analysis, more than makes up for this difference however.

Specific domestic strategies are as follows:

- target low volume stands that have poor commercial harvest chances
- encourage use of under utilized species (birch, larch and aspen)
- target dead and insect damaged stands that are beyond commercial salvage.
- where possible, target alienation Class 3 lands that have low commercial potential
- in areas of high domestic demand, limit volume allocation in designated cutting areas and encourage alternate sources (birch, cutovers, landings, scrub etc)

- monitor stands harvested in domestic cutting areas for compliance to the harvest schedule and change areas available for harvest to reflect this schedule
- with the exception of boat building materials, leave all white spruce on domestic cutting areas to provide a regeneration source that is not susceptible to moose browsing

6.2 Silviculture

Section 1.4.1.4 describes the regeneration patterns of the major tree species by each disturbance type and generally by ecoregion. On average, there is a 20 percent regeneration failure rate (NSR) across all disturbance types. Generally, areas that do not regenerate naturally are renewed by some combination of site preparation and planting or gap planting. Areas that are regenerated are left to develop naturally. In the case of balsam fir which is a prolific regenerator and usually forms an overstocked stand, some form of thinning is usually applied to improve the growth and development characteristics of the regenerating stand. The high density of moose in the Zone particularly in the northern portion of District 17 and southern half of District 18 combined with the high occurrence of balsam fir and low occurrence of hardwoods have created a serious problem with browsing of the regenerating and immature balsam fir stands In just a few short years a fully regenerated site can be reduced to an inadequately stocked site by moose browsing.

6.2.1 Forest Renewal

Since maintenance of the forestry landbase is crucial, forest renewal treatments are the most important silviculture technique in the zone. Forest renewal silvicultural treatments are designed to ensure that a new forest is established after disturbance by harvesting, insect, wind or fire. In most regions of the Province these prescriptions normally involve some form of treatment to prepare the site to accept planted seedlings. In most parts of the zone planting is usually done without mechanical site preparation. Planting, whether full planting or gap planting is done to ensure stocking of desired species is at acceptable levels.

As stated, little mechanical site preparation has been carried out in the zone. Treatment of sites that have been overgrown with hardwoods and other herbaceous species with herbicides has

been done to reduce this competition and make the site more accessible and suitable for planting. Herbicide usually reduces the competition for a few years to allow planted seedlings to get established and “get the jump” on the non crop tree species that occupy the site. Herbicides, while used sparingly, are sometimes a necessary tool to help establishment of a new forest particularly on the better sites.

Complete regeneration failure requiring full planting is rare in the zone because of the excellent regeneration capabilities of balsam fir. When it does happen however, the site is prepared, if necessary, and planted with mainly black or white spruce and to a lesser extent Norway spruce. The majority of the planting requirement in the zone is for gap planting. This treatment is designed to increase the stocking on sites that have not regenerated to sufficient levels or on sites that have sufficient balsam fir regeneration but have a high moose density. On these latter sites planting is done through the existing regeneration to obtain a sufficient stocking level of a browse resistant species. Gap planting is done with the same species as above, and, coupled with the natural regeneration already present on site result in a mixed softwood forest.

Where possible, seedlings are grown with seed from local seed sources. A seed orchard has been established at Pynns Brook to produce seed from plus trees collected throughout the Province. Plus trees are normally selected because they have superior growth and physiological characteristics. It is hoped that once this orchard starts producing seed the majority of the planting stock will be grown from this source. The ultimate goal is to establish plantations with seedlings that have superior growth characteristics and thus increase yield and maintain genetic diversity.

Exotic species have been planted in trials at some locations in the zone, however, it is not anticipated that they will form any substantive proportion of the planting program in the future.

6.2.2 Forest Improvement

Forest improvement prescriptions are designed to treat existing, established forest stands in an attempt to enhance development. These treatments usually involve thinning overstocked balsam fir stands at either a young age 10 -15 years (precommercial thinning) or an intermediate age 25 - 35 years (commercial and diameter limit thinning). In areas that have high moose browsing potential, the pre commercial thinning age is increased to 20 – 25 years so that the crop trees are tall enough to be out of reach of moose.

Pre commercial thinning reduces density levels on overstocked areas in order to maximize volume increment and operability (piece size) in the shortest period of time. Trees removed are not of merchantable size and are left behind to return the nutrients to the site. In the zone, balsam fir is usually thinned to favour any spruce that may be in the stand. In this way a mixed softwood stand is produced (depending on the original density of spruce) which is more diverse and less susceptible to insect infestation. As well, any hardwood species that are not in direct competition with spruce or fir are left to increase the biodiversity of the stand.

Commercial and diameter limit thinning is done on older balsam fir stands and is designed to capture any mortality that would normally occur in the stand through self thinning. The trees harvested are of commercial size and are extracted and utilized. The remaining trees are left to grow, free from competition and are harvested when mature. By salvaging this eminent mortality a higher yield can be obtained in these stands. As with precommercial thinning, spruce and hardwoods are left where possible to increase the stand diversity. Both types of thinning will produce large diameter stems in a shorter time period which should increase the percentage of merchantable volume in stands that is suitable for sawlog material.

Specific strategies:

- ensure regeneration of areas disturbed by harvest, insect, wind and fire to prevent loss of productive land base
- use thinning techniques in young stands to increase stand development, reduce rotation age, and increase the percentage of sawlogs in stands

- where possible, promote species mixes particularly with spruce and hardwoods to reduce susceptibility to insect attack and increase biological diversity
- where possible, use seedlings grown from local seed sources to protect genetic diversity
- ensure levels of planting and thinning used in the wood supply analysis are achieved
- work towards pre harvest planning to identify areas with potential moose browsing problems so that alternate silvicultural prescriptions can be promptly employed
- in areas with high moose browse potential, allow the young fir stand to develop an adequate height prior to pre commercial thinning to ensure moose can not reach the crown after thinning

6.3 Access Roads

Timely access to harvesting areas is the key to successful implementation of harvesting plans. Roads also provide access for other recreational values such as hunting, fishing, skiing, berry picking and hiking. Roads can also have a negative impact both from an environmental perspective (loss of productive land base) and other value perspective (access near remote outfitting lodges).

As a general principle from both an environmental and cost perspective, the minimal amount of road will be built to effectively harvest available timber. As well, roads are constructed to standards (minimum right-of-way and driving surface etc.) that are as low as possible but still access the timber in a safe and effective manner. Forwarding distances are maximized to the economic limit to minimize the amount of road constructed. These principles ensure that the minimum amount of road is built and that loss of productive land base and environmental disturbances are minimized.

In sensitive and wet areas, winter harvesting and road construction are encouraged and are often the only option. This minimizes environmental disturbance and provides access to areas that would otherwise be left unharvested.

In many instances forest access roads “open up” new areas which are then subject to cabin development (often illegal). They also provide access to remote areas where outfitting businesses operate. This generally leads to competition for hunting areas between local and “sport” hunters and may detract from the “remote” designation of the lodge. In such instances cabin

development should be controlled to limit local access. Road decommissioning or deactivation may also be considered, depending on cost and mitigation of conflicting uses for that road.

Specific strategies:

- where possible, build winter roads to access sensitive and wet areas
- minimize amount of road built by maximizing forwarding distances
- use minimum road standard to safely and effectively match the logging chance
- work with appropriate agencies (crown lands) to control cabin development
- consider road decommissioning on roads near remote outfitting lodges and other areas of concern where requested and where feasibly possible
- explore all avenues to secure funding for road construction and encourage operators to build their own roads in exchange for royalty reductions

6.4 Forest Protection

6.4.1 Insects and Disease

As indicated in section 1.5.5, insects have been a major natural disturbance factor in the zone. The main tree species, balsam fir, is susceptible to most of the major insects we have including spruce budworm, hemlock looper, balsam fir sawfly, and balsam woolly adelgid. In the past, severe mortality has occurred resulting in massive salvage efforts. In recent years, quality standards at local pulp mills have changed to require a timely supply of fresh timber. As a result, the window to salvage insect damaged timber is now one to two years after mortality. On a positive note, access to most areas has increased and improved allowing for quicker reaction to salvage insect mortality.

Populations of hemlock looper were building in the early 2000's and resulted in significant mortality and a subsequent treatment program in 2002 and 2003. Since that time the populations of these insects have been in decline.

As outlined in the harvesting and timber supply analysis sections our timber supply is based on following a rigid predetermined harvest schedule and minimizing inventory deductions (of which insect damage is a portion). In the event of a major insect infestation, salvage efforts may change

harvest priorities and thus the optimal harvest schedule may not be followed. If insect damaged stands cannot be harvested in a timely manner, an additional harvest in the form of unsalvaged mortality may occur resulting in inventory deductions that are higher than anticipated. In both eventualities, deviations from harvest schedules and inventory adjustment levels will have to be closely monitored to ensure that the validity of the AAC calculations is not compromised.

Specific strategies:

- use silvicultural techniques at the stand level to alter species mix and increase stand vigor to make stands less susceptible to insect attack
- where possible, use harvest scheduling techniques to alter species mix across the landscape to avoid “setting the table” for severe insect infestation
- in conjunction with Provincial and Federal initiatives, use pertinent and approved biological and chemical insecticides such as BTK virus)

6.4.2 Fire

As outlined in previous sections, most of the zone has little fire history due to the relatively abundant rainfall and above average snowfall; however, some major fires have occurred. A fire in an unusually dry year can have devastating effects on the forest however and can exacerbate an already tight wood supply situation. The zone can minimize the risk of a serious fire by maintaining a highly trained, efficient and effective fire control program and by minimizing the risk in forest stands through maintenance of health and vigour.

Specific strategies:

- use silvicultural treatments and protection from insects to increase health and vigour of stands
- maintain fire control capabilities by both the Crown and Industry.
- where possible, promote species mixes in stands to minimize risk

6.4.3 Windthrow

Wind throw usually occurs in stands that are old and decrepit or in stands that have been predisposed by some other disturbance such as insects and disease. To minimize the effects of

blow down, stands will be managed to promote health and vigour mainly through silvicultural treatments and protection from insects.

Specific strategies:

- avoid thinning in areas with high wind damage potential (hilltops on high elevations etc.)
- maintain forest in healthy vigorous condition through silvicultural treatments and protection from insects
- design cut blocks to follow contours and natural boundaries to minimize risk of windthrow to residual forest

6.5 Information and Education

Information and education is one of the key elements to providing for more active and effective participation in the planning process at all levels. Through interaction with various user groups and the general public a better understanding of each others values and positions is gained. The more we know about each others values and where these values are located on the landscape the better the ability to mitigate any potential impacts of harvesting on these values. For example, learning where a cabin is located can help planners when selecting areas for harvest and provide a contact to discuss impacts and mitigations.

Many comments were made during the planning team meetings about the good exchange of information and ideas that occurred. It is through such forums that information can be shared which will provide a basis for more effective and informed participation in such processes. Other such vehicles for information and education which will be actively pursued are:

Specific strategies:

- field trips
- school visits
- open houses
- commercial operator environmental training programs
- information meetings
- training courses
- seminars
- general day to day contact

Section 7 Proposed Activities

7.1 District 17

7.1.1 Overview

This section will outline all forest activities that will occur on CBPPL limits in District 17 from 2008-2012. More specifically, all proposed harvesting, silviculture and access road construction activities as well as environmental protection measures, activities inside protected water supply areas, surveys, and information and education initiatives will be presented and discussed in detail.

To present a more comprehensive overview of proposed activities on the entire district an overview map is presented in Figure 14 (Appendix 3). This map shows all proposed operating areas by the Crown and by CBPPL so that operations can be viewed from a landscape perspective across all ownerships in District 17. Maps of individual operating areas and summary sheets are also presented in Appendix 3. The summary sheets give a brief description of each area, the type of activities that will occur and any issues raised and mitigative measures employed.

7.1.2 Allocation of Timber Supply

There is 357,500 m^3 of timber scheduled to be harvested by CBPPL in District 17 for the next 5 years. This volume will be harvested on CBPPL limits. The Crown will also harvest on CBPPL limits under exchange to the Crown and this harvesting is outlined in the Crown Plan.

Harvesting activities will be carried out in several locations throughout the District on CBPPL Limits. Summer and winter harvesting operations will be carried out in the District, with summer

operations concentrated in areas farthest from the main public highways, and winter operations closer to the public highways to reduce snow-clearing costs.

For the most part, harvesting will be carried out in accordance with the clear-cut silviculture system. All merchantable spruce and fir trees on site will be cut and extracted, leaving only sub merchantable stems and noncommercial species such as eastern larch and white birch. This approach is appropriate for shallow-rooted Boreal conifers such as fir and spruce, which are prone to wind throw following partial cutting. Additionally, clearcutting enhances the early growth of balsam fir seedlings, which typically exist in large numbers beneath mature balsam fir forests but require full sunlight to achieve optimal growth.

Harvesting and forest access road construction will focus on the harvest of mature and overmature timber throughout the district. Harvesting activities will endeavor to maximize the use of mechanical harvesters, extending winter and summer operating seasons in order to allow for the delivery of fresh wood over the entire twelve months of the year. This will allow us to reduce overall pulpwood inventories, and supply the mill with a constant supply of fresh pulpwood with the optimum species mix, over the maximum number of operating days per year.

Our mechanized logging fleet will be used in combination with our tree length and conventional logging systems to ensure maximum utilization during winter harvesting, harvesting blowdown timber, and harvesting low volume stands. Shortwood harvesters and forwarders, which are equipped with wide tires and tracks, have a very low ground bearing pressure, and when they spread a brush mat of tops and branches in their travel path, ground disturbance is significantly reduced.

Table 7 details this proposed volume and compares it to the 5 year AAC. There will be no deviation from the five-year AAC in either the Class1 or Class 3 landbase.

Table 7. Proposed softwood harvest on CBPPL Limits in District 17 (2008-2012)

Total Class I AAC CBPPL Limits	**357,500 m3**
CBPPL Harvest on CBPPL Limits	**357,500 m3**
Total Harvest CBPPL Limits FMD 17	**357,500 m3**
CBPPL AAC Deviation (+/-)	**0 m3**

7.1.2.1 Commercial

The timber scheduled for commercial harvest in the district is overmature with some small pockets of mature dispersed throughout. This proposed harvest follows the harvest schedule that was used to determine the AAC in Section 3. For commercial operations on Class 1 and Class 3 land, the first two five year periods are highlighted on the operating area maps. This represents two times the actual proposed harvest. The purpose of including more volume than is actually proposed is to allow for operational flexibility within operating areas without having to constantly amend the plan.

7.1.2.2 Domestic

There are 133, 275 m3 scheduled to be harvested domestically from 2007 to 2011 which represents 30 percent of the proposed harvest on Crown Land. Harvesting will occur in designated domestic cutting areas and is generally conducted on a small patch cut system. All domestic cutting is done under Crown permit which has conditions attached which outline the species, volume, location and utilization standards to be employed. For the most part cutting occurs in winter with extraction by snowmobile

7.1.2.3 Hardwoods

There are 9, 275 m3 of hardwoods (birch) scheduled to be harvested for domestic (6, 275) and commercial (3, 000) (CBPPL limits) purposes in the next five years. This birch occurs as a mixture in softwood stands and is utilized as fuelwood. At this point there are insufficient pure hardwood stands or residual on commercial cutovers to support any commercial hardwood activity on Crown Land.

Table 8 CBPPL Proposed Harvest by Operating Area in District 17 (2008-2012)

Operating Area	Operating Area #	Proposed Harvest M3
Western Bluey	K-17-04	20,000
East River	K-17-06	10,000
Squid Cove	K-17-07	40,000
Kill Devil	K-17-08	120,000
Northeast Pond	K-17-10	20,000
Angle Pond	K-17-11	130,000
Main Park	K-17-12	17,500
Total Harvest		**357,500**

7.1.3 Silviculture

There are two silviculture prescriptions scheduled for the next five years; planting/gap planting including site preparation where required, and pre commercial thinning. Planting is designed to return a site to a minimum stocking level with the desired species, mainly spruce. There is full planting when there is complete natural regeneration failure and gap planting when a site has some desired regeneration but not enough to meet minimum stocking standards. Precommercial thinning is done to reduce the density on overstocked regeneration so that growth can be concentrated on the remaining crop trees and thus reduce the time to harvest.

Table 9 summarizes silvicultural treatments for the next five year by treatment and operating area. There are 500 ha of planting and 700 ha of pre commercial thinning scheduled which meet the assumptions for silviculture in the timber supply analysis. These numbers represent minimums however, and it is anticipated that significant more area will be treated. It is difficult to determine exact amounts because a significant amount of ground checks and surveys need to be completed. These surveys will be conducted during this five year period but until they are completed, specific locations and treatment amounts cannot be identified.

Table 9 Proposed Silviculture treatments, CBPPL Limits in District 17 (2008-2012)

Treatment	Area (ha)
Pre Commercial Thinning	700
Planting	500
Total	1,200

Areas that are scheduled for commercial harvest or have been harvested in the past five years are candidates for planting or gap planting to black, white or Norway spruce. These areas will undergo reconnaissance and or intensive regeneration surveys to determine the need for planting. Immature and regenerating stands have also been identified on operating area maps and are candidates for precommercial thinning if reconnaissance surveys deem them suitable.

7.1.4 Primary Access Roads and Bridges

There are 64 km of primary forest access roads scheduled to be built in District 17 in the next five years (Table 19). These roads are of class 3 standard and will be built to access timber for commercial purposes.

All roads will be built to the specifications of the Class 3 standard and all pertinent EPG's will be followed. As well, referrals will be sent to all relevant agencies (including DFO and Water Resources Division) before and construction is initiated.

Table 10 Proposed Primary Access Roads, CBPPL Limits in District 17 (2008-2012)

Operating Area	Operating Area #	KM of Road	Bridges
Western Bluey	K-17-04	0	0
East River	K-17-06	0	0
Squid Cove	K-17-07	4	0
Kill Devil	K-17-08	14	4
Northeast Pond	K-17-10	15	3
Angle Pond	K-17-11	7	2
Main Park	K-17-12	24	3
Totals		**64**	**12**

7.1.5 Activities in Protected Water Supply Areas

For harvesting operations in protected water supply areas (PWSA) wider buffers are required and the pertinent EPG's will be followed. There will be continuous monitoring inside these areas and buffers will be flagged to ensure compliance with the guidelines. In addition, a Certificate of Approval under Section 10 of the Environment Act will be obtained by CBPPL before any commercial harvesting commences inside a PWSA.

7.1.6 Environmental Protection

7.1.6.1 Fire

Wildfire has not been prevalent in the district in the past number of years and as a result there have been few timber losses. There have been major fires in the past however so the district must remain vigilant in its fire suppression program to ensure any future losses are minimized.

There are fire crews and equipment stationed at Port Saunders in the fire season whose direct responsibility is fire protection. In addition, support, equipment and manpower at both the regional and provincial level is available should the need arise. There are air tankers stationed at Deer Lake and Gander and helicopters at Pasadena that are available for initial attack.

7.1.6.2 Insect and Disease

Monitoring and protection for insects and disease is done out of the forest protection division in Corner Brook. District staff are always available however to provide assistance in detection, monitoring, and protection against insects and disease.

7.1.6.3 General Environment

The environmental protection guidelines form the basis for protecting the environment from the effects of forest activities. Forest activities have the potential to impair water quality, erode and compact soil, destroy fish and wildlife habitat, impact viewscape, and disturb sensitive and rare sites etc. The guidelines are designed to provide site specific measured to ensure that these impacts are avoided. Highlights of measures to avoid these impacts include no activity buffer zones, modification of harvesting design and equipment, avoidance of sensitive site during critical periods, consultation with other regulatory agencies and of course, monitoring. Specific measures that govern each forestry activity are detailed in Appendix 1.

7.1.7 Surveys

Utilization surveys will be conducted on both commercial and domestic cutovers to insure loss of merchantable timber is minimized. The district will work in conjunction with the Industry Services Division in Corner Brook to implement a yield comparison study to compare the expected volume in an operating areas to those actually attained. The results of this survey will help refine the inventory deduction described in Section 3.

As previously mentioned, reconnaissance and intensive regeneration surveys will be conducted on commercial cutovers created during the next five years as well as those created in the past five years to determine the need for planting. As well, reconnaissance surveys will be done on regenerating stands to determine the suitability for precommercial thinning.

7.1.8 Information and Education

The district will continue to attempt to educate the general public to ensure meaningful and effective consultation and input can be attained. This will be accomplished through planning team fieldtrips and meetings, school presentations, open houses, meetings and National Forest Week activities.

Section 8 Mitigations

8.1 District 17

Site specific mitigations arising from concerns identified during the planning process and from other regulatory agencies are identified on the summary sheets accompanying each operating area in Appendix 3. As well, guiding principles which outline procedures to follow should an unforeseen conflict arise have been identified for each value in Section 4.

Section 9 Plan Administration

9.1 Monitoring

Monitoring of planned activities is critical to ensure objectives and operations are carried out in a manner consistent with various guidelines and provincial and federal legislation. Monitoring occurs at the operational level and the planning level.

9.1.1 Operational Level

All harvesting activity is regulated using a permitting system and all activities are inspected and monitored on the ground by conservation officers to ensure compliance with the Forestry Act and regulations, cutting permit conditions, and Environmental Protection Guidelines. Permit holders and contractors are also subject to financial deductions if work does not meet contract specifications. Conservation officers conduct inspections on a weekly or monthly basis depending on the level of activity. These inspections may entail surveys such as utilization assessment to ensure compliance with permit conditions.

9.1.2 Planning Level

The planning team has established a monitoring committee (which is the planning team) whose primary role is to monitor implementation of this Five Year Operating Plana as well as the Crown's Plan for the zone. This is a crucial role, as many implementation commitments are stated in the plan. The primary function of the monitoring committee is to:

- monitor plan implementation for consistency with commitments in the plan
- identify concerns with plan implementation to team members
- review annual operating plan before implementation
- provide recommendations for plan changes
- establish protocol for concerns reported to and/or identified by monitoring committee

The monitoring committee should meet at least once a year to review the annual operating plan. Additional meetings may be required to review amendments or provide recommendations should changes be required as a result of a catastrophic event such as fire which may precipitate changes to the plan. Field trips to view on the ground activities has proven effective by monitoring teams in the past and will be encouraged during the implementation of this plan.

9.2 Amendments

Due to the dynamic nature of forest activities, amendments are often required because of changes in the forest, operational realities, imposition of addition requirements or guidelines, or some other unforeseen circumstance. These changes to the five year operating plan must be submitted as amendments and approved before they are implemented. There are two types of possible amendments for this plan, one that can be approved internally by the Newfoundland Forest Service and one that must be submitted to the Environmental Assessment Division for public review. Changes to this plan can be approved by the Newfoundland Forest Service if they are:

-within one kilometer of an operating area described in the five year operating plan, an additional area for timber harvesting that is, in total, not more than 50 hectares in each year of the plan

- within a forest management district, an additional areas for silviculture treatment of not more that 20 percent of the total operating area described in the five year operating plan over the five year term of the plan

- within an operating area described in the five year operating plan, not more than one kilometer, in total, of new primary forest access road in addition to existing and proposed primary forest access road in each year of the plan

- adjacent to an operating area described in the five year operating plan, not more that half a kilometer, in total, of new primary forest access road in each year of that plan.

Changes that are not covered by the above must be submitted for Environmental Assessment (EA) in the form of an amendment to the five year operating plan. Once approved through EA the amendment still has to be approved by the Ecosystem Management Division of the Forest Service.

Amendments requiring submission through EA will be reviewed by the monitoring committee. Other amendments will be reviewed by the monitoring committee if the District Manager deems that they represent a significant change to the plan.

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