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 housed 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 4, 5, 6 and 8 are combined to form Planning Zone 3. 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 three separate submissions by the Crown, Corner Brook Pulp and Paper Limited, and Abitibi Consolidated Incorporated. Throughout this Five Year Plan, references will be made to Districts 5 and 6 individually but when combined they will collectively be referred to as Planning Zone 3 or the zone. The Planning Team for this zone is located in Gander. 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 warranted 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 and not just Crown Land.

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 3 encompasses Forest Management Districts 4, 5, 6 and 8 (Figure 1). It extends from Seal Bay in the northwest, easterly along the coast to New-Wes-Valley in the northeast, then southerly to Terra Nova National Park in the east and then west along the northern edge of the Bay du Nord Wilderness Area to the general area of the Bay D’Espoir Highway near Great Gull Lake.

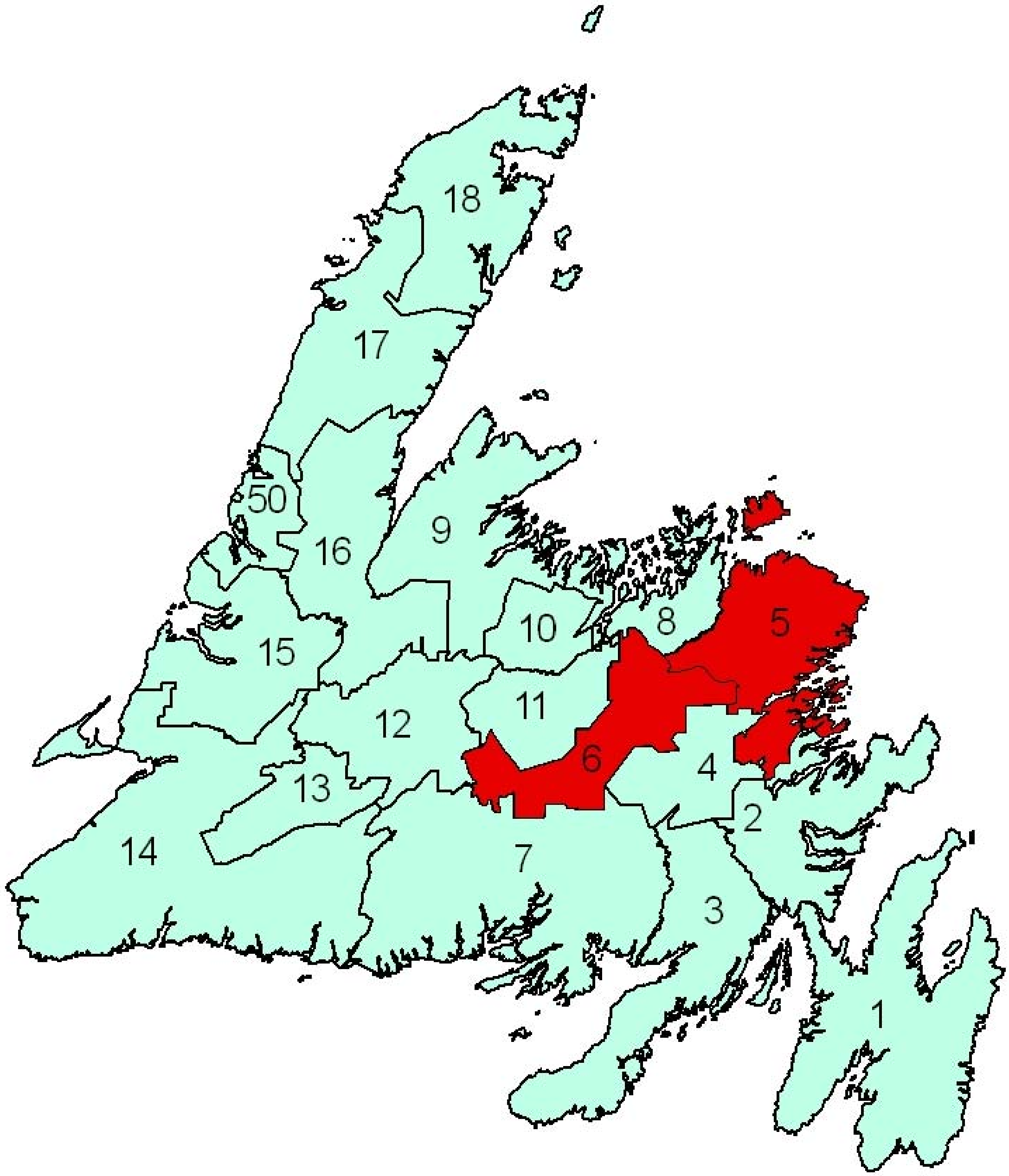


Figure 1 Location of Planning Zone 3

1.1.1. District Boundaries

Forest Management District 4, known as the Terra Nova Management District, basically encompasses both the Terra Nova and Gambo River watersheds. Its boundaries follow tenure lines north of Mint Brook to the south shore of Gambo Pond, then extends south (including Terra Nova Lake) to the Bay Du Nord Wilderness Area, and continues as far west as Little Gander Pond. The western boundary generally follows a northeasterly direction passing just east of Dead Wolf Pond to a point near the headwaters of Mint Brook. The district also includes Kepenkeck Lake, Lake St John and Deer Pond. District 4 has a total gross area of 297,147 hectares, and a total productive forest area of approximately 82,785 hectares.

Forest Management District 5, known as the Bonavista North Management District, is located on the north side of Bonavista Bay. Its boundaries include the Gander River to the west and Gander Lake, Gambo Pond, and Terra Nova Lake to the south. To the east, the district is marked by Bonavista Bay and Terra Nova National Park. To the north, it ends at the Atlantic Ocean. The district also includes Fogo Island. District 5 has a total gross area of 581,040 hectares, and a total productive forest area of approximately 214,254 hectares.

Forest Management District 6 commonly referred to as the Glenwood Management District includes that parcel of land extending generally south and southwest of Gander Lake and the TCH to Great Gull Lake. The southern boundary extends from Great Gull Lake, west to Sitdown Pond and Great Burnt Lake. The western boundary extends through the headwaters of Great Rattling Brook northeast to the Bay D=Espoir Highway near Miguel=s Lake, and then continues on passing just south of Crowe Lake through to the TCH near Notre Dame Junction. District 6 has a total gross area of 408,098 hectares, and a total productive forest area of approximately 152,818 hectares.

Forest Management District 8, also referred to as the Exploits Bay Management District, is located on the northeast coast, covering the geographical area, which can generally be defined as that located north of the former Canadian National Railway line (491 latitude) between the Gander River in the east and Seal Bay in the west. The northern boundary extends into Notre

Dame Bay to include Twillingate, New World Island, Change Islands and Exploits Island, along with many other smaller islands. Major communities within the district are primarily located along the coast with population centers around Gander Bay, Twillingate - New World Island, Birchy Bay, Lewisporte, Norris Arm, Botwood and Point Leamington. District 8 has a total gross area of 283,000 hectares, and a total productive forest area of approximately 162,474 hectares. The boundaries for these districts were originally proclaimed in Newfoundland Regulation 72/79 and filed on May 18, 1979 and revised under Consolidated Newfoundland Regulation 777/96.

The District 4 and 5 headquarters is located in the town of Gambo, while District 6 and 8 fall under the jurisdiction of District Office in Lewisporte. There are also satellite field offices in Gander, Wing=s Point and Northern Arm. Administration of forest management activities in Districts 4 and 6 is shared between the district offices at Gambo, Clarenville, Lewisporte, and Bishop=s Falls.

1.1.2 History

With the exception of Gander, the major communities within the planning area were built around the fishery, the railway and lumbering. Approximately 62,200 people live here and most are located in communities of various sizes that follow the coastline; however, the largest, single concentration is found inland at Gander where the population is around 9,500.

These districts have a history, which is both rich and varied. In District 5, Gander=s existence stems from the need of a stopover point for transatlantic flights in the mid 1930s. Its development took on major importance during World War II when, because of the town=s strategic location, as many as 10,000 military personnel were stationed there. Still, in spite of its contribution on the global and local scene, the Town of Gander was not established until 1951. This is a stark contrast to centers like Fogo Island which were used in the 16th and 17th centuries as French, Spanish, and Portuguese summer fishing stations, and which began to be settled around 1680. The Wesleyville-Badgers Quay area is the birthplace of many great sealing captains. Gambo, whose heyday centered on the now defunct Newfoundland railway, is the birthplace of the last Father of Confederation, the late Premier Joseph R. Smallwood. Gambo was also the site of extensive lumbering activities in the 1800's.

Another noteworthy railway and lumbering town in the region is Terra Nova. The Terra Nova River watershed, which essentially constitutes District 4, was extensively logged for pulpwood and lumber during the 1940's and 50's. The timber limits associated with most of that district were originally secured by Norwegian developers, who in 1920, started construction on a sulphite pulpmill at Glovertown. Devaluation of the Norwegian Kroner disrupted the financing of the project and it was eventually abandoned (Munro, J.A., 1978). Subsequently, the Anglo-Newfoundland Development Company (the predecessor of Abitibi) obtained the rights to the Terra Nova limits in 1923 to support an expansion of the Grand Falls mill.

District 6, which encompasses the watershed of both the Northwest and Southwest Gander Rivers and the area immediately adjacent to Glenwood, has a similar history. While the Corner Brook mill was still under construction, the Reid Newfoundland Company was also trying to promote a newsprint mill on the Gander River (Munro, J.A., 1978). The Gander Valley Power and Paper Company Limited was formed by the Reids and the most of the area which constitutes District 6 was conferred along with water power rights by the government in 1924.The Hearst publishing organization in the United States was involved with the financing and had tentatively agreed to take the full output of the mill. This deal fell through and eventually the Reids negotiated a deal which allowed the Bowater interests in England to acquire the Gander Valley and other properties for the Corner Brook mill in 1938, in what became known as the AGander Deal@.

As with most areas of rural Newfoundland, historical settlement of communities in District 8 developed around the fishing and shipping industries. The community of Twillingate recorded settlers as early as 1700, making it one of the Province=s oldest seaports. During the early 1900's, Campbellton was an industrial town with a lumber mill, pulp mill and its own miniature railway. Over the past 30 years, commercial forestry activities have increased to the point where they now account for a significant portion of employment in the area. Small scale farming is carried out in the Comfort Cove, Laurenceton and Northern Arm areas, while Lewisporte, the largest community in the district, is a service town with a large wholesale distribution center. It is also a main port for the coastal service to Labrador.

There is not much doubt that the four districts have strong ties to the development of the forest industry in Newfoundland. In more recent years the infrastructure, especially the network of forest access roads originally used to support the logging industry, is cited as an important component of other industry developments such as hunting and fishing.

1.1.3 Ownership

There are three major ownerships in the zone; Crown, Corner Brook Pulp and Paper Limited (CBPPL) and Abitibi Consolidated Incorporated (ACI) (Figure 2). Crown land accounts for 41 percent of the area and is located around the extremities of the zone near the coast, stretching from Lewisporte to Gambo. CBPPL limits accounts for 37 percent of the area located mostly in the middle of the zone around Gander Lake and down the Baie D'Despoir Highway. ACI limits account for 20 percent of the area, with the remainder in small pockets of other lands.

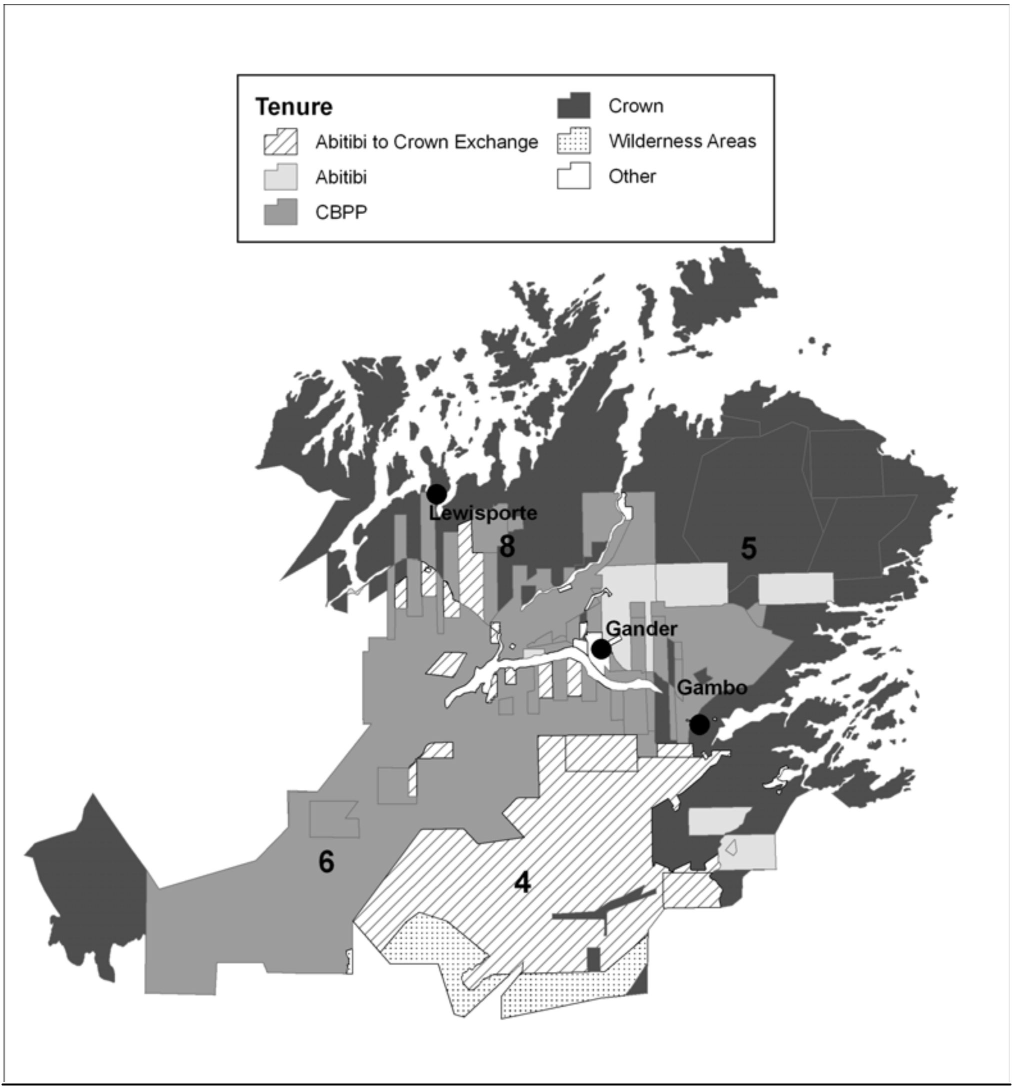


Figure 2 Ownership Map of Zone 3

1.2 Physical

The planning zone is a large area covering much of northeastern Newfoundland. Physical features vary a great deal over such a large landscape. The following descriptions apply generally to the Districts in the planning area.

1.2.1 Topography and Hydrology

Planning Zone 3 contains a diversity of terrain types. The area has generally rolling topography dissected by several large valleys, including Southwest Gander River, Northwest Gander River and Gander River valleys. These rolling hills are commonly between 100 and 200 metres (asl), and rarely extending above 300 metres (asl). Hillsides drop steeply into the major valleys. A broad lowland, below 100 m elevation, is found between the Exploits River and Botwood, and north of Norris Arm. The area has an extensive coastline dominated by bedrock with scattered pocket beaches. Another exception is the area west of Wesleyville, which is generally low relief lowland (less than 100 m asl) dominated by numerous lakes and wetland areas.

The physiography is largely controlled by bedrock structure, shown by the numerous southwest-northeast trending valleys, lakes and ridges. Hills are commonly orientated northeastward, reflecting bedrock lineations. The highest point in the management area is Mount Peyton (482 m asl) near Glenwood in District 6.

This region contains one of the largest lakes in the province; Gander Lake. The lake is 47 km long, an average of 2.0 km wide, has a surface area of 11,200 ha (EDM et. al., 1996), and a surface elevation of 25m asl. A bathymetry survey of the lake was completed in 1995 during the development of a watershed management plan for the Gander Lake Watershed Monitoring Committee (EDM et.al., 1996). Soundings in the Fifteen Mile Brook area recorded depths of 274 m (249 m below present sea level) and depths of 250 m off Little Harbour, decreasing to 60 m off King=s point and 27 m at the extreme eastern end of the lake. The field survey confirmed the maximum Lake depth at 290 metres.

In general, the drainage of the planning area is in a northerly direction and is characteristically poor with many large peat bogs throughout. The main rivers are the Gander, Gambo, Campbellton, and Terra Nova. Other rivers (Indian Bay, Dog Bay and Ragged Harbour), while smaller in size, drain large watersheds. In the past, many of these rivers were important transportation routes for water-driven sawlogs and pulpwood. This is evident by the remnants of a number of large dams as well as the occasional man-made channel.

1.2.2 Geology

The area was completely glaciated during the last glacial period (Late Wisconsinan). Surficial geology mapping has been completed on parts of the area at scales of 1:50 000 (Batterson, 1991, 1999a,b; Mackenzie, 1993; Munro, M., 1993) and 1:250 000 (Liverman and Taylor, 1993, 1994a,b). Mapping of ice flow indicators identify three major flows. Early ice flow was eastward from a source in the Long Range Mountains, and subsequently by north to northeastward flowing ice from the main Newfoundland ice center.

This region shows abundant evidence of glacial activity, and is dominated by areas of bedrock and till. Bedrock that comprises much of the coastal area and the higher ground is smoothed, commonly showing roche moutonée forms. Drumlins are found at the head of Lewisporte Harbour, and crag-and-tail hills are found south of Loon Bay. Areas adjacent to the coast show large area of bedrock exposure, particularly west of Wesleyville and north of Gander. Much of the area is covered by glacial till, commonly as a veneer (less than 1.5 m thick) or as a blanket (thicker than 1.5 m). Rogen moraines, oriented perpendicular to flow, are generally rare, although some are found in the Island PondBDans Pond area and near Sunday Pond and Frozen Ocean Lake These were deposited by north to northeastward flowing ice, consistent with the regional ice flow direction.

The valleys of the lowlands were the main channels for meltwaters created by retreating ice. In these valleys are found the glaciofluvial landforms of terraces eskers, kames and valley trains. Gander Lake was likely a conduit for local ice flow. Ice contact gravel and eskers at the eastern end of the lake show that ice flowed through this area and into the sea at Freshwater Bay. Eskers are also found in the Caribou Lake area south of Gander Lake the Mint Brook area near Gambo and the Terra Nova area.

Areas of non-glacial sediment are generally confined to the valleys. The Great Rattling Brook, Southwest Gander River, Northwest Gander River and Gander River valleys all contain moderately to well sorted, stratified, sand and gravel deposited in a glaciofluvial or fluvial environment. These systems were the routes of meltwater during deglaciation. The Southwest and Northwest Gander River valleys are up to 6 km wide, with flat valley floors. They contain sand and gravel deposited by glaciofluvial outwash. Some sediment has been reworked by the present channel into an alluvial plain up to 1 km wide. Meltwater outflow from the Southwest Gander, Careless Brook valley and from the Northwest Gander River valley flowed northward through The Outflow into the modern Gander River valley.

Evidence of higher water levels was found in the Gander Lake valley (Batterson and Vatcher, 1991). Beach sediments up to 39 m above Gander Lake have been identified. It is possible that higher water levels were the result of marine incursion. Raised marine features on the coast have not been examined in detail, but Munro and Catto (1993) reports Late Wisconsinan marine limits near Carmanville on the north coast at 43 m asl. Marine limit at the coast at the eastern end of the lake has been reported at about 30 m asl (Jenness, 1960; Grant, 1980). Undated marine shells have also been reported from the Gander River valley, north of Gander Lake. Higher water levels drained through the modern Gander River valley.

During the Holocene, organic deposits developed in the poorer drained areas, and colluvial deposits formed at the base of the steeper slopes. Both these processes continue today, although vegetated slopes have retarded the rate of colluviation.

1.2.3 Bedrock Geology

Districts 4, 5, 6 and 8 straddle three technostratigraphic zones of the Newfoundland Appalachians. These are, from east to west, the Avalon, Gander and Dunnage zones (Govt of NL, 1987).

The Avalon Zone lies in District 5 east of a line drawn from Terra Nova Lake northward to the Dover area. This zone is characterized by thick successions of upper Precambrian volcanic, plutonic and sedimentary rocks that are overlain by fossiliferous mudstone, quartzite, limestone and shale of Cambrian age. These various rock types are well exposed in the areas around Bonavista Bay. Granitic and gabbroic rocks of late Precambrian age occur east of Traytown. Granitic rocks of Devonian age occur in the Terra Nova Lake area.

The Gander Zone lies in parts of all four districts. Its western boundary lies roughly along a line that extends from Great Gull Lake northeastward to the Ragged Harbour area. The western part of the Gander Zone consists of a thick sequence of quartz greywacke, quartzite, siltstone and shale. This grades eastward into metamorphic rocks consisting of schist, gneiss and migmatite. These rocks were intruded by massive and foliated biotite granites and by massive and foliated two-mica, garnet-bearing granites. The age of the sedimentary and metamorphic rocks is early Ordovician and older. The granitic rocks are as young as Devonian.

The Dunnage Zone is situated in the western part of District 5 and covers most of Districts 6 and 8. A thin sliver of Dunnage Zone rocks is located in District 4. Rocks within the Dunnage Zone are composed of Ordovician marine mafic volcanic, intrusive and sedimentary rocks that represent remnants of oceanic crust. These are overlain by oceanic basalts and subaerial felsic volcanic rocks. The volcanics are interlayered with and grade laterally into clastic sedimentary rocks. As is the case in the other zones, intrusive rocks of middle Paleozoic age intrude rocks of the Dunnage Zone and consist of granite, granodiorite, diorite and gabbro.

1.2.3 Soils

Portions of the districts have been surveyed with respect to soil profile but information is lacking in other areas, particularly near the coast. A soil survey was conducted in the Gander - Gambo area and the following information relates to that location. The remainder of the districts should not vary greatly with regard to these soil types due to similar parent materials mentioned above (Wells and Heringa, 1972).

The survey concluded that the soils developed from glacial till. These include mainly ground terrain deposits ranging from a few inches to over 20 feet thick and are composed largely of material derived from locally underlying rock. Podzolic soils are the main soils in the area with some orthic gleysols, which are characterized by the lack of aeration and poor drainage.

There are some large areas of organic soils, which may be broadly divided by the degree of decomposition and the vegetation apparent on the site. Sphagnum peat is the predominant type of organic deposit. Other types of organic soils found in the districts would be ericaceous peat and muck peat, both of which are less shallow in depth when compared to sphagnum peat.

In relation to tree growth, the podzolic soils support the following species: black spruce - *Picea mariana* (Mill.) B.S.P.; balsam fir - *Abies balsamea* (L.) Mill; white birch - *Betula papyrifera* (Marsh); and others of lesser importance than the three mentioned. The orthic gleysols support mostly black spruce, the growth of which is somewhat retarded due to the lack of available nutrients. Little, if any, tree growth is supported by the organic soils. The organic mucks support some vegetation depending on growth. Some shallow mucks occur on lower slopes under mixed forest and alder.

1.2.4 Climate

The climate of the four districts can be broken down into two main categories, in accordance with the two larger ecoregions of this area. The Central Newfoundland Ecoregion has the most continental climate on the island. As a result it has the warmest summers and the coldest winters. The mean daily temperatures for July and February are $^{+}15^{o}$C to $^{+}16^{o}$C and $^{-}4^{o}$C to $^{-}8^{o}$C, respectively. The precipitation ranges from 900 mm to 1300 mm annually with 3.0 m to 5.3 m of snowfall. This ecoregion also has the least wind and fog for the island. Due to the warm summers and the highest rates of evapo-transpiration, the soil moisture in this area is considered one of the driest on the island. A result of this is the high frequency of fire in this ecoregion due to its summer dryness. The North Shore Ecoregion has the warmest summers of all the coastal regions on the island, and the winters are cool. The mean July temperatures range from $^{+}15^{o}$C to $^{+}16^{o}$C, while the February mean temperatures range from $^{-}5^{o}$C to $^{-}7^{o}$C. The precipitation for this area is between 900 mm and 1200 mm with snowfall amounts ranging from 2.5 m to 3.5 m. Due to its exposure, the high winds and high summer temperatures the high evapo-transpiration rates cause the soil in this ecoregion to be the driest for the island. This region is also influenced by the cold Labrador Current flowing from the north, especially with its pack ice in the spring. This causes the growing season to be delayed when the ice is heavy. For additional information about the climate of the four districts refer to Meades and Moores, (1994).

1.3 Ecosystems

An ecosystem is a community of interacting and interdependent plants, animals and microorganisms, together with the physical environment within which they exist. 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.

1.3.1 Forest Ecosystems

A forest ecosystem, as the term implies, is an ecosystem dominated by tree cover. At the coarsest level, the forests of Planning Zone 3, 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 phenomenon 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 favored this fire-adapted species. In western Newfoundland the climate is somewhat moister and fires are far fewer in this region resulting in the ascendance of balsam fir, a species that is poorly adapted to fire.

Like the rest of the Province, the forests of Planning Zone 3 (Districts 4, 5, 6 and 8) are part of the larger boreal forest ecosystem. The morainal areas, which are extensive in Zone 3 support, closed stands of conifers, largely black and white spruce *Picea mariana* (Mill.) B.S.P. and *Picea glauca* (Moench Voss), balsam fir *Abies balsamea* (L.) Mill. and tamarack *Larix laricina* (Du Roi) K. Koch. Broadleaf trees, such as white birch *Betula papyrifera* (Marsh.) occur in pure stands on richer soils, but it and trembling aspen *Populus tremuloides* (Michx.) are more prevalent in mixtures with the other conifers. Other needle-leaf trees, notably white pine *Pinus strobus* L. occur in spots scattered throughout the forest while Red pine *Pinus resinosa* (Alt.) is considered rare as it is only found in four separate natural stands located in the Gambo-Glovertown area and two very small stands in District 8.

Soils of the boreal forests in District 4, 5, 6 & 8 are predominantly classed as podzols although brunisols are also present. Throughout the contrasting areas of exposed bedrock, morainal deposits and low lying sphagnum bogs, this mosaic of soils and non-soils tends to be occupied by a range of plant communities dominated by lichens, shrubs and forbs.

Climatic conditions of this region are heavily influenced by the proximity to cold Arctic air masses and the Labrador Current in the north and warm moist air and the Gulf Stream in the south. The interaction of these phenomena results in moderate annual precipitation, high evapotranspiration rates during warm summers and overall the most continental climate on the Island of Newfoundland; with the warmest summers, coldest winters and the least wind and fog.

The primary natural disturbance factors attributed to boreal forests are fire and insects. Forest fires are frequent and extensive in north-central Newfoundland and result in specific successional trends depending on site type. More often than not, the spruce component is increased following fire, whereas other disturbance types such as insects and cutting often results in an increase in the fir component. Repeated burning and cutting of dry, coarse-textured black spruce-feather moss site types can result in ericaceous species such as sheep laurel *Kalmia angustifolia* invading the site to produce heath-like conditions. Successional patterns on other forest cover types vary with site and type of disturbance. These are discussed in greater detail in subsequent sections of this report.

Forest development class, successional pattern and site influence the understory plant community present throughout the district. The species composition and structure of these plants significantly impact on the suitability of a site as wildlife habitat for various species. Some animals are very general in terms of habitat requirements and can occupy a wide range of site conditions, yet have specific seasonal requirements that can determine habitat quality. For example, the moose requires wintering areas with suitable combinations of available cover and browse. It is widely accepted that a variety of forest age classes can provide increased habitat and sustainability for many wildlife species. On the other hand, some species require a specific age class or habitat condition to maintain healthy populations (e.g., Newfoundland marten (*Martes americana atrata*)).

Aquatic ecosystems of the boreal forest are heavily dependant on forest cover for temperature regulation, nutrient cycling and stream flow regulation. Consequently, forest harvesting activities adjacent to riparian areas are critical to sustainability of fish habitat and maintenance of fish migration routes. Suitability of various streams and ponds as waterfowl breeding, feeding and resting areas are also dependent on adjacent forest cover. Biological production in streams is based on a combination of internal and external nutrient and energy pathways. Streamside vegetation has a strong influence on both since they are so closely linked to surrounding terrestrial events. Small streams in forested areas receive much of their materials from the surrounding terrestrial ecosystem. Detritus in the form of needle and leaf litter, twigs and branches, forms the major energy base for consumer organisms. In highly shaded headwater streams, algae production is often low and yields only a small and seasonally variable contribution to the overall energy budget. As streams become larger further downstream, sufficient light penetrates the forest canopy, and consumer populations can take advantage of both particulate detritus and algae (Toews and Brownlee 1981). For these reasons, maintenance of suitable riparian zones for protection of aquatic ecosystems, as well as providing wildlife travel corridors is a primary consideration of any forest management strategy.

Major watersheds within the Zone include portions of the Gander River, Exploits River, Indian Arm Brook, Jumpers Brook, Ten Mile Lake, Big Lake, Campbellton River, Dog Bay River, Indian Bay River, Terra Nova River, Ragged Harbour River, Mint Brook and Traverse Brook. Many of these are associated with protected water supplies for communities within the districts. Small to medium sized lakes are common throughout the zone.

1.3.2. Ecoregions and Subregions

A hierarchical framework of ecological land classifications has been recognized for some time in most jurisdictions as a means of stratifying the earth into progressively smaller areas of increasingly uniform ecological units. In Canada, the Canadian Ecological Land Classification System (Wiken, 1986) provides for seven levels of examination or organization based on ecological principles. This system of classification is better suited than a classical forest inventory for use in an ecological approach to forest management. The seven categories are listed and described in the following table.

Table 1. Canadian Ecological Land Classification System

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

	geomophology, vegetation, water and fauna.	
ECOSECTION	A part of the ecodistrict throughout which there is a recurring pattern of terrain, soil, vegetation, water bodies and fauna.	1:250 000 1:50 000
ECOSITE	A part of the ecosection having a relatively uniform parent material, soil, hydrology, and chronosequence of vegetation.	1;250 000 1:50 000
ECOELEMENT	A part of ecosite displaying uniform soil, topographical, vegetative and hydrological characteristics.	1:10 000 1;2 500

Ecoregions and Subregions

With the evolution of an ecosystem approach to forest resource management, it would be advantageous to have a standard framework to classify combinations like general climate and regional physiography, as well as the other components of an ecosystem, into distinguishable regions. Fortunately, such a framework exists, in a publication entitled *Ecoregions and Subregions of Insular Newfoundland* (after Damman, 1983).

Damman defined ecoregions as areas where a 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 (Damman, 1979).

According to Damman, Newfoundland consist of nine ecoregions, which can be further divided into several subregions. Labrador has ten ecoregions. Each of the Newfoundland and Labrador 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.

Districts 4, 5, 6 and 8 contain four of the ecoregions outlined by Damman (1983). They are: II - Central Newfoundland Ecoregion (which contains IIA - the Northcentral Subregion); III - North

Shore Ecoregion; VII - Eastern Hyper-Oceanic Barrens Ecoregion and VI - Maritime Barrens Ecoregion (which contains VID - the Central Barrens Subregion). Of these, IIA contains the largest portion in the district. The following descriptions are taken from *Forest Site Classification Manual - A Field Guide to the Damman Forest Site Types of Newfoundland* (Meades and Moores, 1994).

1.3.2.1 The Central Newfoundland Ecoregion

The Central Newfoundland Ecoregion has the most continental climate in insular Newfoundland. It has the highest summer and lowest winter temperatures. Because of the warm summers and the high evapo-transpiration losses, soils in the northern section of this ecoregion have a soil moisture deficiency.

The *Hylocomium*-Balsam fir forest type occupies the zonal soils of this area. These soils are generally lighter in color and have a lower organic matter content compared to other ecoregions. Forest fires have had an important role in the natural history of this region. Many sites have been converted to black spruce, while white birch and trembling aspen occupy some of the richer sites.

The Central Newfoundland Ecoregion has four subregions: IIA - Northcentral Subregion; IIB - Red Indian Lake Subregion; IIC - Portage Pond Subregion; IID - Twillick Steady Subregion. Of these, only the Northcentral Subregion is found in District 4, 5, 6 and 8 and contains, by far, the largest area of land relative to the other three ecoregions.

Northcentral Subregion

This subregion has the highest maximum temperatures, lowest rainfall and highest forest fire frequency than anywhere else in Newfoundland. The subregion extends from Clarenville to Deer Lake with a mostly rolling topography of less than 200 meters (asl.). The history of fire is evident by the pure black spruce forest and trembling aspen stand that dominate the region.

1.3.2.2 Northshore Ecoregion

The less prevalent North Shore Ecoregion is essentially a 20-25 km wide coastal zone that extends from Bonavista Bay to the Baie Verte Peninsula. Here, a continuous forest of black spruce and balsam fir dominates except on the coastal headlands where barrens prevail. White spruce is more common here than in central Newfoundland. The quality of growth diminishes as you approach the coastline. There are no subregions in this ecoregion.

1.3.2.3 Eastern Hyper-Oceanic Barrens Ecoregion

This ecoregion occurs on the extreme south coast of the Avalon and Burin peninsulas and on the northeast coast near Bay de Verde and Cape Freels. Here, the extreme oceanic climate limits the development of forest other than Balsam Fir krummholz. The heaths in this ecoregion are similar to oceanic parts of northern Scotland and southern Norway. This ecoregion constitutes very little of the land mass contained within the planning area being limited to the extreme northeastern coastline in District 5.

1.3.2.4 Maritime Barrens Ecoregion

This ecoregion extends from the east coast of Newfoundland to the west coast through the south central portion of the island. It is characterized by relatively mild winters with intermittent snow cover and the coldest summers with frequent fog and strong winds. The dominant landscape pattern consists of usually stunted, almost pure stands of Balsam fir, broken by extensive open heathland. Good forest growth is localized on long slopes of a few protected valleys. The heaths are dominated by *Kalmia angustifolia* on protected slopes where snow accumulates and by cushions of *Empetrum nigrum*, or *Empetrum eamesii* on windswept ridges. The southern portions of Districts 4 and 6 extend into the northeastern extent of this ecoregion.

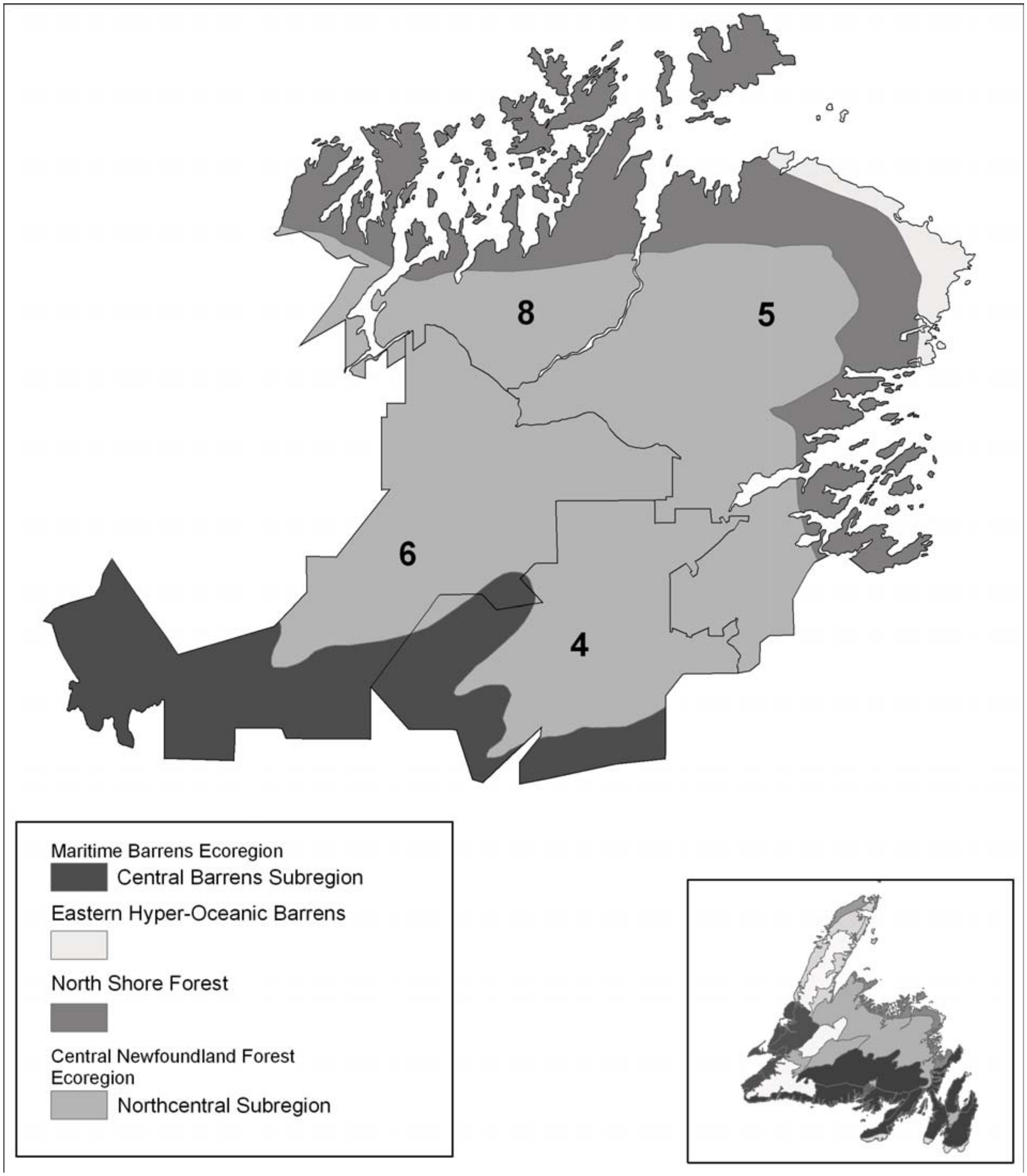


Figure 3 Ecoregions and subregions of Planning Zone 3.

1.4 Ecosystem Dynamics

1.4.1 Ecosystem Condition and Productivity

As with other parts of the Newfoundland and Labrador's boreal forest, those of Planning Zone 3 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.

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.

The following sections will discuss each of these concepts in more detail as they relate to the ecosystems of Planning Zone 3. 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 3 has approximately 50 percent productive forest. As well, the relative proportion of site types is 10 percent good, 70 percent medium and 20 percent poor with a mean annual increment (MAI) of 2.6, 1.7, and, 0.8 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. 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 6 and along the coast in District 5 the soils are shallower with bedrock at or near the surface. The terrain in much rougher and the growing season is shorter (130 as opposed to 160 days).

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 of 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. An 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 (eg. 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, site type, and ecoregion.

1.4.1.4.1 Harvesting

Regeneration patterns in the black spruce type after harvesting is generally back to the black spruce type with a minor component of balsam fir and some white birch on the better sites. There is a higher component of black spruce regeneration in the Central and Long Range Barrens Ecoregions (CLRBE) than in the Western and Northern Ecoregions (WNE). There is substantial regeneration failure in this forest type with average not sufficiently restocked (NSR) rates at 25 percent in CLRBE and 45 percent in WNE. Another general trend is that the poorer the site quality the higher the NSR rate. These sites would be candidates for planting with black, white, or Norway spruce. An exception to this trend occurs when the pre harvest crown density is class 2 or denser. On these areas, black spruce layering is prevalent and is responsible for the majority of stocking. In some instances where balsam fir does regenerate on black spruce sites it becomes very chlorotic at a young age and is highly susceptible to attack from the balsam woolly adelgid.

In the balsam fir types, regeneration success back to balsam fir is much higher averaging 75 percent in CLRBE and 85 percent in WNE. Regeneration rates to balsam fir are higher on the poor sites and fall off somewhat as site quality increases. There is also some regeneration to black spruce and softwood hardwood mixed wood types with the former being more prevalent in the CLRBE. Regeneration failure is relative constant across all ecoregion types at 10 percent.

Regeneration pattern in the mixed wood types is generally back to mixed wood that is dominated by balsam fir and white birch. In the CLRBE there is a larger component of black spruce regeneration after harvesting than in the WNE. 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 highest in poor sites and lowest on the better sites.

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

Since black spruce is a fire adapted species, it is not surprising that it 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 white birch. Balsam fir is conspicuously absent after fir because most advanced regeneration in the under story is killed by the fire. Black spruce regeneration is somewhat correlated with the amount present in the pre fire stand. Generally, the higher the component of black spruce in the original stand, the higher the percentage of regeneration to black spruce. In mixed wood stands a higher component of white birch and sometimes trembling aspen is present after fire. Fire in pure hardwood stands can sometimes regenerate to trembling aspen in certain areas. Regeneration failure after fire is on average 20 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, balsam woolly adelgid, balsam fir sawfly, 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 particularly 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 microorganisms 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 microorganisms. 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 wiped out.

Biodiversity provides such essential services for humans as climate control, oxygen production, and purification of freshwater supplies, 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 microorganisms capable of producing fertile offspring. An example would be all breeds of domesticated dogs are of the same species, while dogs and cats are members of different species. 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 Landscape 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, microorganisms 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. One unique aspect of landscape diversity is the presence of an old growth forest in the northern part of District 6.

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 propagules.

Old-growth forests are best understood within the general context of forest disturbance. Disturbance is ubiquitous in forest ecosystems and may be defined as any relatively discrete event in time that disrupts ecosystems, community or population structure and changes resources, substrate availability, or the physical environment. Disturbances occur over a wide range of spatial and temporal scales and normally interact one with the other to produce the complexity of forest types found across our landscapes.

The structure of the boreal forest is generally affected by large-scale, stand initiating events such as fire, insect and wind disturbances. Wildfire is paramount in controlling the dynamics of the drier, continental boreal forests of western Canada and Alaska. In Newfoundland, fire tends to be important in the forests of central Newfoundland, characterized as it is by a continental climate.

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 fir-spruce forests will self-perpetuate through small-scale gap dynamics in the absence of large-scale disturbance. The dominant disturbance regime is fungal related as root and butt rots become the primary agents of tree death. Trees weakened by root and butt rots are susceptible to stem breakage and wind throw. Thus, disturbance in old-growth forests occurs on a single tree or multiple tree level with an upper limit of approximately 200 m^2 for the majority of gaps. Established advance regeneration is able to respond to the increased growing space afforded by the death of one or several canopy trees and will release into the canopy. Such micro-scale disturbance occurring randomly throughout the forest produces a situation of long-form forest continuity and structurally complex stands.

Old-growth conditions in the Canadian boreal forest are rare or uncommon. This is understandable given the ubiquity of landscape-level fires and recurrent insect outbreaks. As well, logging is becoming an increasingly significant disturbance factor in the boreal forests. Theoretically, boreal forests not disturbed by fire, insect or wind disturbance for long periods of time will revert to multi-cohort, self-perpetuating, gap-driven forests. This is particularly true in the boreal forests of eastern Canada, especially those forests that experience significant oceanic influence and an absence of landscape-level fires and insect epidemics.

Old-growth balsam fir-spruce forests occur in Management District 6, principally in the Main River 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 6 represent important landscape-level biodiversity for the Island of Newfoundland.

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 3. The total mapped land area in the zone is approximately 1.6 million hectares. 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 breakouts 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.

The distribution of this land in each of Districts 4, 5, and 6 is shown in the Table 2, below. The productive forest land base is divided among seven ownerships: Corner Brook Pulp and Paper Ltd (C.B.P.P.), Abitibi-Consolidated Inc. (A.-C.), Provincial Crown (Crown.), Federal Crown, Municipal Crown, Private Land, and Provincial Parks. The four Districts have a total productive forestland of approximately 458 800 ha.

Table 2. Breakdown of area in hectares by tenure owner for Districts 4, 5, 6 and 8.

	C.B.P.P.		**A.-C.**		**Crown**		**Other***		**Total**
District	Area	%	Area	%	Area	%	Area	%	**Area**
4	N/A	N/A	80,479	*92*	2,378	*3*	4,722	*5*	87,579
05	56,905	*28*	28,383	*14*	112,267	*56*	4,718	*2*	202,274
6	148,000	*88*	12,100	*7*	8,761	*5*	67	*#1*	168,927
8	23,611	*14*	3,904	2	134,959	*81*	3,262	*2*	165,736
Total	228,516	*37*	124,866	*20*	258,365	*41*	12,769	*2*	624,516

Other* *Consists of Federal Crown, Municipal Crown, Private Land, and Provincial Parks. These owners make up a small percentage of the land base and were grouped together as a result.*

As Table 2 illustrates, the three principle land tenures consist of Corner Brook Pulp and Paper, Abitibi-Consolidated, and Provincial Crown. As a group, they control 95 % of the productive forestland in District 4, 98 % in District 5, 99 % in District 6 and District 8.

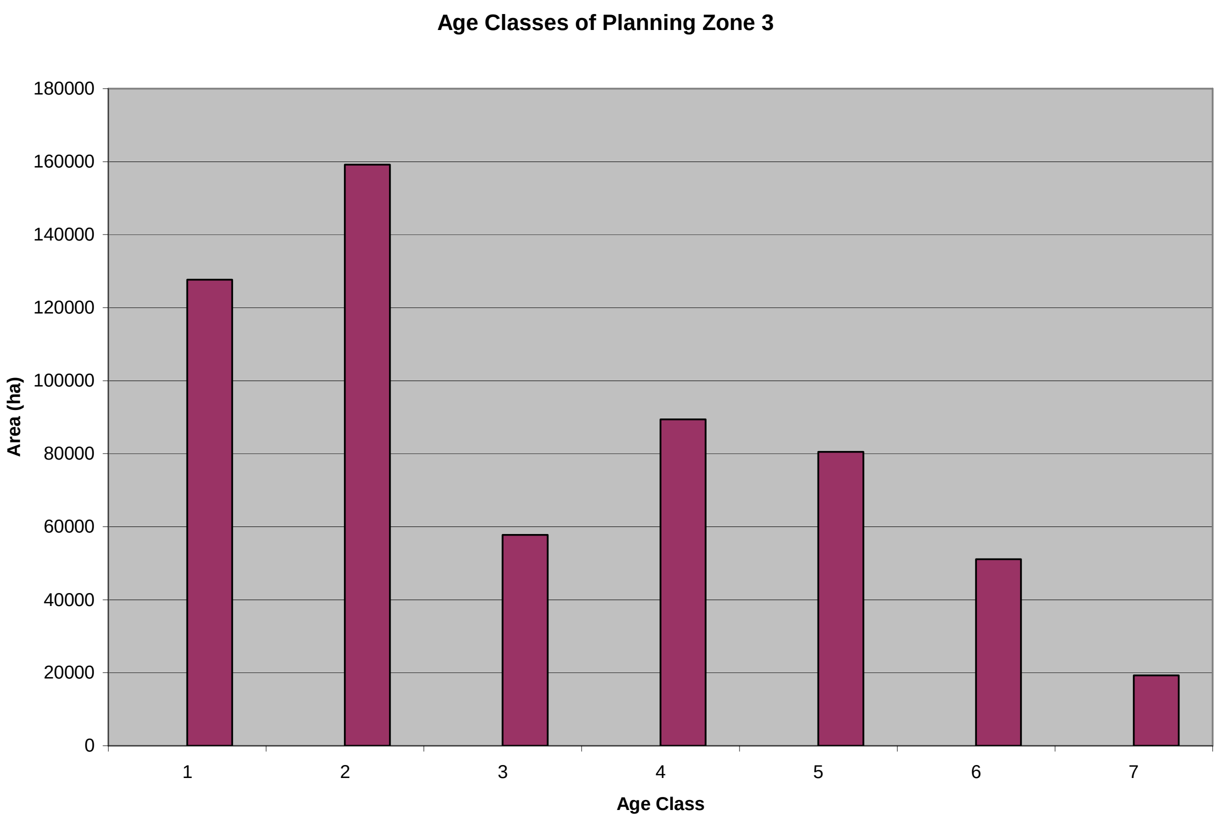
1.5.2 Age Class

Individual tree ages in a stand can all be the same after disturbance such as fire or harvesting; however in most cases the ages vary. Forest managers describe stand ages in terms of age classes, which generally encompass 20 years. The age classes present in the zone are:

Class	**Age (years)**	
1	0 - 20	regenerating
2	21 – 40	immature
3	41 – 60	semi-mature
4	61 – 80	mature
5	81 - 100	over mature
6	100 - 120	“
7	120 +	“

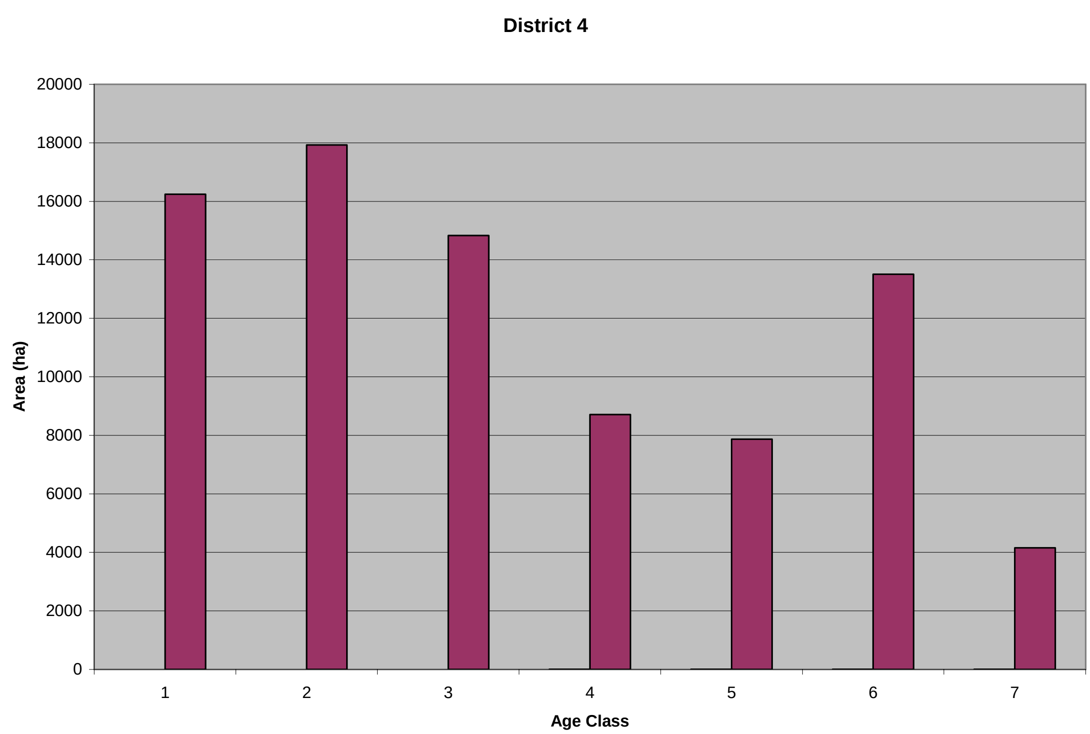
The combined age class distribution in each district for the entire productive forest is shown in Figures 4 ,5 and 6. In general terms, the more balanced the age class distribution in a district, the higher the potential for an even flow sustained harvest of timber, because continuous timber supply is limited by the age class with the lowest frequency of occurrence. A balanced age distribution in the forest would also allow for the highest biodiversity by making habitat available at all stages of development, with the equivalent proportions of the forest to moving from one stage of development to the next over time. This would result in an ongoing renewal of habitat.

Figure 4



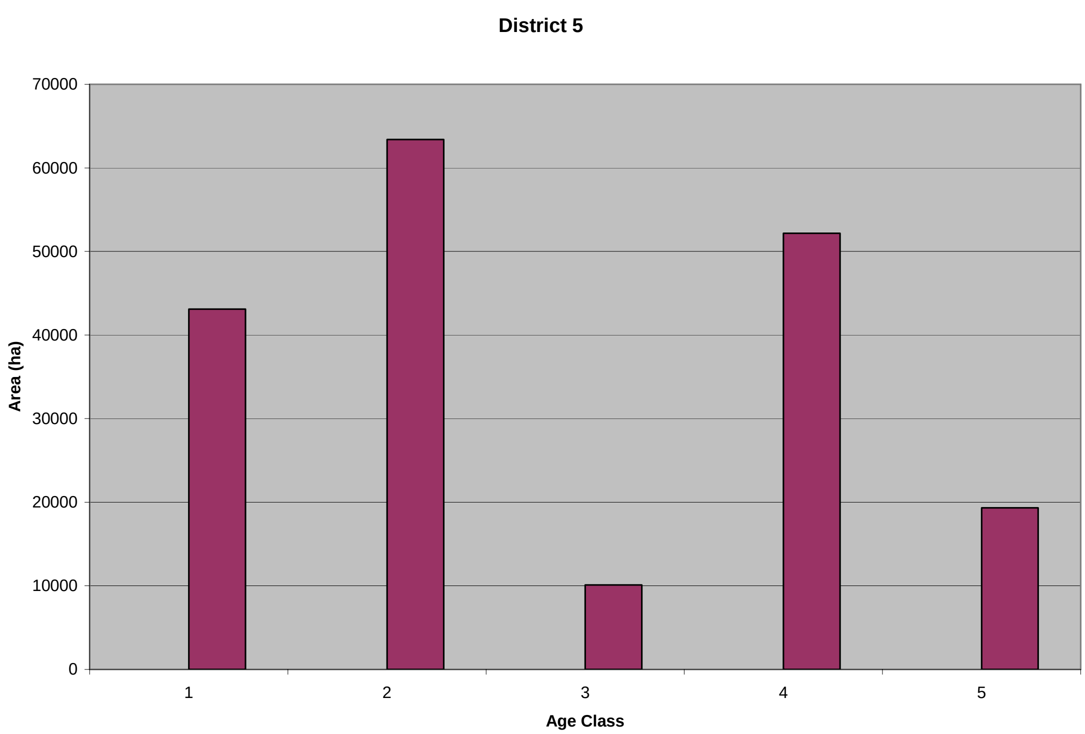
For District 4, Figure 5 shows how the different levels of forest development are represented. As illustrated, the age class structure for the district is basically even-aged in that most of the trees have ages that generally do not span more than 60 years. Currently, Class 5+ represents the most area at 31%. This is followed by Class 2 at 22%, Class 1 at 20%, Class 3 at 18%, and Class 4 at 10%. The imbalance of the District age class distribution causes the various timber owners to rely heavily on Class 5 for their commercial wood supplies (which are the oldest). As each year passes, there is a higher potential for overmature trees to be lost to mortality, resulting in less of the resource being available, from a timber production perspective. The management scheme accepted by the Newfoundland Forest Service is to harvest the oldest stands first. In the case of District 4, this will represent a large amount of the harvest for the next 20-40 years because of the limited amount of area in Class 3 and 4 of the current age class structure. Age Class 5+ will have to support both commercial and domestic harvests (with some inputs from Class 4 and even less from Class 3) over the next 20-year cycle. By that time even less fiber will be available in what is currently Class 5+, because of the heavy reliance for harvesting and additional losses due to mortality. Some of the effects of the reliance on Class 5 as a timber source may be reduced by the help of silviculture (primarily thinning, and to a lesser degree, but still important, a program of planting). The thinning will help selected trees reach a merchantable size in a shorter period of time by utilizing resources once taken in by trees before they were thinned out.

Figure 5 Age Class Distribution District 4



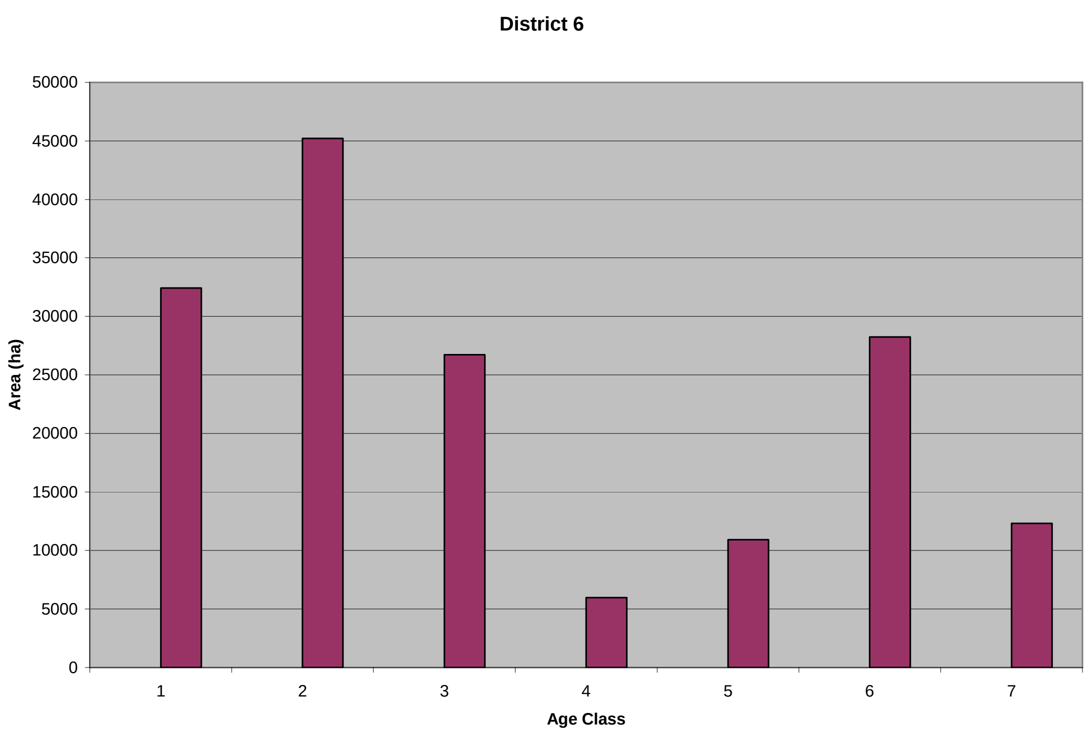
District 5 does not have a balanced aged class structure (Figure XX), as is the goal to maximize sustainable harvest levels. The breakdown for age class for District 5 is as follows: Class 2 (34%), followed by Class 4 (28%), followed by Class 1 (23%), followed by Class 5 (10%), and finally Class 3 (3%). Again, a similar situation is presented here when compared to District 4. The bulk of the area is available in Class 4 with just under half as much in Class 5. With the Aoldest first@ management policy, Class 5 should be able to support some harvesting for commercial and domestic operations until Class 4 areas are needed. This Class 4 area should be able to support the drain when the age classes advance to the next development stage as the forest ages. This will provide more time for the development of the current Class 3 component. Following that, what is now Class 1 and 2 appear to be in capable of supporting current drain levels when the trees in these areas become merchantable. As with District 4, stands that have been thinned are hoped to lessen the impact when less area becomes available by reaching merchantable sizes at earlier ages. The Forest Service's management goal is to implement management strategies, which will ultimately result in balanced age class structure over a period of time (i.e. 1-2 rotations).

Figure 6 Age Class Distribution District 5



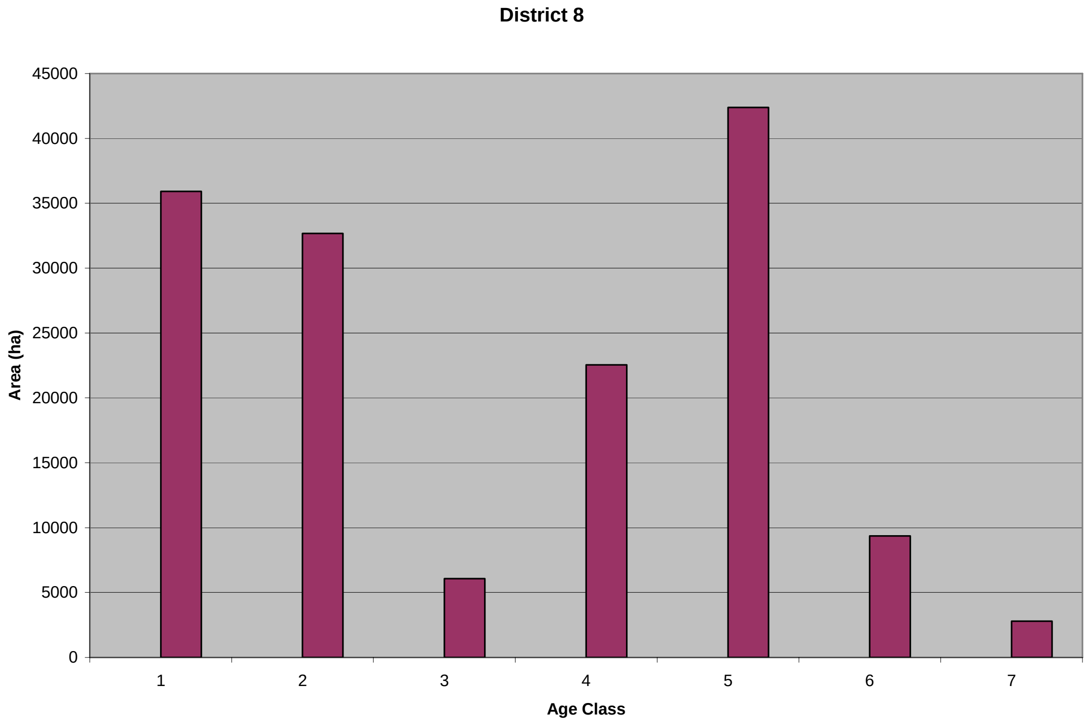
The age class structure for District 6 (Figure 7) indicates Class 5+ occupies the most area at 32%, Class 2 at 28%, Class 1 at 20%, Class 3 at 17%, and Class 4 occupying 4% of the productive forestland in the District. As in the two previous cases, District 6 does not have the desired age class structure for maximized sustainable harvest either. Figure 7 shows that District 6 has a similar age class structure to District 4, with the exception that District 6 has a larger land base. As a result, similar effects are expected to take place with regard to Class 5+ carrying much of the harvest requirements until trees in Class 2 become merchantable. This could be sooner if thinned areas produce as expected.

Figure 7 Age Class Distribution District 6



The present age class structure in District 8 is skewed as follows: Class 1 - 24 %; Class 2 -22%; Class 3 - 4%; Class 4 -15 % and Class 5+ - 36%(Figure 8). The major problem in this structure is the disproportionately low percentage of the forest in Class 3. The implication, for the medium term timber supply, of this shortfall is a significant reduction in the amount of available merchantable-size timber, once stands in the older age classes are either harvested or cycled through natural disturbance. It is projected that this will occur within the next 20 years. In order to achieve a regulated forest, it is fundamental that measures be taken to promote a balanced forest age class structure.

Figure 8 Age Class Distribution District 8



1.5.3 Site Class

The Newfoundland Forest Service has identified four site classes that refer to the potential of a given site to produce timber. These are high, good, medium and poor. The classes are based on a number of factors, some of which are soil type, moisture content, slope, and fertility. Site class is determined through air photo interpretation supplemented with field checks. The classes indicate the volume of wood fiber a site has the capability of producing under natural conditions by the time the trees reach their rotation age (which averages, generally, between 60 and 80 years depending on the species and the location). On average, good sites are capable of producing > 2.6 m3/ha/yr, medium sites 1.7 m3/ha/yr, and poor sites 0.8 m3/ha/yr.

The following table indicates the average potential in cubic meters per hectare for each site class at maturity (based on the provincial average).

Class	**m^3/ha**
High	200+
Good	150
Medium	120
Poor	80

The medium site class is by far the largest in the districts within Zone 3, holding 66% of the total productive area found in the three major landowners. The next largest class is poor (19%), followed by good (14%) and high (<1%). This pattern holds true, generally, for the individual landholders; however, Corner Brook Pulp and Paper has the largest area in the good site class. Figures 9 to 12 present the site class information in graphic form to show the levels of site class in each district.

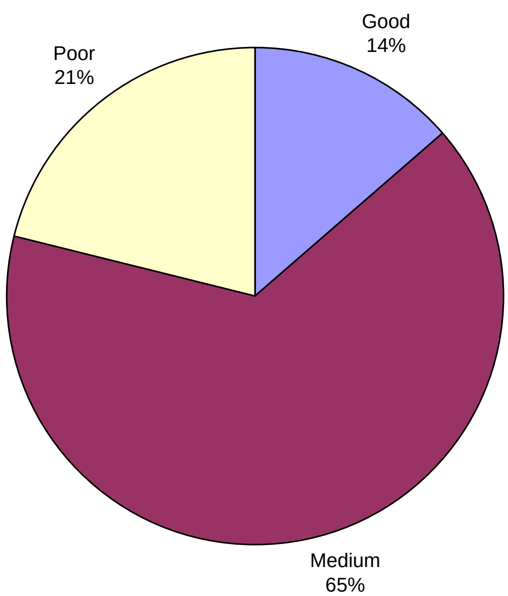


Figure 9. Site Classes for FMD 4

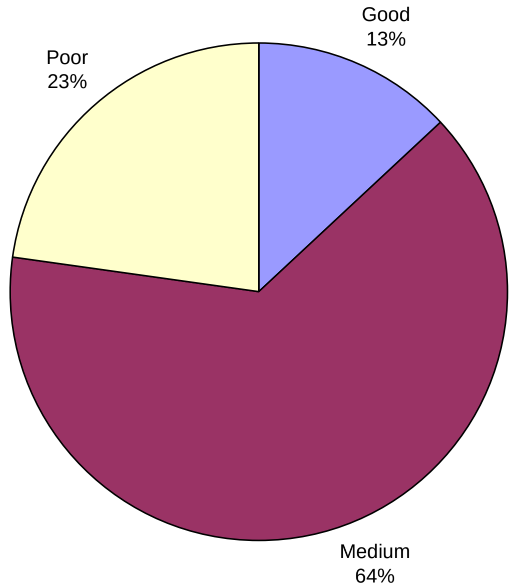


Figure 10. Site Classes for FMD 5

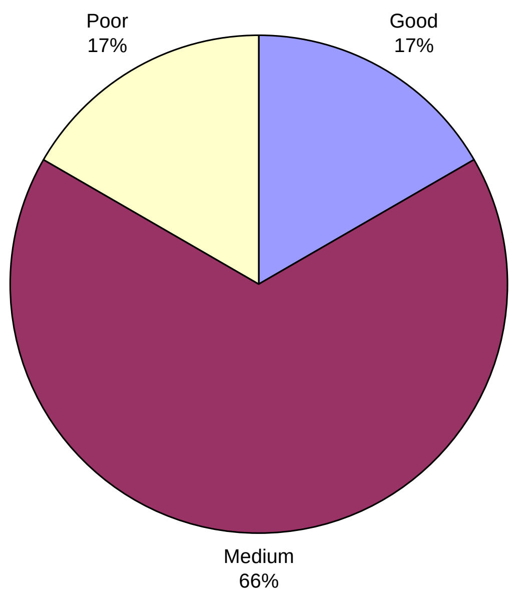


Figure 11. Site Classes for FMD 6

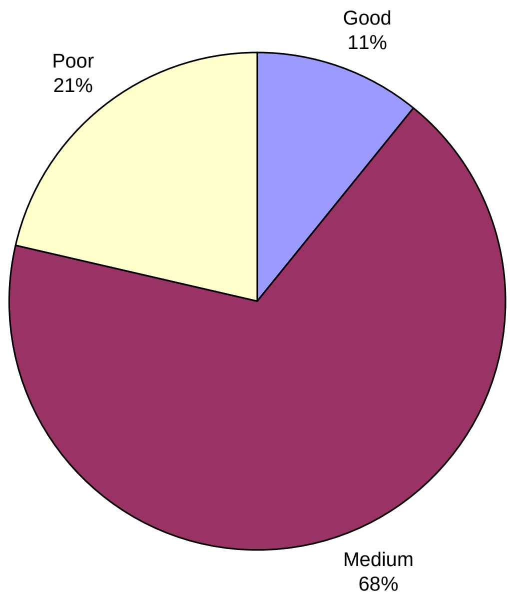


Figure 12. Site Classes for FMD 8

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.

There are twelve working groups within the four districts. In this zone, the softwood working groups dominate accounting for over 85 percent of the productive forest. The black spruce (bS) working group is by far the most prolific accounting for 60 percent of the working groups in Zone 3 (Table 3). Black spruce can occur as pure stands or in association with other species listed below. Balsam fir (bF) is the second most abundant accounting for 15 percent in the four districts. Balsam fir can occur in pure stands or in association with one or more of black spruce, white spruce, white birch, trembling aspen, or larch in varying species compositions.

Softwood/Hardwood and Hardwood/Softwood working groups occupy 10 and 4 percent of the productive forest area in Districts 4, 5, 6, & 8. These working groups occur as varying mixtures of fir, spruce, birch and aspen. The hardwood softwood (hS), and white birch (wB), trembling aspen (tA), white spruce (wS) and jack pine (jP) working groups occupy less than 10 percent of the productive forest in the four districts. Approximately 7 percent of the productive forest is classed as disturbed (NS). NS or not stocked include disturbances other than harvesting, which accounts for most of the total, insect damage, fire, wind throw, and flooding. The relative percentages hold true for all ownerships in all four districts.

The following provides a more detailed outline for some of the larger groups, with additional descriptions of the selected accompanying forest types, as described by Meades and Moores, 1994

Black Spruce - *Picea marina* (Mill.) B.S.P.

Within this working group there are three main forest types that characteristically represent black spruce. These include: black spruce forest, black spruce fen, and *kalmia*-black spruce forest.

A general description for the black spruce forest includes a forest that has a thick humus layer with mainly black spruce as the dominant tree species. The sites within this forest type have a wide range of moisture from dry to wet and the fertility ranges from very poor to rich. Because there is such a wide range in moisture and fertility, this forest type had to be broken down into six specific forest types. These include: *sphagnum*-black spruce, black spruce-feathermoss/bedrock, black spruce-feathermoss/very dry, black spruce-feathermoss/dry, black spruce-feathermoss/bog, and black spruce-feathermoss/moist. This forest type produces merchantable timber. Most of these forest types are common throughout the four districts.

The second forest type, black spruce-fen is characterized by an abundance of understory that is usually described as fertile but poorly drained. Due to this poor drainage the black spruce in this forest type are usually stunted. These forests are considered important wildlife and plant habitats because of the high fertility, and usually grow in open settings. As a result of the open grown, stunted trees, this forest type is not usually merchantable from a commercial harvesting perspective. This forest type is divided into two forest types: *carex*-black spruce and *osmunda*-black spruce, both of which are not common in the four districts.

The third forest type *kalmia*-black spruce represents a black spruce forest that is associated with bogs. The trees are open grown with black spruce as the dominant tree, which is usually stunted with abundant shrubs and mosses growing throughout its understory. These sites are normally infertile but range from dry to very moist. This forest type, because of small variations, can be broken down into four forest types: *nemopanthus-kalmia*Bblack spruce, *sphagnum-kalmia*-black spruce, *kalmia*-black spruce, and *cladonia-kalmia*-black spruce. These forest types are usually considered unmerchantable and are common throughout the districts.

All three of these forest types are the result of regeneration on areas burned a number of times over the years. The natural succession following fire in Newfoundland=s Boreal Forest is towards black spruce with limited amounts of certain pioneer species such as white birch and trembling aspen. Sites occupied by black spruce are usually away from river valleys and any flood plains in these valleys. Most black spruce occupy hillsides, ridges, and open barrens. Areas that are generally made up of rock outcrops contain black spruce as well.

Balsam Fir - *Abies balsamea (*L.) Mill.

Another major forest type is the balsam fir forest. In some districts of the province this type is the dominant species, but in District 4, 5,6 and 8 it is not. This species occupies sites that are usually fertile and moist but because these districts have a recurring history of fire, balsam fir cannot become established, as they do not naturally occupy burned areas. Due to the complexities of the balsam fir forest type, it can be divided into several types. These are: *equisetum-rubus*-balsam fir, *rubus*-balsam fir, *clintonia*-balsam fir, *taxus*-balsam fir, *dryopteris-hylocomium*-balsam fir, *dryopteris*-balsam fir, *dryopteris-rhytidiadelphus*-balsam fir, *dryopteris-lycopodium*-balsam fir, *hylocomium*-balsam fir, *gaultheria*-balsam fir, *pleurozium*-balsam fir, *carex*-balsam fir, and *sphagnum*-balsam fir. They normally occupy river valleys and flood plains as pure stands or mixed with hardwoods, along with side slopes to these valleys. This working group is not as prevalent as spruce in the four districts with many of the thirteen forest types not present. Some are found in limited locations throughout the four districts, which include: *rubus*-balsam fir, *dryopteris-lycopodium*-balsam fir, *hylocomium*-balsam fir, *pleurozium*-balsam fir, *carex*-balsam fir, and *sphagnum*-balsam fir. All balsam fir forest types have balsam fir as the main tree species, with white birch usually abundant throughout.

The *rubus*-balsam fir forest type is found in low to mid-sloped areas that are moist. This forest type has an abundant herb layer but is limited to certain types, which differentiate it from the *equisetum-rubus*-balsam fir forest type, which has a more diverse herb layer. The *dryopteris-lycopodium*-balsam fir forest type has narrow moisture regime from moist to somewhat moist hat is nutrient rich. This forest type has ground cover that is dominated by ferns and certain moss types and plants that are specific to this type. The *hylocomium*-balsam fir forest type is also moist to somewhat moist but is dominated by a layer of moss instead of the ferns. The *pleurozium*-balsam fir forest type has balsam fir and black spruce as the main tree species with few white birch. The moss layer is made up mainly of *pleurozium* schreberi and is found on dry to well drained areas such as dry ridges and outwash deposits. The *carex*-balsam fir forest type has willow found in it. The *sphagnum*- balsam fir is dominated by *sphagnum* moss on the forest floor and is poorly drained.

White Birch - *Betula papyifera* Marsh.

This working group represents the major hardwood component for the forests of the province, and Districts 4, 5,6and 8. White birch is normally found on the fertile sites along streams and rivers, as well as flood plains. It can also be found on fire origin locations, as it is a pioneer species that seeds into an area once the forest cover are removed by fire. Pure white birch stands are not that common in the province, especially in the four districts. Three noteworthy sites are the north shore of Home Pond and the ridge of Jonathon's Pond, both in District 5 and the west shore of Burnt Lake in District 8. There are a number of white birch forest types, all depending upon the understory growth and the associated soil type. It is a species that is becoming important in lumber and furniture manufacturing and still thrives as the preferred fuel for home heating for those that burn wood. This forest type does not make up a large portion of the four districts.

For Districts 4, 5, 6 and 8, all known working groups and their codes are outlined below.

1. bS - black spruce is the major species in this working group making up 75 to 100% of the basal area. This means that the black spruce component has the largest merchantable volume in the stand.

2. bF - the same description for bS applies, except the major species is balsam fir.

3. wB - as above, with white birch the major species.

4. tA - as above, with trembling aspen the major species.

5. SH - in this group, the major species is a combination of softwoods (usually balsam fir and black spruce) with the minor component consisting of hardwoods.

6. HS-the working group is essentially the same as the SH group, only reversed with hardwoods being the major component and softwoods the minor.

7. DI - this designation refers to areas that are classed as disturbed. The disturbance can be the result of wind damage, fire, insects, and so on. It is currently too early to tell if the site will regenerate for this planning period.

8. NS - this refers to areas that have been disturbed but are now insufficiently restocked with a preferred species. For example, a rich balsam fir site could have been harvested and then regenerated to an alder bed.

9. eS - as above, with Engelmann spruce (*Picea engelmannii* Parry) the major species.

10. jP - as above, with jack pine (*Pinus banksiana* Lamb.) the major species.

11. sS - as above, with sitka spruce (*Picea sitchensis* (Bong.) Carr.) the major species.

12. jL - as above, with Japanese Larch the major species.

Table 3 below illustrates the distribution of working groups both by district and by the four districts combined. The main feature of the table is the dominance of bS which comprises over 60% of the four districts, with the next working group bF representing approximately 15% of the four districts.

The majority of the working groups are found in all four of the districts, with the exception of the working group AOther**@*. This group is made up of tA, eS, jP, JL and sS. All five have limited distribution and are grouped together as a result. In fact, eS, jL, and sS are found in District 4, and jP is only found in District 6, with a total coverage of 0.01% (34 ha) combined. These are not native to the area and were introduced in plantation trials over the past 20-30 years*.

Table 3. Breakdown of Districts by working group.

FMD 4				**FMD 5**			
Working Group	Area	% FMD	Rank	Working Group	Area	% FMD	Rank
bF	9,584	11	2	bF	25,356	13	3
bS	67,148	76	1	bS	112,828	56	1
hS	1,301	1	5	hS	13,282	7	4
NS	4,714	5	3	NS	13,174	7	5
sH	2,840	3	4	sH	26,336	13	2
wB	1,027	1	7	wB	7,956	4	6
wS	1,283	1	6	wS	1,433	1	7
Other	57	0	8	Other	917	0	8
Total	**87,954**	**100**			**201,283**	**100**	

FMD 6				**FMD 8**				Total Area by Working Group		
Working Group	Area	% FMD	Rank	Working Group	Area	% FMD	Rank		% of Four FMDs	Rank
bF	22,206	13	2	bF	36,945	22	2	94,092	15	2
bS	121,098	71	1	bS	71,588	43	1	372,662	60	1
hS	4,176	2	5	hS	8,994	5	5	27,753	4	5
NS	7,865	5	4	NS	15,756	9	4	41,509	7	4
sH	9,991	6	3	sH	21,129	13	3	60,296	10	3
wB	3,472	2	6	wB	7,124	4	6	19,579	3	6
wS	0	0	8	wS	3,774	2	7	6,489	1	7
Other	892	1	7	Other	1,821	1	8	3,687	1	8
	169,700	**100**			**167,131**	**100**		**626,067**	**100**	

1.5.5 Forest Disturbances

In the past 20-25 years areas have been disturbed by some means in the zone. Harvesting has accounted for the largest portion of this disturbance, along with wild fires and Insect damage.

There has been a slight amount of mortality due to blow down. This usually occurs after another disturbance (like insect damage) has weakened a stand.

Aerial application of insecticides has been used regularly as a management tool to control insect pests. In more recent years chemical insecticide use has been dropped in favour of the more environmentally benign bacillus thurengiensis (bT), a naturally occurring, biological control agent. New infestations are likely to develop over the next 20 years.

Section 2 Past Activities

2.1 District 5

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 plans for District 5 and District 6 were shortened by 1 year to facilitate this change.

There was 208,228 m^3 harvested on CBPPL limits in District 5 from 2002-2006. Harvest on Crown Land is reported in the Crown plan and was distributed throughout the district and occurred both commercially and domestically. Harvest on CBPPL limits occurred near Joe Batts, Home Pond and Gander.

There were 1,526 hectares silviculturally treated on CBPPL limits, and 45 km of primary access road built on CBPPL limits.

All areas harvested in the past 5 Year Plans can be viewed in context with proposed activities on the operating area maps in Appendix 3.

2.1.2 Harvesting

Table 4 summarizes the total harvest by CBPPL in District 5 and compares it to the AAC for the period. During the period 2002-2006 CBPPL harvested 208,228 m^3 in the District compared to an AAC available of 238,768 m^3. Details of the harvest by Crown in District 5 can be found in the Crown 5 Year Plan. There was a slight under harvest of the AAC's 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

Details of the Crown Commercial Operators harvesting commercially in District 5 can be found in the Crown Plan.

Table 4 Summary of softwood harvest in District 5 by CBPPL for 2002 to 2006

AAC Source	Total (m^3)	AAC (m^3)
CBPPL	208,228	238,768

Note: table includes estimates for 2006

2.1.2.2 Domestic

Details of the of the softwood harvested domestically on Crown Land in District 5 can also be found in the Crown Plan. Most of the harvest occurs on Class 3 land, which represents the poorer logging chances. In addition hardwood was harvested on Crown and CBPPL limits during the period. There is a slightly upward trend in domestic cutting due to the increase in home heating fuel.

2.1.3 Silviculture

Table 5 summarizes the completed silviculture treatments on CBPPL limits as compared to those proposed. Planting is the preferred treatment in this area as opposed to pre commercial thinning. The switch to gap or fill planting 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 is better suited to sites that were previously occupied by spruce but partially regenerated to fir.

Table 5 Summary of silviculture treatments on CBPPL limits in District 5 from 2002 to 2006

Treatment Type	Area Completed – Hectares
Pre Commercial Thinning	189
Planting	1,337

2.1.4 Road Construction

Table 6 summarizes the primary access roads built during the period on CBPPL limits as compared to those proposed. There were 46 built during the period to access commercial timber.
.

Table 6 Primary Access roads built on CBPPL Limits in District 5 from 2002 to 2006

Roads Proposed- Km	Roads Built - Km
56.0	45.8

2.1.5 Natural Disturbance

2.1.5.1 Fire

Details of the District 5 fire history can be found in the Crown Plan.

2.1.5.2. Insect

There has been little insect activity in the district over the past 5 years. Details of the insect activity can be found in the Crown Plan.

2.2 District 6

2.2.1 Overview

There has been significant activity by CBPPL in District 6 from 2002 to 2006. There was nearly 393,941 m^3 harvested on CBPPL limits. There were a total of 725 hectares silviculturally treated on CBPPL limits and 49 km of primary access road built on CBPPL limits.

All areas harvested in the past five years can be viewed in context with proposed activities on the operating area maps in Appendix 4 of the CBPPL and Crown plans.

2.2.2 Harvesting

Table 7 summarizes the total harvest by CBPPL in District 6 and compares it to the AAC for the five-year period. The Crown will make this comparison for Crown Land in the five-year plan.

The harvest in FMD 6 on CBPPL limits for the period was slightly under the AAC. The Crown harvest versus the available AAC can be found in the Crown plan.

Table 7 Summary of harvest in District 6 on CBPPL Limits for 2002 to 2006

AAC Source	Total (m3)	AAC (m3)
CBPPL	393,941	460,332

Note: table includes estimates for 2006

2.2.2.1 Commercial

Details of the Crown Commercial Operators harvesting on Crown Lands in District can be found in the Crown Plan.

2.2.2.2 Domestic

Details of the of the softwood harvested domestically on Crown Land in District 6 can also be found in the Crown Plan. Most of the harvest occurs on Class 3 land, which represents the poorer logging chances. In addition hardwood was harvested on Crown and CBPPL limits during the period. There is a slightly upward trend in domestic cutting due to the increase in home heating fuel.

2.2.3 Silviculture

Table 8 summarizes the completed silviculture treatments for the past five years on CBPPL limits. There were a total of 725 hectares completed on CBPPL limits, consisting of planting only and with no pre commercial thinning completed in the District.

Table 8 Summary of silviculture treatments on CBPPL Limits in District 6 from 2003 to 2006

Treatment Type	Area Completed (ha)(5 Year Total)
Pre Commercial Thinning	0
Planting	725

2.2.4 Road Construction

Table 9 provides a comparison of roads proposed in the previous five-year plan with those actually built. Out of 79.2 km proposed for new construction, only 49.18 were actually built.

Table 9 Summary of access roads built on CBPPL Limits in District 6 from 2002 to 2006

Roads Proposed - km	Roads Built – km
79.2	49.2

2.2.5 Natural Disturbance

2.2.5.1 Fire

Details of the fires in District 6 can be found in the Crown Plan.

2.2.5.2. Insect

Details of the fires in District 6 can be found in 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;

(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 forestland 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. 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 forestland base. In any one year, less than1% of the productive forestland 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 and CBPPL Staff, 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 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 where 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, 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 identified 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 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 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 planting 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 and is outlined in the Crown Plan.

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. District managers in turn reviewed these numbers and adjustments were made for local conditions. The insect deduction for both District 5 and 16 is outlined in the Crown Plan.

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 and on all tenures over a five-year period. Information was analyzed by harvesting system and season. The utilization deduction for Districts 5 and 6 is outlined in the Crown Plan.

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 Districts 5 and 6 is outlined in the Crown Plan.

The total inventory adjustment for District 5 and 6 is 15 percent.

3.6 Results

3.6.1 District 5

Table 10 summarizes the result of the timber supply analysis for CBPPL limits in District 5. In this analysis, the Class 3 AAC was calculated by the same method as the Class 1 AAC, whereas in the 2001 analysis the Class 3 AAC was done using a simple area to volume ratio. In this analysis there is a hardwood AAC calculated based on the same methodology with rudimentary yield curves for white birch.

The net AAC for Class 1 land is 53,200 m^3, which is up from the net AAC of 46,400 m3 in 2001. Reasons for this increase are the change of land base from Class 1 to Class 3 and the effects of harvest scheduling (difference between aspatial gross and spatial gross). The Class 3 AAC also increased from 5,000 m3 in 2001 to 5,600 m3 in 2006. Although one obvious reason is the change in land base from Class 1 to Class 3, it is probably unfair to compare these AAC's because of the different methods of calculation. The overall AAC has increased from 51,400 m3 to 58,800 m3. It is questionable if all the Class 3 can be harvested however.

The hardwood AAC for CBPPL limits in District 5 is 4,880 m3, which is similar to the 2001 number when the area to volume ratio method was used. Although no empirical data is available, an inventory adjustment of 5 percent was used.

Table 10 Annual Allowable Cut Results for CBPPL Limits in District 5.

CBPPL Limits	Spatial Net AAC (m^3)
Softwood	
Class 1 Softwood	53,200
Class 3 Softwood	5,600
Total Softwood	**58,800**
Hardwood	
Class1	1,680
Class 3	240
Residual	2,960
Total Hardwood	**4,880**

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.

While doing maximum silviculture would give an increase in AAC, operational and monetary constraints render this option unrealistic at this time. 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 eg. a one percent drop in inventory adjustment represents a one percent gain in net AAC. For this reason a significant effort must 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 by 20 year age classes for the simulation period can be found in our Sustainable Forest Management Plan which is available through our website at cbppl.com, or by contacting CBPPL at 637-3371.

3.6.2 District 6

Table 11 summarizes the result of the timber supply analysis for CBPPL limits in District 6. The Class 1 AAC on CBPPL limits has increased from 98,500 m3 in 2001 to 127,900 m3 in 2006. The main reason for the increase is the shift in land base from Class 1 to Class 3 and the effects of harvest scheduling. Conversely, the Class 3 AAC has decreased from 19,000 m3 in 2001 to 9,200 m3 for this analysis. The overall AAC has increased from 117,500 m3 to 137,100 m3. There is a new hardwood AAC of approximately 8,320 m3 for Class 1 and Class 3 areas.

Table 11 Annual Allowable Cut Results for CBPPL Limits in District 6.

CBPP Limits	**Spatial AAC (m3)**
Softwood	
Class 1	127,900
Class 3	9,200
Total CBPPL Softwood	**137,100**
Hardwood	
Class 1	1,660
Class 3	40
Residual	6,620
Total CBPPL Hardwood	**8,320**

3.6.2.1 Sensitivity Analysis

The sensitivity analysis for District 6 is the same at that listed in section 3.6.1.1 for District 5 with the same results.

3.6.2.2 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 by 20 year age classes for the simulation period can be found in our Sustainable Forest Management Plan which is available through our website at cbppl.com, or by contacting CBPPL at 637-3371.

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 many of Newfoundland’s people and their representative, the 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 cannot 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 the five-year operating 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 (eg., 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. 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.

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. 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. Between 1980 and 2000 the number of caribou has increased considerably on the Island with a population estimated at 200,000+ animals. In the past few years however populations have declined significantly with Planning Zone 3 being no exception.

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. 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.

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

To ensure the continued protection of these animals the following EPG's will be followed during forestry activities:

- In areas where caribou utilize lichens, a minimum amount of lichen forest must be maintained for caribou. (This amount is to be determined through consultation with IFWD);

- Harvesting and road construction should be minimized during the May 15 to July 30 calving period.

- Forest access roads, borrow pits and quarries shall avoid: known sensitive wildlife areas such as, calving grounds, post calving areas, caribou migration routes, caribou rutting areas and wintering areas.

Because the caribou population is in decline, the IFWD has identified critical caribou habitat areas and has established guidelines for forestry activities within these areas. Wildlife division, Forestry division, and the Pulp and Paper companies developed these guidelines cooperatively. They will now be used to replace and/or enhance those listed above.

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 furbearer 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 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 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 5. Based on this information, it is important that marten habitat be protected in these areas. 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 (30km^2) and female (15km^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 area in Main River (i.e., the marten study area) 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 a more 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 and CBPPL are cooperative partners 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.

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 major 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 Other Species

Other species, particularly the red crossbill, are currently listed as endangered. CBPPL 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 3, water is used beneficially for numerous purposes. There are several communities within the zone, which have water supplies, many of which 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. 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 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.

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.

Commercial activities provide many jobs in harvesting, sawmilling, trucking, pulp and paper manufacturing and related spin off industries for local residents.

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.

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 $350,000 is spent by CBPPL 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. Protection through integrated pest management techniques is an important activity. Fire has been a major disturbance, and protection is 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 substantial agriculture industry in the zone, an industry with considerable potential to expand and provide increased economic benefits to the local area

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 must be given for the agriculture industry to expand. This is particularly important for areas outside established agriculture areas.

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 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:

In Planning Zone 3 there is a diverse geological environment which hosts a wide variety of both metallic and industrial minerals including, but not restricted to; copper, nickel, lead, bitumen, granite, gneiss, marble, gold, asbestos, silver, iron, limestone molybdenum, uranium and thorium.

Critical Elements:

Location of deposits close to markets is vital in controlling aggregate costs, which often increase dramatically with increased transportation distances.

Guiding Principles:

Harvesting timber for prospecting lines must meet the same rigor as commercial harvesting. The mining industry will enact best management practices to ensure little to no impact on ecosystem values.

- Every attempt will be made to extract timber harvested as part of mining exploration and development.
- If timber cannot be feasibly extracted using conventional means then timber shall be piled so that it may be extracted during winter months by snowmobiles.
- Infractions by mining companies will be dealt with through warnings and/or charges as necessary.
- 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. Each year archaeology projects provide many seasonal jobs, i.e. Ferryland employs approximately 50 people each year. Many of these people are successful in obtaining employment in archaeology and conservation for longer periods of time. By calling for archaeological impact assessments on projects, which have, potential to negatively impact historic resources the PAO is providing jobs for consulting archaeologists in the province. New businesses are created as a result of archaeological projects. These businesses include bed and breakfasts, boat tours, restaurants and gift shops.

Critical Elements:

Major threats to historic resources are projects involving activities, which disturb soil layers and/or provide unintended public access to the archaeological resources. Forestry activities such as construction of access roads and bridges, harvesting and mechanical site preparation have the potential to destroy historic resources.

While forestry activities can have adverse impacts on historic resources there are also beneficial effects. When impact assessments are carried out and new sites found, it adds to our understanding of Newfoundland and Labrador’s heritage. When archaeological sites are discovered through impact assessments these resources are protected from damage or destruction and preserved.

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 Newfoundland T'Railway

Characterization:

A large section of the Newfoundland T'Railway Provincial Park lies in the zone and has an impact on forestry operations. The former CNR right of way, which is 25 feet each side of the center line, is the main route for the T'Railway with some minor deviations. It provides for an all season, multi-use recreation corridor developed and managed with community partners to maximize adventure tourism and recreational opportunities.

The T'Railway is protected for the present and future enjoyment of the public as part of the system of provincially designated parks and natural areas. The Provincial Parks Act provides the legislative framework for the administration and management of the T'Railway.

The T'Railway constitutes the Province's contribution to the Trans Canada Trail System. It is the largest provincial park in the Province with the most users. It is used primarily for snowmobiling, skiing, hiking, walking and all terrain vehicle usage. Other new or historical uses such as commercial and domestic harvesting, quarry and mining access and cabin access are also permitted with a special permit

Critical Elements:

- protection of the historical landscape integrity of the T'Railway corridor
- preservation of the scenic quality along the corridor
- control of land usage adjacent to the T'Railway

Guiding Principles

- coordination of activities with various other agencies responsible for land management outside the T'Railway corridor to ensure that the integrity of the park is maintained
- coordinate and build partnerships with other stakeholders and user groups such as communities, industry and recreational organizations for the long-term maintenance and development of the T'Railway
- in an attempt to preserve the natural value of the T'Railway, other land management agencies are requested to maintain a 100 m buffer along the right of way and to consider viewscapes in their harvesting and development plans.
- where access is required from the T'Railway, all roads shall be 100 meters away from the track before a landing or turnaround is constructed.
- a one hundred meter no harvest zone shall be maintained from the center of the T'Railway.
- where feasible, harvesting using the T'Railway shall be from May to December to avoid conflict with other user groups.

4.2.2.6 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.

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 new development such as mining activity, hydroelectric projects, forestry activity, agriculture activity, roads and trails and cabins and new structures.
- where forestry operations are within one kilometre of provisional and ecological reserves, wilderness reserves or provincial parks, modified operations may be necessary

4.2.2.7 Outfitting

Characterization:

An economic impact study conducted in 1995 by the Department of Industry, Trade and Technology suggests that a big game license has a net economic impact of $6864. By approximating this value at $7000 for 2006, it is possible to estimate the economic contributions of this industry: approximately 300 licenses * $7000 / license = $2.1 million. An additional $135 000 is estimated to be brought in from fishing. (Bear hunting has not been included in the above figures.) Given that 85 percent of the hunting market comes from the United States of America, it follows that the above monetary figures are reflections of money entering the Province from elsewhere. 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 impacting 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 negatively upon 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:

It is necessary that no harvest buffer zones be left 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. Some operators make use of areas that are 8 to 10 kilometers away from their camps.

- consideration should be given to decommissioning roads and bridges (where possible) after harvesting is completed. This will eliminate damage to the hunting area by reducing the possibilities of increased hunting pressure. When roads are in use actively for harvesting purposes, access to hunters should be restricted or limited.
-cottage development should be prohibited in areas adjacent to outfitting operations. This requires more vigorous enforcement of buffer zones and development of buffers for spike camps.
- harvest in the winter whenever possible. Winter roads are less passable in summer and fall and will help to reduce traffic. These roads will also be cheaper and easier to decommission.
- 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.
- forest operations should ensure that whatever is brought into an area is removed from the area once harvesting is complete.

4.2.2.8 Recreation

Characterization:

The Zone 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, kayaking, and many hiking trails, numerous ski and snowmobile trails, and excellent hunting and fishing 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 removal or alteration of this pristine wilderness through forest harvesting practices will 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**iewscape*

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.

4.2.2.9 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. Tourism has been contributing between $580 million and $700 million annually to the provincial economy. Government tax revenue from tourism in 1998 was estimated to be $105 million. The worldwide growth of tourism is at rate of 41 percent, the national growth is at 25 percent and the provincial growth rate at 33 percent indicates that tourism is one of Newfoundland and Labrador’s best opportunities for economic diversification and growth.

There are many excellent tourist destinations in the zone.

Critical Elements:

- viewscape
- accessibility
- wilderness ambiance
- remoteness

Guiding Principles:

Work with tourism operators to implement strategies to minimize the visual impact of harvesting operations on the aesthetic values associated with viewscapes. By bringing together 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.

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, narrow 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 has 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 CBPPL Limits in Planning Zone 3 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, a decision had to be made whether to combine planning teams into a single team, which would meet in one central location, and for this Zone Gander was chosen as the central meeting location. Attendance at all meetings was very high.

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 Gander. 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 teams for each district. 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. 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.

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 clear-cut silviculture system most closely emulates this natural disturbance pattern and therefore is the most preferred method employed for harvesting. 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 clear-cut system takes place in the Crown domestic areas whereby the cuts are relatively small and disbursed resulting in the creation of a range of age and development classes.

Operational trials on partial harvest were conducted by CBPPL in the Main River area to address pine marten and other connectivity concerns. The results of these trials will be monitored to determine applicability in other regions of the Province. The clear-cut system is the only system being considered by CBPPL in the zone at this time however.

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 stratums 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 (ie. 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)
- continue to encourage and pursue transfers and exchanges with paper companies to ensure sawlog supply for local sawmills.

6.1.2 Domestic

The harvest of domestic fuelwood and sawlogs occurs from three 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. For the designated cutting blocks, the harvest scheduling and priorities apply, however it may not always be practical to follow. Crown 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

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.

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, however, in most parts of the zone planting is usually done without site preparation. Planting, whether full planting or gap planting is done to ensure stocking of desired species is at acceptable levels.

As stated, little 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.

When complete regeneration failure requiring full planting occurs in the zone, the site is prepared, if necessary, and planted with mainly black or white spruce and to a lesser extent Norway spruce or white pine. Gap planting is designed to increase the stocking on sites that have not regenerated to sufficient levels. 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.

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 thinning)

Precommercial 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 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. This treatment has been used sparingly in the zone however.

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 grow 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 balsam woolly adelgid problems so that alternate silvicultural prescriptions can be promptly employed

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 disturbance 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 may also be considered, depending on cost and mitigation of conflicting uses for that road.

The nature of the current wood supply, is that harvestable areas or stands are becoming smaller and more scattered. Achievement of the allocated harvest is contingent on accessing these areas and stands therefore more roads are needed to access this timber.

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

6.4 Forest Protection

6.4.1 Insects and Disease

Insects have not been a major natural disturbance factor in the zone. The main tree species, black spruce, is not susceptible to most of the major insects we have including spruce budworm, hemlock looper, balsam fir sawfly, and balsam woolly adelgid. In recent years, quality standards at local pulp mills have changed to require a timely supply of fresh, green 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.

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

- use species conversion techniques, where possible, to convert adelgid susceptible balsam fir to other less susceptible species
- in conjunction with Provincial and Federal initiatives, use pertinent and approved biological and chemical insecticides such as BTK, Mimic, Neemix4.5 and NeabNPV (virus)
- in cooperation with Provincial insect and inventory divisions, monitor and measure adelgid infested stands to help refine yield curves to be used in the next timber supply analysis

6.4.2 Fire

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 other's 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 (e.g. CBPPL operations and mill tours)
- 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 5

7.1.1 Overview

This section will outline all forest activities that will occur on CBPPL Limits in District 5 from 2007-2011. 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 Appendix 3. This map shows all proposed operating areas by the Crown, by CBPPL and by ACI so that operations can be viewed from a landscape perspective across all ownerships in District 5. 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 265,000 m^3 of timber scheduled to be harvested by CBPPL in District 5 for the next 5 years. This volume will be harvested on CBPPL limits.

Harvesting activities will be carried out in several locations throughout the District on CBPPL Limits as outlined in Table 13.

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 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 12 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.

Table12 Proposed softwood harvest on CBPPL Limits in District 5 from 2007-2011

Total Class I AAC CBPPL Limits	**266,000 m^3**
CBPPL Harvest on CBPPL Limits	**265,000 m^3**
CBPPL AAC Deviation (+/-)	**-1,000 m^3**

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. The first two five year periods are highlighted on the operating area maps in red and blue. 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.

Table 13 CBPPL Harvest by Operating Area in District 5, 2007-2011

Operating Area Name	Operating Area Number	Proposed Harvest Volume (Net m3)
Joe Batts	K-05-02	30,000
Home Pond	K-05-07	143,000
Gander Bay Road	K-05-08	30,000
Traverse Brook	K-05-10	2,000
Island Pond	K-05-11	20,000
Middle Brook	K-05-15	40,000
Total		**265,000**

7.1.2.2 Domestic

Domestic harvesting in the District is administered by the Crown and will occur in designated domestic cutting areas and is generally conducted on a small patch cut system. All domestic cutting is done under 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

The Company policy as it relates to domestic cutting is that after pulpwood harvesting operations have been completed in an area, domestic cutting for fuel wood will be allowed on cutover areas to cut hardwoods left behind. Details of the domestic cutting on Crown Lands can be found in the Crown Plan.

7.1.3 Silviculture

Silviculture prescriptions scheduled for the next five years will be planting and site preparation where required. No pre commercial thinning is planned. 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 14 summarizes silviculture treatments for the next five-year by treatment. There are 250 ha of planting scheduled.

Table 14 Summary of silviculture treatments on CBPPL Limits in District 5 for 2007-2011

Pre Commercial Thinning (ha)	Planting (ha)
0	250

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 80 km of primary forest access roads scheduled to be built in District 5 in the next five years (Table 15). These roads will be built to access timber for harvesting in the operating areas proposed.

Table 15 Primary Access Road Construction on CBPPL Limits in District 5
For 2007 –2011

Operating Area Name	Operating Area Number	Length (km)	Bridges
Joe Batts	K-05-02	8	0
Home Pond	K-05-07	41	0
Gander Bay Road	K-05-08	15	0
Traverse Brook	K-05-10	6	0
Island Pond	K-05-11	4	0
Middle Brook	K-05-15	6	1
Total		**80**	**1**

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 any construction is initiated.

7.1.5 Activities in Protected Water Supply Areas

For all harvesting operations scheduled to occur in protected water supply areas, wider buffers will be used inside these PWSA's and the pertinent EPG's for operations within PWSA's will be strictly adhered to. 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 must be obtained before any commercial or domestic harvesting commences inside the PWSA.

7.1.6 Environmental Protection

7.1.6.1 Fire

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 Crown fire crews and equipment stationed at Gambo 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 and helicopters stationed at Gander 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.

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, impact fish and wildlife habitat, impact viewscape, and disturb sensitive and rare sites etc. The guidelines are designed to provide site specific measures 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 all cutovers to insure loss of merchantable timber is minimized. CBPPL will work with the Industry Services Division in Corner Brook to implement a yield comparison study to compare the expected volume in an operating area 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 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.

7.2 District 6

7.2.1 Overview

This section will outline all forest activities that will occur on CBPPL Limits in District 6 from 2007-2011. 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 4). 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 6. Maps of individual operating areas and summary sheets are also presented in Appendix 4. 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.

7.2.2 Allocation of Timber Supply

There is 635,000 m^3 of timber scheduled to be harvested by CBPPL in District 6 for the next 5 years on CBPPL Licensed land.

Harvesting activities will be carried out in several locations throughout the District as shown on the operating area maps contained in Appendix 4.

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 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.

There will be no deviation from the five-year AAC in either the Class1 or Class 3 landbase.

Table 16 Proposed Harvest on CBPPL Limits in District 6, 2007-2011

Total Class I AAC CBPPL Limits	**639,500 m^3**
CBPPL Harvest on CBPPL Limits	**635,000 m^3**
CBPPL AAC Deviation (+/-)	**-4,500 m^3**

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7.2.2.1 Commercial

The timber scheduled for 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. The first two five year periods are highlighted on the operating area maps in red and blue. 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.

Table 17 Summary of CBPPL Harvesting by Operating Area in District 6
2007-2011

Operating Area Name	Operating Area Number	Proposed Harvest Volume (Net m3)
Crown Ridge	K-06-01	5,000
Coopers Brook	K-06-02	50,000
Careless Cove	K-06-03	10,000
Dowd Pond	K-06-04	5,000
Red Rock	K-06-05	70,000
Rodney Pond	K-06-06	40,000
South West Gander	K-06-07	10,000
Greenwood Pond	K-06-08	30,000
Eastern Pond	K-06-09	100,000
Coy Pond	K-06-12	105,000
Gull Lake	K-06-13	5,000
Lane Pond	K-06-14	5,000
Canning Brook	K-06-15	45,000
Third Berry Hill Pond	K-06-16	40,000
Dead Wolf South	K-06-17	15,000
Dead Wolf North	K-06-18	65,000
Hunts Pond	K-06-19	10,000
Salmon Brook	K-06-20	5,000
Beatty Lake	K-06-21	20,000
Total		**635,000**

7.2.2.2 Domestic

All domestic cutting is done under 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.

7.2.2.3 Hardwoods

The Company policy as it relates to domestic cutting is that after pulpwood harvesting operations have been completed in an area, domestic cutting for fuel wood will be allowed on cutover areas to cut hardwoods left behind. Details of the domestic cutting on Crown Lands can be found in the Crown Plan

7.2.3 Silviculture

The silviculture prescription scheduled for the next five years is planting/gap planting including site preparation where required. 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.

Table 18 Summary of Silviculture Treatments on CBPPL Limits 2007-2011

Pre Commercial Thinning (ha)	Planting (ha)
0	1,050

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 or white spruce. These areas will undergo reconnaissance and or intensive regeneration surveys to determine the need for planting. These areas will be either full planted or gap planted to bring them up to minimum stocking levels to spruce. Site preparation using either mechanical means or prescribed burning will be employed on suitable sites that have impediments to planting.

7.2.4 Primary Access Roads and Bridges

There are 275 km of primary forest access roads scheduled to be built in District 6 in the next five years. These roads will be built to access timber for harvesting in the operating areas proposed. 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 19 Summary of Primary Access Road Construction on CBPPL Limits in District 6 2007 -2011

Operating Area Name	Operating Area Number	Length (km)	Bridges
Crown Ridge	K-06-01	1	0
Coopers Brook	K-06-02	15	1
Careless Cove	K-06-03	5	0
Dowd Pond	K-06-04	14	0
Red Rock	K-06-05	4	0
Rodney Pond	K-06-06	41	1
South West Gander	K-06-07	8	2
Greenwood Pond	K-06-08	8	0
Eastern Pond	K-06-09	9	2
Coy Pond	K-06-12	35	2
Gull Lake	K-06-13	0	0
Lane Pond	K-06-14	12	1
Canning Brook	K-06-15	24	1
Third Berry Hill Pond	K-06-16	30	1
Dead Wolf South	K-06-17	7	1
Dead Wolf North	K-06-18	35	4
Hunts Pond	K-06-19	7	1
Salmon Brook	K-06-20	12	2
Beatty Lake	K-06-21	8	0
Total		**275**	**19**

7.2.5 Activities in Protected Water Supply Areas

For harvesting operations inside PWSA's, wider buffers will be used and the pertinent EPG's will be attached to any permits issued for these areas. 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 must be obtained before any domestic harvesting commences inside the PWSA.

7.2.6 Environmental Protection

7.2.6.1 Fire

The district must remain vigilant in its fire suppression program to ensure any future losses are minimized.

There are Crown Fire Crews and equipment stationed in the District during 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 is an air tanker and helicopter stationed at Gander that are available for initial attack.

7.2.6.2 Insect and Disease

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

7.2.6.3 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.

7.2.7 Surveys

Utilization surveys will be conducted on both commercial and domestic cutovers to insure losses of merchantable timber is minimized. CBPPL 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 area 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 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 for balsam woolly adelgid will be done to determine suitable areas to conduct silvicultural treatments.

7.2.8 Information and Education

CBPPL Staff 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 5

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. Highlights of the mitigative measures that arose as a result of Planning Team concerns are:

- Our existing MOU with the Freshwater-Alexander Bay Ecosystem Development Corporation (FABEC) which was signed during the previous 5 Year Plan was modified to reflect the changes to our operating plans in the Middle Brook area. We will accelerate our plans for this area and harvest there during the winter season and use a temporary bridge to cross Middle Brook.

- Concerns were raised regarding the harvesting operations adjacent to Cobbs Pond. Before harvesting begins in this area, consideration will be given to these concerns, and mitigative measures such as wider buffers and or winter harvesting will be implemented where possible.
- Our existing MOU with the Indian Bay Ecosystem Development Corporation (IBEC) will continue throughout this plan and changes will be made relative to our operations at Southern Pond and limiting road access to the area.
- Existing guidelines for caribou and pine marten will be followed for all affected areas and any new guidelines developed as a result of ongoing processes will be adhered to. No harvesting will take place in Pine Marten Critical Habitat without prior approval from the Wildlife Division.
- Appropriate buffers will be maintained to protect potential archaeological artifacts.

8.2 District 6

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 4. As well, guiding principles, which outline procedures, to follow should an unforeseen conflict arise have been identified for each value in Section 4. Highlights of the mitigative measures that arose as a result of planning team concerns are:

- Our existing MOU with the Freshwater-Alexander Bay Ecosystem Development Corporation (FABEC) that was signed during the previous 5 Year Plan will continue throughout this plan.
- Revision of our road plans for the Eastern Pond area to accommodate a Commercial Outfitter operating in the area.

- Concern raised by a local Tourism Operator about primary access road in the Indian Arm Brook area and effect on area. CBPPL agreed to work with group to limit access after harvesting is competed.
- Existing guidelines for caribou and pine marten will be followed for all affected areas and any new guidelines developed as a result of ongoing processes will be adhered to. No harvesting will take place in Pine Marten Critical Habitat without prior approval from the Wildlife Division.
- Appropriate buffers will be maintained to protect potential archaeological artifacts.

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

Annually, Corner Brook Pulp and Paper Limited is issued a **Certificate of Managed Land**. Attached to this Certificate are schedules that set out the conditions that must be followed in order to maintain managed land status. Schedule five contains the Environmental Protection Guidelines (EPG). Industry planning and operations must comply with schedule five or the land can be declared unmanaged and fines levied. NFS staff will monitor for compliance with schedule five and recommend managed or unmanaged status.

All planned activities are monitored by the NFS to ensure all guidelines and regulations pertaining to environmental protection, harvesting, road construction, and silviculture are followed. Any infractions or deviations from the regulations or guidelines are dealt with as required under the Forestry Act.

In addition to the monthly Government monitoring for compliance Corner Brook Pulp and Paper Limited has put in place an Environmental Management System (EMS), which was registered to the internationally recognized environmental standard ISO 14001 CSA Z809.

As part of this EMS, many monitoring activities take place throughout the year (checking for non-compliances) including:

- Field inspections completed by Operations Superintendents,
- Yearly internal EMS audit,
- Yearly external EMS and field surveillance audits,
- External compliance audit every five (5) years,
- External communication from the public through our web site, cbppl.com.

All non-compliances are documented and reported to the EMS Management Review Committee. All non-compliances are reviewed by the EMS Committee, and corrective action is implemented where and when required.

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 Plan as well as those of the Crown and Abitibi Consolidated 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 plans 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 however.

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

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