INTRODUCTION

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

Another major change is the creation of eight planning zones on the Island, which are based loosely on ecoregion location. Districts that share common ecoregion characteristics are combined to form these zones. Districts 14 and 15 are combined to form Planning Zone 6. The requirement for submission to the Newfoundland Forest Service and for environmental assessment is one Five Year Operating Plan for each owner in each zone. The past requirement was one Five Year Operating Plan by each owner in each district. In this zone there will be two separate submissions by the Crown and Corner Brook Pulp and Paper Limited (CBPPL). Throughout this Five Year Plan, references will be made to districts 14 and 15 individually but when combined they will collectively be referred to as Planning Zone 6 or the zone. The planning teams for this zone are located in St Georges and Corner Brook. 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 CBPPL timber limits in the zone, where possible. This will be done by combining statistics and other information from each district and reporting for the zone. However, 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 CBPPL limits.

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 Six encompasses Forest Management Districts 14 and 15 (Figure 1). It is located on the west and southwest coasts of the Island and extends from Burgeo and Port aux Basques in the south to the southern boundary of Gros Morne National Park in the north. Major towns located within the zone are Deer Lake, Pasadena, Corner Brook, Stephenville, Port aux Basques and Burgeo. District 14 is administered from St. Georges with a depot in Burgeo while District 15 is administered from Corner Brook with a depot in Woody Point.

1.1.2 History

The natural resources of the zone have played a major role in the well being of the residents. Since the earliest settlement, the forest and fish resources were the mainstay of the economy.

Generally, settlement occurred around the coastal areas where the fishery was prevalent. Initially the forest was used as a source of fuel wood as well as construction materials for houses and fishery related items (stages, lobster pots, boats etc.). Sawmills developed to supply the local demand for lumber and construction timber.

The first major sawmill was constructed near Corner Brook stream in 1863 and at peak production employed 45 people. In the 1900's forestry became the employment mainstay in the region. From 1921 to 1947 sawmills were established in Bonne Bay which produced approximately 6 million fbm of lumber per annum.

In 1923 the construction of a pulp and paper mill in Corner Brook and a hydro generation station at Deer Lake commenced; both developments were completed in 1925. The mill was initially owned by the Newfoundland Power and Paper Company limited and operated until 1928. At that time it was taken over by the Canadian International Paper Company before giving way to

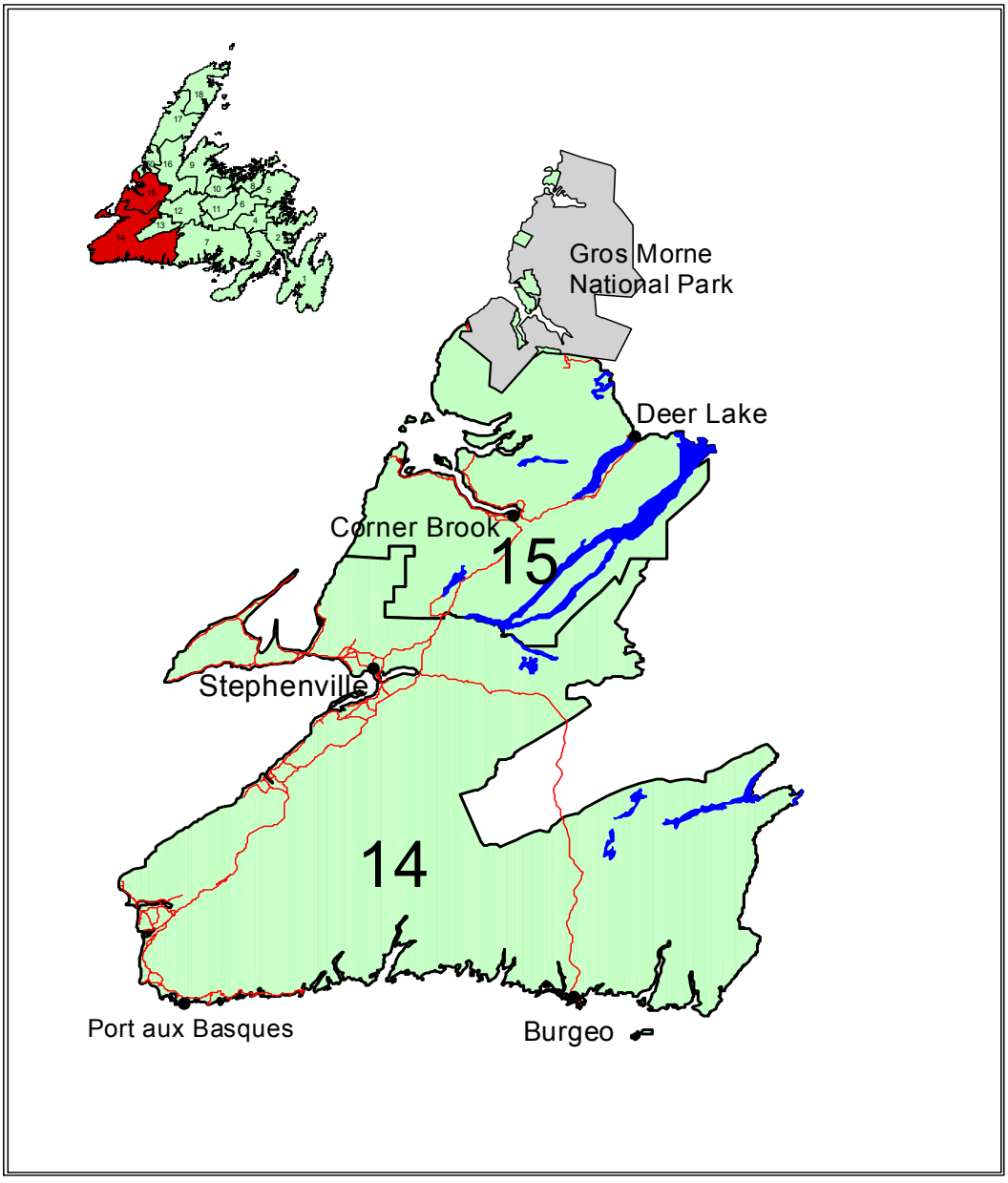

Figure 1 Location of Planning Zone 6

Bowaters in1938. Bowaters operated the mill until 1985 when it was taken over by Kruger Inc., who operate the mill today. Woodlands employment peaked at 2000 employees and is still important to the local economy today employing fewer than 400 employees.

A linerboard mill was also established by the provincial government in Stephenville and opened in the early 1970's. The supply for this mill came from the Labrador Linerboard licenses in Districts 9, 14 and 16 and Goose Bay. This mill shut down in 1977 due to the uncertainty of supply and high cost of delivered timber from Labrador. The mill was purchased by Abitibi Price, converted to newsprint and reopened in 1981. Despite having the most modern and efficient paper making machine in Newfoundland and Labrador, the mill closed in the fall of 2005 in an attempt to bring the supply of newsprint more in line with the demand.

1.1.3 Ownership

There are two major tenure holders in the zone; Crown and Corner Brook Pulp and Paper Limited (Figure 2). Overall CBPPL, through timber licenses, accounts for 30 percent of the total land area in the zone with the crown controlling 70 percent. The majority of these licenses are due to expire in 2037. The productive forest breakdown for the zone is 50 percent for each tenure holder. In District 14, the crown controls 92 percent of the total land area and 61 percent of the productive forest. This is mainly due to the large area of unmapped crown land on the south coast. In District 15, CBPPL controls 75 percent of the total land area and 83 percent of the productive forest.

There is a timber transfer in District 15 from CBPPL to Crown at Governors Pond that is due to expire in 2017. This transfer provides pulpwood and saw logs for the Bonne Bay sawmillers.

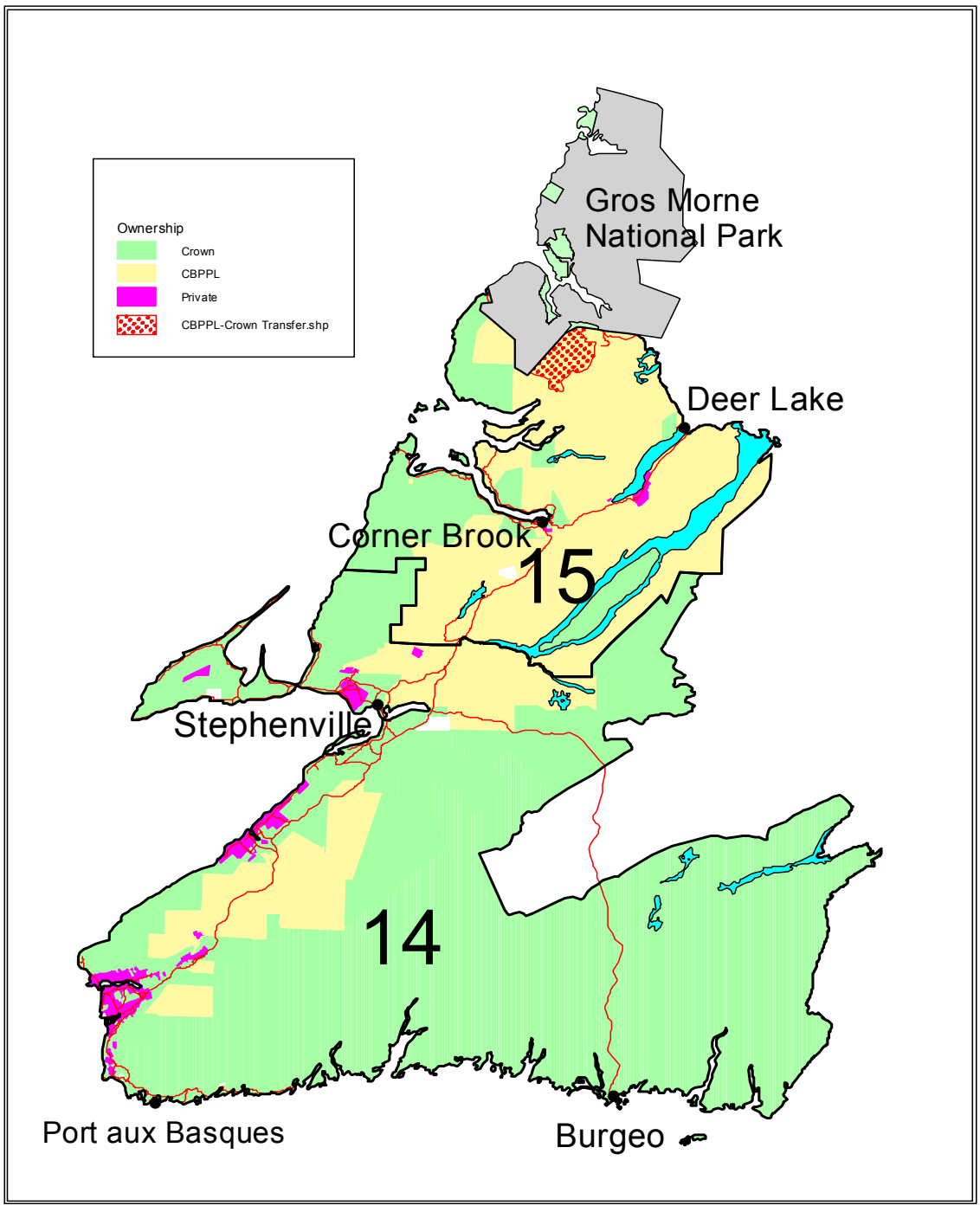

Figure 2. Ownership Map for Planning Zone 6

1.2 Physical

1.2.1Topography and Hydrology

The topography of the zone is generally rugged however the flat, high upland plateaus provide contrast. Lowland areas occur along the coast and extend inland in the river valleys as well as in interior basins. The hilly upland areas make up a large portion of the zone and generally contain the most productive sites. They are dissected with very rugged topography and with ridges commonly in excess of 300 m in height. Another major land feature is the flat-topped, high uplands. These plateaus are dissected by wide valleys, which flow to the lowlands. The lower slopes of the Long Range Mountains in the east flatten out towards the coast into extensive plateau bogs, sometimes covering up to 10 km². The landscape is generally undulating and intersected by numerous ponds, lakes and streams. Forested land is naturally fragmented with bog, barren and ponds.

In the southwest, the lowland areas give rise to upland barren areas that are drained in an orderly fashion by major river valleys. Most of the South Coast is covered by gently rolling ground moraine, although areas of exposed bedrock are common. Deposits of till from a retreating glacier formed the unique hummocky terrain near Burgeo. The interior of the southwest is a windswept, highland area with extensive barrens and elevations rising from 200m to more than 650m. Slope and basin bogs and fens are the dominant peatland.

The more prominent highland areas in the zone are Blow me Down Mountains, North Arm Hills, Mount Gregory, Lewis Hills, Annieopsquotch Mountains, and Cape Anguille Mountains.

Some of the major river basins in the zone are; Humber River, Harrys River, Serpentine River, Barachois Brook, Fishells River, Robinsons River, Crabbes River, Southwest Brook, Codroy River, Grey River, and White Bear River. With the exception of the latter two, these rivers originate in the highland areas and drain major watersheds before meandering through the fertile coastal lowlands.

1.2.2 Geology

Carboniferous deposits, mainly conglomerate, sandstone and shale, underlie the lowland portions of the zone. The age of these rocks is younger in the southern part of the zone at about 300 million years. Thick layers of glacial drift, outwash and delta deposits mostly conceal the bedrock. The lowest elevations in the hilly uplands are underlain by Ordovician shales whereas the highest elevations are generally underlain by limestone, quartzite and, in the eastern portion, by Precambrian rocks such as gneiss and schist.

The Long Range Plateau, which runs north south through the middle of District 15, is composed mainly of igneous and metamorphic rocks of which gneiss, granite and anorthosite are the most common. The Bay of Islands Range, which dominates the western side of District 15 and the northwestern part of District 14, is underlain by serpentinized dunite and periodotite, amphibolite and gabbroic rock. The serpentine rock type is particularly prevalent in the highest areas.

Three groups of rocks occur in the interior of District 14. The Notre Dame rocks are mostly sandstones, conglomerates, volcanic ash and lava that were created about 550 million years ago. Exploits rocks are volcanic ash and lava, sandstones, shales, and conglomerates formed about 500 million years ago. Gander zone rocks are sandstones, shales, and conglomerates formed about 550 million years ago. Some of these rocks have been metamorphosed into schist and gneiss. Large granite intrusions (areas where molten rocks seeped up) occur in the central and western portion and are about 450 million years old.

The southern areas of District 14 are mostly granites created by intrusions 300 to 400 million years ago. They form an almost unbroken band from Rose Blanche to Harbour Breton. Sandstones, shales and conglomerates, deposited about 500 to 550 million years ago, are found around Port aux Basques. These rocks belong to the dunnage zone and are also found farther east and north across the Burgeo highway and around Bay d'Espoir. Just east of La Poile Bay are ash and lava deposits that were created about 420 million years ago.

The entire zone has been severely glaciated and is mostly covered by glacial till. Extensive outwash deposits occur only in some of the major river valleys. "Plucking" of rock basins, now lakes, is noted and quarrying of the lee sides of some hills has been identified. Reorganization, and probably disorganization, of drainage is evident. Erratic boulders are found at the highest elevations however glacial debris is never found as a continuous blanket in the zone.

1.2.3 Soils

Extending north and south from the Bay of Islands there are two significant alpine rock barren areas known as the Bay of Islands Serpentinized Range (North Arm Mountain and the Blomidon Range). These have a sparse but botanically interesting flora which has adapted to the magnesium and related natural soil toxicity problems. The soils are orthic and gleyed regosols with horizon development restricted by frost churning (Roberts, 1980). The areas are geologically important and attract people from all over the world for viewing (Roberts and Proctor, 1992.) They are also important hiking and winter recreation areas both from a local and national perspective.

The dominant soils of the forested uplands and slopes are orthic humo-ferric (brown soils containing mostly inorganic material that occur on relatively dry sites) and ferro-humic podzols (dark soils with a high organic content and a high amount of iron and aluminum), some of which are gleyed in the lower B horizon (Roberts,1983). The presence of limestone and shale bedrock and tills derived from these calcareous substances and soil seepage (lateral movement of moisture on slopes) are the most important factors for tree growth (Roberts, 1986, Meades and Roberts, 1992). The major site variables are landform, soils, drainage, moisture and fertility gradients, and understory vegetation. A prominent feature of this region is the presence of marl ponds, sometimes called living limestone ponds (Blue Ponds is a prime example). Significant soils in and around these ponds are orthic regosols and rego gleysols often with a mucky phase and very low trafficability.

The area adjacent to the Serpentinized Range west of Corner Brook includes many productive orthic ferro humic podzols derived from shale on long slopes. Forest growth is excellent on the well to moderately well drained, medium textured soils. However, erosion can be a problem if ground disturbance is moderate or worse.

The soils in the interior and southern part of District 14 are almost entirely humo ferric podzols. There are also some areas of exposed bedrock or bedrock with a thin soil covering (less than 10 cm).

1.2.4 Climate

The climate in this zone is one of the most favourable on the island with relatively warm summers and abundant precipitation. Conditions vary as a result of differences in topography and proximity to the coastline.

Annual precipitation is between 102 and 140 cm with the larger amounts associated with higher elevations. Annual snowfall is in the 317 to 508 cm range and often small patches of snow remain until late July in sheltered north facing valleys above 600 m.

Mean January temperature is -10 C and mean July temperature ranges from 16 C in valleys to 13 C in the highlands. The frost-free period averages 110 days at the lower elevations and the growing season is between 130 to 160 days.

Severe windstorms have occasionally caused some blow down damage especially in shallow-rooted, over-mature stands. Periodic ice storms have also caused damage to predominantly hardwood stands.

There are significant local variations because of the many mountains and valleys. On mountain slopes and summits, winters are generally colder and the growing season is shorter than in the

protected valleys. Mountain slopes also tend to receive more precipitation than low-lying valleys.

The climate of the interior of District 14 is notable for its short growing season and permanent snow-cover throughout the winter. Snow covers about 60 percent of the landscape into late May which is about a month longer than in neighboring areas.

On the South Coast, the summers are colder due to the fog and prevailing onshore winds. This part of the zone also receives the most precipitation, mainly as rainfall.

1.3 Ecosystems

1.3.1 Forest Ecosystems

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

A forest ecosystem, as the term implies, is an ecosystem dominated by tree cover. At the coarsest level, the forests of Planning Zone 6, like all forests on the island, form part of the boreal forest ecosystem. The boreal forest is a green belt, which spans much of the northern hemisphere. It stretches from the Atlantic shores of Scandinavia through Russia, across Alaska,

through the mid latitudes of Canada until it reaches the Atlantic Ocean again in Newfoundland and Labrador. One of the distinguishing characteristics of the boreal forest is the phenomena of periodic, catastrophic stand replacement natural disturbances such as fire and insect outbreaks which typically give rise to uniform, even aged forests dominated by a few tree species.

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

1.3.2. Ecoregions and Subregions

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

Figure 3 depicts Planning Zone 6 relative to Damman's ecoregion classification system. The Western Newfoundland Forest Ecoregion encompasses the majority of the area in District 15 while the Long Range Barrens Ecoregion covers the largest percentage of area in District 14.

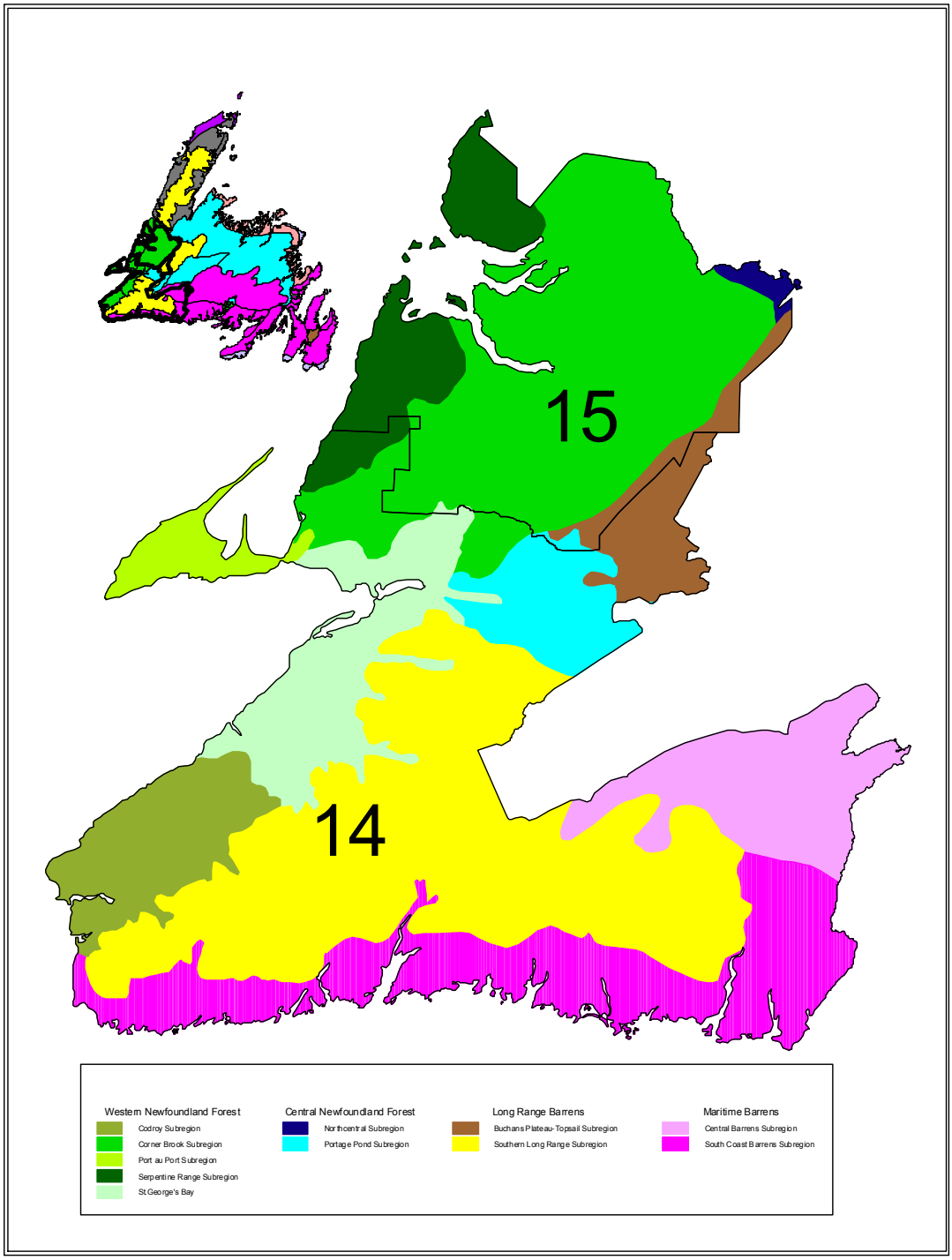

Figure 3 Ecoregions and subregions of Planning Zone 6.

This ecoregion along with the Maritime Barrens Ecoregion covers over 50 percent of the area in District 14 however the Corner Brook Ecoregion is more important in terms of forest productivity.

Table 1 depicts the percentage of the ecoregions and subregions that are represented in the zone. It describes each ecoregion and subregion as a percentage of the total in the province as well as the relative importance within each district and in both districts combined. For example, District 14 contains 100 percent of the Codroy Subregion of the Western Newfoundland Forest Ecoregion in the province. As well, 8 percent of the district and 6 percent of the zone is located within this subregion. The following is a detailed description from (Meades, 1990) of each ecoregion and subregion in both districts.

1.3.2.1 Long Range Barrens Ecoregion

This ecoregion comprises the highlands extending from the southwest coast to the northern part of the Northern Peninsula. It consists of three distinct units, the Southern Long Range, the Buchan's Plateau-Topsails, and the Northern Long Range subregions. Areas of more or less continuous forest separate the subregions with the former two occurring in the zone.

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

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

Table 1. Percentage of ecoregions and subregions in Planning Zone 6.

Name of Ecoregion and Subregion	Total Area in Province (ha)	Percentage of Total Area in Districts			Relative Percentage of Ecoregion and Subregion in Districts		
		14	15	Total	14	15	Combined
Long Range Barrens							
Buchans Plateau - Topsail Subregion	369811	15	7	22	4	5	4
Southern Long Range Subregion	599815	94	0	94	37	0	27
Western Newfoundland Forest							
Codroy Subregion	116278	100	0	100	8	0	6
Corner Brook Subregion	515637	11	82	93	4	75	23
Port au Port Subregion	41579	100	0	100	3	0	3
Serpentine Range Subregion	145132	13	67	80	1	18	6
St. Georges Bay Subregion	152185	99	1	100	10	<1	7
Central Newfoundland Forest							
Portage Pond Subregion	149319	55	2	57	5	< 1	4
Northcentral Subregion	2310742	0	<1	< 1	0	<2	<1
Maritime Barrens							
Central Barrens Subregion	1514392	10	0	10	10	0	7
South Coast Barrens Subregion	894252	30	0	30	18	0	13

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

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

1.3.2.1.1 Buchans Plateau - Topsail Subregion

The Buchan's Plateau-Topsails Subregion lies between Grand Lake and Red Indian Lake and its western edge extends into District 15. Most of the subregion is barren. Dwarf shrub heaths, shallow patterned peatlands, and areas with low krummholtz dominate the landscape.

1.3.2.1.2 Southern Long Range Subregion

The Southern Long Range Subregion encompasses most of the center of District 14 and covers the upper reaches of the river valleys and the higher terrain. In these river valleys, more of the southern plant species are present particularly yellow birch. Speckled alder thickets occur on alluvial soils.

1.3.2.2 Western Newfoundland Forest Ecoregion

The Western Newfoundland Ecoregion runs from the mouth of the Codroy Valley in the southwest corner of the island, northwest to Bonne Bay and eastward to Grand Lake. It encompasses almost all of District 15. This ecoregion is characterized by a humid climate with a relatively long frost-free period. It contains some of the most favourable sites for forest growth although there is considerable variation due to altitude and proximity to the coast. The *Dryopteris-Hylocomium*-balsam fir Damman type is the zonal forest for this region. The zonal soils are nutrient rich humic podzols with a very dark podzolic B horizon due to humus enrichment.

The ecoregion is home to more than 700 species of vascular plants (about 2/3 of the flora), more than 300 species of mosses and more than 35 different vegetation types (Bouchard et al., 1978, Robertson and Roberts, 1982, Belland, 1987, Bouchard et al., 1991). The absence of prolonged dry periods appears to have excluded fires from all but the coarsest textured soils. Consequently,

balsam fir rather than black spruce is the dominant forest cover. Yellow birch is common and it displays its best growth in protected valleys below 200m elevation. It is absent at higher elevations and north of Deer Lake. Red maple is also most common and robust in this ecoregion. Other species that occur here include white spruce, eastern larch, trembling aspen, balsam poplar, white pine and black ash. Red pine, the rarest coniferous tree species in Newfoundland (Roberts, 1985), does not occur in the district: its nearest location is the Howley-Sandy Lake area, 30 km to the northeast.

As a general rule overstocking is a more common silvicultural problem than understocking in western Newfoundland. Localized regeneration failures can occur in forests with a very dense fern and herb stratum such as the *Rubus*-balsam fir and the *Dryopteris*-balsam fir forest types. On these types, hardwoods, particularly mountain maple on seepage slopes, can form semi-stable thickets. These thickets may eventually develop into hardwood forest types. The development of *Ericaceous* heath after logging or fire is only observed on very small areas of coarse textured till. This is in stark contrast to central Newfoundland where succession to *Kalmia* heath is a common occurrence. The Western Newfoundland Ecoregion is subdivided into six subregions of which five are represented in the zone.

1.3.2.2.1 Codroy Subregion

This subregion covers the southwest coast of District 14 and includes the Codroy Valley and Cape Anguille Mountains. The topography is rugged with deep, heavily forested, protected valleys. The most climatically favorable sites occur within this subregion.

1.3.2.2.2 Corner Brook Subregion

This subregion extends from Bonne Bay to Stephenville and east to Grand Lake. In forestry terms, it is the only important subregion in District 15. The subregion is characterized by hilly to undulating terrain. Slates and limestone till dominate the soil parent materials. Areas with

calcareous till are distinguished by the occurrence of light colored marl deposits around ponds and in valleys. The parent material consists of shallow, stony silt loam underlain by limestone bedrock or calcareous basal till. The rugged topography is dominated by the *Taxus*-balsam fir and *Dryopteris*-*Rhytidiadelphus*-balsam fir site types.

The hilly, non-calcareous terrain in this subregion is dominated by shallow loamy soils over shale bedrock. However, the shallowness of the till does not adversely effect forest growth since nutrient rich seepage waters are held in the rooting zone by bedrock or a fragipan layer. The steep topography is dominated by the *Dryopteris*-balsam fir forest and supports some of the most productive stands in Newfoundland.

1.3.2.2.3 Port au Port Subregion

This subregion covers the Port au Port Peninsula. Soils are shallow and wind exposed limestone barrens are common; however, the herbaceous flora is rich and diverse. Many calcareous arctic-alpine species, gulf endemics and Cordilleran disjuncts are characteristic of this subregion.

1.3.2.2.4 Serpentine Range Subregion

This subregion dominates the western side of District 15 and extends from the Lewis Hills in the south to Bonne Bay in the north, spanning both shores of the Bay of Islands. The area is mountainous with elevations exceeding 800m. The vegetation is sparse, low and dominated by rock barrens. Despite this, the serpentine and ultra basic rock types support numerous rare plant species.

1.3.2.2.5 St. George's Bay Subregion

This subregion occurs on the western portion of District 14 and extends coastally, from Port aux Port to Codroy. It has flat to rolling topography and the deep soil deposits are mainly glacial or glacial-fluvial till. Gypsum is present in this subregion but limestone is absent. The ecoregion is

forested but coastal areas are marginally productive. Ombrogenous (low plateau) bogs cover much of the lowlands.

1.3.2.3 Central Newfoundland Forest Ecoregion

This ecoregion is located in the north-central part of the island with a small outlet near Bay d'Espoir. The topography is gently rolling to hilly with most elevations between 150 and 450 meters. It has the most continental climate in insular Newfoundland with the warmest summers and coldest winters. It has the least wind and fog of any ecoregion and a growing season of 140-160 days and average precipitation of 900-1300mm.

This ecoregion is heavily forested and is the most distinctly boreal part of the island. Balsam fir, black spruce, and to a lesser extent white birch are the dominant tree species. There is an extensive fire history thus fire origin stands of black spruce and white birch cover extensive areas in the northern and eastern portions. Trembling aspen forms local stands after fire but is restricted to the central and northern portion.

Hylocomium-balsam fir is the zonal forest type and is dominant in areas not disturbed by fire. *Kalmia*-black spruce and *Pleurosium*-balsam fir forests are also common. The *Kalmia*-black spruce-lichen forests, which occur on outwash sands and gravels, are unique to this ecoregion. Red pine also occurs but is restricted to extremely dry sites. This ecoregion comprises less than five percent of the zone mostly in the Portage Pond subregion.

1.3.2.3.1 Portage Pond Subregion

This subregion includes the Annieopsquotch Mountains with elevations up to 677 metres. It has rugged topography and is heavily forested, primarily with balsam fir.

1.3.2.3.2 North Central Subregion

The North Central Subregion has the highest maximum temperatures, lowest rainfall, and highest forest fire frequency on the island. The subregion extends from Clarenville to Deer Lake with a mostly rolling topography of less than 200 meters. The history of fire is evident by the pure black spruce forest with white birch and aspen stands that dominate the subregion. This subregion comprises less than one percent of the zone.

1.3.2.4 Maritime Barrens Ecoregion

This ecoregion extends from the east coast of Newfoundland to the west coast through to 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.

1.3.2.4.1 Central Barrens Subregion

This subregion includes the barrens between the forests of Central Newfoundland and the foggy zone along the south coast. Summers are warmer, fog is less frequent, and snow cover is more persistent than in other subregions. Forest patches are common throughout the barren but Arctic-alpine species are poorly represented. Speckled alder is present but does not form alder swamps and bogs are slightly domed to raised.

1.3.2.4.2 South Coast Barrens Subregion

This ecoregion covers the wind-exposed foggy zone along the South Coast. Elevations over 300 metres occur in most parts of this subregion. It provides important wintering ground for caribou due to the thin snow cover.

1.4 Ecosystem Dynamics

1.4.1 Ecosystem Condition and Productivity

Landscape patterns determine the variety, integrity, and interconnectedness of habitats within a region. These landscape patterns are a direct result of the relationship amongst 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 6. 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 6 has approximately 45 percent productive forest. As well, the relative proportion of site types is 21 percent good, 62 percent medium and 17 percent poor with a mean annual increment (MAI) of 3.4, 2.7, and, 1.3 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 and gently rolling uplands of the zone. These areas have deeper soils and less exposed bedrock. The landscape patterns are more consistent and the growing season is longer. In the extreme western and northwestern parts of District 15 and the south central and southwest portion of District 14 the soils are shallower with bedrock at or near the surface. The terrain is much rougher and the growing season is shorter.

In practice, it is nearly impossible to measure the amount of biomass produced in an ecosystem, or the energy consumed in the process. However, in the Provincial Sustainable Forest Management Strategy, criteria and indicators to monitor productivity have been identified. One method outlined is tracking mean annual increment in m^3/ha/yr by tree species by ecoregion. This can be readily measured over time and manipulated through silvicultural 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 depends 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 ecosystem's 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. Measuring and monitoring these parameters determine resilience. Forest activities must be carefully planned to not upset the natural balance and lower an ecosystem's resilience.

The ability of forest stands to regenerate themselves demonstrates their resiliency in the face of harvesting or some other natural disturbance. An example is harvesting on the more fragile sites where steep slopes and shallow soil over bedrock increase the potential of site degradation beyond repair.

1.4.1.3 Stability

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

There are three levels of stability; species stability, structural stability, and process stability. Species stability is the maintenance of viable populations or meta-populations of individual species. Structural stability is the stability of various aspects of ecosystem structure such as food web organization or species numbers. Process stability is the stability of processes such as primary productivity and nutrient cycling. To put stability in perspective, it must ensure that the

system does not cross some threshold from which recovery to a former state is either impossible, (extinction) or occurs only after long time periods or with outside inputs (e.g. loss of topsoil).

Some indicators of stability which can be monitored are: area of forest converted to non-forest use, area, percentage and representation of forest types in protected areas, percentage and extent of area by forest type and age class, and change in distribution and abundance of various fauna. These indicators can be measured and monitored to ensure stability is maintained and to evaluate the impact, if any, of forest activities on ecosystem stability.

1.4.1.4 Disturbance Regimes and Successional Patterns

There are four main driving forces that cause disturbance in the boreal forest. As stated in section 1.5.5, 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 some other agent like insects weakens a stand. For this reason successional patterns after insect damage and wind throw will be discussed together. The following is a brief synopsis of successional patterns after each major disturbance type by forest type and site type.

1.4.1.4.1 Harvesting

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

In the balsam fir types, regeneration success back to balsam fir is much higher averaging 85 percent. Regeneration rates to balsam fir are higher on the poor sites and fall off somewhat on the good sites where a small hardwood component exists. Regeneration failure is low across all ecoregion types at 5 percent.

Regeneration pattern in the mixed wood types is generally to balsam fir or back to mixed wood that is dominated by balsam fir. There is also a component of white spruce regeneration after harvest on these mixed wood types. There is a higher component of white birch regeneration after harvesting in types that had a higher percentage of hardwood before harvest. As well, the better the site class the more hardwood regeneration. Regeneration failure on the mixed wood types is variable across site types and ecoregions depending on local conditions but averages 20 percent.

Regeneration after harvest on the hardwood types is variable. Sites regenerate back to hardwood or to balsam fir in varying proportions. Mixed wood regeneration is also common. Usually the better the site the more likely the site will regenerate to hardwood. Since the timber supply for hardwood is so sensitive to regeneration of hardwood types, this component merits further survey.

1.4.1.4.2 Fire

On the black spruce types regeneration is usually back to black spruce with a minor component of white birch. More white birch regenerates after fire on the better sites. Regeneration failure on the black spruce types is common after fire averaging 45 percent. Generally the rate of regeneration failure increases, as the sites get poorer. On the balsam fir types regeneration is usually back to mixed wood dominated by balsam fir with a minor component of pure black spruce. More white birch regenerates after fire on the better sites. Regeneration failure on the balsam fir types is common after fire averaging 35 percent. Generally the rate of regeneration failure increases, as the sites get poorer. On the mixed wood types regeneration is variable. The softwood hardwood sites regenerate the birch and mixed wood while the hardwood softwood

sites tend to have a higher component of black spruce. The component of hardwood in the regeneration increases, as the sites get better. Regeneration failure on the mixed wood forest types averages 20 percent and decreases as the component of hardwood in the original stand increases. Regeneration on the hardwood types is generally to hardwood and can be dominated by aspen if it was present in the original stand. Black spruce regeneration also occurs after fire.

1.4.1.4.3 Insect

Balsam fir is highly susceptible to insect attack from the hemlock looper and spruce budworm whereby black spruce and hardwood 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 throw.

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. In black spruce stands regeneration is usually back to black spruce and increases as the sites improve. 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 patterns in the hardwood types are variable. Regeneration failure occurs approximately 20 percent of the time but can be significantly higher if pure stands of immature balsam fir are killed.

1.4.2 Biodiversity

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

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

While the boreal forest does not have the extent of biodiversity that some of the equatorial regions possess, Canada does have just over 70 000 species of plants, animals, and 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. 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 color, weight and height, are examples of genetic diversity found in humans. Genetic diversity within species is the foundation of all biodiversity. Assessing genetic diversity does not mean tracking every gene in the zone's forest. Responsible planning should design and implement measures which maintain or enhance viable populations of all forest vegetation species and which use the genetic diversity of commercially important species to a maximum benefit. The genetic diversity of commercially important species can also be managed to increase economic benefit from some portions of the landscape while allowing other portions to provide greater social and ecological values. Genetic diversity is the basis by which populations (flora and fauna) can adapt to changing environmental conditions.

1.4.2.3 Ecosystem Diversity

Ecosystem diversity describes the range of natural systems found throughout a region, a country, a continent, or the planet. Wetlands and grasslands are examples of ecosystems in Canada. A

complex and intricate mix of plants, animals, 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. Representative and protected areas will be discussed in more detail in Section 4.
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 2 displays the land classification broken down by ownership and district for Planning Zone 6. The total mapped land area in the zone is approximately 1.27 million hectares. There are approximately 750 000 and 45 000 ha not mapped in Districts 14 and 15 respectively. The following discussion will focus mainly on the mapped area.

There are four basic categories that currently represent how the land is classified; productive, non-productive, non-forest and fresh water. Individual breakouts by district and owner are shown in Table 2. Figures 4 and 5 displays the relative percentages of each major land class category in each district with all ownerships combined. The ratios across ownerships in each district are skewed toward CBPPL because it has a greater percentage of productive area. This is because

crown land holdings in both districts is concentrated near the coast or near interior barrens where site productivity in not as good.

In general, District 14 has 37 percent of its total land area in the productive forest category while District 15 has 56 percent. This is mainly due to the high proportion of area in the bog, barren, and scrub category in the coastal and interior areas in District 14. The higher the percentage of productive forest generally means that the forests are more contiguous and not as fragmented by bog, scrub and water. This has implications for harvesting and road building costs, which are generally higher when the forest is more fragmented. Another point is that the Forest Service is now classifying scrub by site, height and density class as new inventories are completed. This information will be invaluable in determining which scrub areas are marginally productive or can meet some other non-timber objective.

Table 2 Land classification by district and ownership in hectares for Planning Zone 6.

Land Class	Ownership				Total		
	Crown		CBPPL				
	14	15	14	15	14	15	Total
disturbed	4987	1542	5115	6770	10102	8312	18414
age class 1	44952	6932	26116	60449	71068	67381	138449
age class 2	33106	8310	27016	33836	60122	42146	102268
age class 3	15830	7100	17166	29962	32996	37062	70058
age class 4	12905	7666	7954	41403	20859	49069	69928
age class 5	19992	8235	8755	38787	28747	47022	75769
age class 6	30846	5883	10489	20452	41335	26335	67670
age class 7	9844	2711	6996	10712	16840	13423	30263
Total Productive	172511	48382	109558	242370	282068	290752	572820
softwood scrub	155187	20928	33561	61412	188748	82340	271088
hardwood scrub	3533	2816	2324	3293	5857	6110	11967
Total Non-Productive	158720	23744	35885	64705	194605	88449	283054
rock barren	55059	26049	6918	13121	61977	39170	101147
soil barren	52267	13555	10628	9366	62895	22921	85816
bog	80804	11996	19734	27610	100538	39607	140145
cleared land	2097	554	241	835	2339	1389	3728
agriculture land	1602	324	339	415	1941	739	2680
residential	2970	2335	93	1486	3062	3821	6883
right of ways	1699	364	1571	2749	3270	3113	6383
miscellaneous	9755	121	236	298	9961	419	10380
Total Non Forested	196833	55299	39760	55881	236583	111180	347763
Fresh Water	35846	3256	9324	20913	45170	24169	69339
Total All Classes	563899	130680	194527	383969	758426	514549	1272975

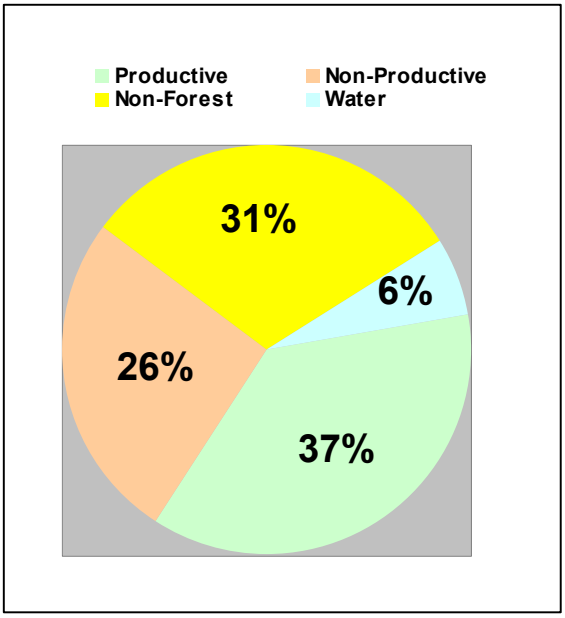

Figure 4 Land class breakdown for all ownerships in District 14

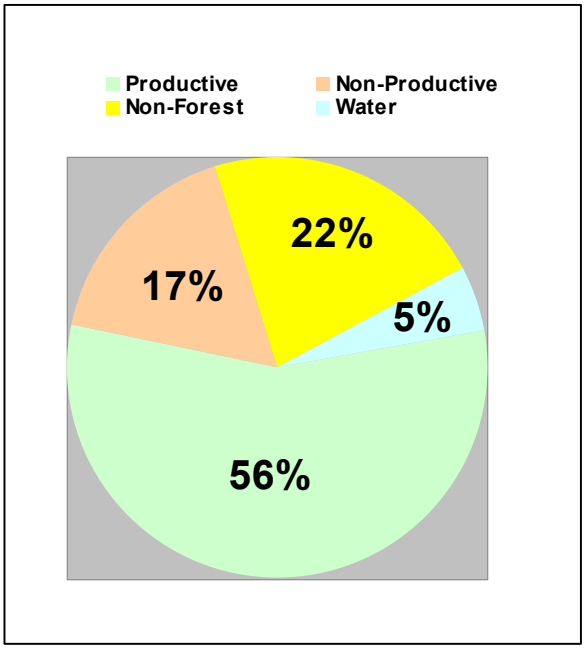

Figure 5 Land class breakdown for all ownerships in District 15

1.5.2 Age Class

Individual tree ages in a stand can all be the same after fire or planting however, in most cases the ages vary. Foresters describe ages in terms of age classes, which generally encompass 20 years. The age classes present in the zone are regenerating (age class 1, 0-20 years), immature (age class 2, 21-40 years), semi-mature (age class 3, 41-60 years), mature (age class 4, 61-80 years), and over mature (age class 5, 81-100 years), (age class 6, 100-120 years), (age class 7, 120+ years). The combined age class distribution in each district for the entire productive forest is shown in Figures 6 and 7. In general terms, the more balanced the age class distribution in a district, the higher the potential even flow sustained yield of timber can be because continuous timber supply is limited by the age class with the lowest area. The age class structure for District 14 are typical of that of the island with an abundance of area in the young and old age classes with a dip in the intermediate age classes. In District 15 the age class structure is more balanced. Age class structures by owner and district will be discussed in more detail in each pertinent five-year plan. The age class structures for Crown land in Districts 14 and 15 as well as strategies to rectify any imbalances or impacts on wood supply of poorly structured age classes will be presented in Section 3 of this plan.

1.5.3 Site Class

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

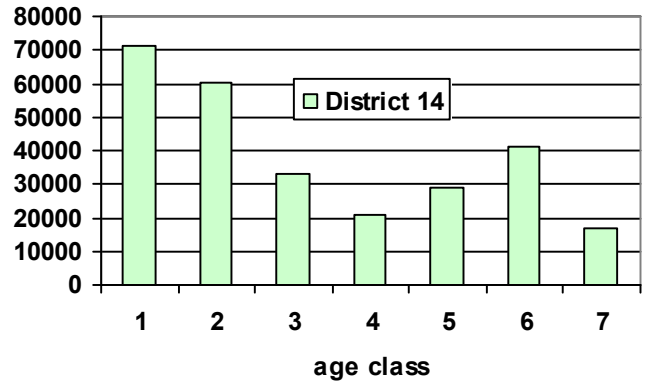

Figure 6 Age class distribution for all ownerships in District 14

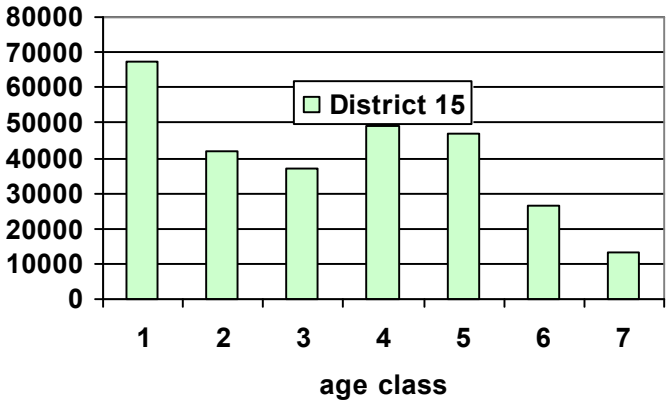

Figure 7 Age class distribution for all ownerships in District 15

The distribution of area of all ownerships combined by site class for each district is shown in Figures 8 and 9. As with productivity, the proportion of better sites favours CBPPL timber limits. On average, good sites are capable of producing 3.4 m3/ha/yr, medium sites 2.7 m3/ha/yr, and poor sites 1.3 m3/ha/yr.

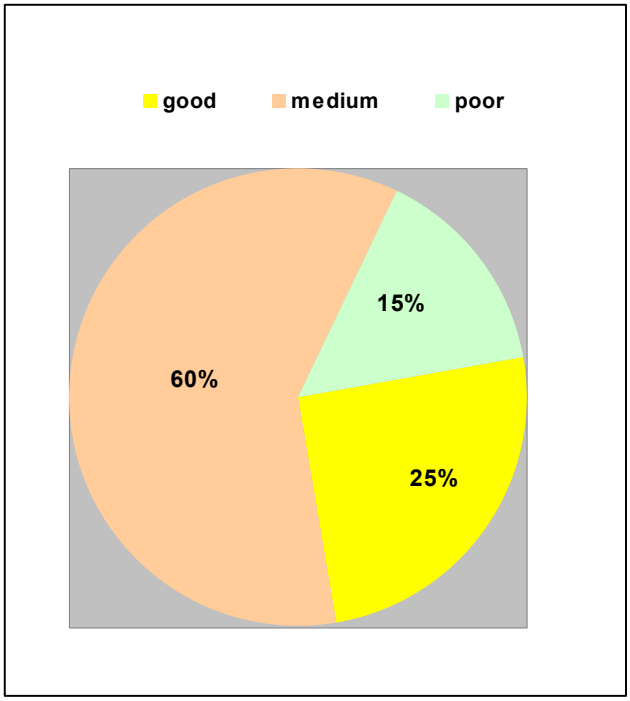

Figure 8 Site class breakdown for all ownerships in District 14

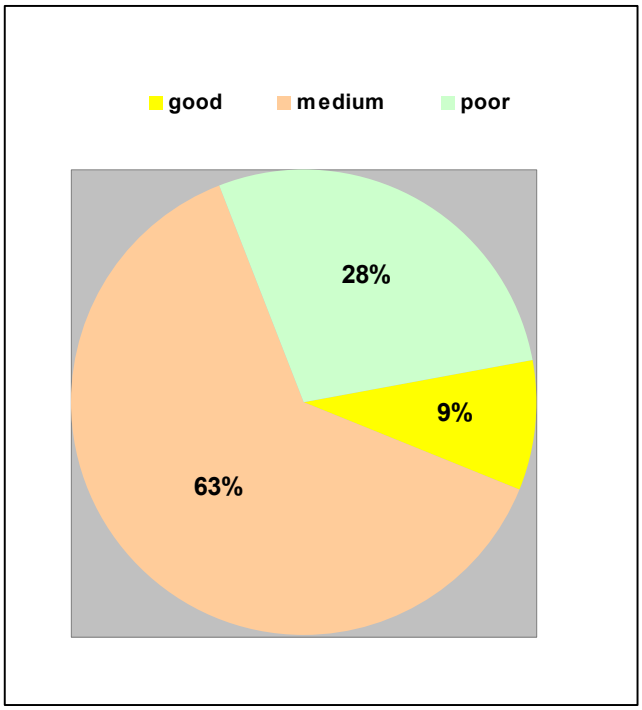

Figure 9 Site class breakdown for all ownerships in District 15

1.5.4 Species and Working Group

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

In the zone, the softwood working groups dominate accounting for over 90 percent of the productive forest. Balsam fir (bF) is by far the most prolific accounting for 72 percent of the working groups in District 14 and 70 percent in District 15 (Figures 10 and 11). Balsam fir can occur in pure stands or in association with one or more of black spruce, white spruce, white birch, or larch in varying species compositions. The black spruce (bS) working group accounts for approximately 10 percent in each District. As with balsam fir, black spruce can occur as pure stands or in association with other species listed above. Softwood hardwood working groups occupy nine and 13 percent of the productive forest area in Districts 14 and 15 respectively. This working group occurs as varying mixtures of fir, spruce, and birch. The hardwood softwood (hS), and white birch (wB), white spruce (wS) working groups occupy around five percent of the productive forest in both districts. Approximately three percent of the productive forest is classed as disturbed (DI). Disturbances include harvesting, which accounts for most of the total, insect damage, fire, wind throw, and flooding. The relative percentages hold true for all ownerships in both districts with the exception of black spruce in District 14. There is a higher percentage of black spruce on crown land because there are more poor sites.

1.5.5 Forest Disturbances

In the past 20-25 years approximately 30 000 ha have been disturbed by some means on crown land in the zone. Harvesting has accounted for a large portion of this disturbance at approximately 9 400 ha. Insect damage has occurred on over 3 800 ha with 12 percent in light

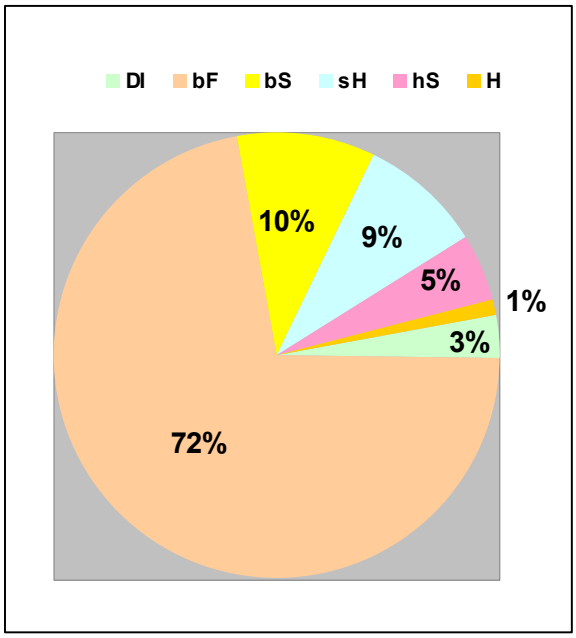

Figure 10 Working group breakdown for all ownerships in District 14

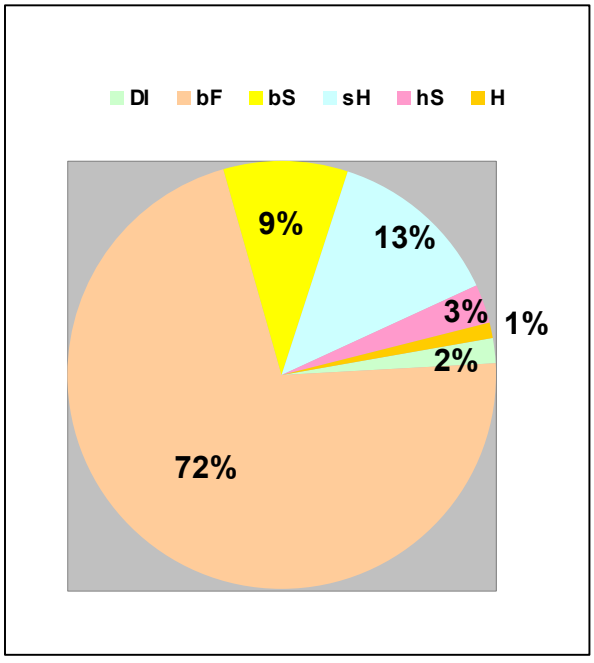

Figure 11 Working group breakdown for all ownerships in District 15

(0-25 percent mortality), 11 percent in moderate (26-50 percent mortality), 6 percent in severe (51 -75 percent mortality) and 71 percent in extreme (76+percent mortality). There has been over 11 700 ha of mortality due to blow down which has occurred as scattered pockets in mostly remote areas. This usually occurs after another disturbance (like insect damage) has weakened a stand. Other miscellaneous disturbances account for approximately 450 ha. It should be noted that these areas are not mutually exclusive and there is overlap between disturbances. (ie. insects may have killed a stand, followed by salvage harvesting and then perhaps fire).

The main forest insects, which have affected forests in western Newfoundland, are the hemlock looper (1949, 1961, 1962, 1969, 1986-88, 1995, 1996), the spruce budworm (1956, 1978-80 to present at lower levels), the balsam woolly adelgid (1963, 1970-present) and the birch casebearer (1970-present). A chemical spray program was initiated in 1969, to aid in the control of the hemlock looper. Since then, the aerial application of insecticides has been used regularly as a management tool to control insect pests of balsam fir. In more recent years chemical insecticide use has been dropped in favor of the biologically insecticide bacillus thurengiensis (bT), a naturally occurring, biological control agent. Despite the use of insecticides, the hemlock looper and the spruce budworm continue to pose a significant threat to the forests of the zone and new infestations are likely to develop over the next 20 years.

Another insect of particular importance is the balsam fir sawfly, a native defoliator that rarely causes significant mortality. Typically, an infestation of this insect collapses due to parasitism and viral diseases well before lethal damage occurs. However, a sawfly epidemic began in the Bottom Brook area of District 14 in the early 1990's and spread northward into District 15. This infestation, which has now collapsed has resulted in serious growth loss in the affected forests. The balsam woolly adelgid is an ongoing insect pest of balsam fir, particularly in District 14. This insect occurs mainly on the coastal lowlands and impacts the newest tree growth causing node swelling and stagnation, which results in severe growth loss of, affected stands and poorer wood quality. To date there has been no available treatment for this insect other than stand conversion.

Section 2 Past Activities

2.1 District 14

2.1.1 Summary of Past Activities

As stated in the introduction, there has been a change in the planning process and requirements for the province by combining ownerships for certain districts into planning zones. To do this it was necessary to change the start and end dates of some existing five-year plans so that they could be synchronized for the new planning process. The five-year plan for District 14 was extended by 1.75 years to facilitate this change therefore reporting of past activities will be for a seven-year period.

Corner Brook Pulp and Paper Ltd's harvesting and silviculture activity in FMD 14 from 2002 to 2008 is outlined in table 3 and table 4. Harvesting in the district over the last 7 years averaged 56,357m3, which is well below the current five year AAC of 99,400m3. Over the same period 24 kilometers of primary access roads were constructed and 3609ha were silviculturally treated with the major emphasis on pre-commercial thinning and to a lesser extent planting.

Table 2.1 summarizes the total harvest on CBPPL limits in FMD 14 and compares it to the AAC for the period. During the period 2002-2008 CBPPL harvested 394,496m3 in the district compared to an AAC available of 695,800m3. Details of the harvest by Crown in the district can be found in the Crown 5 Year Plan.

Table 3 Summary of softwood harvest in FMD 14 by CBPPL for 2002 to 2008.

AAC Source	Total (m^3)	AAC (m^3)
CBPPL	394 496	695 800

Note: table includes estimates for 2007 and 2008

Table 4 Summaries of Silviculture Treatments in FMD 14 by CBPPL for 2002 to 2008.

Treatment Type	Area Completed (ha)
Pre commercial Thinning	2664
Planting	855
Herbicide	90

2.2 District 15

2.2.1 Summary of Past Activities

Corner Brook Pulp and Paper Ltd's harvesting and silviculture activity in FMD 15 from 2002 to 2008 is outlined in table 5 and table 6. Harvesting in the district over the last 7 years averaged 246 735m3, which is well below the current five year AAC of 302 200m3. Over the same period 206 kilometers of primary access roads were constructed and 6141ha were silviculturally treated with the major emphasis on pre-commercial thinning and to a lesser extent planting.

Table 5 summarizes the total harvest on CBPPL limits in FMD 15 and compares it to the AAC for the period. During the period 2002-2008 CBPPL harvested 1 727 142m3 in the district compared to an AAC available of 2 115 400m3. Details of the harvest by Crown in the district can be found in the Crown 5 Year Plan.

Table 5. Summary of softwood harvest in FMD 15 by CBPPL for 2002 to 2008.

AAC Source	Total (m^3)	AAC (m^3)
CBPPL	1 727 142	2 115 400

Note: table includes estimates for 2007 and 2008

Table 6. Summaries of Silviculture Treatments in FMD 15 by CBPPL for 2002 to 2008.

Treatment Type	Area Completed (ha)
Pre commercial Thinning	3332
Planting	2694
Herbicide	115

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

3.2 Guiding Principles and Policy Direction

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

In concert with the policy of establishing sustainable timber harvest levels, government policy requires that harvesting not exceed the established AAC's. Likewise, government's 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 6 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 a matrix of measures is employed which is designed to fill the gap in the 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. Many ponds, bogs, rivers, streams carve the province's landscape, 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. Other users are constantly eroding the land base available for forest activity. 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. District 15 has a new

forest inventory and although the last inventory for District 14 was done in 1999, 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, harvesting operations influences less than1% of the productive forestland base.

3.4.2.1.1 No-Cut Buffer Zones

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

3.4.2.1.2 Pine Marten and Caribou Habitat

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

3.4.2.1.3 Wildlife Corridors

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

3.4.2.1.4 Protected Areas

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

3.4.2.1.5 Watersheds

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

3.4.2.2 Timber Related

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

3.4.2.2.1 Insect/Fire/Disease Losses

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

3.4.2.2.2 Logging Losses

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

3.4.2.2.3 Operational Constraints

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

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

3.4.3 Growth Forecasting

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

Yield curves are a key element in a wood supply analysis. In fact, the validity, or "usefulness", of the wood supply analysis is determined by the truth, or "correctness", of the yield forecasts. While there is no way of predicting with certainty how stands will actually grow in the future, care must be taken to ensure that the yield projections used are realistic and reasonable.

Respecting the sensitivity and importance of these forecasts, the Newfoundland Forest Service has directed a large portion of its resources and time into developing realistic yield curves. Two growth models were used, one for projecting stand development under natural conditions and the other for projecting growth under managed (i.e., silviculturally enhanced) conditions. Tree and stand development data generated from the Forest Service's forest inventory program were used to make stand growth predictions. These projections were then checked against empirical data from thousands of temporary plots established throughout the island. If the projections varied from the real life evidence, the curves were adjusted to make them more accurate.

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

3.4.4 Management Strategies

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

3.4.4.1 Harvest Flow Constraints

An even-flow harvest constraint was used in the analysis to maximize the sustainable harvest level. This strategy produced the maximum even flow harvest but resulted in less than optimum economic use of the forest resource. If no even flow constraint is used and harvest levels are permitted to fluctuate in response to market value, the overall economic potential of the forest will increase. However, the lower economic potential is offset by stability in mills and employment. This is in line with Goal 1 of Value 5.1, Commercial Timber, of the Economic

Benefits Element of Criterion 5, Economic and Social Benefits, in the *Provincial Sustainable Forest Management Strategy.*

3.4.4.2 Spatial Analysis

A major improvement in this wood supply analysis is the introduction of manual harvest scheduling. In 2001, the harvest scheduling was an automated process where the software picked the stands to be harvested over the 25 years based on user supplied criteria. While, the 2001 approach was an improvement over previous wood supply analysis 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 case, 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 tied directly to discreet forest areas, and these forest areas can be the link that allows the many different forest values to be managed simultaneously. The forested areas needed for each resource can be mapped and potential conflicts can be addressed before they become an issue. Finally, the harvest schedule maps developed for the wood supply analysis can be a starting point for the 5 year planning process, especially the first two periods. The harvest schedule maps, if done correctly, can help reduce the work of the 5-year planning process. One point to note is that harvest scheduling is only done for the class 1 land base. The class 3 AAC, for the most part, is opportunistic at best and is harvested only if extra effort is applied. It is not scheduled because of the uncertainty of obtaining extra funding for access and harvesting.

3.4.4.3 Planning Horizons

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

3.4.4.4 Operable Growing Stock Buffer

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

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

3.4.4.5 Old Forest Targets

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

3.4.4.6 Operability Limits

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

average condition. Therefore, the first operability limit was staggered by 5-year intervals with the 10 percent, 30 percent, and 60 percent assigned to each availability class listed above respectively. 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 use in the 2006 analysis include; 1) precommercial thinning of balsam fir, black spruce, and softwood hardwood stands, 2) full plant of any areas that do not regenerate naturally with either white spruce, black spruce, or Norway spruce, and 3) gap planting of either black spruce or balsam fir stands with either white spruce or black spruce. Gap plant is the filling of "holes" within stands that have inadequate natural regeneration of either balsam fir or black spruce.

3.5 Inventory Adjustments

One of the limitations of the current wood supply model is its inability to account for volume depletions outside of what is reported for harvesting operations. The model produces a gross merchantable volume (GMV) figure, which needs to be adjusted to account for volume losses as a result of; fire, insects and disease, timber utilization practices and the presence of stand remnants. In previous analyses the lack of province wide digital stand information, the absence of computer tools and the small number of people involved with the wood supply analysis,

resulted in a high degree of uncertainty around values derived for each depletion. It was recognized that a need existed to study each component more intensely and to expand the time frame and staff responsible for such an analysis. Such was the task of the Forest Engineering and Industry Services Division whose staff, over a seven-year period, completed an analysis of the individual components.

3.5.1 Fire

An estimate of productive area loss as a result of fire was based on an analysis of the historical fire statistics maintained by DNR. The fire deduction for both domestic and commercial operations in District 14 and District 15 is 0.9 and 0.0 percent respectively.

3.5.2 Insects

An aerial mortality survey was completed on areas with historically high insect infestations. This information along with a GIS analysis of areas salvaged enabled DNR to determine the amount of productive area lost to insect mortality each year. District managers in turn reviewed these numbers and adjustments were made for local conditions. The insect deduction in Districts 14 and 15 is 3.0 percent.

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 14 is 5.6 percent while in District 15 it is 8.5 percent.

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 District 14 is 14 percent and for District 15 it is 9.5 percent. The total inventory adjustment for Districts 14 and 15 is 23 and 21 percent respectively.

3.6 Results

3.6.1 District 14

Table 7 summarizes the result of the timber supply analysis for CBPPL limits in District 14. The class 1 softwood AAC is up from 73 300m3 in 2001 to 81 400m3 in the 2006 analysis. The main reasons were the change in land base from the class 3 to Class 1 and the results of harvest scheduling (the difference between aspatial gross and spatial gross). The class 3 softwood AAC also dropped from 19 000 m3 to 18 000m3. In addition to the reasons above, the land base was closely scrutinized and many stands that were included in the 2001 analysis were taken out for operational reasons.

Table 7 Annual Allowable Cut results for CBPPL Land District 14.

	Aspatial Gross (m3)	Spatial Gross (m3)	Spatial Net (m3)
Class 1 Softwood	130 777	108 537	81 400
Class 3 Softwood	24 094	24 094	18 000
Total Softwood	154 871	132 631	99 400
Hardwood	9430	9430	9430

The hardwood AAC for CBPPL limits in District 14 is 9430 m^3, which represents a minor component in pure stands with the majority being residual. There was only a rudimentary hardwood AAC calculated for District 14 in 2001 so comparison to 2006 is unwarranted.

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 so therefore little sensitivity analysis was needed.

The silviculture targets used were 210 hectares of planting and 90 hectares of thinning. While doing maximum silviculture would give an increase in AAC, operational and monetary constraints render this option unrealistic. Similarly, increased yield would give a higher AAC, but current yield curves have been constructed using the best available data so a further increase in unwarranted. Lowering the operability limits would also increase the AAC. This would represent a significant and unwarranted risk however, if stands situated at the lower end of operability were 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).

Figure 14 shows the change in total forest age on crown land in District 14 by 20-year age classes for the simulation period. There are shifts in age classes from period to period as a result of natural progression as stands age or are disturbed resulting in mortality. Normally, after stands are severely disturbed they are regenerated and revert back to the first age class. Initially there is a dip in the age class structure in the intermediate age classes with an abundance of area in the younger age classes. This has an impact on the wood supply since AAC is limited by the lowest amount of area in an age class. The intermediate age classes tend to "fill in" after 25 years however. The 81+ forest target ensures that the forest will be well represented in all age classes through time. This category is mainly represented by alienation class 3 stands and poor black spruce stands that are not harvested.

There is insignificant change in the balsam fir and black spruce working groups as a result of forest management activities on crown land for the next 25 years. There is however a ten percent shift from balsam fir to the spruce working groups (particularly white spruce) at the end of the simulation period. The major reason for this is the planting program is geared towards spruce.

This program will see a gradual stand conversion from fir to spruce. This is necessary because fir is highly susceptible to insect attack and moose browsing, whereas spruce is more resistant to these pests. There is a slight decrease in the hardwood component of the forest over time. This decrease is mainly due to the regeneration assumptions used in the model, which tend to favor softwood regeneration after disturbance. Since the value-added hardwood industry is emerging and being developed in the district, more emphasis should be placed on refining the hardwood portion of the regeneration assumption for the next analysis.

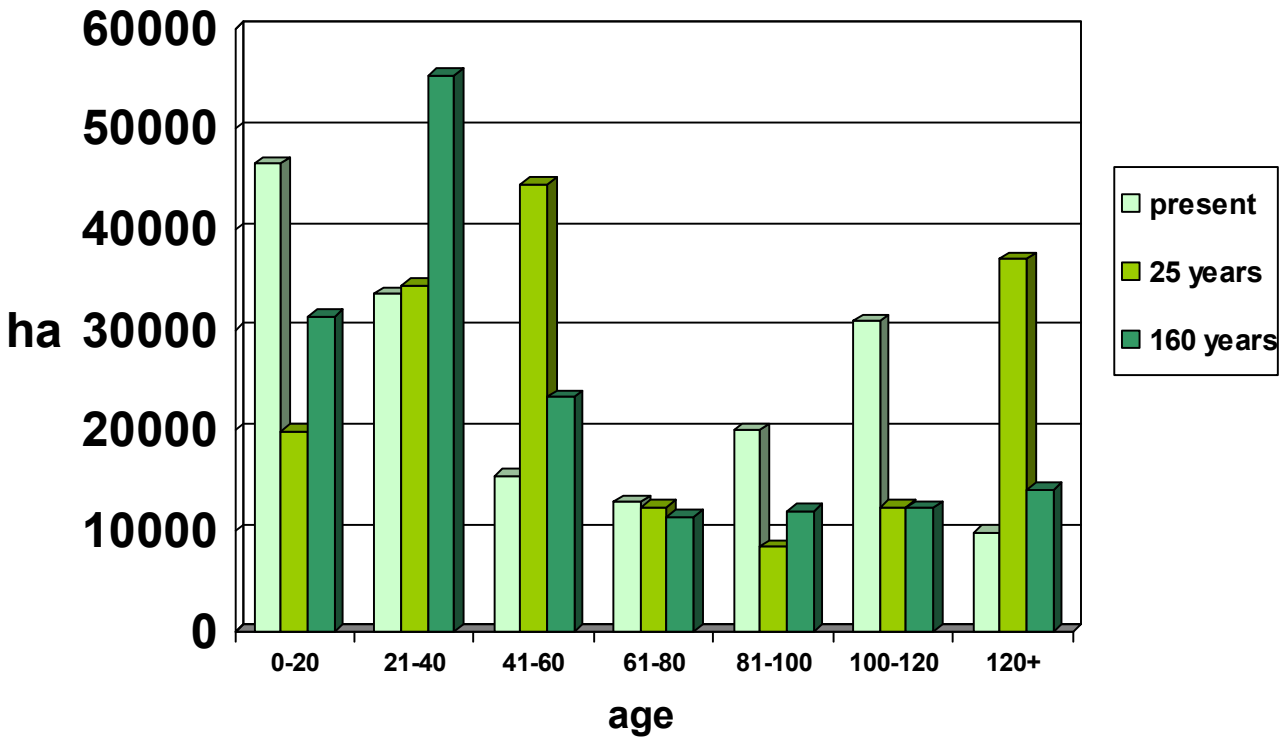

Figure 12 Change in age class structure on Crown Land in District 14 for the 160 year simulation period.

3.6.2 District 15

Table 8 summarizes the result of the timber supply analysis for CBPPL limits in District 15. There is a decrease in the class1 softwood AAC from 293 900 m3 in 2001 to 285 300 m3 in 2006 and an increase in the class 3 softwood AAC from 9700 m3 to 16 900 m3. This difference is mainly due to the rationalization of the landbase. Overall the AAC change is mainly due to harvest scheduling (the difference between aspatial gross and spatial gross) as previously discussed.

The hardwood AAC for District 15 is 35 180 m3 which represents a minor component in pure stands with the majority being residual. There was only a rudimentary hardwood AAC calculated for District 15 in 2001 so comparison to 2006 in unwarranted.

Table 8 Annual Allowable Cut results for Crown Land District 15.

	Aspatial Gross (m3)	Spatial Gross (m3)	Spatial Net (m3)
Class 1 Softwood	403 959	380 421	285 300
Class 3 Softwood	22 592	22 592	16 900
Total Softwood	426 551	403 013	302 200
Hardwood	35 180	35 180	35 180

3.6.2.1 Sensitivity Analysis

The sensitivity analysis for District 15 is the same at that listed in section 3.6.1.1 for District 14 with the same results. The silvicultural inputs are 10 ha for planting and 25 ha for thinning.

3.6.2.2 Forest Composition and Structure Change

Figure 13 shows the change in total forest age on crown land in District 15 by 20-year age classes for the simulation period. The age distribution in all classes is well distributed throughout the three comparison periods during the simulation. There are shifts in age classes from period to period as a result of natural progression as stands age, however, overall representation is balanced. The 81+ forest target ensures that the forest will be well represented in all age classes through time.

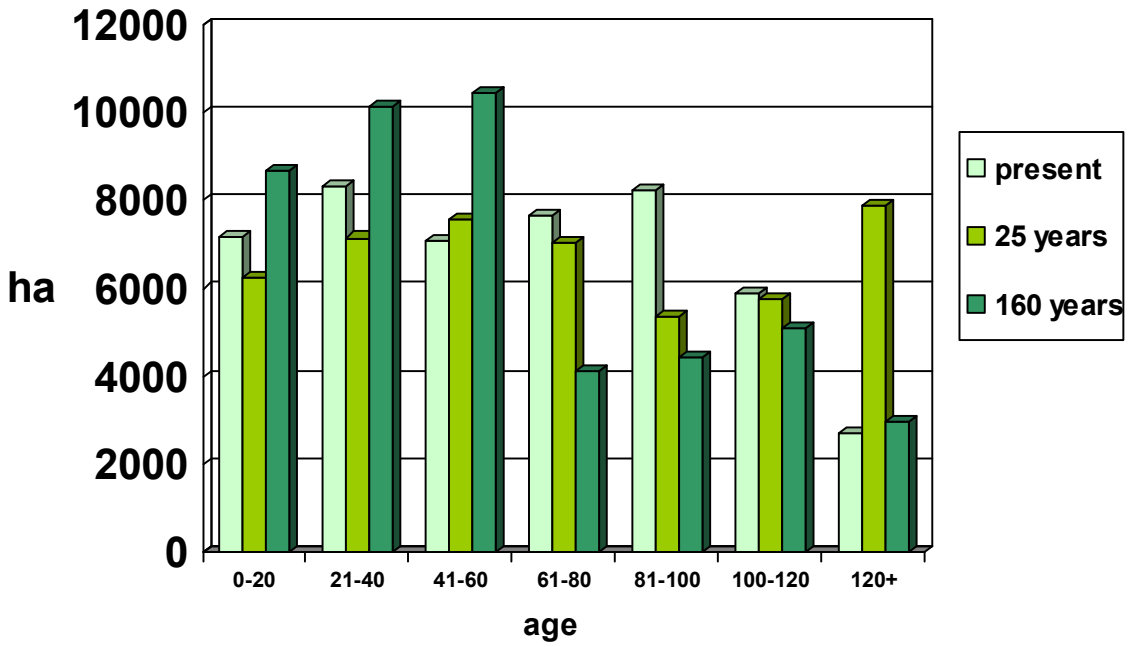

Figure 13 Change in age class structure on Crown Land in District 15 for the 160 year simulation period.

There is very little change in area of all softwood dominated working groups over the entire simulation period. There is no migration from fir to spruce as in District 14 because the planting

level in the analysis is so low for District 15 (10 ha per year). The pure hardwood stands disappear from the landscape over the simulation period however. This is due to the regeneration assumptions for disturbance in hardwood stands, which favor a higher softwood regeneration component. As with District 14, more work needs to be done on refining the regeneration assumptions of hardwood stands after disturbance if landscape diversity is to be maintained. The not sufficiently restocked area triples over the regeneration period. This needs to be examined more closely for the next analysis by reviewing the regeneration assumptions and the planting level used.

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.

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

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

4.2 Value Description

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

Many of the values in the zone were identified by this or previous planning teams. Presentations of pertinent information on each value by knowledgeable individuals or groups provided stakeholders with relevant information to make informed decisions. Other values, while not specifically outlined by the planning team, are also identified and

discussed to provide a more complete description of the range of values found in the zone. The following represents a framework for characterizing values in a clear and consistent manner. This approach consists of three components:

Characterization

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

Critical Elements

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

Guiding Principles

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

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

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

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

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

Each individual value was discussed both at the strategic and operational level. Strategic level information (characterization, critical elements, and guiding principles) are the focus of discussion in this section. They provide a mechanism to resolve conflicts that might arise throughout or after the five-year planning process. Where possible, the physical location of the value on the landscape (operational level) was also identified during the discussion of each

value. This will help facilitate the preparation of later sections of this plan by identifying potential areas of conflicting use early into the process.

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

4.2.1 Biotic Values

4.2.1.1 Big Game

4.2.1.1.1 Moose

Characterization:

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

Currently, moose are managed on an area/quota system in the province. The island is divided into 50 management areas and license quotas are set annually for each area. Quotas are set based upon the management objective for each area (i.e., whether it is desired that the population increase, decrease or stabilize). Generally, if an area has too high of a moose population, managers will increase quotas to bring down the population in order to prevent damage to the habitat. However, if the habitat is in good condition, and the area could support more animals, future quotas may be increased. All or portions of moose management areas 5-13, 18, 19, 27 and 43 are located within the zone.

Critical Elements:

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

4.2.1.1.2 Caribou

Characterization:

Caribou is the only native ungulate species on the island (Northcott, 1980). Biologists estimate that prior to the railway being built in 1898 the population on the island was approximately 100,000 animals but by 1930 the population had declined to about 2,000 animals (Murphy and Minty 1993). Between 1980 and 2000 the number of caribou has increased considerably on the island with a population estimated at 70,000+ animals. In the past few years however populations have declined significantly with Planning Zone 6 being no exception. All or portions of caribou management areas 61, 62, 63 and 75 are located in the zone. Core caribou areas 19 to 26 are located in the zone representing the Buchans, LaPoile and Grey River caribou herds.

Critical Elements:

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

4.2.1.1.3 Black Bear

Characterization:

The black bear is native to the island and is found in forested areas (Northcott, 1980). Currently, the number of black bears occurring on the island is not known (due to difficulty in conducting a census) but is crudely estimated to about 6 - 10,000 animals (Christine Doucette, Pers. Comm.). All or portions of black bear management areas 5-13, 18, 19, 27 and 43 are located within the zone.

Critical Elements:

- den sites for winter hibernation;
- forest cover

Guiding Principles:

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

Management of big game species in the province is accomplished by a planning process in which a Big Game Management Plan is prepared annually by the Inland Fish and Wildlife Division (IFWD) of the Department of Environment and Conservation. 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

- 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);

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

- Plan primary roads and road corridors to avoid traditional winter and calving grounds.
- Avoidance of sensitive periods will still be applied to all herds.
- Operators should avoid an area during i) calving period – May 15 – July 30; ii) wintering period – December 1 – April 30; iii) If caribou are encountered in an area operators should avoid disturbance or harassment of caribou, and contact the Wildlife Division.
- within the core areas a harvest strategy should occur that maintains 75% of overmature (80+ years) forest (based on 2005 forest resource inventory).
- operators should avoid an area if caribou are present during calving/post-calving or wintering seasons and return to operations when caribou move out of the area. If large groups (20+) of caribou are encountered at any other time, operators should avoid disturbance or harassment of caribou, and contact the Wildlife Division for direction on how to proceed.

Bear

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

4.2.1.2 Furbearers

Characterization:

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

Critical Elements:

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

Guiding Principles:

Fur Bearer Management Strategy:

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

Environmental Protection Guidelines:

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

4.2.1.3 Species of Interest

4.2.1.3.1 Pine Marten

Characterization:

Before 1900, marten ranged over most of the forested areas of the island (Bergerud, 1969) but, it was listed as endangered by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). Habitat loss, predation, disease and accidental trapping and snaring are possible reasons for the marten population decline in Newfoundland. The status of marten has been upgraded from endangered to threatened in January of 2008 because new population estimates indicate that marten populations have increased from 300 to 600-800 animals.

Since the initiation of the live-trapping program, it has been revealed that the Main River watershed to the north of District 15 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. 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 sits 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 has identified critical and recovery marten habitat and is now determining which forest activities can take place within these areas. In addition, Brian Hearn of the Canadian Forest Service has been tasked with examining the 25 year harvest schedule produced for each owner to determine the impact of changing habitat on potential marten populations.

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

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

Early indications from Brian Hearn's work with the harvest schedule indicate that there is lots of suitable habitat in District 15 today and that the amount will increase over the next 10 years, even if the full harvest schedule is implemented. Work is now underway to extend this analysis to 20 years. The analysis also seems to suggest that snaring and trapping may be the main impediments to marten recovery.

Recommendations resulting from any of these ongoing initiatives will be incorporated into harvesting prescriptions as required.

4.2.1.3.2 Piping Plover

Characterization:

The piping plover, (*Charadrius melodus*), is a small sandy coloured shorebird which can be found on sandy beaches in North America. It is distinguished from other plovers by its yellow-orange legs, a black band across its forehead and a black ring around the base of its throat (the band may be complete or open in the front). The Atlantic Coast population is considered a distinct subspecies (*C.m. melodus*) and breeds on coastal beaches from Newfoundland to North Carolina and winters mainly from North Carolina to Florida although some may migrate further south.

This species is listed federally as endangered by COSEWIC as well as provincially in Newfoundland under the Endangered Species Act. In 2007, only 28 breeding pairs were found on the island of Newfoundland with all but one pair being found on the Southwest Coast. Beaches inhabited by piping plover in 2007 were as follows: Stephenville Crossing, Little Codroy (MacDougals), Grand Bay West, Cape Ray Beach in Cheeseman Park, Sand Banks Park, Big Barasway, Burgeo, and Seal Cove in the Coast of Bays area (east coast). Surveys in previous years revealed that they nested at 3 additional sites: Sandy Point, Flat Bay and Searston Beaches'.

Preferred nesting habitat for these birds are relatively undisturbed wide sandy beaches or beaches with sand and scattered cobble, gentle slopes, beach wrack (seaweed and other marine material which washes shore) for hiding and foraging, and tidal flats (muddy areas) or backwater lagoons (areas with a mix of fresh and saltwater in back of the beach). The latter are rich in invertebrates and provide excellent feeding sites for adults and chicks.

Because of such low numbers of breeding pairs on the island, loss of any nests or chicks represents a significant loss of overall annual productivity. In 2007, productivity on the island was very low with only 0.5 young surviving to fledge per nesting pair. This means that each nesting pair contributed only 0.5 young plover to population. Perhaps the greatest threat to piping plover in Newfoundland is the use of ATV's on nesting beaches. Not only are the adults often driven off their nests and the eggs vulnerable to being run over but also the tracks left in the sand by the vehicles are very dangerous for the chicks. Chicks are too small to be able to get out of these deep tracks and because the adults are unable to help them, they consequently perish. Another problem for plover is people allowing their dogs to roam free on nesting beaches. Dogs may drive adults off the nests exposing the eggs to the elements and to predators and will often harass and kill young chicks, which they encounter. Pollution and litter on our beaches also pose problems for piping plover by affecting habitat quality and by attracting predators (such as gulls, fox, and mink) when there is food scraps in with the garbage.

Critical Elements:

1. Pristine beaches
2. Beach wrack
3. Undisturbed natural features such as dunes, dune grass, and lagoons

Guiding Principles:

(1) Do not drive ATV's or other motorized vehicles on nesting beaches during the critical nesting and brood rearing period (mid May to late July). Travel on the beach should be close to the waters edge.

(2) Do not allow dogs off the leash on nesting beaches from early April until early August. If plovers or nests are encountered the area should not be used.

(3) Respect all fences or markers placed around nests or nesting areas and stay away
(4) Do not approach, chase, or linger near piping plover or their nests. Never touch or remove eggs or attempt to catch or chase newly hatched chicks.
(5) Do not dump garbage or leave (or bury) food scraps on beaches.
(6) Report any violations you discover to either District Forestry Office or the Wildlife Division Office in Corner Brook.

4.2.1.3.3 Rare Plants

Characterization:

Approximately 300 plant species, or about a quarter of all plant species on the island of Newfoundland, are considered to be rare and are known from 20 or fewer locations on the island. Rare plants are often found in habitat types that are themselves rare or at least fairly restricted on the island. While the limestone barrens of the Great Northern Peninsula have garnered wide recognition as an important rare plant area, limestone barrens also exist further south along the west coast of Newfoundland, and other habitats with a high rare plant diversity exist on the central and southern west coast as well.

The areas with limestone barrens include the western Port au Port Peninsula, and Table Mountain west of Stephenville. Although none of the three species listed federally and provincially as endangered occur south of Port au Choix, the southern limestone barrens nevertheless are rich in rare plant species, some of which are not found on the Great Northern Peninsula. For example, the only known locations of the Mackenzies's sweetvetch in Newfoundland are on the western Port au Port Peninsula.

Other rare plant hotspots include the following:

-The Bay of Islands region, especially the Corner Brook Area, which has abundant limestone. While this area generally does not have large expanses of limestone barrens, open limestone cliffs, talus slopes and wetlands on limestone are abundant. The flora is somewhat similar to limestone barrens but the most arctic/alpine species do not occur in this area.

-The Stephenville Crossing/St. Georges River/Flat Bay area, has rare plants characteristic of salt marshes, coastal dunes, and shallow pond and river shores

-The lower reaches of Robinson's River, Crabbes River and Middle Barachois River host a variety of rare plants on river gravels and in the flood plain.

-The Codroy valley, which is warmer than most of Newfoundland and its complement of rare plants contains species characteristic of river floodplain and brackish estuary habitat, wetland species of the Coastal Plain element (distributed mainly on the Eastern Seaboard of North America), as well an arctic/alpine flora on barren mountain summits

-The Lewis Hills and Blow me Down Mountains, which have barren serpentine soils (rich in iron, magnesium and heavy metals) and support a special rare plant flora tolerant of these toxic conditions

-The Port aux Basques area harbours rare plants in sheltered stream valleys and coastal back dunes.

Most of the rare plant species throughout Newfoundland are inhabitants of fairly open habitats, such as river gravels, salt marshes, wetlands, aquatic habitats and barrens; all areas where no forestry operations are practiced. However, there are a number of rare plants that prefer or tolerate the partial shading found in forests. These are scattered throughout Districts 14 and 15, and often occur as single occurrences of rare plant species, rather than in groups of several rare species. Some species in forest habitat are protected from harvesting operations by buffers along watercourses, but some locations are not protected. Rare forest species are more likely to be found in moist sites with nutrient rich or calcium influenced soils, and is commonly associated with open forests or small forest gaps.

In forested areas many rare plant locations probably remain unknown because areas with only very scattered rare plants do not draw much botanical attention. The known rare plant distribution is very much a reflection of survey effort, which is by no means evenly distributed across the island. Botanical surveys have been mostly done within a few kilometers of major roads, and known plant hotspots generally inspire repeated botanical surveys. Many areas of central and southern part of western Newfoundland appear to be devoid of rare plants, but it is likely that they have never been visited by botanists.

Critical Elements:

- quarrying and road construction

- logging and extraction using heavy equipment
- mechanical site preparation
- all terrain vehicle traffic also poses a potential threat in some areas

Guiding Principles:

- To ensure that rare and endangered plant species present in the district do not become extinct because of forest management operations.
- To identify and protect rare plant habitat
- To educate department personnel and the public on the locations and importance of rare plants
- Identify and update all rare plant sites on GIS forestry data base
- Ensure that areas containing rare plants are marked and posted
- Work with the IFWD to develop mitigative measures in areas where rare plants occur.

4.2.1.3.4 Other Species

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

4.2.1.4 Water Resources

Characterization:

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

In Planning Zone 6, water is used beneficially for numerous purposes. Most communities within the zone have water supplies. Thirty-eight of these supplies are protected under the province's Protected Water Supply Program. Recreational waters within this zone are used for activities such as fishing, boating and as a water supply source for numerous cabin owners.

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

Critical Elements:

Forest management activities such as road construction, use and maintenance, timber harvesting, and silviculture may substantially alter the quality of water draining from watersheds as well as other defining characteristics such as stream hydrology, sediment loadings, stream characteristics, and aquatic discharges from municipalities. Careless storage and handling of

fuels by industrial and recreational users, stream diversions and agricultural operations are other examples.

Guiding Principles:

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

4.2.2 Human Values

4.2.2.1 Timber Resource

Characterization:

One of the major resource values of the forest ecosystem is the harvesting of timber to provide forest products. The market value of forest products harvested on crown land in Zone 6 is more than $2 million and provides direct employment for approximately 30 - 40 individuals. Historically timber has been harvested since the first inhabitants settled in the zone. Initial uses were mainly domestic in nature to supply timber to build houses, fishing sheds and equipment and for heating and cooking. With the increase in population, more commercial uses have arisen to supply lumber and pulp and paper products. The crown portion of the zone supports an annual allowable cut (AAC) of both softwood and hardwood on Crown land of 73 800 m3 in District 14 and 27 400 m3 in District 15.

Commercial logging contractors are allocated approximately 35 percent of the annual allowable cut on crown land in the zone. Commercial harvesting and sawmilling activity provides many jobs in harvesting, sawmilling, trucking, pulp and paper manufacturing and related spin off industries for local residents. There are approximately 40 direct jobs created by the industry with

an estimate of nearly twice that many in spin off industries. There is also a value added hardwood industry emerging in District 14 which shows promise.

Domestic harvesting still provides fuel wood to heat many homes and saw log material for residential house construction in the zone. In fact, the easy access to domestic saw logs and lumber is one of the reasons why this province has the highest rate of home ownership in the country. There are between 2800-2900 domestic cutting permits issued annually which accounts for approximately 65 percent of the harvest on crown land.

Silviculture treatments are important to the forest resource of the zone because they ensure a vigorous and healthy forest is maintained. Forest renewal activities are critical because they ensure that the productive land base is maintained by planting areas that are not sufficiently restocked. Forest improvement activities help improve and enhance the growing stock which can reduce harvest cost, enhance forest product options and increase sustainable timber supply. There is approximately $150000-300000 spent on silviculture in the zone each year creating more than 20 seasonal jobs.

Timely access to timber is critical to planning any forestry operations. Primary, secondary and tertiary roads form an integral part of operating areas and are used after timber extraction is completed for silviculture and recreational purposes. In excess of $150 000 is spent by the Crown to construct forest access roads each year in the zone.

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

Critical Elements:

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

- maintenance or enhancement of productive land base
- planting of non-regenerating areas
- minimizing loss of land base to other users
- minimize losses to fire, insect and disease
- timely access road construction
- enhancement of younger age classes through thinning to correct age class imbalance

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 are 80-100 farms in the zone; the majority of which are located in the Humber Valley, Codroy Valley, and Bay St.George (Robinsons, Highlands Flat Bay) areas. These farms employ 250-300 people with gross farm receipts of $15-20 million. Main commodities produced in the zone are dairy, vegetables, and greenhouse products. Other commercial items include fur, berries, eggs, hogs, sheep, beef, honey, and sods. In addition, there is hundreds of subsistence farming plots scattered throughout the zone. The vegetables grown on these plots are used to

supplement food requirements during the winter months. There are also several pastures and areas designated for hay production.

The wild berry industry (bakeapple, partridgeberry, strawberry, blueberry, and raspberry) plays a significant role in the economic picture for the zone. While there is no actual record of domestic production, thousands of kilograms of berries are harvested annually. These berries are sold locally and to travelling tourists.

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 Forestry and Agrifoods Agency to determine if opportunities exist for an exchange between agriculturally viable forest areas with unsuitable agriculture land within the Agriculture Development Areas.

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

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

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

4.2.2.3 Mining

Characterization:

There is a significant mining presence in the zone, particularly in District 14. Some of the major mines, past and present, have been located at Hope Brook, Agathuna, Lower Cove, and Flat Bay producing gold, gypsum, limestone, dolomite and aggregate. Smaller mines harvesting other products are located throughout the zone. In recent years, oil exploration has seen a number of sites developed with major exploration work using seismic lines occurring. There are also a number of active aggregate and quarry leases located throughout the zone. These are usually for very small areas which can be rehabilitated; thereby, minimizing their impact upon the forest ecosystem. Exploration activities continue to form a large portion of the activities in the zone.

Critical Elements:

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

Guiding Principles:

- Ensure that quarries and open-pit mines are rehabilitated

- Ensure that the organic overburden is stockpiled and stored in a manner so that it can be used to rehabilitate the site.
- Maintain updated maps of mineral potential and mineral claims at the district office. Update maps on a yearly basis
- Maintain updated maps of aggregate and quarry areas.
- Avoid planning silviculture activity in areas adjacent to mines or quarries.
- Every attempt will be made to extract timber harvested as part of oil and 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.
- 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 as 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 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 years, however many areas still remain to be surveyed. To date there are 120 known archaeological sites within the zone which are protected under the Historic Resources Act. These sites show

evidence of Maritime Archaic Indian, Palaeoeskimo, Recent Indian, Beothuk, Mi'kmaq and European occupation. There is potential for other historic resources to be found in the zone.

Archaeology projects provide many seasonal jobs and 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. Presently, there is no active archaeology within the zone and there are no developed archaeological sites, which would attract tourists.

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, mechanical site preparation and regeneration have the potential to destroy historic resources.

While forestry activities can have adverse impacts on historic resources there are also beneficial effects. Where 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 The Greater Gros Morne Ecosystem

Characterization:

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

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

Biodiversity goes beyond the range of wildlife and plant species to include the range of habitats and landscapes. Loss of special habitats such as the old-growth forest and associated species may impair the ecological integrity of GMNP in ways that are not currently understood.

While ecological integrity has prominence regarding the management of national parks, legislation and policy dictate broader responsibilities for national parks. These include providing opportunities for Canadians and others to have high-quality experiences in a natural setting. Currently, 61 percent of GMNP is classified as Zone II - Wilderness. The southwestern portion of this zone borders on District 15. The Long Range Traverse, a 3-4 day hike within GMNP, currently has a reputation as a high-quality wilderness experience due to its remoteness and difficult access. Increased access, as a result of forestry operations can threaten this wilderness quality. The presence of the endangered Newfoundland pine marten has been noted in the northern and southern areas of the park. Those sighted in the south are not closely connected with a core population and are likely "dispersers" from either the Little Grand Lake/Red Indian Lake or Main River populations. Habitat connectivity with these other core populations may be critical to long term survival of marten in GMNP.

Critical Elements:

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

Guiding Principles:

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

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

allow for a continuous distribution of marten habitat and home ranges to the park boundary. A conservative approach that preserves future options should be adopted until the marten guidelines are fully developed.

4.2.2.6 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 Element

- 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'Rrailway shall be from May to December to avoid conflict with other user groups.

4.2.2.7 Parks and Protected Areas

Characterization:

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

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

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

Proposed protected areas in the zone include; Browmore Bog with an alternate area at Journal Bog which protects the dome bog feature representative of the St Georges Bay Subregion of Western Newfoundland Forest Ecoregion, Cape St John which is representative of the Codroy Subregion of the Western Newfoundland Forest Ecoregion, Garia Bay which is representative of the South Coast Barrens Subregion of the Maritime Barrens Ecoregion, and the Port au Port Peninsula with an alternate at Table Mountain, which protects the limestone barrens, in the Port au Port Subregion of the Western Newfoundland Forest Ecoregion. Other protected areas include the T'Railway and Little Grand Lake public, wildlife and ecological reserves. Major parks include Gros Morne National Park, and J. T. Cheeseman, Sandbanks, and Barachois Provincial Parks.

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

4.2.2.8 Outfitting

Characterization:

The outfitting industry has been an integral component of the tourism industry on the southwest coast since the early 1900's. This region has always been a popular hunting and fishing destination because of the pristine environment and abundance of fish and wildlife species. There are approximately 40 outfitters operating within the boundaries of the zone with over 70 main or line camps. These operations provide seasonal employment for many local individuals.

There are in excess of 300 big game licenses assigned to outfitters in the zone.
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 2008, it can be seen that big game alone has a significant impact on the local economy. The many trout and salmon destinations in the zone also make fishing an important economic contributor.

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 destroying 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.

In some cases, past harvesting practices has resulted in increased levels of garbage (skidder tires, abandoned buses, heaps of oil containers, etc.). This can be frustrating for outfitters who concentrate on not leaving permanent marks on the landscape. Possible erosion caused by hillside logging and heavy equipment use is also a concern - particularly due to its possible effects on water quality for fish habitat.

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.
- 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.

4.2.2.9 Recreation

Characterization:

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

Canoeing and kayaking around the coastline and on the many rivers, the hiking trails (especially the Appalachian Trail), numerous ski and snowmobile trails, and excellent hunting, fishing and adventure tourism areas highlight some of the recreational opportunities in the zone.

Critical Elements:

Wilderness

Backcountry recreational activities are dependent on the existence of natural pristine wilderness areas. The temporary 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.

Accessibility

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 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.

Viewscape

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

4.2.2.10 Tourism

Characterization:

The tourism industry in Newfoundland and Labrador is based on our natural and cultural resources. Protection of these resources is critical for our industry to survive and grow**.** We currently have the resources to compete internationally with tourist destinations; however, competition for the international traveler is high in the tourism marketplace. The tourism industry in Newfoundland and Labrador has experienced significant growth since 1997. 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 and continues to increase. The worldwide growth of tourism at rate of 41 percent, the national growth of 25 percent and the provincial growth of 33 percent indicates tourism is Newfoundland and Labrador's best opportunity for economic diversification and growth.

There are many excellent tourist destinations in the zone. Gros Morne National Park and J. T. Cheesman, Barachois and Sandbanks Provincial Parks, Rose Blanch Lighthouse, and Captain Cook Lookout are just a few examples of the more formal and prominent tourist attractions. Many tourists also come for the outdoor recreational opportunities or to partake of the excellent scenery.

Critical Elements:

- viewscape
- accessibility
- wilderness ambiance
- remoteness

Guiding Principles:

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

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 crown land in Planning Zone 6 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. Due to the specific issues

in the zone and the geographic separation of the main centers in the districts it was initially decided to hold meetings separately in Stephenville and Corner Brook.

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 interest groups and individuals was done to inform potential participants of initial meetings in Stephenville and Corner Brook. A listing of all invitees and the interest group they represent is listed in Appendix 2. The initial meeting was designed to inform attendees of the change in the planning framework as a result of the new legislation, the ground rules for participation, and to form the new planning team for the zone. Attendance at these meetings was extremely poor therefore a second public meeting was held at both locations. This meeting was also poorly attended, however, with a few exceptions; attendees were common to both meeting locations. A planning team was formed and it was decided to combine both processes and hold meetings in Corner Brook since many of the same stakeholders were involved. A list of planning team members and their affiliations is shown in Appendix 2. Planning team membership was not restricted to those listed and was open to anyone who wanted to join the process at any time.

A planning team meeting was then held in Corner Brook and it was also poorly attended by stakeholders. 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 and introduced at the meeting and gave particular emphasis on harvesting areas for the next 10 years. Little interest was shown by participants. As well, there was little or no interest in identifying values for presentation and discussion at subsequent meetings. This lack of interest in the process left organizers in a dilemma on how to garner input from stakeholders. It was decided to contact the major stakeholders individually to identify and characterize their values. A list of these stakeholders is shown in Appendix 2.

This information along with the harvest schedule was used to identify potential operating areas. Once operating areas were identified they along with proposed roads and operating area summaries were sent digitally for comment to the Deputy Ministers of government departments representing the major stakeholders. Additionally, other stakeholders not represented above were contacted for comment on the proposed areas. Since both groups represented the entire planning team, another meeting was not scheduled until all comments were received and mitigations undertaken. A list of stakeholders that were sent shape files or contacted is shown in Appendix 2.

A draft plan was prepared and a final planning team meeting was held to garner input from members. The results from this meeting and from comments received on the operating area shape files that were sent out were used to make revisions to the plan before it was submitted for environmental assessment.

Changes to harvest areas or processes to follow to resolve conflicts, where possible, were ongoing throughout the limited 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.

Every attempt was made to garner input from a wide range of groups and individuals. It is very disheartening however, that despite numerous attempts, little interest was shown.

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 silvicultural system most closely emulates this natural disturbance pattern and therefore is the most preferred method employed for harvest. The size, shape, arrangement and juxtaposition of clear-cut areas vary across the landscape depending on localized topography and terrain conditions. A modification of the clear-cut system takes place in domestic areas whereby the cuts are relatively small and disbursed resulting in the creation of a range of age and development classes.

6.1.1 Commercial

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

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

Specific commercial strategies are as follows:

- Utilize irregular cut block sizes that follow contours and natural boundaries where possible

- Consider maintenance of unharvested corridors between harvest blocks to act as wildlife utilization corridors
- Vary buffer widths to protect other values (i.e. larger buffers on salmon rivers)
- Where possible, utilize winter harvest on wet and sensitive sites
- Maintain current size and distribution of clear cuts
- Use landscape design techniques to mitigate view shed impacts on areas of concern
- Keep losses through timber utilization to a minimum (< 6 m3/ha)

6.1.2 Domestic

The harvest of domestic fuel wood and saw logs occurs from four main sources in the zone; from designated domestic cutting blocks on crown land, from cutover clean up on crown and industry limits, and from landing and roadside clean up on both crown and industry limits, and from hardwood harvest on industry limits. For the designated cutting blocks, the harvest scheduling and priorities apply, however it may not always be practical to follow. Domestic cutting blocks are generally established near communities where concentrations of timber that is eligible for harvest exist. Mixed within these blocks may be timber that normally would not be scheduled for harvest in the planning period. Ideally, each individual domestic cutter would be issued their own cutting block, which would ensure harvest of optimal stands. This is not practical however and domestic cutters are allowed to cut anywhere within the designated area provided that immature timber is not harvested. For this reason, the optimal harvest schedule may not always be followed in domestic areas. Utilization of cutover residue, dead timber and scrub areas that 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 resulting in areas not sufficiently regenerated (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. In District 14 and parts of District 15 there is concern about the type (species) of regeneration because of the presence of balsam woolly adelgid in the lowlands. In these areas, regeneration to balsam fir may not necessarily be acceptable on certain site types. Prescriptions to deal with these problems will be presented in sections to follow.

6.2.1 Forest Renewal

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

Treatment to prepare 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. Release herbicide treatment is also done which reduces the competition for a few years to allow planted seedlings to get established and "get the jump" on the non-crop tree species that occupy the site. Herbicides, while used sparingly, are sometimes a necessary tool to help establishment of a new forest, particularly on the better sites.

Complete regeneration failure requiring full planting is rare in the zone because of the excellent regeneration capabilities of balsam fir. When it does happen however, the site is prepared, if necessary, and planted with mainly black or white spruce and to a lesser extent Norway spruce. In some cases where adelgid has been a problem, balsam fir regeneration is ignored and the site is planted anyway. In instances where regeneration failure is incomplete but the site does not have enough desired regeneration, the area can be gap planted. This treatment is designed to increase the stocking on sites that have not regenerated to sufficient levels or on sites that have sufficient balsam fir regeneration but have a high adelgid risk. On these sites planting is done through the existing regeneration to obtain a sufficient stocking level of an adelgid resistance species. Gap planting is done with the same species as above, and, coupled with the natural regeneration already present on site, result in a mixed softwood forest. White pine is often mixed into the species composition in District 14 in an attempt to maintain this species on the landscape.

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 the orchard is in full production, the majority of the planting stock will be grown from this source. The ultimate goal is to establish plantations with seedlings that have superior growth characteristics and thus increase yield and maintain genetic diversity.

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

6.2.2 Forest Improvement

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

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 favor any spruce that may be in the stand. In this way a mixed softwood stand is produced (depending on the original density of spruce) which is more diverse and less susceptible to insect infestation. As well, any hardwood species that are not in direct competition with spruce or fir are left to increase the biodiversity of the stand.

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

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 saw logs in stands.
- Where possible, promote species mixes particularly with spruce, white pine and hardwoods to reduce susceptibility to insect attack and increase biological diversity.
- Where possible, use seedlings grown from local seed sources to protect genetic diversity.
- Ensure levels of planting and thinning used in the wood supply analysis are achieved.
- Work towards pre harvest planning to identify areas with potential 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, road 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, particularly on class 3 areas, is that harvestable areas or stands are becoming smaller and more remote and 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.
- Explore all avenues to secure funding for road construction and encourage operators to build their own roads in exchange for royalty reductions.

6.4 Forest Protection

6.4.1 Insects and Disease

As indicated in section 1.5.5, insects have been a major natural disturbance factor in the zone. The main tree species, balsam fir, is susceptible to most of the major insects we have including spruce budworm, hemlock looper, balsam fir sawfly, and balsam woolly adelgid. In the past, severe mortality has occurred resulting in massive salvage efforts. In recent years, quality standards at local pulp mills have changed to require a timely supply of fresh, 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.

Populations of hemlock looper and balsam fir sawfly were building in the late 1990's and resulted in mortality and growth loss and a subsequent treatment program in the early 2000's. Since that time the populations of these insects have been in decline. The adelgid problem has been consistent in the lowland areas of District 14.

As outlined in the harvesting and timber supply analysis sections, the 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. Yield curves are also adjusted in areas that have been chronically attacked by balsam woolly adelgid and balsam fir sawfly to account for growth loss.

Specific strategies:

- Use silvicultural techniques at the stand level to alter species mix and increase stand vigor to make stands less susceptible to insect attack.
- Where possible, use harvest-scheduling techniques to alter species mix across the landscape to avoid "setting the table" for severe insect infestation.
- In conjunction with provincial and federal initiatives, use pertinent and approved biological and chemical insecticides such as BTK virus).

6.4.2 Fire

As outlined in previous sections, most of the zone has little fire history due to the relatively abundant rainfall and above average snowfall; however, some fires have occurred. A fire in an unusually dry year can have devastating effects on the forest however and can exacerbate

an already tight wood supply situation. The zone can minimize the risk of a serious fire by maintaining a highly trained, efficient and effective fire control program and by minimizing the risk in forest stands through maintenance of health and vigour.

Specific strategies:

- Use silvicultural treatments and protection from insects to increase health and vigour of stands.
- Maintain fire control capabilities by both the crown and industry.
- Where possible, promote species mixes in stands to minimize risk.

6.4.3 Windthrow

Wind throw usually occurs in stands that are old and decrepit or in stands that have been predisposed by some other disturbance such as insects and disease. To minimize the effects of blow down, stands will be managed to promote health and vigour mainly through silvicultural treatments and protection from insects.

Specific strategies:

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

6.5 Information and Education

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

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

Specific strategies:

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

Section 7 Proposed Activities

7.1 District 14

7.1.1 Overview

This section will outline all forest activities that will occur on CBPPL Limits in District 14 from 2009-2013. 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 CBPPL and by the Crown so that operations can be viewed from a landscape perspective across all ownerships in District 14. 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 mitigation measures employed.

7.1.2 Allocation of Timber Supply

There is 475 000 m^3 of timber scheduled to be harvested by CBPPL in District 14 for the next 5 years.

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, clear cutting 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 over mature timber throughout the district. CBPPL has conducted trial harvests in semi mature PCT in adelgid damaged stands as part of a stand conversion silviculture treatment. The 2009-2013-harvest plan for district 14 will include a component of semi mature PCT timber. Harvesting activities will endeavor to maximize the use of mechanical harvesters, extending winter and summer operating seasons in order to allow for the delivery of fresh wood over the entire twelve months of the year. This will allow us to reduce overall pulpwood inventories, and supply the mill with a constant supply of fresh pulpwood with the optimum species mix, over the maximum number of operating days per year.

Our mechanized logging fleet will be used in combination with our tree length and conventional logging systems to ensure maximum utilization during winter harvesting, harvesting blow down timber, and harvesting low volume stands. Short wood 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. Cable logging systems may be considered in areas of steep terrain to maximize timber volume recovery while minimizing site disturbance. Full tree harvest systems will not be employed.

Table 9 details this proposed volume and compares it to the 5 year AAC. There will be no deviation from the five-year AAC.

Table 9 Proposed softwood harvest on CBPPL Limits in District 14, 2009-2013

Total AAC CBPPL Limits	**497 000m3**
CBPPL Harvest on CBPPL Limits	**475 000m3**
Total Harvest CBPPL Limits FMD 14	**475 000m3**
CBPPL AAC Deviation (+/-)	**-22 000 m3**

7.1.2.1 Commercial

The timber scheduled for commercial harvest in the district is mature to over mature with some stands of semi – mature PCT . The proposed harvest follows the harvest schedule that was used to determine the AAC outlined in Section 3.

7.1.2.2 Domestic

Domestic harvesting in FMD 14 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 species, volume, location and utilization standards to be employed. Most harvesting occurs in the winter with extraction by snowmobile.

Table 10 CBPPL Harvest by Operating Area in District 14, 2009-2013

CBPPL/Crown/ACCC Limits in FMD 14 Operating Area Name	Operating Area Number	Proposed Harvest Volume (m^3)
Black Duck	K-14-51	200 000
Camp 185	K-14-52	10 000
Fishell's River	K-14-54	20 000
Robinsons River	K-14-55	10 000
Camp 180	K-14-56	125 000
MacPherson's Pond	K-14-57	70 000
Codroy Pond	K-14-58	40 000
Total CBPPL Harvest:		**475 000m3**

7.1.2.3 Hardwoods

The management of hardwoods on CBPPL timber limits for commercial and domestic use has been transferred to the Crown. The Crown is proposing 1250m3 of commercial harvest and 2500m3 of domestic harvest. For more information on the Crown hardwood harvest and management please refer to the Crown 2009-2013 plan.

7.1.3 Silviculture

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

Table 11 summarizes silviculture treatments for the next five-year by treatment. There are 750 ha of planting and 1500 ha of pre-commercial thinning scheduled which meet the assumptions for silviculture in the timber supply analysis.

Table 11 Summary of silviculture treatments on CBPPL Limits in District 14 for 2009-2013

Treatment	Area (ha)
Pre Commercial Thinning	1500
Planting	750
Herbicide	100
Total	**2350**

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

CBPPL is estimating 14.0 km of primary forest access roads to be built in District 14 in the next five years (Table 15). These roads will be built to access timber for harvesting in the operating areas proposed.

Table 12 Primary Access Road Construction on CBPPL Limits in District 14
For 2009 –2013

Operating Area Name	Operating Area Number	Length (km)	Bridges
Black Duck	K-14-51	14.0	2
Camp 180	K-14-56	0.0	1
Total		**14**	

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. Significant harvesting will be occurring in previously harvested areas (second growth). Where necessary, existing roads and abandoned roads will be upgraded to a primary or secondary road standard.

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

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

There are 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 are air tankers stationed at Deer Lake and Gander and helicopters at Pasadena and 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 15

7.2.1 Overview

This section will outline all forest activities that will occur on CBPPL Limits in District 15 from 2009-2013. 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 15 (Appendix 4). This map shows all proposed operating areas by the CBPPL and by the Crown so that operations can be viewed from a landscape perspective across all ownerships in District 15. 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 1 209 000 m^3 of timber scheduled to be harvested by CBPPL in District 15 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, clear cutting 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 over mature timber throughout the district. Harvesting activities will endeavor to maximize the use of mechanical harvesters, extending winter and summer operating seasons in order to allow for the delivery of fresh wood over the entire twelve months of the year. This will allow us to reduce overall pulpwood inventories, and supply the mill with a constant supply of fresh pulpwood with the optimum species mix, over the maximum number of operating days per year.

Our mechanized logging fleet will be used in combination with our tree length and conventional logging systems to ensure maximum utilization during winter harvesting, harvesting blow down timber, and harvesting low volume stands. Short wood 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. Cable logging systems may be considered in areas of steep terrain to maximize timber volume recovery while minimizing site disturbance. Full tree harvest systems will not be employed.

Table 13 details the proposed volume and compares it the 5 year AAC. There will be no deviation from the five-year AAC.

Table 13 Proposed Harvest on CBPPL Limits in District 15, 2009-2013

Total Class I AAC CBPPL Limits	**1 511 000**
CBPPL Harvest on CBPPL Limits	**1 209 000 m3**
Crown Harvest on CBPPL Limits	**29 100 m3**
Total Harvest CBPPL Limits FMD 15	**1 238 100 m3**
CBPPL AAC Deviation (+/-)	**272 900 m3**

Note: The Crown harvest is shown in the Crown 5 Year Plan.

7.2.2.1 Commercial

The timber scheduled for commercial harvest in the district is mature to over mature with some stands of semi – mature PCT . The proposed harvest follows the harvest schedule that was used to determine the AAC outlined in Section 3

7.2.2.2 Domestic

Domestic wood cutting for firewood is allowed on Company limits with a valid permit. Permits are supplied to the public at no costs and allow the public to cut residual birch in cutover areas, birch in hardwood stands (unless otherwise posted), larch, and slash left from past logging operations for domestic use only (not for sale). Permits can be obtained from the Woodlands office. CBPPL does not charge a fee for the cutting of domestic firewood on

Company licence limits; however, it does request that the public adhere to the Regulations and Policies outlined on the Domestic Wood Cutting permit.

7.2.2.3 Hardwoods

The hardwood AAC for District 15 is 35 180m3. The majority of this volume is residual hardwood contained in softwood-dominated stands. Although hardwood is not specifically targeted in this plan, the residual hardwood volume encountered during the softwood harvest will be utilized either as biofuel for the pulp mills energy requirements or it will be left on the cutovers for domestic or commercial harvest.

Table 14 Summary of CBPPL Harvesting by Operating Area in District 15
2009-2013

Operating Area Name	Operating Area Number	Proposed Harvest Volume (m3)
Georges Lake	K-15-51	140 000
Serpentine	K-15-52	100 000
Corner Brook Lake East	K-15-53	60 000
Corner Brook Lake West	K-15-54	300 000
Glide Lake	K-15-55	99 000
Grand Lake South	K-15-56	100 000
Bonne Bay Pond	K-15-57	120 000
Old Mans Pond North	K-15-58	40 000
Old Mans Pond South	K-15-59	250 000
Total		**1 209 000**

7.2.3 Silviculture

There are two silviculture prescriptions scheduled for the next five years; planting/gap planting including site preparation where required, and pre commercial thinning. Planting is designed to return a site to a minimum stocking level with the desired species, mainly spruce. There is full planting when there is complete natural regeneration failure and gap planting

when a site has some desired regeneration but not enough to meet minimum stocking standards. Precommercial thinning is done to reduce the density on overstocked regeneration so that growth can be concentrated on the remaining crop trees and thus reduce the time to harvest. Vegetation control using herbicides may be employed, and mechanical plantation cleaning may be undertaken.

Table 15 Summary of Silviculture Treatments on CBPPL Limits 2009-2013

Treatment	Area (ha)
Pre Commercial Thinning	2600
Planting	1200
Herbicide	100
Total	**3900**

7.2.4 Primary Access Roads and Bridges

There are 63km of primary forest access roads scheduled to be built in District 15 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. Significant harvesting will be occurring in previously harvested areas (second growth). Where necessary, existing roads and abandoned roads will be upgraded to a primary road or secondary road standard.

Table 16 Summary of Primary Access Road Construction on CBPPL Limits in District 15 2009 -2013

Operating Area Name	Operating area Number	Length (km)	Bridges
Georges Lake	K-15-51	6	1
Serpentine	K-15-52	5	
Corner Brook Lake East	K-15-53	6	
Corner Brook Lake West	K-15-54	14	
Glide Lake	K-15-55	6	
Grand Lake South	K-15-56	7	
Bonne Bay Pond	K-15-57	6.0	
Old Mans Pond North	K-15-58	5.0	
Old Mans Pond South	K-15-59	8.0	
Total		**63**	**1**

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

Wildfire has not been prevalent in the district in the past number of years and as a result there have been few timber losses. Despite this fact 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 Pasadena and Sop's Arm 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 is an air tanker stationed at Deer Lake and a helicopter at Pasadena 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.

As stated, reconnaissance surveys will be carried out to monitor the extent and rate of spread of the balsam woolly adelgid.

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 14

There were no site-specific mitigations arising from concerns identified during the planning process and from other regulatory agencies. Guiding principles, which outline procedures to follow should an unforeseen conflict arise have been identified for each value in Section 4. Highlights of the general mitigative measures that CBPPL consider are:

- 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.
- Appropriate buffers will be maintained to protect Permanent Sample Plots established by the Department of Natural Resources.
- Appropriate buffers will be maintained to protect the T'Railway Provincial Park.

- Appropriate buffers will be maintained adjacent to the Trans Canada Highway.
- Appropriate buffers will be maintained adjacent to the Viking Trail Highway.
- CBPPL commits to a 100m no-cut buffer on the main stem of scheduled salmon rivers.
- CBPPL recognizes that certain areas along the Trans Canada Highway and around communities are considered visually sensitive. Landscape design techniques will be incorporated into harvest block layout where appropriate.
- The threatened Newfoundland marten is known to reside in some of the proposed operating areas. CBPPL commits to working with the Wildlife Division of the Department of Environment and Conservation, the Canadian Forest Service, the Department of Natural Resources and other partners to ensure the habitat requirements of an expanding marten population are me, while simultaneously addressing the timber requirements of CBPPL.
- Designated Cottage Development areas occur in areas across CBPPL timber limits. CBPPL recognizes that there will be certain concerns related to harvesting around these areas and commits to working with Crown Lands Administration Division and local cottage owners.
- A Certificate of Approval will be obtained from the Minister of Environment and Conservation (Water Resources Division) before any forest management activities are implemented within a Protected Public Water Supply Area.
- No timber harvesting will be carried out within the Little Grand Lake Reserve System.
- CBPPL met with the Newfoundland and Labrador Outfitters Association and reviewed the proposed activities for district 14 areas. No concerns were raised at the meeting. A copy of the maps was delivered to the NLOA office and no comments were received.

8.2 District 15

There were no site-specific mitigations arising from concerns identified during the planning process and from other regulatory agencies. Guiding principles, which outline procedures to

follow should an unforeseen conflict arise have been identified for each value in Section 4. Highlights of the general mitigative measures that CBPPL consider are:

- 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.
- Appropriate buffers will be maintained to protect Permanent Sample Plots established by the Department of Natural Resources.
- Appropriate buffers will be maintained to protect the T'Railway Provincial Park.
- Appropriate buffers will be maintained adjacent to the Trans Canada Highway.
- Appropriate buffers will be maintained adjacent to the Viking Trail Highway.
- CBPPL commits to a 100m no-cut buffer on the main stem of scheduled salmon rivers.
- CBPPL recognizes that certain areas along the Trans Canada Highway and around communities are considered visually sensitive. Landscape design techniques will be incorporated into harvest block layout where appropriate.
- The threatened Newfoundland marten is known to reside in some of the proposed operating areas. CBPPL commits to working with the Wildlife Division of the Department of Environment and Conservation, the Canadian Forest Service, the Department of Natural Resources and other partners to ensure the habitat requirements of an expanding marten population are me, while simultaneously addressing the timber requirements of CBPPL.
- Designated Cottage Development areas occur in areas across CBPPL timber limits. CBPPL recognizes that there will be certain concerns related to harvesting around these areas and commits to working with Crown Lands Administration Division and local cottage owners.
- A Certificate of Approval will be obtained from the Minister of Environment and Conservation (Water Resources Division) before any forest management activities are implemented within a Protected Public Water Supply Area.
- No timber harvesting will be carried out within the Little Grand Lake Reserve System.

- CBPPL met with the Newfoundland and Labrador Outfitters Association and reviewed the proposed activities for district 15 areas. No concerns were raised at the meeting. A copy of the maps was delivered to the NLOA office and no comments were received.

Section 9 Plan Administrations

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. DNR staff will monitor for compliance with schedule five and recommend managed or unmanaged status.

All planned activities are monitored by the DNR 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.

9.2 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.