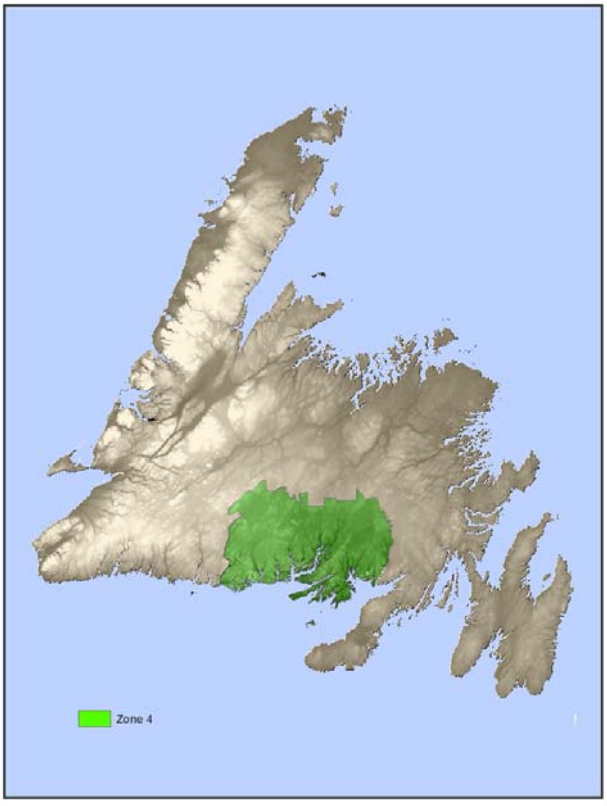
Crown Five Year Operating Plan
Forest Management District 07
Zone 4 2018-2020



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Introduction

This five year operating plan incorporates the new provincial planning requirements. In the past, there were five major planning documents; the provincial sustainable forest management strategy, the district strategy document, the five year operating plan, the annual operating plan, and the past 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 to the planning process is the creation of eight planning zones on the island which are based primarily on ecoregion composition. District 07 is somewhat of an anomaly in that it is the only district it planning zone 4. The requirement for submission to the Forestry Services Branch 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.

Finally, this document will build on previous documents. 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.

Section 1 Description of the Land Base

1.0 Description of Forest Management Districts

1.1. General

Forest Management District 07, also referred to as the Bay d'Espoir District, is one of eighteen Forest Management Districts contained on the island portion of the province. Located on the south coast, the District lies approximately halfway between St. John's and Port-aux-Basques.

The northern boundary extends to Berry Hill Pond on the Bay d'Espoir highway and to Great Burnt Lake and Meelpaeg Lake in the northwest section of the District.

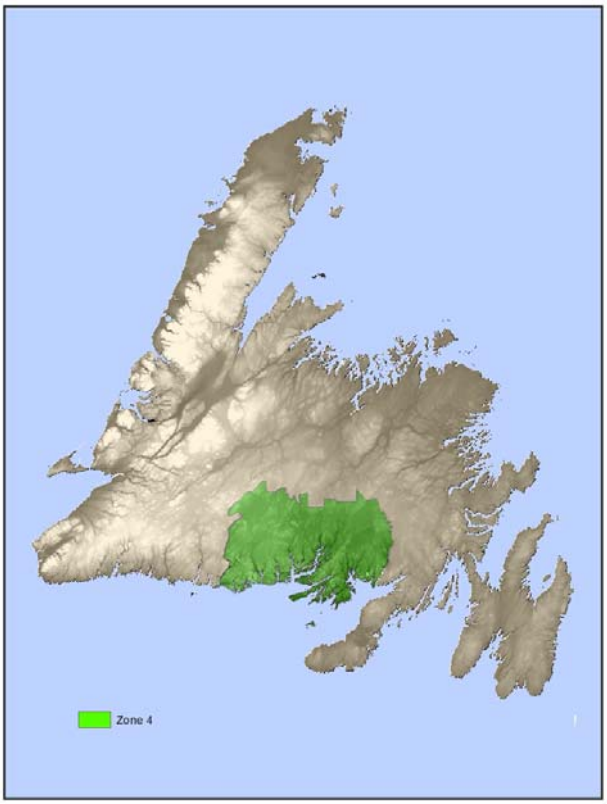

Figure 1 Location of Planning Zone 4

1.1.1. District Boundaries

The District was established in 1974 and at that time was composed of Crown and Bowater (Nfld) Limited holdings. The Bowater holdings were sold to the Crown in 1979. This move was precipitated by the Forest Management and Taxation Act, which heavily taxed companies for not managing their limits. Bowater had no future plans for harvesting and silviculture work in the Bay d'Espoir area and coupled with the significant distance from its Corner Brook operations, decided to relinquish their holdings to the Crown.

The boundaries for District 7 were originally filed on May 18, 1979 under Newfoundland Regulation 72/79, Forest Management Areas Proclamation, 1979 under The Crown Lands Act. This legislation was repealed in 1996 and replaced by the Consolidated Newfoundland Regulation 777/96, Forest Management Districts Proclamation under the Forestry Act.

Communities in the District are located along the coast. The main centers include St. Alban's, Milltown, Conne River, Harbour Breton, Belleoram and Hermitage.

1.1.2 History

The major communities within the District were built around the fishery and lumbering. Approximately 10,000 people live here and most are located in communities of various sizes that follow the coastline; however, the largest, single concentration is in the Milltown/St. Alban's area.

(a) Establishment

Before the establishment of the Management Unit Office, Bay d'Espoir had a forest ranger station. This office was staffed with a District Ranger and a Forest Ranger whose main responsibilities were the issuing of cutting permits and the checking of woods operations. The Management Unit was set up in September of 1974 as a result of the Forest Land Management and Taxation Act (1974) and has evolved to become the Forest Management District.

(b) Management Plans

In 1955, Finn Frost, Regional Forester with the Provincial Government prepared a tentative management plan for the Bay d'Espoir area. The plan only included that portion of Crown land containing commercial timber along with Bowater limits. Volume and acreage figures were outlined and a crude estimate was given for the allowable cut on both Crown and Bowater land.

(c) Development

In the past no control was placed on managing the forest resource. The Finn Frost Management Plan contained proposals but these were never implemented.

Records are limited but from the Finn Frost Report it is revealed that the first sawmill in the District was established around 1900.

Additional records reveal the following large scale pulpwood operations.

1922-1923	St. Alban's Co-op cut 50,000 cords (120,346 m^3) pulpwood
1933-1941	During this time period Rolland Goodyear cut 7,000 cords (19,821 m^3) annually for a total of 56,000 cords (134,787 m^3) over this eight year period.
1942-1959	Bowater Nfld Limited harvested 25,000 cords (60,173 m^3) per year for a total of 325,000 cords (782,251 m^3).
1956-1958	Bowater Nfld Limited cut 4,000 cords (6,627 m^3) of export pulpwood.
1959-1960	Head of Bay d'Espoir Co-op harvested 10,000 cords (26,069 m^3).

Most of these pulpwood operations were confined to Conne River and Twillick Brook because the only means of transporting the wood was by water. The wood was driven down Conne River to Bay d'Espoir where it was loaded on ships for overseas markets.

In 1970 the Government established a forest resource road program and throughout the five year period that followed 24.5 miles of road was completed. With the implementation of the access road program sawmill operators were given access to the more remote timber stands.

(d) Forest History

The majority of the forest stands in the District are overmature uneven age softwood stands dominated by balsam fir. The origin of these stands is from the lack of fire history and other major disturbances (i.e. harvesting operations, insect infestation, etc.). The Bay d'Espoir Management District has a relatively fire-free history and harvesting operations conducted in the past were limited. Records of cutting operations conducted in the past are also limited but it is known that sawlogs have been cut from the area for the past 100 years. The method of harvesting was a hi-grade method where only mature trees having good form, large diameter and free from defects were harvested. As a result overmature uneven age stands are common to the area. Throughout parts of the District particularly the former Bowater limits dense fir thickets were common. These stands were the result of past clear-cut pulpwood operations.

In the past Bay d'Espoir has been relatively free of forest fires. The Newfoundland Forest Fire History 1619-1916 shows that no major forest fires (in commercial timber) have been recorded in the Bay d'Espoir area during this time period. This is mainly attributed to the high relative humidity from the coastal fog.

The area of forest around Bay d'Espoir has a long list of insect attacks. The major outbreaks and the year of their occurrence are as follows:

1947 Hemlock Looper *(Lambdina fiscellaria fiscellaria (Guenee))* 1200 acres (800 ha.) Bowater limits

1961-1965. Black headed budworm *(Acleris variana* (fern..)) and tussock moth *(Orgyia antiqua* (L.)) A salvage operation was carried out to remove

the damaged forest and 6,000 cords (21,747 m^3) of wood was salvaged and exported.

1969 Hemlock Looper *(Lambdina fiscellaria fiscellaria (Guenee))* infestation of 68,593 acres (27,094.31 ha.)

1970 Balsam fir sawfly *(Neodiprion abietis* (Harr)) infestation of 150 acres (60.70 ha) near Swanger's Cove. The following year in 1971 the balsam fir sawfly *(Neodiprion abietis)* population collapsed.

Other forest insects recorded in the area were: the Green Headed Sawfly *(Pikonema dimmockii*(Cress)), European Spruce Sawfly *(Diprion hercyniae* (Htg)), Birch Casebearer *(Coleophora fuscedinella* (Zeller)) and the Birch Skeletonizer *(Bucculatrix canadensisella* (Chambers)).

Spruce budworm *(Choristoneura fumiferana* (Clem)) created destruction of forest stands in the 1980's.

1.1.3 Ownerships

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1.2 Ecosystems

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

1.2.1 The Forest Ecosystem

A forest ecosystem, as the term implies, is an ecosystem dominated by tree cover. At the coarsest level, the forests of Planning Zone 4, 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-replacing natural disturbances such as fire and insect outbreaks which typically give rise to uniform, evenaged forests dominated by a few tree species. The landscape of the boreal zone is characterized by the effects of glaciation with rolling terrain and rock outcrops interspersed with mantles of glacial moraine. Within Canada the zone is described as the Boreal Shield Ecozone under Canada's Ecological Classification System.

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

The morainal areas in District 07 support closed stands of conifers, largely black and white spruce *Picea mariana* (Mill.) B.S.P. and *Picea glauca* (Moench Voss), balsam fir *Abies balsamea*(L.)Mill. and tamarack (*Larix laricina*(Du Roi) K. Koch. White pine (*Pinus strobus* L.) occurs on sites scattered throughout the forest. Broadleaf trees, such as white birch (*Betula papyrifera* Marsh.) occur in pure stands on richer soils, but it is more prevalent in mixtures with conifers. Trembling aspen (*Populus tremuloides* Michx.), though common in Central Newfoundland, is relatively uncommon in Zone 4. Perhaps

the most characteristic species of the forested lands in the immediate vicinity of Bay d'Espoir itself is yellow birch (*Betula alleghaniensis* Britt) which has a restricted distribution on the island of Newfoundland.

Soils of the boreal forests in District 07 are predominantly classed as podzols although brunisols are also present. Throughout the contrasting areas of exposed bedrock, morainal deposits and low lying sphagnum bogs, this mosaic of soils and non-soils tends to be occupied by a range of plant communities dominated by lichens, shrubs and forbs. Small to medium sized lakes are
common. Major watersheds within District 07 include portions of the Bay du Nord River, Long Harbour River, Salmon River, Dolland Brook and Grey River systems.

Climatic conditions of this region are heavily influenced by the proximity to the southern currents which result in warm moist air along the coast. Fog is common along coastal areas. Inland cold air masses are prevalent resulting in a cooler climate.

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

Forest development class, successional pattern and site influence the understory plant community present throughout the District. The species composition and structure of these plants significantly impact on the suitability of a site as wildlife habitat for various species. Some animals are very general in terms of habitat requirements and can occupy a wide range of site conditions, yet have specific seasonal requirements that can

determine habitat quality. For example, the moose requires wintering areas with suitable combinations of available cover and food sources. It is widely accepted that a variety of forest age classes can provide increased habitat and sustainability for many wildlife species. Nonetheless, there are certain wildlife species with very specific age class requirements for habitat suitability.

Aquatic ecosystems of the boreal forest are heavily dependant on forest cover for temperature regulation, nutrient cycling and stream flow regulation. Consequently, forest harvesting activities in riparian areas around waterbodies, is critical to sustainability of fish habitat and maintenance of fish migration routes. Suitability of various streams and ponds as waterfowl breeding, feeding and resting areas are also dependant on adjacent forest cover. For these reasons, maintenance of suitable riparian zones for protection of aquatic ecosystems and providing wildlife travel corridors is a primary consideration of this plan.

1.2.2 The National Ecological Land Classification System

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

Table 1 Canadian Ecological Classification System

Level	Description	Common Map Scale
ECOZONE	Areas of large land masses representing very generalized ecological units, based on the consideration that the earths surface is interactive and continuously adjusting to the mix of biotic and abiotic factors that may be present at any given time (e.g., Boreal Shield).	1:50 000 000
ECOPROVINCE	Areas of the earths surface characterized by major structural or surface forms, faunal realms, vegetation, hydrology, soil, and climatic zones (e.g., Island of Newfoundland).	1:10 000 000 1:5 000 000
ECOREGION	A part of the ecoprovince characterized by distinctive ecological responses to climate as expressed by vegetation, soil, water, and fauna (e.g., Avalon Forest Ecoregion).	1:3 000 000 1:1 000 000
ECODISTRICT	A part of ecoregion characterized by a distinctive pattern of relief, geology, geomophology, vegetation, water and fauna.	1: 500 000 1:125 000
ECOSECTION	A part of the ecodistrict throughout which there is a recurring pattern of terrain, soil, vegetation, water bodies and fauna.	1:250 000 1:50 000
ECOSITE	A part of the ecosection having a relatively uniform parent material, soil, hydrology, and chronosequence of vegetation.	1;250 000 1:50 000
ECOELEMENT	A part of ecosite displaying uniform soil, topographical, vegetative and hydrological characteristics.	1:10 000 1;2 500

1.2.3 Ecoregions and Subregions

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

Damman defined ecoregions as areas where a comparable vegetation and soil can be found on sites occupying similar topographic positions on the same parent material, provided that these sites have experienced a similar history of disturbance. Thus, an

ecoregion cannot be defined in isolation from the physical landscape, but vegetation toposequence, vegetation structure, floristic composition and floristic distributions can provide the primary criteria (Damman, 1979).

According to Damman, Newfoundland consists of nine ecoregions which can be further divided into twenty one subregions. Labrador has ten ecoregions. Each of the Newfoundland and Labrador ecoregions and subregions contain many of the same ecosystem variables. It is the dominance and variance of these variables (e.g., vegetation and climate) that determine their classification.

The Bay d'Espoir District contains three of the nine ecoregions that are found on the Island portion of the province. These are:

(1)Western Newfoundland Ecoregion
    Bay d'Espoir Subregion
(2) Central Newfoundland Ecoregion
    Twillick Steady Subregion
(3) Maritime Barrens Ecoregion
    (a) South Coast Barrens Subregion and
    (b) Central Barrens Subregion

The following descriptions are taken from the *Forest Site Classification Manual - A Field Guide to the Damman Forest Site Types of Newfoundland* (Meades and Moores, 1994).

1.2.3.1 Western Newfoundland Ecoregion

This Ecoregion is characterized by a humid climate with a relatively long frost-free period. It contains some of the most favorable sites for forest growth in the province. The *Dryopteris-Hylocomium*-Balsam Fir Forest is the dominate forest type of this ecoregion. The absence of prolonged dry periods has excluded fires from all but the most coarse-textured soils. Consequently, balsam fir rather than black spruce is the dominant forest cover type. Yellow birch is common and it displays its best growth in protected

valleys below 200 meters in elevation. Red maple is also most common and robust in this ecoregion. On flat costal areas, extensive plateau bogs occur.

Bay d'Espoir Subregion

This small outlier of the Western Newfoundland Ecoregion is in a sheltered valley system on the southeast coast. Excellent stands of *Dryopteris*-Balsam Fir forest type dominate the area.

1.2.3.2 Central Newfoundland Ecoregion

Central Newfoundland has the most continental climate of any part of insular Newfoundland. It has the highest summer temperatures and the lowest winter temperatures. Because of warm summers and high evapo-transpiration losses, soils in the northern part of this ecoregion exhibit actual soil-moisture deficiency. The *Hylocomium*-Balsam Fir forest type is characteristic of this area. Forest fires have played a more important role in this ecoregion's natural history than in other regions. Thus, much of the Balsam Fir-Feathermoss forest types have been converted to black spruce and some of the richer site types are dominated by white birch and aspen. In areas that have been burned repeatedly, dwarf shrub (Kalmia) barrens have replaced forest stands. Raised bogs are the characteristic wetland type.

Twillick Brook Subregion

This subregion occurs immediately to the north of the Bay d'Espoir Subregion of the Western Newfoundland Forest Ecoregion. Balsam fir is the most common upland cover type.

1.2.3.3 Maritime Barrens Ecoregion

The Maritime Barrens Ecoregion extends from the east to the west coast of Newfoundland along the south-central portion of the island. This ecoregion has the coldest summers with frequent fog and strong winds. Winters are relatively mild, with intermittent snow cover, particularly near the coastline. The landscape pattern usually

consists of stunted balsam fir broken by extensive open *Kalmia* barren which developed because of indiscriminate burning by European settlers. Good forest growth is restricted to the long slopes of a few protected valleys. Slope and basin bogs are the most common wetland type.

South Coast Barrens Subregion

This subregion includes the higher elevations along the south coast of the district that are up to 300meters in elevation. Snow cover is shallow and arctic-alpine plants occur locally. Yellow birch is present in valleys.

Central Barrens Subregion

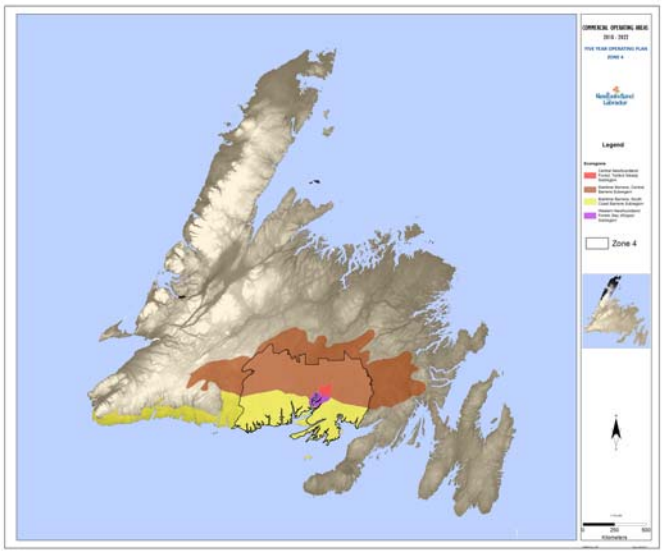
This area occurs south of the Central Newfoundland Ecoregion and north of the South Coast Barrens Subregion. Residual forests that have not been destroyed by fire have moderate forest capability. The dwarf shrub heaths are robust and *Rhododendron canadense(L.)* is a conspicuous component suggesting deep snow cover. Arctic-alpine species are poorly represented. Yellow birch is absent from the forest.

Table 2 Ecoregions Associated with District 7

Central Newfoundland Ecoregion	28,690 km²
Twillick Steady Subregion	190 km²
	(0.66%)
Western Newfoundland Ecoregion	9,980 km²
Bay d'Espoir Subregion	250 km²
	(2.51%)
Maritime Barrens:	38,120 km²
South Coast Barrens Subregion	9,190 km²
	(24.11%)
Central Barrens Subregion	15,260 km²
	(40.03%)

(%) = % of Total Ecoregion

Figure 2 Ecoregions and Subregions of District 7 (Planning Zone 4)



1.3 Ecosystem Dynamics

1.3.1 Ecosystem Condition and Productivity

As with other parts of Newfoundland's boreal forest, those of District 7 have evolved in concert with a history of fire, insect attack and subsequent disease and wind throw. Human intervention in this forest has been extensive and widespread with a resultant significant impact on current landscape patterns.

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

Another important role determining the condition of a forest is change. Forests are an ever evolving entity, resisting stagnation, and constantly moving through their cycles of

life, death, and renewal. The process of change over time is the essence of nature itself. It has been nature's underlying storyline since time began, and will continue to be until time ends.

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

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

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

The following sections will discuss each of these concepts in more detail as they relate to the ecosystems of District 7. 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.

1.3.1.1 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 dependent 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 the 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 total landscape in Planning Zone 4 has approximately 9 percent productive forest. This distribution of productive sites across the landscape and range of productivity within these sites is largely dependent on landscape patterns, climate, and soils. The more productive areas of the zone occur in the lowlands of the river valleys. These areas have deeper soils and less exposed bedrock. The landscape patterns are more consistent and the growing season is longer. In contrast, the southern part of FMD 7 along the coast, have soils that are shallower with bedrock at or near the surface. The terrain in southern and southwestern section is very rough and the growing season is shorter than in the valley lowlands (130 as opposed to 160 days).

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

1.3.1.2 Resilience

Ecosystem resilience reflects the ability of the ecosystem to absorb change and disturbance while maintaining the same productive capacity and the same relationships among populations. Healthy forest ecosystems maintain their resilience and adapt to periodic disturbances. The renewal of boreal forest ecosystems often depend on these

disturbances. Resilience is characterized by the forest's ability to stabilize vital soil processes and maintain succession whereby the system is returned to a community composition and the productivity level is consistent with the ecosystem's physical constraints. To a large degree, a forest ecosystems' resilience is controlled by properties such as climate, parent soil, relief 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. Other measures include the percent and extent of area by forest type and age class and the percentage of disturbed areas that are successfully regenerated. Resilience is determined by measuring and monitoring these parameters. Forest activities must be carefully planned to not upset the natural balance and lower an ecosystem's resilience. An example is harvesting on the more fragile sites where steep slopes and shallow soil over bedrock increase the potential of site degradation beyond repair.

1.3.1.3 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 (loss of topsoil).

Some indicators of stability which can be monitored are (a) area of forest converted to non-forest use (b) area, percentage and representation of forest types in protected areas (c) percentage and extent of area by forest type and age class and (d) change, 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.

1.3.1.4 Disturbance Regimes and Succession Patterns

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

1.3.1.4.1 Harvesting

Regeneration patterns in the black spruce type after harvesting is generally to the balsam fir type with a component of black spruce, on average. There is a higher regeneration failure in this forest type with average not sufficiently restocked (NSR) rates at 25-30 percent across all ecoregion and site types. Another general trend is that the poorer the site quality the higher the NSR rate. These sites would be candidates for planting with black spruce or red and/or white pine. In some instances where balsam fir does regenerate on black spruce sites it becomes very chlorotic at a young age and is highly susceptible to attack from the balsam woolly adelgid. It therefore has not been considered as an acceptable softwood regeneration species on these sites, thus planting has become the norm.

In the balsam fir types, regeneration failure is much lower than the black spruce types averaging 15-20 percent across all ecoregion and site types. The majority of these sites will regenerate back to balsam fir after harvesting. There is also some regeneration of these sites to mixed balsam fir/black spruce and/or mixed softwood/ hardwood types.

The typical regeneration pattern in the mixed wood types is generally back to mixed wood (i.e., dominated by white birch and balsam fir with a minor spruce component).There is a higher component of white birch regeneration after harvesting in types that had a higher percentage of hardwood before harvest. Generally, the better the site class the more hardwood regeneration. Regeneration failure on the mixed wood types is highest on poor sites and lowest on the better sites averaging 10-15 percent.

There are two main white birch site types. The basic difference between them is terrain which impacts site quality. The good(G) and high(H) white birch sites are typically located on sloped terrain resulting in continual ground water movement or seepage slopes. These sites are prone to revert to alder dominated NSR sites in the absence of very hot ground fire as the disturbance mechanism. Consequently the management prescription to ensure productivity on these valuable sites is to plant fast growing softwood species. The medium(M) white birch sites are typically on more level terrain and will revert to white birch /balsam fir or white birch/black spruce after disturbance. Regeneration failure on these sites is low (10 percent). The management prescription to regenerate these site to white birch is to remove the overmature birch in a seed tree cut to provide a seed source for the next rotation of birch. Intermediate treatments of precommercial thinning, to maximize sawlog potential of these stands, are recommended in future.

Harvesting of white birch in this zone has traditionally been for firewood purposes with a limited amount used for value added purposes. Evidence from domestic cutting in these types indicates that they will regenerate to mixed wood types dominated by balsam fir and white birch.

1.3.1.4.2 Fire

Since black spruce is a fire adapted species, it is not surprising that it is the most prolific regeneration species after fire across all forest types, site types and ecoregions within the District. It regenerates as pure stands or in combination with white birch. Balsam fir is conspicuously absent after fire because most advanced regeneration in the understory is killed by the fire. Black spruce regeneration is somewhat correlated with the amount present in the prefire stand. Generally, the higher the component of black spruce in the original stand, the higher the percentage of regeneration to black spruce. In mixed wood stands a higher component of white birch and sometimes trembling aspen is present after fire. Regeneration after fire in white birch dominated stands is typically back to white birch, but can also include a black spruce component. Regeneration failure after fire is on average 20-25 percent across all forest types, typically being higher as sites get poorer and ground fire temperatures decrease. Generally, the poorer(P) site types will revert to Kalmia dominated not sufficiently restocked(NSR) sites and require planting to ensure adequate regeneration. When ground fire temperatures are lower, less of the humus layer is removed and regeneration failure increases due to lack of adequate seed bed.

1.3.1.4.3 Insect

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

Mature balsam fir types usually regenerate to balsam fir or to balsam fir hardwood mixtures. In recent history, however, many insect killed fir stands have reverted to NSR areas due to the high browse rate on fir regeneration by moose in sections of the District. Disturbance by insect kill in young balsam fir stands can also cause succession to white spruce. Regeneration patterns in mixed wood types usually depend on the type of mixture. If black spruce is a component then it will persist and form part of the new stand. Otherwise balsam fir and balsam fir/hardwood mixtures regenerate after insect attack. Regeneration failure of fir sites after insect attack is low and only occurs approximately 15 percent of the time. Regeneration failure mostly occurs on sites where

the immature balsam fir regeneration is killed by either insect attack or over browsing by moose.

1.3.2 Biodiversity

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

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

While the boreal forest does not have the extent of biodiversity that some of the equatorial regions possess, Canada does have just over 70,000 species of plants, animals, and micro organisms in its boreal and other forest regions. An equivalent number remain undescribed 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 as climate control, oxygen production and purification of freshwater supplies, carbon dioxide removal from the atmosphere, soil

generation, and nutrient cycling for humans. 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 the 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.

1.3.2.1 Species Diversity

Species diversity describes the overall range of species in a given area or ecosystem. Species are groups of animals, plants, and microorganisms capable of producing fertile offspring. An example would be all breeds of domesticated dogs are of the same species, while dogs and cats are members of different species. Species extinction is the most dramatic and recognizable form of reduced biodiversity; habitat loss the most drastic in terms of far reaching effect. The prevention of species extinction is a key factor in the conservation of biodiversity. Changes in species population levels indicate the potential for serious changes in ecosystem integrity.

1.3.2.2 Genetic Diversity

Genetic diversity describes the range of possible genetic characteristics found within and among different species. Hair and eye colour, weight and height, are examples of genetic diversity found in humans. Genetic diversity within species is the foundation of all biodiversity. Assessing genetic diversity does not mean tracking every gene in the zone's forest. Responsible planning should design and implement measures which maintain or enhance viable populations of all forest vegetation species and which use the genetic

diversity of commercially important species to a maximum benefit. The genetic diversity of commercially important species can also be managed to increase economic benefit from some portions of the landscape while allowing other portions to provide greater social and ecological values. Genetic diversity is the basis by which populations (flora and fauna) can adapt to changing environmental conditions.

1.3.2.3 Landscape Diversity

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

A forest interspersed with barrens, marshes, lakes and ponds provides for diversity across the landscape. Each ecoregion in the province should have representative areas protected which displays the diversity where such exists. With this in mind, Department of Natural Resources supports the development of ecological reserves in FMD 7. At the present time, the Bay du Nord Wilderness Reserve and the Middle Ridge Wildlife Reserve protect the three major ecoregions in the District: the Maritime Barrens, the Central Newfoundland and the Western Newfoundland ecoregions. The Devil's Bay Ecological Reserve (South of Francois) represents the Maritime Barrens/South Coast Barrens subregion. These areas can serve as a benchmark from which to measure and guide management decisions. These representative areas protect the wilderness of the ecoregion and are vital for guiding management actions. As benchmark areas, they will illustrate the multispecies mosaic that planning actions must maintain. One unique aspect of landscape diversity in Planning Zone 4 is the high representation of native white pine stands relative to other planning zones on the island.

Old growth forests are valued for their contributions to society in the sense of heritage, culture, aesthetics, and spirituality. Old growth forests are best understood within the general context of forest disturbance. Disturbance is ubiquitous in forest ecosystems and may be defined as any relatively discrete event in time that disrupts ecosystems,

community or population structure and changes resources, substrate availability, or the physical environment. Disturbances occur over a wide range of spatial and temporal scales and normally interact one with the other to produce the complexity of forest types found across our landscapes.

Theoretically, boreal forests not disturbed by fire, insect or wind disturbance for long periods of time will revert to multi-cohort, self-perpetuating, gap driven forests. When viewed from the perspective of forest-level disturbance, it may be stated that old growth forests are common in areas not prone to recurrent or periodic stand replacing disturbance from fire, insects or wind. In situations where stand initiating events are rare, then old growth will tend to dominate. The disturbance forces which would naturally recycle mature forests are absent and therefore forests will tend to grow to the old growth stage. Old growth forests are thus composed entirely of trees which have developed in the absence of stand replacing disturbance. Old-growth fir-spruce forests will self-perpetuate through small-scale gap dynamics in the absence of large-scale disturbance.

Old growth conditions in the Canadian boreal forest are rare or uncommon. This is understandable given the ubiquity of landscape level fires and recurrent insect outbreaks. As well, logging is becoming an increasingly significant disturbance factor in the boreal forests. Wildfire is paramount in controlling the dynamics of the drier, continental boreal forests of western Canada and Alaska. In Newfoundland, fire tends to be important in the forests of central region, characterized by its continental like climate.

The occurrence of old growth forests on the Island of Newfoundland is unknown. Except for the old growth research conducted in the upper Main River watershed, empirical definitions of old growth according to forest types and edaphic conditions are not available. Furthermore, the frequency of natural forest disturbances and their role in shaping landscape level forest composition and structure of the Island's forests are little understood. However, given our general knowledge of the historic occurrence of fire, insect and wind disturbance in Newfoundland's forests, as well as recognition of a century of logging activity across the Island, it is reasonable to assume that primary old

growth forests on the Island are not common. DNR does acknowledge that the older cohorts in the age class structure of a district are important from many ecosystem perspectives. Accordingly, during the 2006 wood supply modeling, the maintenance of 15 % of the overmature cohort (i.e. 81+ years) on the landscape over the forecast horizon was a requirement on a district basis. This will be discussed further in other sections.

1.4 Forest Characterization

1.4.1 Land Classification

There are four basic categories that currently represent how the land within a forest management district is classified; productive forest, non-productive forest, non-forest and fresh water. The total mapped area in the zone is approximately 1.6 million hectares. Of this approximately 635,580 ha is productive forest, 417,920 ha is nonproductive, 404,000 ha is non-forest, and 157,000 ha is water. Productive forest is defined as forested area that is capable of producing 60 m^3/ha at rotation. Essentially, this is the forested area that sustains industry in the province.

1.4.2 Age Class

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

Class Age (years)

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

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

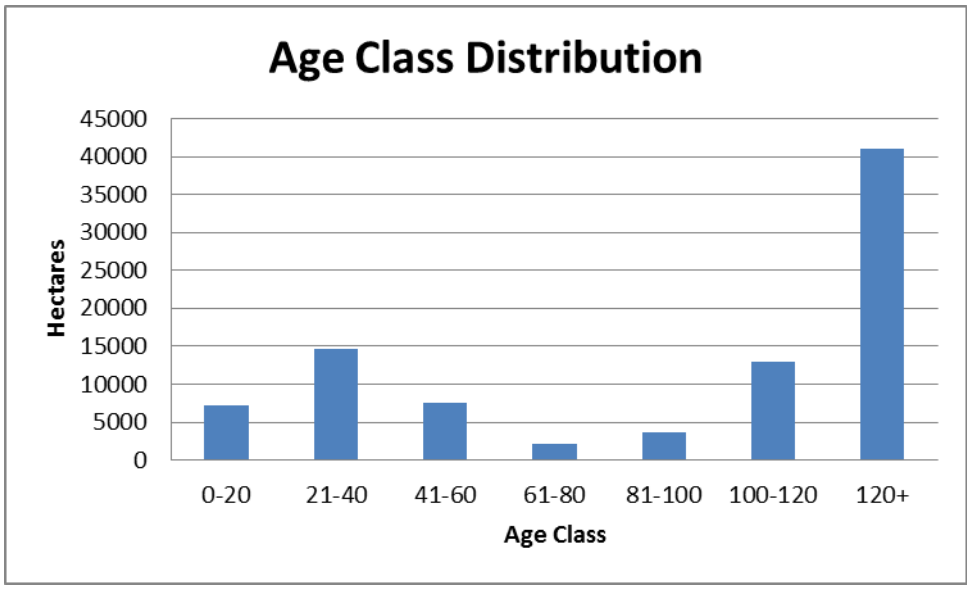


Figure 3 Age class distribution in Planning Zone 4

1.4.3 Site Class

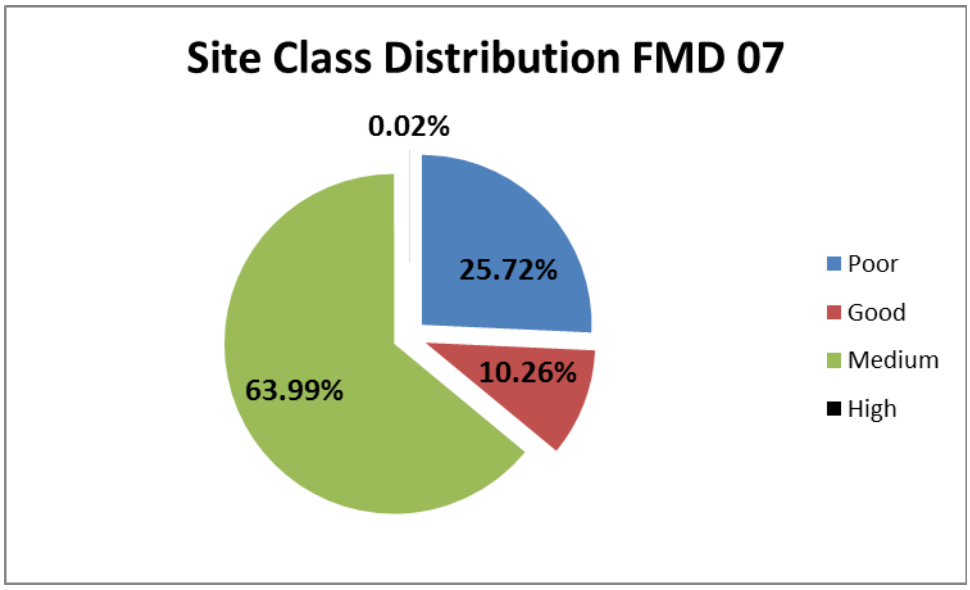
The Forest Service has identified four site classes that refer to the potential of a given site to produce timber. These are high, good, medium and poor. The classes are based on a number of factors, some of which are soil type, moisture content, slope, and fertility. Site class is determined through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

average, good sites are capable of producing > 2.6 m3/ha/yr, medium sites 1.7 m3/ha/yr, and poor sites 0.8 m3/ha/yr. The following indicates the average potential in cubic meters per hectare for each site class at maturity (based on the provincial average).

Class	**m3 /ha**
High	200+
Good	150
Medium	120
Poor	80

The medium site class is by far the largest within Planning Zone 4, holding 64% of the total productive area. The next largest class is poor (19%), followed by good (14%) and high (<1%).

Figure 4 Site Class Distribution for FMD 7



1.4.4 Forest Types (Species and Working Group)

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

There are ten working groups associated with the District. The four major working groups are the balsam fir-softwood, black spruce-softwood, softwood-hardwood and the hardwood-softwood working groups.

The total working groups in the District are the following:

1. bS -black spruce is the major species in this working group making up 75 to 100% of the basal area. This means that the black spruce component has the largest merchantable volume in the stand.
2. bF -The same description for bS applies, except the major species is balsam fir.
3. wB -as above, with white birch the major species.
4. tA –as above, with trembling aspen the major species.
5. SH –in this group, the major species is a combination of softwoods (usually balsam fir and black spruce) with the minor component consisting of hardwoods.
6. HS –the working group is essentially the same as the SH group, only reversed with hardwoods being the major component and softwoods the minor.
7. DI –this designation refers to areas that are classes as disturbed. The disturbance can be the result of wind damage, fire, insects, and so on. It is currently too early to tell if the site will regenerate for this planning period.
8. NS –this refers to areas that have been disturbed but are now insufficiently restocked with a preferred species. For example, a rich balsam fir site could have been harvested and then regenerated to an alder bed.
9. jP –as above, with jack pine (*Pinus banksiana* Lamb.) the major species.
10. jL –as above, with Japanese Larch (*Larix keampferi.)* major species.

Table 3 Breakdown of District by Working Group

Working Group	Area	% FMD	Rank
bS	39465	44%	1
bF	30844	35%	2
sH	14921	17%	3
hS	3574	4%	4
wB	557	1%	5
other	11	0%	6
Total	89372		

The balsam fir and black spruce working groups account for 79 % of the productive forest area in the District with balsam fir accounting for 35% and black spruce accounting for 44%. The third major working group is the softwood-hardwood cover type which occupies 17% of the production forest. The remaining working groups are of limited area.

A look at the productive forest (Figure 4) by age class shows the vast majority of the timber stands being in age class 6 and 7. The unbalanced, uneven age class distribution can be attributed to the lack of major disturbances in the past (i.e. limited harvesting operations and the lack of fire history), thus the high percentage of overmature timber. The timber stands of age class 1 resulted mainly from recent cutovers and with the mortality caused by the spruce budworm in the late 1970-80's. This resulted in the breakdown and disintegration of the previous stands.

The Bay d'Espoir area, (St. Alban's-Milltown), which is characterized by soil of erosion origin has an above average amount of forest in comparison to the remainder of the coastal region. The major tree-species are balsam fir (*Abies balsamea*) (L.) Mill), black spruce (*Picea mariana*) (Mill BSP), white birch (*Betula papyrifera*) Marsh), yellow birch (*Betula alleghaniensis* Britt). Minor tree species include white spruce (*Picea glauca* Moench) Voss), tamarack (*Larix laricina* (Du Roi) K. Koch), and eastern white pine (*Pinus strobus* L.).These species occur in the four cover types.

(a) Softwood

This cover type occupies 79% of the production forest land in the district. The softwood cover type is composed of 76-100% softwood with the remaining 0-24% being hardwood. The softwood cover type is predominately balsam fir with the remainder of the softwood content consisting mainly of black spruce. White birch is the major hardwood component in the softwood cover type.

(i) Black Spruce

Black spruce is a slow growing species ranging from 9-12 meters in height and from 15-30 cm in diameter. It grows best on well drained sandy soils but is found on a variety of sites including sphagnum bogs. It is more abundant in the northern section of the district. Black spruce is not usually found in pure stands but grows in association with balsam fir. Black spruce is usually found around the fringes of softwood and softwood-hardwood cover types where the soil is boggy and wet..

(ii) Balsam Fir

Balsam fir is the second most common tree species of the Management District. Of the softwood cover type, 35% is occupied by balsam fir. Pure stands of balsam fir are not common in the District. Usually black spruce and white birch are associated with the fir species. Balsam fir is a medium sized tree growing from 12-15 meters in height and 30-36 cm. in diameter. It is adapted to a variety of sites but grow best on moist, well drained soils. As mentioned earlier, balsam fir grows in association with black spruce and white birch. This softwood species is one of major economic importance to the Management District and is used for sawlog material and pulpwood material.

(b) Softwood-Hardwood and Hardwood-Softwood

The softwood-hardwood and hardwood-softwood cover types occupy 17% and 4% of the forest production land in the District respectively. These two cover types are usually found on the richer sites which are considerably drier.

The softwood-hardwood cover type is comprised of 50-75% softwood with the remaining being hardwood. This cover type is predominately balsam fir with white birch being the major hardwood constituent.

The hardwood-softwood cover type is comprised of 25-49% softwood with the remainder being hardwood. Of the hardwood content in this cover type 55-60% of the volume is yellow birch. However, on a stem per acre basis, white birch is the predominant species. The yellow birch, which are for the most part large overmature trees, grow in association with balsam fir and white birch.

These two cover types are important to the Management District for they comprise 21% the production forest land. Three species are of economic importance to these cover types: balsam fir, white birch and yellow birch.

(**C) White Birch.**

White birch is normally found on the fertile sites along streams and rivers, as well as flood plains. It can also be found on fire origin locations as it is a pioneer species that seeds into an area once the forest cover is removed by fire. Pure white birch stands are not that common in the province, especially in the districts.

Section 2 Past Activities Planning Zone 4 - Crown

2.1 Overview

As stated in the introduction, Forest Management Districts 7 is a standalone Planning Zone 4. For consistency purposes, a description of the past five activities will cover the period from 2013 to 2017 inclusive. It should be noted that forest activities that were carried out during this planning period were compliant with the Five Year Plan. Amendments were channeled through the appropriate agencies and required approvals obtained before any work was initiated.

2.2 Harvesting

For the most part, the harvest was distributed throughout FMD 07 and occurred both commercially and domestically. In total, over the five-year period, there was approximately 60,781 m³ harvested on Crown land from 2013 to 2017. Table 2 summarizes the total commercial harvest administered by the Crown in this Planning Zone.

Table 4 Summary of Crown AAC Commercial Harvest in Planning Zone 4 for 2013-2017

District:				Core					Operational (Available)				Non-AAC Wood	
				AAC	Commercial	Deviation	Total		AAC	Commercial	Deviation	Total	Operational	Regulatory
Softwood			2013	22308	1339				2652				183	
			2014	22308	1451				2652				112	
			2015	22308	2087				2652				126	
			2016	22308	1998				2652				58	
			2017	22308	1900				2652				100	
	Sub-total													
				Core					**Operational (Available)**				**Non-AAC Wood**	
				AAC	Commercial	Deviation	Total		AAC	Commercial	Deviation	Total	Operational	Regulatory
Hardwood			2013	1061	87								0	
			2014	1061	65								0	
			2015	1061	359								59	
			2016	1061	618								0	
			2017	1061	500								50	
	Sub-total													
	District Total													

Table 5 Summary of Crown AAC Domestic Harvest in Planning Zone 4 for 2013-2017

District:			Core				Operational (Available)				Non-AAC Wood	
			AAC	*Domestic*	*Deviation*	**Total**	AAC	*Domestic*	*Deviation*	**Total**	*Operational*	*Regulatory*
Softwood		2013		3899							3680	
		2014		4047							4136	
		2015		3849							4545	
		2016		4010							4728	
		2017		3977							4689	
	Sub-total			***9782***							***21778***	
			Core				**Operational (Available)**				**Non-AAC Wood**	
			AAC	*Domestic*	*Deviation*	**Total**	AAC	*Domestic*	*Deviation*	**Total**	Operational	Regulatory
Hardwood		2013		499							2402	
		2014		676							2658	
		2015		834							3095	
		2016		871							3203	
		2017		864							3177	
	Sub-total			***3744***							***14535***	
	District Total			**13526**							**36313**	

2.3 Silviculture

No silviculture projects where conducted over the course of the 2013-2017 plan. This was a result of the small scattered nature of commercial harvesting in the zone along with the presence of natural regeneration. Many of the areas harvested during the last planning period are once again included and will be assessed for silviculture treatments.

Table 6 Summary of Crown Silviculture treatments in Planning Zone 4 from 2013 to 2017

Treatment Type	Area (ha)	
	Proposed	Treated
Pre Commercial Thinning	225	0
Prescribed Burn / Planting	1355	0
Plantation Maintenance	550	0
Prescribed Burn / Planting/Plantation Maintenace	300	0
Stand Conversion / Presribed Burn / Planting	150	0
PCT / Plantation Maintenance	75	0
Total	2655	0

2.4 Road Construction

There were 1.25 km's of new access roads constructed in Planning Zone 4 by the Crown under Tender and by Crown forest operators under contract. Tables below summarize the roads constructed in the district. All roads built during the period were required to access commercial timber. There is a significant difference in proposed vs actual construction due to the smaller than anticipated demand for commercial fiber in the zone

Table 7 Summary of Crown access roads built (primary and secondary) in Planning Zone 4 from 2013 to 2017

Roads	
Proposed	Constructed (km)
21	1.25

2.5 Natural Disturbance

2.5.1 Fire

Planning Zone 4 has historically had a low fire history. During the period of 2013 to 2017, there were a few small fires recorded that did not burn a significant area of forested land. In total there were 7 fires reported that burned an area of approximately 4 hectares.

2.5.2 Insect

There has been little insect activity in the Zone over the period 2013 to 2017. With the exception of the balsam wooly adelgid (aka aphid), no other insect infestations have been documented by the Forest Engineering and Industry Services Division in Planning Zone 4. The majority of the remaining balsam fir stands in the zone are now infected with aphid. Wide scale treatment for eradication of this insect is yet to be developed. According, the only work carried out in the zone to deal with aphid has been the removal of balsam fir ingrowth through cutting in some Precommercial Thinned stands where the

fir has started to deteriorate. It is hoped that this treatment will help reduce the spread of aphid.

Section 3 Timber Supply Analysis

3.1 Introduction

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

3.2 Guiding Principles and Policy Direction

The key underlying principles that guide this analysis are:

(i) the AAC must be sustainable;

(ii) the level of uncertainty (risk) associated with the AAC must be minimized by using empirical information wherever possible;

(iii) there must be conformity between information and assumptions used in the analysis and actions and decisions taken on the ground;

(iv) the analysis must be consistent with other forest values and objectives; and

(v) the timber supply calculation must consider economic factors, not solely the physical supply of timber.

In concert with the policy of establishing sustainable timber harvest levels, Government policy requires that harvesting not exceed the established AAC's. Likewise, Governments policy is to optimize forest industry opportunities from the sustainable fiber supply.

Government also requires consultation be conducted during the timber analysis. The forest industry was consulted directly throughout the process.

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, but limited intermediate age forests. This imbalance is not unusual in a boreal forest where cyclic catastrophic disturbances are common. Figure 4 illustrates this age class imbalance. The insufficient amount of intermediate age forest on the island is one of the most important factors influencing AAC's, therefore it is the basis for many of our forest management strategies. Essentially; we are employing a matrix of measures designed to fill the gap in our age structure, which include: an aggressive forest protection program, harvesting programs that attempt to exclusively target the oldest stands first, and thinning the regenerating forest so that it becomes operable at an earlier age.

Another important aspect of the Province's forest posing a challenge to forest managers is the natural fragmentation of the resource. The Province's landscape is characterized by many ponds, bogs, rivers, streams, and rock outcrops resulting in relatively small pockets of timber. This makes the determination of an economic timber supply very challenging given that each stand has unique economic characteristics. Arguable the most important factor affecting present and future AAC's is the available productive landbase. However, this productive landbase available for forest activity is constantly being evaluated by the demands/requirements of other stakeholder values. Therefore, it is important that we manage relationships with other users to minimize loss to the forest landbase, while taking into account these other values. As well, to mitigate losses to the productive landbase, we must continue to explore ways for growing more volume on the existing landbase.

3.4 Timber Supply Analysis

In 2015, the Forest Service began another review of the provincial timber supply. 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 require 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 Land 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. Although the latest inventories used in the 2016 Wood Supply Analysis for this zone, the estimate of forest stock is kept current through an annual update program. This program accounts for all natural and man-made disturbances such as: fire, insects, harvesting, and any enhancement programs, including 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) area can be harvested with reasonable economic restrictions (expensive wood) and

b) area is highly unlikely to be harvested under current economic conditions.

Only the first 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 non-timber values has 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 landbase (area where harvesting operations can occur) is only 18 % of the total productive forest land base. On average, in any one year, less than 1% of the productive forest land base is influenced by harvesting operations.

3.4.2.1.1 No-Cut Buffer Zones

The Province has guidelines that require all water bodies (visible on a 1:50,000 map sheet) be given a minimum 20 meter uncut buffer (from waters edge). In addition to these legislated water buffers, District Ecosystem Managers, in consultation with various stakeholders, have increased buffer zone widths beyond the 20 meter minimum to protect special values such as: salmon spawning areas, cottage 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 study both species and ensure adequate habitat will be available for pine marten and caribou into the future. This work is examining the quantity and quality of habitat, as well as, the connectivity of habitat. With respect to Caribou, both wildlife biologist and foresters within the Forestry and Wildlife Branch are working together to develop an adaptive management strategy. This initiative started during the development of Zone 5 planning process in 2011 and will be further explained in Section 4.2.1.1.2

3.4.2.1.3 Wildlife Corridors

As part of the evaluation process for harvesting plans, wildlife specialists sometimes recommend managed corridors to ensure various species of wildlife have sufficient cover to move around the landscape. These corridors are temporal in nature and generally have little impact on timber supply.

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

The majority of the public protected water supply areas and 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 these watersheds over time.

3.4.2.2 Timber Related

The Forest Service also reduces the gross AAC's by taking into account other potential losses of timber, which include:

3.4.2.2.1 Insect/Fire/Disease Losses

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

3.4.2.2.2 Logging Losses

Surveys of recent harvested areas are conducted each summer throughout the Province to determine the quantity and quality of fiber remaining. The estimates from these surveys are used to reduce the available AAC. As well, information is gathered throughout the AAC period to determine projected volume against the actual harvested volumes within a given area. The difference is evaluated and applied to net down the gross AAC numbers.

3.4.2.2.3 Operational Constraints

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

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

3.4.3 Growth Forecasting

A key requirement for forecasting future wood supply is an understanding of how forest stands grow and develop through time. That is, as a forest stand develops, how much merchantable (i.e. harvestable) volume does it carry at any given point? These yield forecasts (referred to as yield curves) are required for each type of forest stand (called a

stratum) comprising the forest under consideration. In Newfoundland, there are dozens of distinct forest strata for which separate yield curves are required. These are defined by the tree species in question (e.g., balsam fir, black spruce), the site quality (e.g., good, medium, poor), the geographic region (e.g., Central 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 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 to more accurately portray the varied stand growth within and among the districts.

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 minimized 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 manufacturing plants and employment.

3.4.4.2 Spatial

A major improvement that occurred over the last several analyses is 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. The 2001 approach was an improvement over previously wood supply processes because there was no harvest scheduling completed. Basically, the software used cannot realistically know all the operational restrictions within a forest management district. By utilizing the spatial manual process, 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 evaluate its sustainability and determine if non-timber objectives are achieved. In most cases, the harvest scheduling exercise has to go through several iterations before an acceptable harvest schedule could be realized. 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 identify forest stands that are considered not as accessible for harvesting.

Manual harvest scheduling has several 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 which delay or restrict harvesting of stands. Secondly, the mapped 25 year harvest schedules build credibility into the forest management process. 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, 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 the resource is being used in a responsible manner. Next, harvest scheduling will help integrate the management of other forest resource values into timber management planning. All forest values can be typed directly to discreet forest areas, providing the link allowing 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.

Finally, the harvest schedule maps developed for the wood supply analysis can be a starting point for the 5 year management 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 completed only for the Class 1 landbase. 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 and ecosystem management as well.

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 the Forest Service's ecosystem approach, the Province introduced into the analysis an old forest target that at least 15 percent of forests be older than 80 years. This was designed to provide a course filter approach to maintaining representative forest structure. It ensures the presence of certain amounts of old forest across the landscape into the future. With advances in modeling, this target can now be tracked across a district rather than a single ownership. This has resulted in this strategy being less restrictive than the last analysis. As well, an attempt has made to connect these areas across the landscape for the 25 years in the form of 81+ corridors.

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 2016 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 main silvicultural actions used in the 2016 analysis include; precommercial thinning of balsam fir, black spruce, and softwood hardwood stands, and full plant of any areas that do not regenerate naturally mainly with either black spruce, white spruce and to a lesser degree with red pine, or Norway spruce and larch (both eastern and Japanese).

3.5 Inventory Adjustments

One of the limitations of the current wood supply model is the inability to account for volume depletions outside of what is reported for harvesting operations. The model produces a gross merchantable volume (GMV) figure which requires adjustment to account for volume losses as a result of: fire, insects, disease, timber utilization practices and the presence of stand remnants.

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 Forest Services.

3.5.2 Insects

No forest mortality was documented by Forest Insect and Disease Surveys by the Forest Services in FMD 7 during the last five year period. Long term averages of area of timber mortality from insect defoliation were used as the deductions in Planning Zone 4

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). Information was analyzed by harvesting system and season.

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 total inventory adjustment for the Crown is 22%. The Class III inventory adjustment figures are the same for all districts/tenures. Hardwood inventory adjustment figures for all tenures/districts are the same as the Class 1 softwood figures noted above. Hardwood stands are resistant to fire and it is anticipated that there will be little utilization loss due to the high value for fuelwood.

3.6 Timber Supply

The previous discussion in this chapter on woodsupply forms the basis of the 2016 analysis.

Table 8 Annual Allowable Cut results for districts in Planning Zone 4 for 2016-2020

District	Ownership	Softwood		Hardwood	
		Core	Operational	Core	Operational
7	Crown	22,308	2652	1061	0

Section 4 Values

4.1 Guiding Principles of Sustainability

There are five guiding principles of overall sustainability, which include; environmental, economic, political, social, and cultural sustainability. Environmental sustainability looks directly at ecosystem health, both now and in the future. Ecosystem health is determined by such factors as ecosystem integrity, biodiversity, productive capacity, and resiliency. The five year operating plan must ensure these factors are intact.

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. However, economic development should not proceed without the incorporation of the other factors into the decision making process.

Political sustainability refers to goals and management objectives being applicable, administrable, and practical. These goals and objectives must maintain these qualities well into the future with the aid of public input and support. Social sustainability means fairness and equity to all stakeholders. Cultural sustainability is attained by applying Newfoundland's culture to the planning process. A forest management strategy cannot be successful without allowances within the strategy for traditional access and use of the land. For generations, many of Newfoundland's public had free range in our pristine wilderness, a fact that cannot be ignored when planning for the zone. All are key interlocking components and each must be maintained if sustainable development is to be achieved.

4.2 Value Description

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

Other values such as water quality, parks and protected areas etc. provide for the protection of the forest ecosystems which can enhance the other values listed above. Many of the values in the zone were identified by this or previous or 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

Individual values were 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 values. This helps facilitate the preparation of the five year operating plan by identifying potential areas of conflicting use early into the process. In many instances, the Environmental Protection Guidelines (EPG's) form the guiding principles for a value. Quite often the spatial extent or location of all values is not known (eg., raptor nests). Specific guidelines are still listed in order to provide a direction or course of action when and if these values are encountered.

4.2.1 Biotic Values

4.2.1.1 Big Game

4.2.1.1.1 Moose

Characterization:

Moose are not native to the island. 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 seven moose management areas 17, 18, 20, 25, 26, 27 and 37 are located within District 7.

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

4.2.1.1.2 Caribou
Characterization:
Caribou is the only native ungulate species on the island. Biologists estimate that prior to the railway being built in 1898 the population on the Island was approximately 100,000 animals but by 1930 the population had declined to about 10,000 animals. Between 1980 and 2000 the number of caribou has increased considerably on the Island with a population estimated at 90-100,000 animals. In the past few years however populations have declined significantly, with Planning Zone 4 being no exception. All or portions of 3 caribou management areas 63, 64 and 67 are located in the zone.

Critical Elements:
It is unclear how forestry activities in the immediate vicinity of calving areas during the calving period may have an impact on caribou populations. Recent studies and anecdotal information has indicated that harvesting restriction zone around caribou calving zones may be significantly larger than 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.

Within the Zone 4 (FMD 07) five-year operating plan (2018-2022), the Forestry Branch and Wildlife Branch of the Department of Fisheries and Land Resources have committed to applying the principles of adaptive management where forest management and caribou values overlap. Both parties have tentatively agreed to assign some conflict areas for inclusion in an adaptive management study. The results of this adaptive management study will be used to inform the development of forest management-caribou guidelines that will be the basis for resolving value conflicts in future forest management planning processes. A complete description of this study is found in Section 8 of that plan.

4.2.1.1.3 Black Bear

Characterization:
The black bear is native to the Island and is found in forested areas. Currently, the number of black bears occurring on the Island is not known (due to difficulty in conducting a census) but is crudely estimated to about 6 - 10,000 animals. All or portions of black bear management areas 17, 18, 20, 25, 26, 27 and 37 are located within the District

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 Wildlife Division of the Department of Fisheries and Land Resources. This process takes into consideration information provided by the public and wildlife and forestry staff. Each year the Wildlife Division 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 are required for moose shelter and yards, they will be identified in consultation with the Wildlife Division.

Caribou

- to ensure the continued protection of these animals the following EPG's will be followed during forestry activities;
- in areas where caribou utilize lichens, a minimum amount of lichen forest must be maintained for caribou. (This amount is to be determined through consultation with Wildlife Division);
- harvesting and road construction will be minimized during the May 15 to July 30 calving period in operating areas adjacent to known calving areas;

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

As stated, both the Forest Service and the Wildlife Division is in the process of identifying impacts of forest harvesting on critical caribou habitat areas through a research study that is being conducted in zone 5. The results of this adaptive management strategy will be applied to the forest areas identified in this plan. However, until the results of that study are finalized, the Forest Service will work closely with the Wildlife Division with respect to areas proposed within this planning document.

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 Wildlife Division.

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 by the Wildlife Division, 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 will remain standing during harvesting operations.

4.2.1.3 Salmonids

Characterization:
The Atlantic salmon and the brook trout are native to the Island and are found in waterways surrounded by forested areas. There are 12 scheduled salmon rivers in Planning Zone 4 and population counts are conducted on the Conne River system. The scheduled rivers include Conne River, Grey River, Long Harbour River, and Bay du Nord River.

Critical Elements:
- water quality maintenance;
- riparian buffer zones along water systems

Guiding Principles:
Salmonid Management (Atlantic salmon and brook trout)
Management of Atlantic salmon and brook trout in the Province is delivered by the Federal Department of Fisheries and Oceans (DFO). DFO annually sets bag limits, season dates, and river closure dates based on extreme water temperature.

Protection
- DFO recommends that a 100 metre no-cut buffer zone be left in designated sensitive spawning areas .
- under the Environmental Protection Guidelines designated protected public water supply areas (PPSWA's) also provide protection for these species through existing Environmental Protection Guidelines that apply to these areas (ie. increased buffers, usually 150 meters on intake ponds, 75 meters on main river stems, 50 meters on major tributaries and minimum 30 meter buffer regulated in the rest of the district).

4.2.1.4 Song Birds

Characterization:

The distribution of songbird species in a forest ecosystem is widely considered to be a relative indicator of ecosystem health. Many songbird species are distinct to specific habitats (Whitaker et al., 1997) therefore; the presence, absence, or health of a specific songbird population can indicate the health of its corresponding habitat. Songbirds are also the natural predators of our native Lepidoptera pests (ie. looper and budworm) and help to control these populations. Consequently, their value cannot be underestimated.

Critical Elements:

- forest cover for protection;
- water quality maintenance;
- riparian buffer zones along aquatic areas;
- variety of forest seral stages and species (nesting sites, habitat, etc.)

Protection of songbird species will mainly involve protection of their habitat through the various methods discussed in earlier sections.

4.2.1.5 Other Avian Species

Characterization:

Other valued avian species include ptarmigan, grouse, migratory birds and raptors. The former includes important game species, while the latter (ie. raptors) occupy higher trophic levels in the food chain. Higher level trophic feeders are considered important indicators of ecosystem health as they are sensitive to environmental stress. Population trends for these species as defined by the Wildlife Division and Canadian Wildlife Service (CWS) are available on a regional basis.

Critical Elements:

- forest cover for protection;
- water quality maintenance;
- riparian buffer zones along aquatic areas;
- snags and coarse woody debris (prey habitat)
- buffer zones on nesting sites
- Under the Guidelines for Ecologically-based Forest Management, no forestry operations are to occur within 800 metres of a raptor nest during the nesting period and not within

200 metres in the off nesting season. These guidelines are attached as terms and conditions to all commercial operator permits.

- The locations of all known bald eagle and osprey nests will be identified on all cutting maps and harvesters will be informed of their locations by Forest Services Staff. Regular operator checks and routine patrols of domestic cutting areas by Forestry Staff will ensure compliance of these guidelines.

- On recommendation by the CWS, sensitive waterfowl habitat has been protected through increased buffers of 50 meters on certain ponds. As well, the establishment of municipal wetland conservation areas in the planning zone by Eastern Habitat Joint Venture through stewardship agreements with municipalities.

4.2.1.6 Rare and Endangered Species

4.2.1.6.1 Pine Marten

Characterization:

Before 1900, marten ranged over most of the forested areas on the island. Unfortunately, due to a variety of reasons, the population levels dropped where this species was listed to the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) as Endangered. Habitat loss, predation, disease and accidental trapping and snaring are thought to be primary reasons for marten population decline in Newfoundland. Marten still naturally occurs in three main areas on the island including: Main River watershed, Little Grand Lake and Red-Indian Lake areas. Additionally, marten also now exist at Terra Nova National Park (TNNP) and surrounding landscape. As well, in the Bay Du' Nord Wilderness Area around Lake St. John through a relocation effort by the Eastern Newfoundland Pine Marten Recovery Team. Representatives from TNNP, Forest Service, Wildlife Division and CBPPL are represented as stakeholders of the recovery team. The purpose of this team is to set short-term and long-term population goals for the species in eastern Newfoundland and recommend ways which this may be accomplished. The Team has been established for some time now and has worked on the process of evaluating critical and recovery marten habitat and determining which forest activities can take place within these areas. Approximately, 16 marten have been relocated to these

areas and the population estimate today is in excess of 300. Once listed as Endangered, COSEWIC has now downgraded the marten listing to Threatened.

It is important marten habitat is protected in this area and some remnant stands of old growth (80+) forests remain throughout the zone. 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.

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;
- 70% or greater of that unit must be suitable habitat;
- 40% or greater of the unit should have trees greater than or equal to 9.6m in height;
- The remaining portion of the 70% (30% or less) should have trees between 6.6 and 9.5m;
- 50% of the unit should be contiguous; stands will have to be within 50 m of an adjacent habitat to be considered contiguous.
- A qualifying stand will have to be within 150 m of another stand or habitat patch to be considered as habitat.
- minimum patch size equals 20 ha;
- basal area requirement equals 40 m^3/ha (~18 m_2);
- hardwood stands (insect kill, wind throw) will be considered where crown closure is greater than or equal to 30%;
- Softwood scrub that meets the minimum requirements (6.5 m) will be considered habitat.

Where height is not known, softwood scrub within 50 m and adjacent to a qualifying stand is considered as habitat. As stated, critical and recovery pine marten habitat is being or has been identified. The development and evolution of the marten habitat suitability model in recent years has been a useful tool in identifying potential marten habitat and evaluating impacts of harvesting on this habitat and resultant changes to population levels. Continued development and refinement of this model will provide more a reliable means of evaluating impacts of harvesting on marten habitat in the future. There is also ongoing research into a variety of aspects of marten dynamics through the Model Forest, Canadian Forest Service, and University of Maine. Recommendations resulting from any of these ongoing initiatives will be incorporated into harvesting prescriptions as required.

4.2.1.6.2 Erioderma)

Characterization

Erioderma pedicellatum (Boreal Felt Lichen) is anepiphytic lichen growing on trunks and branches of trees in moist, mature forests. Its preferred host is balsam fir. The leafy thallus is gray on the upper surface and white underneath. The edges of the thallus curl upward, giving the lichen a unique, white-fringed appearance when viewed from a distance.

Boreal felt lichen grows in sub-oceanic forest regions of Newfoundland. It is absent from the eastern parts of the Great Northern Peninsula and from the northern central parts of the island. The known population is concentrated in two areas, the central Avalon and Bay d'Espoir. Over 5000 thalli have been counted since 1994. Habitat loss from wood harvesting is considered the greatest threat to boreal felt lichen in Newfoundland. Other threats include air pollution, particularly acid rain/fog, forest pesticides, forest fires, climate change, land and industrial development, and impacts of moose on forest ecosystems. The life cycle of this lichen is complex and poorly understood.

This species is the only boreal member of an otherwise strictly tropical group of lichens of very ancient origin. It once had a global Amphi-Atlantic distribution with populations

occurring in Scandinavia, and in New Brunswick, Nova Scotia, and Newfoundland. The species is now seemingly extirpated from Scandinavia and in the last few decades it has experienced drastic declines in the Maritimes. The health of the Newfoundland population is pivotal to the global survival of this species. In addition, boreal felt lichen can be an excellent indicator to monitor changes in air quality; it is one of our lichen species with the highest degree of sensitivity to air pollution (Wildlife Division, Department of Fisheries and Land Resources).

The Province of Newfoundland and Labrador listed the Boreal Felt Lichen as Vulnerable under the Endangered Species Act in 2002 and as a result mandated the development of a management plan for the species. This management plan can be found on the Department of Environment and Conservation website. The report is entitled "A 5 Year (2006-2011) Management Plan For the Boreal Felt Lichen (Erioderma pedicellatum) In Newfoundland and Labrador."

Before the above report the Department of Forest Resources and Agrifoods in 1998 contracted a consultant to accumulate information on the Boreal Felt Lichen. Dr. Alexander Robertson produced a report entitled "The Boreal Felt Lichen (Erioderma pedicellatum (Hue) P.M.Jorg.) in Newfoundland" which has been a reference source for the Department since that time.

At present, formal protected areas, including Wilderness Reserves, Provincial Parks and Salmonier Nature Park, contain over half of the known Boreal Felt Lichen thalli. Additional thalli are located within two candidate ecological reserves on the Avalon Peninsula. The majority of the protected thalli are found in the Bay d'Espoir area in Jipujijkuei Kuespem (Little River) Park (3000 thalli) and 294 thalli within the Avalon and Bay du Nord Wilderness Reserves.

Other locations in District 7 where thalli have been recorded include Hermitage Bay, Salt Pit-Twin Brooks area, Harbour Breton Road, and a new location found in March 2006 at Bay d'Espoir Brook.

Critical Elements

Forest management activities such as road construction, use and maintenance, timber harvesting and silviculture may reduce the abundance and/or habitat of the Boreal Felt Lichen in the District. These factors alone or in combination with natural factors such as stand senescence, forest blow down, insect outbreaks and perhaps slug/mite herbivory, or factors of anthropogenic origin such as development, moose herbivory, fire, air pollution, pesticides, and climate change may threaten the populations of this species.

Guiding Principles

Habitat suitability models have not been developed for critical habitat and therefore a landscape approach discussed in the five year management plan for the Boreal Felt lichen is a logical approach. The Best Management Practices based on Robertson's (1998) recommendations have been employed by Department of Natural Resources as a stop gap measure and are superseded by the above mentioned landscape approach. They were put in place to provide guidance in the absence of detailed researched management strategies and are used on a site-by-site basis.

-Limit patch cutting to $\leq$ 5 ha on the Avalon Peninsula, which may be applicable to other areas of the province with Boreal Felt Lichen.

-Salvage operations in large wind throw areas (generally more than 5 ha) in the vicinity of Boreal Felt Lichen, especially in areas where the prevailing wind blows away from the phorophytes, should be carried out no closer than 10m stands which may become potential habitats for Boreal Felt Lichen 50-60 years hence.

-Routes for new extraction routes and roads should naturally avoid Boreal Felt Lichen sites.

-Leave a buffer zone of at least 20 m around Boreal Felt Lichen sites and restrict harvesting to trees greater than 12 cm diameter at breast height.

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4.2.1.6.3 Red and White Pine

Characterization:

Provincially, the range of white pine is shrinking due to a variety of reasons including past harvesting practices and infection from blister rust. However, significant stands of white pine still exist in forest management districts of Planning Zone 4. Red pine is the rarest tree species in the province with a distribution of some 22+ small stands (<15,000 trees in total). Despite this, it is represented fairly well in this Planning Zone. For example, an approximate 400 ha mature stand exists at Grant's Pit in FMD 5. With approximately 5,000 trees, this is the largest known to exist in the province (Roberts, 1985). Since both of these species occur in Planning Zone 4, local protection is required to maintain local and provincial biodiversity.

Critical Elements:

- maintenance or enhancement of stands on the landbase
- minimizing loss of trees/stands through public education
- minimize losses to fire, insect and disease
- enhancement of younger age classes through planting natural regeneration and pruning to ensure continuance of the species
- maintenance of native genetic stock

Guiding Principles:

- enforcement of forestry act, regulations, guidelines and policies
- gene preservation gardens for these species and a clonal orchard for white pine have been developed by DNR at Wooddale Tree Nursery. At some point, the goal is to produce seed from these gardens/orchards to grow pine seedlings of native origin.
- some native red pine stands are protected under reserve status.
- Forest Serviceshas adopted a no cutting policy of pine by non traditional users and a phase out of cutting by traditional commercial users. Currently, no commercial operators harvest pine in Planning Zone 4.
- protection of these species in planning zone is expected to be strengthened by public education and no-cut conditions on permits (both domestic and commercial).
- implementation of silviculture treatments designed to merge pine back into the landscape.

- DNR is collecting seed from red pine stands of native origin and the collection of white pine scions for the clonal orchard at Woodale
- DNR also implements stand level silviculture prescriptions such as pruning of immature white pine to reduce the infection rate of blister rust and cone production enhancement on red pine to ensure an adequate supply of native red pine seed.

4.2.1.6.4 Red Crossbill

The red crossbill, is currently listed as endangered. The Forest Service currently has a representative on the recovery team for this species. Any recommendations on modified forestry activities, if any, will be developed with input from all members.

4.2.1.7 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 Trihalomethane (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 4, there are approximately 150,000 ha or 11 percent of the total area of lakes, ponds, rivers, brooks and streams. There are 13 communities within the zone which derive their potable water from Public Protected Water Supply Areas (PPWSA's). It is the responsibility of the Department of Municipal Affairs and Environment to monitor water quality of these protected areas. Recreational waters within this zone are used for activities such as fishing, boating and as a water supply source for numerous cottage owners. Industrially, waters within the zone are primarily used for hydroelectric production. Water bodies such as Victoria Lake, Granite Lake and Round Pond are examples.

Human activity on the land has the potential to alter water quality and water quantity. Commercial forest harvesting is the predominant industrial activity and occurs throughout the zone. There is a limited road system associated with this harvesting as well as a network of traditional access routes. Mining operations within the zone are limited to mostly small quarrying operations for gravels and dimension stone and are typically associated with road construction. New mining potential exists in the District for expansion of that industry

Critical Elements:

Forest management activities such as road construction, maintenance, timber harvesting, and silviculture may potentially 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 4 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 resource values is harvesting of timber to provide forest products. Historically, timber has been harvested since the first inhabitants settled in the zone. Initial uses were mainly domestic in nature to supply timber to build houses, fishing sheds, heating and cooking. With the increase in population, more commercial uses have arisen for timber, which includes: lumber, pulp and paper products, and value added products.

Domestic harvesting still provides fuelwood to heat many homes and sawlog material for residential home construction. There are approximately 825 permits issued on Crown land in FMD 7.

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

Silviculture treatments are important to the forest resource because it ensures a vigorous and healthy forest is maintained. Forest renewal activities ensure productive landbase 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.

Protection of the forest from various disturbances is also a major characteristic of resource management. Because of the long fire history in the zone, protection through well maintained and/or upgraded initial attack equipment (i.e. water bombers, pumps, hose and trucks) and well trained fire management staff is required. A large fire today in the older softwood forest would be devastating to industry. While insect kill has not been a major disturbance in recent years, protection is still critical since there is a significant area of thinned balsam fir stands, which is paramount to future AAC's. Protection of other resource values through modification of activities and enforcement is also important.

Spruce and Fir

Black spruce, white spruce and balsam fir are the main sawlog and pulpwood species within the province. Within this planning zone, black spruce accounts for more than 60 % of the softwood harvest. Black spruce fiber is valued for its strength properties in lumber and pulp and paper products. Recently, Newfoundland black spruce received the highest strength rating in North America for use in the production of wooden I-beams. Additionally, spruce and fir-dominated stands comprise more than 90% of the available forested habitat in the zone.

These species are managed for maximum sustainable harvest levels though the harvesting and silviculture strategies referred to later in section 6. Protection and long term sustainability of these species will be achieved through strict adherence to AAC's and refinements to future woodsupply analysis.

White Birch

Traditionally, white birch has been a valued species for domestic fuelwood. However; it is now emerging as an important value-added species within the sawmilling and value added manufacturing industries of the province. It also has recently been researched for its ability to produce sap and the subsequent global marketability of this product. Accordingly, three areas have been set aside for sap production research on Crown limits in the planning zone.

Additionally, white birch benefits the cycling of nutrients, the structure of forest soils, and can help in the reduction of insect infestations and in the decrease in spread rates of forest fires (Perry, 1994). White birch dominated stands comprise approximately 15% of the forested land base in the planning zone. With efforts to manage this species on a sustainable basis, in 2002 the first AAC's were developed for white birch and were refined in the 2005 woodsupply analysis. One of the criteria of species sustainability is its ability to regenerate. To aid in the sustainability of white birch, silvicultural prescriptions are being considered and designed to favor its regeneration. Implementation of this prescription would help facilitate a birch component on the landscape, increasing the diversity of both flora and fauna and maintaining natural processes within managed stands.

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 landbase
- planting of non-regenerating areas
- maintenance of the white birch component
- minimizing loss of landbase to other users
- minimize losses to fire, insect and disease

- timely access road construction
- enhancement of younger age classes through thinning to correct age class imbalance
- maintain both a sawlog, pulpwood and firewood industry
- maintain support of local research into birch sap production

Guiding Principles:

- enforcement of forestry act, regulations, guidelines and policies
- maintenance of AAC's; adherence to harvest schedules
- minimize loss of productive land base through spatial and temporal compromises and continuous dialogue with other resource users
- maintenance of white birch sap production and harvesting activities occur at the landscape level without negative impacts to either activity
- 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 conducting forestry activities. These EPG's are outlined in their entirety in Appendix 4 with some highlighted subject areas listed below:

- silviculture and harvesting activities
- mineral soil exposure
- buffer requirements
- road and bridge construction
- garbage disposal
- fuel storage

4.2.2.2 Agriculture

Characterization:

The majority of agriculture activity in the Bay d'Espoir area is that of home gardening and small subsistence livestock operations. Limited commercial development is

concentrated in and around communities.

The major areas of arable soils and farm properties were designated as an Agriculture Development Area ADA in the 1970's; however, the area has not been legislated. This area is delineated on the Provincial Land Use Atlas and is used for planning purposes and is located along Route 361 as you enter the Milltown/Head of Bay d'Espoir area.

Within the (ADA) the majority of soils that are suitable for agriculture are also suitable for forestry work. Over the years, there has been considerable cooperation between the Forest Services and the Agrifoods Branch of the Department of Fisheries and Land Resources in resolving issues associated with this particular area. It is recognized that agriculture development is the initial consideration in the ADA and that continued cooperation is required to ensure a viable agriculture presence.

The newest agricultural sector developing in the province is cranberries. Recently there has been established in the Grand Falls region, eleven new cranberry farms, along with already established operations in Terra Nova and an experimental site at Deadman's Bay, operated by the Production and Research Division of . Total acreage is in the vicinity of 75 hectares with an expected 100 hectares to be developed in the near future.

Critical Elements:

Surveys indicate approximately five percent of soils in the province are suitable for agriculture. It is difficult to identify and plan all sites for potential future agriculture use and often this will result in conflicts with other land uses, particularly forestry because these sites are of high growing capability. Although a suitable landbase 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 will be available for the agriculture industry to expand.

Guiding Principles:

Lands designated for forest management can include areas with high potential for agriculture. Consequently; the Forest Service will work with the Agriculture Branch of

the Department of Fisheries and Land Resources to determine where potential opportunities exist for agriculture development areas. The agriculture leasing policy initiated in 1976 ensures 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.

4.2.2.3 Mining

Characterization:

Located throughout the District, there are sites of geological significance which are important to the tourism and recreation industry. These sites illustrate geological features, such as rock types and rock formations that indicate the processes and geologic ancestry of the parent material from which the soils of the District's ecoregions were derived. These Geostops can therefore be considered as important educational sites, and as well as points of interest for tourists. The Newfoundland and Labrador "Traveler's Guide to the Geology and Guidebook to Stops of Interest" lists three significant areas in District 7. These are located at Trout Hole Falls (Route 361), Hermitage Bay area (Route 362) and Simmons Brooks (Route 362). Any significant sites will be evaluated if operations are planned in close proximity to any strategic location.

As with agriculture, both mineral and energy developments have the potential to reduce the productive forest land base. The locations of the existing aggregate quarries in the District are known to staff. Should new developments occur during this planning period District staff will ensure that any merchantable timber associated with these developments is allocated to the existing commercial operators of the District. Furthermore, District staff will monitor ongoing mineral development activity within the district through the Department of Natural Resourceswebsite. This will provide an adaptive base for the planning of future forest ecosystem management activities within the district.

Energy development and in particular hydroelectric development is an important issue in District 7. There are major hydroelectric generating stations at Bay d'Espoir (616MW),

the Upper Salmon (84MW), and Granite Lake (42MW) which is now completed. Although in the majority of cases the flooding of areas for hydroelectric development reduces the land base available for forestry purposes, the district is very fortunate in being able to access timber stands that are considerable distance from communities via main roads constructed by Hydro to generating sites and transmission lines.

Energy development derived through the utilization of waste wood bi-products (i.e. Bark and sawdust from sawmill production) could be beneficial to sustainable ecosystem management. These sawmill waste bi-product piled in large quantities can be a fire hazard, and as well detract from the aesthetics of the surrounding landscape from the tourism point of view. Should technologies be developed that utilize these waste products, it could virtually eliminate residue piles that exist throughout the district. The District staff will therefore support the development of energy or other products from waste wood bi-products during this planning period.

Critical Elements

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

Hydro development important to the energy requires of the province.

Guiding Principles

Harvesting timber for prospecting lines must meet the same rigor as commercial harvesting. The mining industry should enact best management practices to ensure little to no impact on ecosystem values. Hydro development in many cases provides access to timber stands in this District

4.2.2.4 Historic Resources

Characterization:

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

Archaeological sites are non-renewable resources and are considered a vital role in understanding our heritage. It is important to professionally record as much information as possible at an archaeological site to fully understand its history. To do this properly, the site must not be disturbed. Generally, archaeological sites are small, spatially bounded units. Therefore, protecting these resources usually do not have an adverse impact on forestry activities. Archaeological surveys have been carried out in several areas within the zone over the past 20 years. There are a number of known archaeological sites within Planning Zone which are protected under the Historic Resources Act. Many areas still remain to be surveyed so there is potential for other historic resources to be discovered. Sites of archaeological significance, such as Boyd's Cove, Black Harbour, Wigwam Point, Gander River and the Bloody Bay Reach Archeological Sites (i.e. Burnside archeological tours of the Beaches and the Quarry) also hold the key to our understanding of past. While some of these sites have been developed (Boyd's Cove, the Beaches, the Quarry and Wigwam Point, others have not had archaeological work completed and their locations cannot be disclosed. These sites show evidence of Maritime Archaic Indian, Palaeoeskimo, recent Indian and European occupation.

Archaeology is very important for our tourist industry. Archaeological excavations and interpretive sites draw thousands of visitors each year to this province. The preservation and interpretation of archaeological sites will continue to benefit the tourism industry in this province for years to come. Thousands of tourists from all over the world visit our archaeological sites each year and the numbers continue to increase (e.g. Boyd’s Cove and Burnside typically see approximately 8,000 visitors per year combined). Each year archaeology projects provide many seasonal jobs. For example, Boyd’s Cove and Burnside employ approximately 15 people each year. Many of these people are successful in obtaining employment in archaeology and conservation for longer periods of time. By calling for archaeological impact assessments on projects which have potential to negatively impact historic resources, the PAO is providing jobs for consulting archaeologists in the province. New businesses are created as a result of archaeological projects, which include: bed and breakfasts, boat tours, restaurants and gift shops.

Critical Elements:

Major threats to historic resources are projects involving activities which disturb soil layers and/or provide unintended public access to the archaeological resources. Forestry activities such as construction of access roads and bridges, harvesting and mechanical site preparation have the potential to negatively impact valuable historic resources. When impact assessments are carried out and new sites found, it adds to our understanding of Newfoundland and Labrador's heritage. When archaeological sites are discovered through impact assessments, these resources are protected from damage or destruction.

Guiding Principles:

Any project involving land-use has the potential to adversely impact historic resources. Therefore, it is important the Provincial Archaeology Office is involved at the planning stage to ensure mitigative measures that protect historic resources. Known archaeological sites and potential unknown sites are protected by utilizing no harvest buffer zones, whereas archaeological assessments may be required in other areas. Archeological buffers are typically required along rivers and ponds, as well as, along the coastline where there is a high potential for archaeological resources to be found. Occasionally there are accidental discoveries made of historic resources. In the event 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 Recreational Trails

Characterization:

There are recreational trails that protect heritage and provide for expanded recreational opportunities within District 7. These trails are tradition walking links between the communities and now lead to vantage points to scenic ocean vistas, and in season, whale and bird watching and at one time provided vital links between smaller outport communities and larger centers for the movement of provisions and trade, medical attention, hunting etc., when sea routes were not useable. Today, they provide recreational opportunities for hiking, skiing, viewing of exceptional landscapes, and nature walks, as well as preserving out heritage of isolated fishing and logging communities.

Some of the more important hiking trails that provide excellent opportunities to view nature and wildlife species include those at Harbour Breton, Hermitage, Belleoram, Gaultois, Milltown and English Harbour West. Several winter-season recreational trails add to the variety of outdoor activities available in the district that make it an important year round tourism environment.

As with parks and natural areas, the greatest impact to scenic recreational trails from forestry operations is the visual impact to their surrounding aesthetics. District 7 staff has cooperated with community groups in the development and protection of some of these trails. "No-Cut" buffers of varying widths and specific "No Cut" areas (e.g. scenic hillside viewscapes) will be reviewed with appropriate organizations and added to commercial and domestic permits if necessary.

District staff will also liaise with the municipalities, community groups and development associations concerned with the development of other trails, to determine if adequate protection from forestry impacts is currently in place. As indicators of the maintenance of these values, District staff in conjunction with the associated municipalities, local service

districts, development associations and Parks Division, will undertake to maintain a record of the number of kilometers of available recreational trails contained within the District.

Critical Elements

- protection of the historical landscape integrity of trail corridors
- preservation of the scenic quality along trail corridors
- control of land usage adjacent to trails

Guiding Principles

- 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 trails
- in an attempt to preserve the natural value of the trails maintain buffers along the right of way and consider viewscapes in harvesting and development plans. Buffers of varying widths have also been applied to trails in the planning zone by Department of Fisheries and Land Resources.

4.2.2.6 Parks and Protected Areas

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. Natural areas are store houses of natural diversity that exists in a wild, pristine state. They serve as ecological bench marks indicating the natural succession of forest ecosystems. They also preserve in perpetuity, provincially significant representative and special natural features and outstanding recreational environments.

There are many types of protected areas in the province. The Wilderness and Ecological Reserves Act enables the Province to establish the following; wilderness reserves (Component 1), ecological reserves (Component 2) and protected sites (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 (< 50 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. Zone 4 contains Jipujijkuei Kuespen (Little River) Provincial Park Reserve along with two wilderness reserve's Bay du Nord Wilderness Reserve
Middle Ridge Wildlife Reserve

Critical Elements:

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

Guiding Principles:

- the Province of Newfoundland's Natural Areas Systems Plan recommends that a minimum of 12% of the province's entire land base be protected.
- only allow traditional (hiking, berry picking, hunting etc.) activities, educational activities and scientific research within protected areas provided the integrity of the reserve is not compromised
- prohibit all forms of new development such as mining activity, hydroelectric projects, forestry activity, agriculture activity, roads and trails and cottages and new structures.
- where forestry operations are within one kilometre of provisional and ecological reserves, wilderness reserves or provincial parks, modified operations may be necessary

4.2.2.7 Outfitting

Characterization:

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

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

Critical Elements:

Remote outfitting camps are dependent on their remoteness, where forest access roads potentially impact the ability of a camp to maintain its remote status. Increasing accessibility through establishment of access roads may lead to increased hunting and fishing pressures in a given area, which may lead to decreased success rates of tourists. Forest access roads may also lead to increased resource development, which has a potential negative an impact on both remoteness and game availability. Forest harvesting may also have the potential 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 the experiences (i.e. sights, sounds, smells, etc.).

Guiding Principles:

It is necessary to ensure properly managed areas remain around outfitting camps, which have been determined by relevant parties. These types of 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 the main lodge.

- consideration should be given to decommissioning roads and bridges (where possible) after forestry activity is completed. This will eliminate potential negative aspects to the hunting area by reducing the possibilities of increased hunting pressure. Access to hunters will be restricted or limited when roads are actively used for harvesting purposes.

-cottage development is prohibited within established outfitting buffers.

- where possible, harvest areas in the winter. Winter roads are less passable in summer and fall, which will facilitate reduced traffic.

- where possible, construction of new forest access roads should occur away from existing outfitting camps. 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 will be undertaken in compliance with existing regulations

-efforts will be made to ensure the integrity of viewscapes from outfitter cottages is maintained when conducting forest operations.

- forest operations will be evaluated to should any garbage is removed.

4.2.2.8 Recreation

Characterization:

The Bay d'Espoir areas have 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. Hunting, sport fishing, hiking, skiing, kayak/canoeing and ATV/snowmobiling are major recreational activities in the area. There are also a number of safe anchorages for boat touring in Bay d'Espoir. Non-timber recreational values are expected to play an increasing role in forest management practices.

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 may result in decreased recreational activities for a given period of time.

Accessibility

An increase in forest access roads may increase accessibility to remote areas. In turn, this may increase the amount of traffic in an area (both vehicular and pedestrian) and decrease the value of the experience for many recreational activities. The majority of individuals involved in recreational activities are concerned about viewscapes. Many of the recreational activities occur because of particular viewscapes.

Guiding Principles:

To prevent negative ecological effects and provide positive experiences, 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

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

Limiting Accessibility

Decommissioning of forest access roads could be a possible option when forestry activities are completed. Where possible, harvesting should be conducted using winter forest access roads, which creates less traffic and better facilitates decommissioning. Where possible, the Land Branch of the Department of Fisheries and Land resources shall plan cottage development along newly developed forest access roads in conjunction with the Forest\ Services of the Department of Fisheries and Land Resources. This will allow for planned cottage development areas and potential Crown land reserves to help minimize potential land use conflicts.

Viewscape

Aesthetic views using landscape design techniques will be utilized in areas where forest operations occur with high concentrations of recreational activities.

4.2.2.9 Tourism

Characterization:

The tourism industry in Newfoundland and Labrador is based on natural and cultural resources, where protection is important for the industry to survive and grow**.** The tourism industry in Newfoundland and Labrador has experienced significant growth since 1997.

Tourism Industry has been contributing between $580 and $700 million annually to the provincial economy. Government tax revenue from tourism in 1998 was estimated to be $105 million. The worldwide growth of tourism at rate of 41 percent, the national growth of 25 percent and the provincially 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 such as the Bay du Nord Wilderness Area and the Bay du Nord Heritage River, coastal communities and the Conne River Reserve.

Critical Elements:

- viewscape
- accessibility

- wilderness ambiance
- remoteness

Guiding Principles:

Work with Tourism Division, local tourism operators and local town councils in the District to implement strategies to minimize the visual impact of harvesting operations on the aesthetic values associated with viewscapes. Strategies can then be discussed, negotiated, and implemented to provide a balance between harvesting and the values associated with tourism.

Section 5 Mitigations

Table 9 Mitigations

A mitigations Table will be inserted here for any concerns elevated in this process or issues from previous plans that are still relevant

Section 6 Public Consultation Process

6.1 Planning Framework

Forest Resource managers in Canada are striving for a society that successfully integrates economic, environmental and social considerations into all resource-related decision making. Since the early 1990's, there has been a country-wide shift from single resource management to a more comprehensive approach of forest ecosystem management. 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" or in this case "sustainable forests", which not only takes into account the social, cultural, economic, and environmental benefits of the present, but those of future generations as well. Involvement of Interested Stakeholders into the five-year planning process is recognized by the Forestry Services Branch as a key component to achieving sustainable development.

As a result of the 1995 Environmental Preview Report, the Forestry Services Branch adopted an adaptive management planning process, which 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 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 interested stakeholders and 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.

6.2 Stakeholder Involvement

Since the mid 1990's, for each five-year plan, the Forestry Services Branch embarked upon a rigorous public consultation process involving a series of meetings spanning a number of months at an established venue, where interested stakeholders could discuss a range of forest management issues at an operational level.

With respect to the strategic level, in 2014, the Forestry Services Branch released a 10-year Provincial Sustainable Forest Management Strategy (PSFMS) Document (2014-2024), which emerged through wide consultation with citizens of the Province. The 2014-2024 PSFMS builds on the strengths of the previous strategy plans and uses a landscape-scale planning approach to implement the progressive and innovative ecological policies required for Sustainable Forest Management (SFM). The strategy builds on the strengths of the many modern and high-quality forest management programs that are currently being implemented in this province to ensure a vibrant and competitive forest industry.

Taking into account the many five-year plans successfully implemented within the province since the mid 1990's through public consultation processes and the recent PSFMS developed through public consultations, The Forestry Services Branch strives to improve its methods to garner advice from the public while also mitigating land-use conflicts. To this effect, as new five-year plans are being developed and implemented provincially, relevant issues raised from previous planning processes are considered the foundation the new plans.

In 2016, in addition to transferring issues/concerns/mitigations from previous planning processes, a revised approach of stakeholder involvement for the development of this plan was implemented. Known interested stakeholders from previous planning processes were engaged on a “one-on-one” basis to evaluate potential activity prior to the plan submission to the Environmental Assessment Process. A Draft version of all maps and text was posted to the Government Website on June 01, 2017. The Department issued a Press Release on June 01, 2017 with the title “Dates Set to Discuss Five-Year Forest Management Operating Plans

For Zone 4, there were 2 formal meetings held

- June 8, from 2pm-4pm at the Milltown District Office
- June 8, from 6pm-8pm at the Milltown District Office
- June 28, from 10am-12pm at the Milltown District Office
- June 28, from 2pm-4pm at the Milltown District Office
- June 28, from 6pm-8pm at the Milltown District Office

The results of stakeholder involvement are identified in the Mitigations Table in Section 5.

Section 7 Management Objectives and Strategies

7.1 Harvesting

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

7.1.1 Commercial

Section 3 outlines in detail a general approach for the timber supply analysis and specific results and sensitivity analysis for the zone. The model used to calculate woodsupply is a maximization model, outlining a specific course of action and timing of such actions to maximize timber production. The harvest schedule is an example which indicates the specific forest stratums to be harvested and an indication on 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 considered in worst condition and losing volume fastest is targeted as first harvest priority. Younger stands that have been damaged by insects and disease may also receive high priority. Once managed stands are eligible for harvest, this priority may change in some cases to allow for a faster rotation on good sites that are silviculturally treated.

Specific commercial strategies are as follows:

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

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

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7.1.2 Domestic

The harvest of domestic fuelwood and sawlogs occurs from three main sources in the zone;

- designated domestic cutting blocks on Crown land,
- cutover clean up on Crown land
- landing and roadside clean up on Crown land.

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 existing timber are eligible for harvest. Typically, scattered throughout these blocks there exist timber that normally would not be scheduled for commercial harvest in the planning period. Ideally, each individual domestic cutter would be issued their own harvest block to ensure harvest of optimal stands. However, this is generally not practical and domestic cutters are allowed to harvest anywhere within the designated area provided immature timber is not harvested. For this reason, the optimal harvest schedule may not always be followed in domestic areas. Utilization of cutover residue, dead timber and scrub areas which are not part of the timber supply analysis would compensate this difference. Specific domestic harvest strategies include:

- target low volume stands which have poor commercial harvest opportunities

- encourage use of under utilized firewood species (larch, aspen and maple)
- target burned 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 (cutovers, landings, scrub etc)
- monitor stands harvested in domestic cutting areas for compliance to the harvest schedule

7.1.3 White Birch

The harvest of white birch occurs throughout the planning zone in close association with softwood harvest for sawlogs, pulpwood and firewood. In many instances, it is an integrated aspect of both commercial and domestic harvesting activities. In recent years, there has been an increase in commercial demand for white birch sawlogs, resulting in the development of several value added sawmills in the province . The value added industry focuses on products such as cabinet stock, flooring, guard rails posts and pallet stock.

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Specific harvesting strategies include:

- encourage the use of sawlog sorting by commercial harvesters
- encourage the development of relationships between harvesters and value added white birch sawmillers.
- target overmature white birch stands that are forecasted to succumb to mortality
- where possible, direct domestic harvest to alienation Class 3 white birch stands, which 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 all areas for compliance to the harvest schedule and AAC’s for each fiber source

7.2 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 natural regeneration failure rate (NSR) across all disturbance types. Generally, areas that do not regenerate naturally are renewed by some combination of site preparation and planting. Areas that are regenerated naturally are either left to develop naturally or they may receive an intermediate stand density management treatment. 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 recent years however, particularly in FMD 7 there is concern about the type (species) of regeneration because of the increased presence of balsam woolly adelgid in the area. In these areas regeneration to balsam fir may not necessarily be acceptable on certain site types. As well, on certain sites balsam fir has been regenerating on black spruce sites and often forms the majority of available stocking. This regeneration is “off site” and often becomes chlorotic and stagnates at an early age. As a result of these concerns with natural balsam fir regeneration, there has been a marked shift towards a greater reliance on the planting of nursery-cultivated black spruce on harvested sites.

7.2.1 Forest Renewal

Since maintenance of the forestry landbase is crucial, forest improvement 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 the prescriptions normally involve some form of treatment to prepare the site to accept planted seedlings. Planting, whether full planting or gap planting, is done to ensure stocking of desired species is at acceptable levels.

Treatment of black spruce and balsam fir sites that have been harvested normally, at times, involves the row scarification treatment of disc trenching the site one year prior to planting to produce an acceptable number of microsites (approximately 2,500 per

hectare). Microsites created via row scarification are superior because they are a mixture of organic material and mineral soil. Disc trenching also breaks up Kalmia root mats when present and makes the site more accessible and suitable for planting through the alignment of harvesting slash. Kalmia is an ericaceous species that inhibits the growth of spruce seedlings, in particular, through the production of chemicals toxic to spruce and by "locking up" available nutrients on the site thereby depriving spruce of enough nutrients to grow.

The majority of the planting requirement in the zone is for full planting of disturbed sites. The seedling species planted is mainly black or white spruce and to a lesser extent Norway spruce, larch (eastern and Japanese), red or white pine depending on the site capability. This treatment is designed to regenerate disturbed sites to a stocking level that will produce equal or better harvest volumes than the original stand on similar tree numbers and shorter rotation lengths. Gap planting is done with the same species as above and coupled with the natural regeneration already present on site results in a mixed softwood forest.

Where possible, seedlings are grown with seed from local seed sources. A seed orchard has been established at Wooddale Provincial Tree Nursery to produce seed from plus trees collected throughout the Planning Zone. Plus trees are normally selected because they have superior growth and physiological characteristics. First generation white spruce seed has already been produced at the nursery and some seedlings grown from this genetically superior source have already been planted in the zone. The ultimate goal is to establish plantations that have superior growth characteristics and thus increase yield and lower rotation lengths, while still maintaining genetic diversity.

Exotic species have been planted in operational trials at limited locations in the zone. These mainly include Japanese larch and Norway spruce because of their superior growth capabilities on particular sites. However, it is not anticipated this will form any substantive proportion of the provincial planting program.

In some limited cases, herbicide treatment may be required. Herbicides, while used sparingly, are sometimes a necessary tool to help establishment of a new forest, particularly on the better sites. In this planning zone, these sites are typically rated as “good or high” capability and are located on seepage slopes. These sites typically revert to NSR dominated with alder after disturbance. Reforestation of these sites is important as they are the best growing sites in the planning zone, and placing them back into rotation will help maintain the productive forest land base. An herbicide treatment will allow the planted crop species to “get the jump” on the competition through suppression of the alders occupying these sites. Non-crop species and other forest plants and shrubs typically rebound after suppression with herbicide, minimizing the long-term biodiversity on the area.

Natural regeneration of softwood species has typically relied on the excellent dispersal of balsam fir after clear cutting throughout this planning zone. However, as stated earlier balsam fir in this zone has become seriously infected with adelgid. As a result, natural regeneration of balsam fir will have to be reviewed in future silviculture projects

7.2.2 Forest Improvement

Forest improvement prescriptions are designed to treat established forest stands in an attempt to enhance development. These treatments usually involve thinning overstocked balsam fir stands at either a young age 10 -15 years (precommercial thinning), or an intermediate age 25 - 35 years (commercial thinning) or cleaning/maintenance of young plantations 10-15 years of balsam fir in growth. Precommercial thinning and plantation cleaning reduce density levels in 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 planning zone, balsam fir is usually thinned to favour any spruce that may be in the stand. In this way a mixed softwood stand is produced (depending on the original density of spruce) which is more diverse and less susceptible to insect infestation. As well, any hardwood species that are not in direct competition with spruce or fir are left to increase the biodiversity of the stand.

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

- ensure regeneration of areas disturbed by harvest, insect, wind and fire to prevent loss of and/or increase the future productive forest land base
- use thinning/cleaning techniques in young stands to increase stand development, reduce rotation age, and improve stand quality through removal of aphid attacked balsam fir regeneration and increase the percentage of sawlogs in stands
- where possible, promote species mix, particularly with spruce and hardwoods to reduce susceptibility to insect attack and increase biological diversity
- where possible, use seedlings grown from local seed sources to protect genetic diversity
- ensure levels of planting and thinning used in the wood supply analysis are achieved
- work towards pre harvest planning to identify areas with potential balsam woolly adelgid problems so that alternate silvicultural prescriptions can be promptly employed
- continue development and implementation of silvicultural strategies designed to regenerate existing white birch dominated stands to white birch where applicable, as well as strategies designed to develop the white birch component of managed stands

7.3 Forest Access Roads

Timely access to harvesting areas is the key to successful implementation of harvest allocations. Roads also provide access for other recreational values such as hunting, fishing, skiing, berry picking and hiking. However, it is recognized 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 required to effectively harvest available timber will be built. As well, roads are constructed to standards (eg. width of right-of-way and driving surface etc.) that are the minimum required to 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 the loss of productive landbase and environmental disturbance are minimized. In sensitive and wet areas, winter harvesting and road construction are encouraged, to minimize environmental disturbance. In many instances, forest access roads "open up" new areas which are then subject to cottage development. Forest roads 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 cottage development should be planned to reduce conflicts between potential cottage owners and other resource users. As well, road decommissioning may also be considered, depending on cost and mitigation of conflicting uses for a particular road.

The nature of the current wood supply, is that harvestable areas or stands are becoming smaller and more dispersed. Achievement of allocated harvest is contingent on accessing these areas and stands. Therefore, more road infrastructure is required to access this timber. Specific strategies include:

- 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, Land Management) to control cottage development
- where possible, consider road decommissioning in areas of concern for other values (e.g. near remote outfitting lodges, PPWSA's)

7.4 Forest Protection

7.4.1 Insects and Disease

While having been a major natural disturbance factor within the zone, insects are now considered of lesser importance. Balsam fir is susceptible to most of the major insects and is in lower proportion throughout the zone than in the past. The budworm and looper

damaged fir stands of the 1970's and 1980's that were salvage harvested have been replaced with planted less susceptible spruce species.

The major insect found throughout the zone today is the balsam woolly adelgid. It seems to be moving further inland, causing growth problems in young balsam fir stands. As outlined in the harvesting and timber supply analysis sections, wood supply forcast 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, resulting in the optimal harvest schedule not being 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 circumstances, deviations from harvest schedules and inventory adjustment levels will be closely monitored to ensure that validity of AAC calculations are not compromised. Specific strategies include:

- use silvicultural techniques at the stand level to alter species mix and increase stand vigor, making stands less susceptible to insect attack (eg planting and cleaning).
- where possible, use harvest scheduling techniques to alter species mix across the landscape to avoid promotion for severe insect infestation
- where possible, use species conversion techniques to convert adelgid susceptible balsam fir to other less susceptible species
- in conjunction with Provincial and Federal initiatives, use pertinent and approved biological and chemical insecticides such as BTK, Mimic, Neemix4.5 and NeabNPV (virus)
- in co-operation with Provincial insect and inventory divisions, monitor and measure adelgid infested stands to help refine yield curves to be used in the next timber supply analysis

7.4.2 Fire

Fire has been a limited natural disturbance factor historically in the District. There has been a low fire history due to the coastal climate in a large portion of the District. The northern, more inland portion is more susceptible to fire occurrences. A fire in an unusually dry year can have devastating effects on the forest and can exacerbate a wood supply situation. The District 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 vigor.

Specific strategies include:

- ensure harvest schedule is followed targeting oldest/worst condition (and high fire risk) stands
- maintain fire control capabilities by both the Crown and Industry
- where possible, promote species mixes (white birch) in stands to minimize risk

7.4.3 Windthrow

Wind throw or blowdown occurs in stands that are old and decrepit or in stands that have been predisposed by some other disturbance such as insects and disease. Blowdown can also be increased in high risk stands when unnatural edges are left on cutovers such as in the case buffers. To minimize the effects of blow down, stands will be managed to promote health and vigor mainly through silvicultural treatments and protection from insects. Specific strategies include:

- 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
-investigate techniques to minimize the risk blowdown in buffers (i.e. buffer management).
- ensure harvest schedule is followed to target the oldest worst condition (and risk) timber first.
- continue to sample overmature stands for signs of imminent breakup (e.g. windthrow and butt rot) and update harvest schedule on a 5 year basis accordingly to capture mortality

7.5 Information and Education

Information and education is important to providing for more active and effective participation in the forest management planning process. Through interaction with various user groups and the general public, we gain a better understanding of each others values and positions. Information about a stakeholder's values and the location on the landscape provides a better ability to mitigate any potential negative impacts of harvesting activity on these values. For example, learning where a cottage is located can

help planners when selecting areas for harvest and provide a contact to discuss impacts and mitigations. Public Planning team meetings provide a good exchange of information and ideas about a particular piece of landbase. It is through such forums that information can be shared that provides a basis for more effective and informed participation. As a Forest Industry, other such vehicles for information and education which will be actively pursued include: field trips (e.g. Crown and paper company woodlands tours, mill tours), school visits, open houses, commercial operator environmental training programs, information meetings, training courses, seminars, and general day to day contact.

Section 8 Proposed Activities

8.1 Overview

This section will outline forest activities proposed on Crown Land in Planning Zone 4 for the period 2018-2022. 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.

8.2 Allocation of Timber Supply

The allocation of timber supply in Planning Zone 4 is split among industry and domestic use. Overall, the commercial harvest accounts for the majority of all AAC timber and is derived from Class I Landbase. More discussion on commercial and domestic activity is provided in the upcoming sections.

8.2.1 Commercial

The Tables below indicate Crown's proposed harvest by operating area in the zone. These areas are shown on an overview map and on individual 1:50,000 scale maps in appendix 1.

Table 10 Summary of proposed Crown commercial harvest areas in Planning Zone 4 from 2018-2022

Operating Area					Volume Harvested (m^3)								
					Softwood					Hardwood			
Number	Name	Tenure	Area (ha)	Number of Permits	Core	Operational Constrainted	Sub-total	Non AAC wood		Core	Operational Constrainted	Sub-total	Non AAC Wood
CC07001	North Salmon	Crown	1412		17,107					430			
CC07002	Diversion	Crown	695		5,236					0			
CC07003	Domshell Ridge	Crown	805		19,962					0			
CC07004	Cold Spring Pond	Crown	459		9,824					0			
CC07005	Bailey Bridge	Crown	203		7,953					0			
CC07006	Long Pond	Crown	90		2,291					0			
CC07007	Swanger Cove	Crown	658		4,592					283			
CC07008	Forebay	Crown	632		8,035					843			
CC07010	Twin Brooks	Crown	960		6,261					1287			
CC07011	Mill Pond	Crown	460		2,758					1983			
CC07012	Camp 6	Crown	495		5,717					0			
CC07014	Camp 4	Crown	1470		5,150					0			
CC07015	Camp 8	Crown	551		3,082					0			
CC07016	Conne Ridge	Crown	4714		54,287					22220			
Sub-Total			**13,604**	**0**	**152,255**	**0**	**0**	**0**	**0**	**27,046**	**0**	**0**	**0**

The areas proposed are within the acceptable variance for planned harvesting since the 2016 Wood Supply Analysis is designed to ensure operable growing stock is maintained at a minimum of two times the AAC throughout the 160 year planning horizon. Simply put, under this analysis, there will always be at least twice as much merchantable timber available on the landbase than harvested in any one period. The actual total harvest volume for each Land class for the five year 2016 woodsupply period will not exceed the total allowable harvest. This means that at any given year, the proposed and actual harvest level may fluctuate from the actual AAC number, but the maximum allowable harvest over the five-year period will not be exceeded.

When determining the allocation of woodsupply areas to commercial operators, the following outlines the Forest Service priority:

- First priority is given to damaged and diseased stands, where feasible. However, realistically in this zone, there is limited potential because only a small portion of the production forest currently shows evidence of insect or disease damage, which is interspersed.
- Second priority is to harvest merchantable, over mature stands. Most scheduled operating areas consist of a portion of stands in the 81 + year old age class.
- Third priority is to harvest merchantable mature stands.

Some of the operating areas listed in the previous table have been proposed specifically to target cleanup of small stands of scheduled AAC and are required to meet scheduled commercial allocations. The stands have mainly resulted from previous commercial harvesting and because of their small size (ie. ranging from 2 ha to 20 ha), proposed commercial operations will more closely approximate domestic harvesting. Due to the varied economic feasibility of harvesting individual stands, not all stands identified maybe able to be harvested.

Some of the proposed operating areas contain merchantable timber that is currently designated as Class III (ie. operationally constrained). Stands in this category are typically difficult to access and/or harvest from both physical and economic aspects. As a result, they have been removed from the landbase used to calculate the sustainable Class I AAC. The designation of these stands has been set for the period 2016 to 2020, after which time the landbase will be reviewed in preparation for the next wood supply analysis. It is the intent of the department that this designation of timber will also be harvested in a sustainable manner.

8.2.2 Domestic

There are 23 Crown domestic areas identified in Planning Zone 4. These areas were designed to provide a supply of fuelwood close to communities. It is difficult to quantify the supply of domestic fuelwood available in each domestic area and the demand that will be required. Accurate inventory data are not always available for domestic cutting blocks due to the small size of individual harvests. Many of the identified areas contain remnants of commercially harvested forest, commercially uneconomical stands and scrub, as well as underutilized species (i.e. aspen, maple, and larch). In remote parts of the zone not covered by any operating areas, domestic permits may be issued to remote cabin owners for firewood to heat their cabins as requested. Table 8 details the domestic areas available in the planning zone. The distribution of all domestic areas in Planning Zone 4 is shown on a 1:250,000 scale map and on individual 1:50,000 scale maps in appendix 3.

Table 11 below indicate a summary of proposed Crown's domestic harvest areas in Planning Zone 4 from 2018-2022

Operating Area				Number of Permits		Estimated Volume	
Number	Name	Tenure	Total Area (ha)	Commercial	Domestic	Softwood	Hardwood
CC07502	Tangle Pond	Crown	6858		25	300	75
CC07504	Seven Island Pond	Crown	17424		55	665	160
CC07505	Salmon River	Crown	8818		85	1015	255
CC07506	St. Albans	Crown	14778		580	4335	4335
CC07507	St. Joseph's Cove	Crown	5863		315	2350	2360
CC07508	Burnt Jacket	Crown	9072		25	260	115
CC07509	Hd Bayd'espoir	Crown	3620		175	1830	755
CC07511	Twin Brooks	Crown	7578		170	1315	1230
CC07513	Twillick Brook	Crown	13448		110	1150	495
CC07514	Spruce Pond	Crown	20148		110	1150	495
CC07518	Camp One	Crown	5936		160	1435	955
CC07519	Milltown	Crown	3432		340	2540	2545
CC07522	Little River	Crown	6916		20	210	90
CC07523	Hr. Breton Road	Crown	32893		70	835	210
CC07524	Pool's Cove	Crown	26981		440	4605	1975
CC07525	Rencontre East	Crown	21963		30	315	135
CC07526	Belleoram	Crown	25988		555	6640	1655
CC07527	Harbour Breton	Crown	18990		280	3350	835
CC07528	Hermitage	Crown	16768		455	5440	1360
CC07529	Gaultois	Crown	27620		50	525	225
CC07530	Macallum	Crown	47381		35	418	103
CC07531	Gray River	Crown	82623		35	418	103
CC07532	Bois Island	Crown	32422		50	600	150
Sub-total							
		Grand-total	**425100**		**4120**	**41100**	**20465**

Crown domestic permits are issued for 23 m³/permit/yr. Residents are permitted to choose two areas per permit. Typically there are approximately 825 domestic permits issued annually in FMD's 7. The estimated drain on timber supplies determined from analysis of domestic cutting returns at Bay d'Espoir office is approximately 15 m³/permit/yr. The total drain varies by year as a direct result of the variation in permits purchased annually.

Generally, traditional domestic areas near communities have been expanded into harvested commercial areas to provide residents access to additional fuelwood supplies. Over time, these expansions into commercial areas will have to be closed to prevent the illegal harvest of immature stands. Given the present fuelwood demand, and growth rates of regenerating forest, it is anticipated that these problems will persist and expand to other domestic areas in the medium term. However, it is also anticipated that continuing the expansion process of domestic areas into recent commercially harvested areas will alleviate much of the supply concern.

8.3 Silviculture

The silviculture treatments proposed for the period 2018 -2022 in Planning Zone 4 by the Crown are outlined on a 1:250,000 scale overview map, and detailed and on individual 1:50,000 scale topographic maps in Appendix 2. In order to minimize impacts on the long-term timber supplies and ecosystem processes, a steady reforestation program will be conducted with the objective to plant all medium, or higher classed sites that are not regenerating to a satisfactory stocking level. Areas scheduled for planting have been harvested in the past five years or will be during this five year period. These areas will undergo reconnaissance and or intensive regeneration surveys to determine the need for planting. Reforestation of current cutovers through planting will be priority of silvicultural area treatment during this planning period. It is anticipated most of the scheduled planting will not require site preparation in the form of row scarification or prescribed burning. All proposed harvest areas in this upcoming planning period (2018-2022) will be considered for Silvicutlure treatments when they actually become harvested.

Table 12 Summary of Crown's Proposed Silviculture Treatments in Planning

Treatment	Operating Area Number	Operating Area Name	Area (ha)
Precommercial Thinning			
Sub-Total			**0**
Planting	CC07001	North Salmon	80
	CC07002	Diversion	25
	CC07003	Domshell Ridge	100
	CC07004	Cold Spring Pond	50
	CC07005	Bailey Bridge	40
	CC07006	Long Pond	5
	CC07007	Swanger Cove	50
	CC07008	Forebay	40
	CC07010	Twin Brooks	30
	CC07011	Mill Pond	15
	CC07012	Camp 6	25
	CC07014	Camp 4	25
	CC07015	Camp 8	15
	CC07016	Conne Ridge	100
Sub-Total			**600**
Scarification			
Sub-Total			**0**
Other			
Sub-Total			**0**
Grand-Total			**600**

Additionally, there are areas NSR occupying productive sites in the zone, resulting from past wildfire disturbance and in some cases past harvesting practices. These sites need to be converted to a more vigorous, useful state by re-establishing forest cover. Reclamation of backlog, non-sufficiently restocked sites (NSR) through planting will: (1) result in an increase in the production forest landbase; (2) account for future losses to the landbase from permanent disturbances; and (3) result in the production of successional habitat that will aid in the maintenance of landscape connectivity for wildlife.

No density management treatments are proposed for hardwood dominated immature stands. Silviculture treatments designed to promote management of the District's red and white pine components at both the landscape and stand levels may be conducted during this period to help achieve the ecosystem management initiatives.

8.4 Primary Access Roads and Bridges

Proposed access road construction by the Crown for the next five years in Planning Zone 4 is detailed in the tables below and outlined on an overview map and on individual 1:50,000 scale topographic maps in Appendix 1.

A total of 18.25 kms of roadwork is planned for construction during this period, comprising of Primary, Secondary and Reconstruction. There are 6 large steam crossings proposed at this time; however each site will receive a detailed field inspection that could result in the installation of additional large culvert or bridges.

It is proposed that primary roads in the zone will be constructed by the Department of Transportation and Work under tendered contract. These roads are the main trunks into operating areas. It is anticipated that most secondary roads in the zone will be built by Crown commercial operators. This breakdown, however, is dependent on funding and is therefore subject to change.

Associated with the proposed road construction are water crossings which will require the installation of appropriate sized culverts or bridges. The size and design features of each crossing will be determined through field work prior to construction of the associated road system, and is subject to all provincial and federal legislation / guidelines.

The majority of the road construction will be conducted to facilitate access into mature and overmature stands for the primary purpose of accommodating commercial harvesting operations. As well, these forestry roads will be used to provide access for silviculture operations. Other uses of forest access roads include: domestic cutting and recreation (ie. hunting, fishing, cottage access and berry picking). Consideration for the variety of tourism/recreation values that exist within the boundary of Planning Zone 4, road-specific

decommissioning is to be considered on an area specific basis should a conflict of values exist.

Decommissioning of specific roads to protect other ecosystem values can take the form of removing bridges and culverts, in addition to replacing excavated material from adjacent embankments back into the roadway to restore the areas as close as possible to their natural state. The degree of decommissioning will ultimately depend on the value being protected. The scheduling of road decommissioning is undertaken upon the completion of harvesting and silviculture activities within identified areas of concern. While the Forest Service can adopt this approach as a goal of the plan, the implementation of this strategy will be entirely dependent upon the ability to prevent the establishment of permanent structures such as cottages along the road routes proposed for decommissioning.

Table 13 Summary of the Crown's Proposed Resource Road Activity in Planning Zone 4 from 2018-2022

Operating Area		Construction/ Reconstruction	Length (km)	Water Crossings	
Name	Number			Culvert	Bridge
Domshell Ridge	CC07003	C	1.45		
Bailey Bridge	CC07005	C	1.10		
Swanger Cove	CC07007	C	1.50		
Forebay	CC07008	C	0.90		
TwinBrooks	CC07010	C	3.40	1	
Mill Pond	CC07011	R	2.10	1	
Camp 6	CC07012	C	3.50		1
Camp 8	CC07015	C	1.60	1	
Camp 8	CC07015	R	2.70	2	
		Sub-total	**18.25**	**5**	**1**

8.5 Activities in Protected Water Supply Areas

In total there are 13 protected public water supply areas in Planning Zone 4 where some forestry activity is planned for the period 2018-2022. Identified in the tables below, the proposed forestry activity could include: Commercial and Domestic Harvesting, Roadbuilding and Silviculture.

Approval to operate in these areas over the next five years will be requested as required from the Water Resources Management Division of the Department of Municipal Affairs and Enviroment and the appropriate municipalities. The terms and conditions of approval will be applied to all Crown permits and contracts and strictly enforced by district staff. In wet areas with a greater potential for site degradation and erosion, commercial operators in the districts will be directed, where possible, to employ winter harvesting and road building. This will be less intrusive to the sites concerned and minimize impacts. FSB staff will work with commercial operators, ensuring only the minimum amount required road is built.

In addition to commercial operations, certificates of approval are required for domestic cutters to harvest within protected public water supply areas. Approval to operate in these areas will be requested every five years from the Water Resources Management Division of the Department of Municipal Affairs and Enviroment and the appropriate municipalities. The corresponding conditions for cutting within each respective protected public water supply area are printed on the back of the map attached to each domestic permit.

Table 14 Summary of Crown's proposed forestry activity in the public protected water supply areas of Planning Zone 4 from 2018 to 2022

Proposed Activity	Blcok Number	Public Protected Water supply Area	Community
Domestic	CC07519	Morrisville Pond	Morrisville
Domestic	CC07506 CC07507	Well Field	St. Alban's
Domestic	CC07527	Connaigra Pond, Hutchings Pond	Harbour Breton
Commercial	CC07016	Southwest Brook	Conne River
Domestic	CC07531	Our Pond	Francois
Domestic	CC07528	Granfer's Pond	Hermitage-Sandyville
Domestic	CC07528	Big Black Duck Pond	Seal Cove, F.B.
Domestic	CC07519	Jersey Pond	Milltown, Head of Bay D'Espoir
Domestic	CC07526	St. Jacques Pond (Proposed)	St. Jacques-Coomb's Cove
Domestic	CC07530	Drilled	McCallum
Domestic	CC07529	Piccaire Pond	Gaultois
Domestic	CC07526	Rabbit's Pond	Belleoram
Domestic	CC07531	Big Charlies Pond	Gray River

8.6 Environmental Protection

8.6.1 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 fire crews and equipment stationed at Milltown District offices in the fire season whose direct responsibility is fire protection. In addition, support, equipment and manpower at both the regional level in Gander and provincial level in Corner Brook is available should the need arise. Gander houses the bank of provincial fire equipment and as well is the base for 2 air tankers and a helicopter with a crew of fire fighters for initial attack.

8.6.2 Insect and Disease

Monitoring and protection for insects and disease is the responsibility of the forest protection division in Corner Brook. District staff is always available to provide

assistance in detection, monitoring, and protection against insects and disease. As well, district staff can be involved in conducting reconnaissance surveys to monitor the extent and rate of spread of infestations.

8.6.3 General Environment

The environmental protection guidelines form the basis for protecting the environment from potential negative effects of forest activities. Such negative impacts could include: impairing water quality, soil erosion and compaction, losses to fish and wildlife habitat, impact viewscape, and disturb sensitive and rare sites etc. The guidelines are designed to provide site specific measures to minimize or eliminate these negative impacts. Highlights of measures to avoid these impacts include: machine free buffer zones, modification of harvesting design and equipment, avoidance of sensitive sites during critical periods, consultation with other regulatory agencies and of course, monitoring. Specific measures that govern each forestry activity are detailed in appendix 4.

8.6.4 Surveys

Reconnaissance and intensive regeneration surveys will be conducted on commercial cutovers created during the next five years, as well as those created in the past five years, to determine the requirements for manual reforestation activity. As well, reconnaissance surveys for balsam woolly adelgid will be undertaken to determine suitable areas for conducting silvicultural treatments.

As well, utilization surveys have been conducted in the past on both commercial and domestic cutovers to insure losses of merchantable timber are minimized. District staff will work with Headquarters Staff to continue with this program and determine effective methods of realizing actual versus inventory yields.

8.6.5 Information and Education

Where possible, district staff will continue to educate the general public on forest management activity. This may be accomplished through planning team fieldtrips and

meetings, school presentations, open houses, meetings and National Forest Week activities.

Section 9 Plan Administration

9.1 Monitoring

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

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

9.2 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 Forest Service and the other must be submitted to the Environmental Assessment Division for public review. Changes to this plan can be approved by the 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 area(s) 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. Amendments requiring submission through EA will be reviewed by the planning team.

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Appendix 1 Proposed Crown Commercial Harvesting and Road Construction Operating Area Maps for Planning Zone 4 for 2018-2022

Appendix 2 Proposed Crown Silviculture Area Maps for Planning Zone 4 for 2018-2022

Appendix 3 Proposed Crown Domestic Harvesting Opreating Area Maps for Planning Zone 4 for 2018-2022

Appendix 4 Environmental Protection Guidelines