2.0 The Bonavista Peninsula Management District

2.1 General Description

The Bonavista Peninsula comprises a significant portion of Forest Management District 2 (see Figure 1). The District is bounded by channels within Bonavista Bay known as Clode Sound and Chandler Reach on the north and by Trinity Bay on the east. District 2 narrows on its southern boundary, where it is bounded by an extension of Trinity Bay known as Bull Arm and by the northern bottom of Placentia Bay. The western boundary is formed by Pipers Hole River and by a line which meanders north from the headwaters of that river system through Middle Pond and Norsemans Pond to a point just north of Ocean Pond. From there the boundary follows a straight line east for approximately 8 kilometres and then north along a straight line for Figure 2.1. Map showing boundaries of Forest Management District 02 approximately 15 kilometres, through Ams Pond and Bittern Pond to a point on the ridge that lies between the Terra Nova and Northwest Rivers. Then the boundary follows a generally eastern direction, to the north of the Northwest River system, for approximately16 kilometres to intersect with a corner of the Terra Nova National Park boundary. From there it follows the Park boundary in a southerly direction for approximately 3.5 kilometres and then to the east for another 1.5 kilometres to the junction of Salmon Brook and Clode Sound. The population of the District is 25,290 (census - 2004). The peninsula portion of the District is the most densely populated, with coastal communities scattered around its sheltered bays. Major service centres are located at Clarenville and Bonavista. The southeastern and western (i.e. west of the Trans Canada Highway) portions of the District are remote and unpopulated .

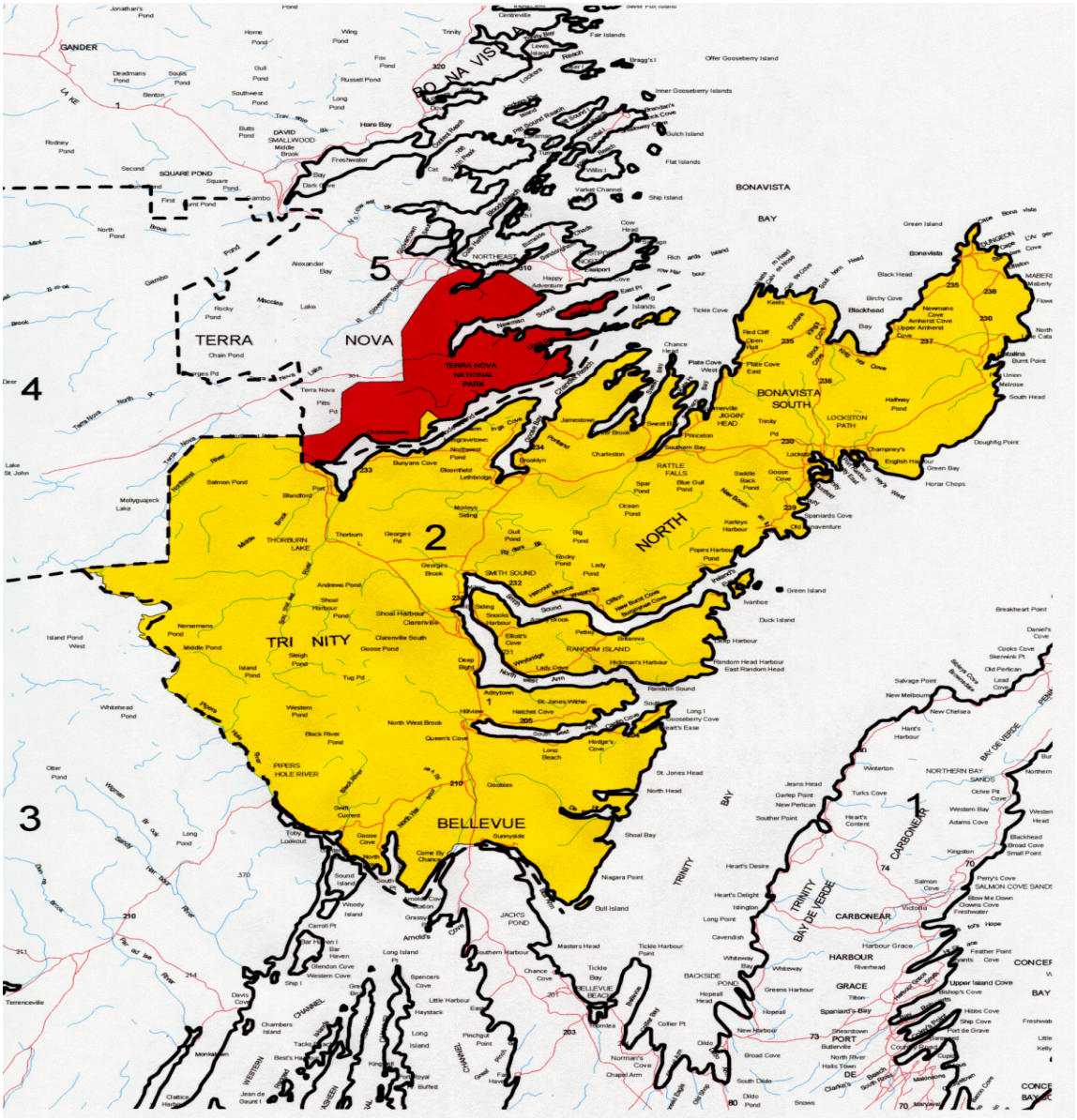

Figure 2.1: Map showing boundaries of Forest Management District 02

Typical of most rural Newfoundland regions, the economy is largely dependent on harvesting and primary processing of natural resources. Fishing and forestry have long been major contributors to local employment. The down-turn in the fishery caused by the crash of the northern cod stocks has had a dramatic impact on the economy in the region and has contributed to out-migration of young families from the area. Local wood supplies are currently well below the productive capacity of the forest to past damage by high populations of forest insects and mismanagement. There is strong anecdotal information that suggests that Government historically failed to adequately regulate harvest quotas. There is also abundant evidence of past wasteful logging practices found throughout the District. Illegal over-harvest and poor utilization practices continue to be serious concerns within the District and receive the highest priority within the District's compliance program. If wood supplies continue to decline, it will threaten the sustainability of the local forest industry. Despite this, certain aspects of this industry appear to be strengthening due to modernization, accessing outside fibre

supplies and diversifying into higher valued end products. The Bonavista Peninsula has one of the more active and successful agricultural communities in the Province. Tourism has been a growth industry in the region as well.

2.1.1 Geology

Glacial History

Carbon aging indicates that it has been approximately 7400 years since the last glaciation occurred on the Bonavista Peninsula. The direction of ice flow was from west to east in the northern part of the District and from west/northwest to east/southeasterly in the southern portion. Glaciation was responsible for the rolling topography prevalent in much of the District and for the glacial deposits in some of the regions valleys. Climatic change caused a relatively rapid retreat of ice flows and the unstratified deposition of glacial till. Retreat of a later glacial advance during this period caused some out wash deposits to form. Out wash material (in the form of sand and gravel deposits) is present in various locations throughout the District. These deposits have been identified in the South West and North West Arm areas; west of Georges Brook; west of Lethbridge; in the Plate Cove area; south of the Northwest River and south of the Southwest River.

Physiography

The predominant physical feature throughout the District is rolling topography. Coastal hills dominate the landscape from Bull Arm north to Trinity and then strike north across the peninsula to Keels. The elevations of the hills on the peninsula are within a range of 150-250 metres above sea level, with the highest peak reaching 260 metres. The highest hills in the District are to the west of Clarenville and strike southwest to Swift Current. These hills reach elevations of up to 400 metres. Coastal relief is generally greater than that which occurs in the interior of the peninsula.

A relatively narrow plain is located in a transverse across the peninsula between Elliot's Cove and Goose Bay. This plain is underlain by Cambro Ordovician shales and contains most of the land within the District which is best suited for agricultural development.

A narrow swath of rolling topography runs parallel and to the south of the Trans Canada Highway between Port Blandford and Clarenville. West of this land form, the District spreads out to its western boundary in an expansive plateau of barren land and bog, with very intermittent forests occurring in narrow riparian areas and on valley slopes. Many small ponds are interspersed throughout this plateau and the eastern half of the peninsula.

Geology

The type of rock, or parent material, underlying our forest soils is fundamental in the development of those soils. Some rock types, such as shales and slates, have many mineral elements which are essential to plant growth, and through geological time, become readily available. Generally, soils which form on parent material deriving from these type of rock group are fertile and can support favourable forestry/agricultural development. Geologic groups forming from igneous processes, such as granite, have far less inherent trace elements and generally lead to the development

of soils in which fertility is a more limiting factor to plant growth.

The geologic groups located on the Bonavista Peninsula are described in the soils report for that region by Heringa and Woodrow (1991) and are illustrated in the map shown in Figure 2.2. The peninsula contains the following geologic groups: Musgravetown; Adeytown; Harcourt; Granite; Connecting Point and Love Cove. These groups fall within the Ordovician, Cambrian, or Devonian periods of the Paleozoic Era. Brief descriptions of these groups are provided below.

Cambrian Period:

Musgravetown Group: The rocks are chiefly red and green coarse grained conglomerates, greywackes, arkose, and acidic to basic lavas of relatively shallow water origin. Near Musgravetown and Canning's Cove, the soils have developed on a thick sequence of greenish conglomerates overlain by reddish conglomerate. Sandstone is interbedded with the conglomerate. The material in the red conglomerate is often rounded, poorly sorted, with fragments from sand size to 15 cm cobbles. The Ball Formation overlies the Canning's Cove formation west of Musgravetown as acidic and some basic lavas and pyroclastic rocks; other formations contain sandstone and red pebble conglomerate, shale, some lava and tuff.

Adeytown Group: A sequence of red, green, and grey shales and slates with interbedded pink, green and grey limestone, some lime nodules, some white calcareous sandstone and a granule sandstone with carbonate cement. Also prominent beds of red massive limestone may be present interbedded with red shale and shell fragments.

Connecting Point Group: The rocks consist largely of black and grey slates, sandy and silty greywackes, with minor conglomerates or lavas and no carbonate rocks. Argillaceous slates are common with argillites, and thin beds of siltstone. Also present are greenish grey cherty quartzites, red quartzite and conglomerates.

Love Cove Group: Rocks of this formation occur only in the northwest and southwest corners of the map sheet. They include a wide variety of sedimentary and volcanic rocks interbedded with each other. In the southwest they include many chlorite schists, metamorphosed basic to acidic rocks, sandstones and conglomerates; in the northwest: feldspathized and granitized chlorite schists of metamorphosed acidic and basic rocks, sandstones and conglomerates occur. Individual bands or beds are generally less than 15 metres thick, thus many rocks types can be observed within a short distance, and in areas of scattered outcrops each outcrop is generally different from those near it.

Cambrian and Ordovician Period:

Harcourt Group: A succession of alternating dark grey and black shales, silty shales, siltstone and some limestone. Numerous beds of grey siltstone are generally present and also black limestone nodules and beds with micaceous and other siltstone. Fossils may be found in thin black shale.

Figure 2.2 Geological map showing parent material.

<u>*Devonian Period*</u>:

Granitic Rocks: Granite and granitic rocks occur in two small areas near the northwestern and southwestern margins of the map area. They are part of the Ackley batholith, which extends from Fortune Bay northeastward to the north side of Bonavista Bay and probably as far as Fogo Island

northeast of the Island of Newfoundland. It consists mainly of an orange-pink to light red coarse grained porphyritic biotite granite. Orange-pink feldspar is generally the dominant mineral in the granite, but buff coloured sodic plagioclase is commonly present in amounts exceeding 15 percent. Small bodies of orange-red, medium-grained granite occur near Clarenville.

2.1.2 Soils

Soils develop over a long period of time and are influenced by the underlying parent material, topography, ground water, climate and living organisms (including plants, micro-organisms, animals and man). The soils on the Bonavista Peninsula began forming after the last glacial retreat nearly 8000 years ago and are considered to be mature. Mature soils show well defined horizontal layers with varying mixtures of organic and mineral soil materials. The percentage of organic material in the horizons generally decreases with depth.

Under the Canadian System of Soil Classification, Management District 2 has representation of three Orders of soil, podzolic, gleysolic and organic. Each order represents soils that developed as a result of similar environmental influences.

Soils of the Podzolic Order are acidic, well to imperfectly drained and developed under coniferous or mixed forest or heath in cold climates. Well formed surface litter or organic layers (L-H) are a common characteristic of soils in this Order. Beneath the surface horizon, there is usually a mixed organic (Ah) layer which may be leached (Ae) and of lighter appearance. Beneath that there is a Podzolic B horizon, which has a lesser amount of organic material combined with varying degrees of iron and aluminum. Podzols on the Bonavista Peninsula can be further sub-divided into Ferro-Humic and Humo-Ferric Great Groups.

Soils of the Gleysolic Order develop under hydrophytic (water-loving) vegetation and are usually saturated with water. Soils in this Order may have a deep organic surface layer and dull coloured A and B horizons. These lower horizons often show mottling which results from a fluctuating water table. The only Great Group recorded on the Peninsula is the Gleysol.

Organic soils develop from organic deposits and contain greater than 30% organic matter and 17% organic carbon. These soils are usually saturated with water for a large part of the year.

Detailed soils maps for the Bonavista Peninsula are available in a report titled Soils of the Bonavista Peninsula (Heringa, P.K. and E.F. Woodrow, 1991).

The underlying parent material has a significant role in the soil forming process. It is one of the key factors which influence the fertility of soils. The presence of shale parent material under many of the soils on the Bonavista Peninsula has helped build nutrient rich forest soils. As a result, many sites in this area are highly suitable for the development of productive forest or for agricultural development.

2.1.3 Climate

District 2 is located in the southeastern region of the province and lies generally between the $54^0$35' and $53^0$00' longitude and $47^0$40' and $48^0$45' latitude . Bordering the Atlantic Ocean on the eastern extremity, its climate is largely influenced by maritime conditions. Seasonal temperatures are moderated by this influence, yet conditions during certain seasons, especially the beginning of the growing season, can be harsh due to the cooling effect from the ice laden Labrador Current.

The average mean daily February temperature in the District ranges from -5 ^{0}C to -8 ^{0}C with the minimum being -14^{0}C. The average mean daily July temperature ranges from $^+$13 ^{0}C to +16^{0}C with the maximum being + 22 ^{0}C.The growing season in the District ranges between 140 and 160 days. Average precipitation ranges from 900mm - 1300mm and average snowfall ranges from 2.5 to 3.5m.

2.1.4 Land Cover Statistics

The land cover statistics for District 2 are presented in Figure 2.3 . The District contains a land-base totalling 420,104 hectares of water, non-forested land, scrub forest and productive forest. The portion of the District's surface covered by fresh water is 30,900 hectares, comprising 7% of the total land-base within the District. A further 23% (or 98,976 hectares) of the District consists of other categories of non-forested land including: soil and rock barrens, bog, residential areas, agricultural land and other cleared land. The remainder of the District (286,531 hectares or 68%) is forested. The forested land includes 116,312 hectares of scrub forest (see Figure 2.4) representing 28% of the total District land-base. The other 170,219 hectares (or 40% of the total land base) is categorized as productive forest land. Productive forest land (see Figure 2.5) is defined as land capable of producing, at rotation age and under natural conditions, a forest stand containing a minimum merchantable timber volume of 35m^3 (solid) per hectare. The production forest is the component of the productive forest which is considered to be currently available for calculation of the commercial and domestic wood supply. The availability of forest to contribute to wood supply is defined within a series of alienation classes. During the previous wood supply analyses, the forest land-base (individual stands or groups of stands) was apportioned into one of three classes. However, the District is now divided into only two Alienation Class designations - I and III. Alienation Class I land contains the main body of forest which is currently available to support the forest industry and domestic cutting requirements. It is that portion of the District which is used to calculate the base sustainable harvest level (refer to Figure 2.6). Class III land is considered to have operational or institutional constraints which make it less viable or completely unsuitable for current wood supply. These availability classifications are not fixed in stone - rather they are but a snapshot in time. Alienation classes are evaluated every five years and adjustments made based upon conditions of the day. For example, if the Province's/District's timber supply/demand imbalance forces an increase in the value of round timber products or if additional funding programs become available to provide access to more expensive wood-supplies, then some forests can potentially be moved from Class III (ie productive <u>but</u> non-production forest) to Class I (i.e. productive and production forest).

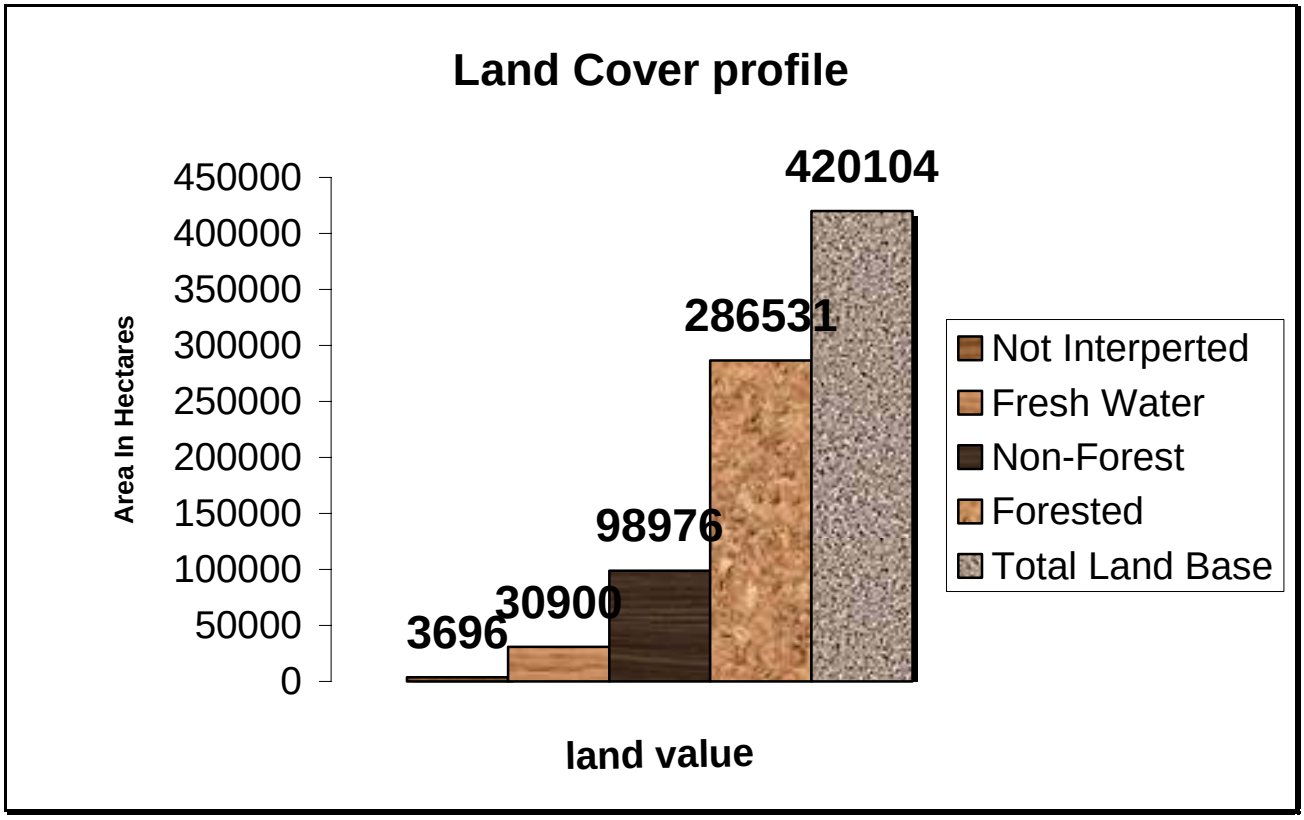

Figure 2.3 Land cover profile : District 2

Figure 2.4 Picture of scrub forest

Figure 2.5 Picture of productive forest

The production forest excludes areas of Class I stands which are unavailable to harvest and excludes all Class III stands. Forests are excluded from wood supply because of spatial or institutional constraints. Riparian (i.e. stream and pond) buffers left intact for environmental reasons are examples

of institutional constraints within Class I land. Remote inaccessible bodies of timber are examples of operationally constrainted forest within Class III land which would preclude an area from being part of the production forest. In the long term, it is possible that the production forest will continually decline as land-base is committed for non-forestry development purposes or is protected for aesthetic or environmental reasons. However, a strategy is discussed in Section 7.4 (Agriculture/Forestry land-use strategy) which presents possibilities to help mitigate the loss of the production forest in the District. Also presented in this, and other sections of the report, are various management strategies which can increase the productivity of portions of existing production forest land, from a timber value perspective. The current area of production forest on un-alienated Crown land in Management District 2 is 95,045 hectares, which represents 25% of the total land-base.

Giving a parcel of forest or a specific stand the designation of Class III does not ensure that these areas will be excluded from harvest or from other industrial use in the future. Future alienation class reviews and changing industry conditions may allow some current Class III stands to be designated as Class I stands. Tracts of forest must be given an exclusion status to ensure restrictions on the types of activities, including forestry, that may occur in an area. However, many substantial tracts as well as small pockets of productive forest land in this District's alienation Class III category most likely will be excluded from forestry development (commercial as well as domestic) due to severe spatial/operational constraints. This will help the District to meet its commitment to maintain 15-20% of its productive forest in the 81+ age class, as outlined in the Provincial Sustainable Forest Management Strategy.

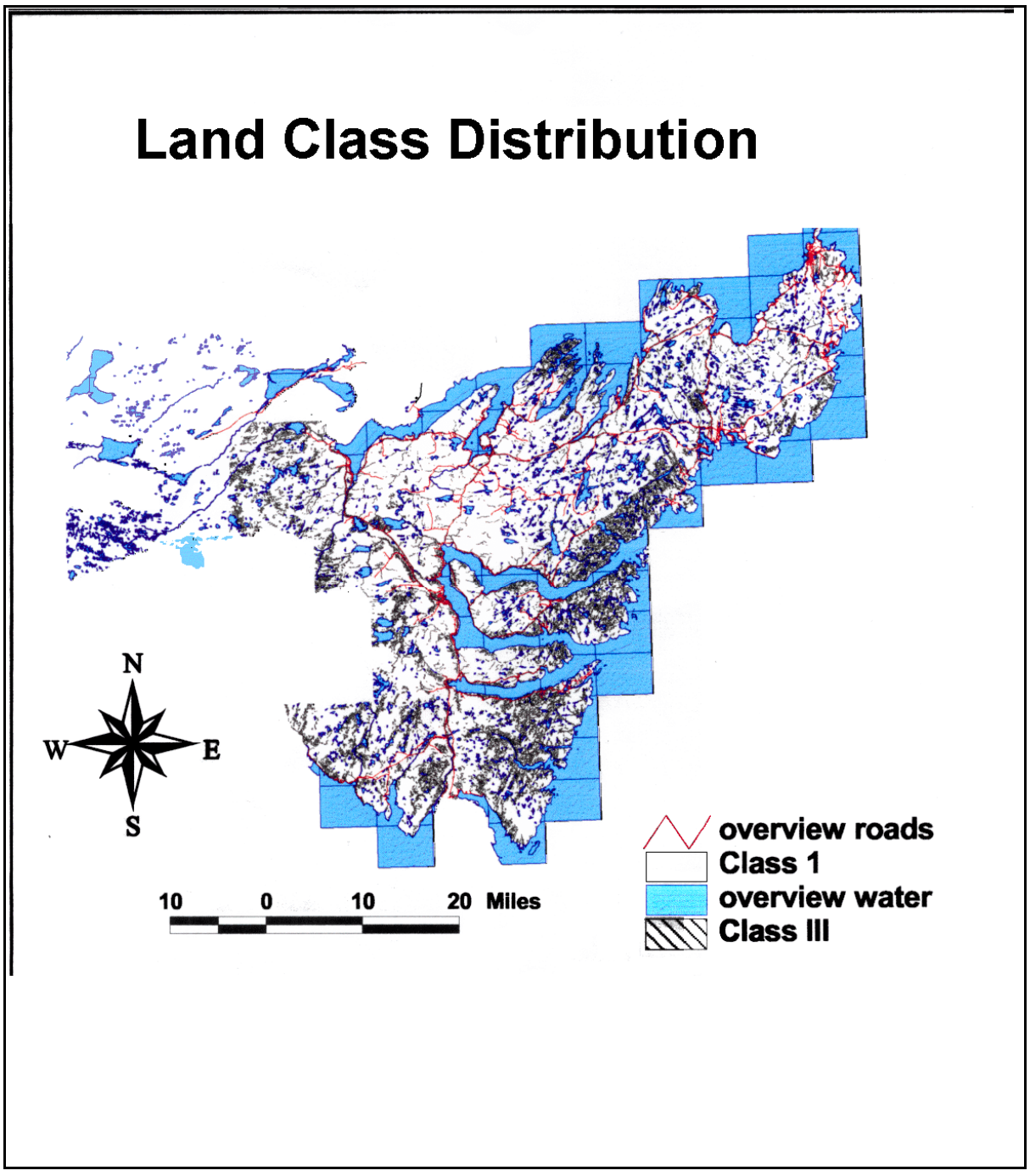

Figure 2.6. Map of alienation classes for Forest Management District 02

2.2 The Bonavista Peninsula Forest Ecosystem

2.2.1 General Description

An ecosystem is considered to be a community of interrelated plants and animals and its surrounding physical and chemical environment. In other words, an ecosystem is a dependent association of abiotic and biotic components. It can be very large - Earth is a global ecosystem; or very small - beneath a stone on a seashore is a micro-ecosystem. The forests of Management District 2 are part of a much larger system known as the boreal forest ecosystem. The boreal forest is a green belt of forest which stretches around the northern part of Earth - through Russia, Scandinavia, Alaska and Canada. In Canada, the boreal forest stretches through mid Canadian latitudes from Alberta to Newfoundland. One of the characteristic features of this ecosystem is the phenomenon of periodic catastrophic stand replacement events such as fire or insect outbreaks which creates huge natural disturbances across the landscape.

Similar to much of insular Newfoundland, the landscape in District 2 consist of a mosaic of barren, forest and wetland. There are two types of barren (or heath) common to this area, including Kalmia (sheep laurel) and Empetrum(crowberry). Kalmia heath is the most prevalent throughout the District. The western portion of the District is dominated by heath barrens.

The morainal areas of the District, which occur primarily on the peninsula, support closed conifer stands comprised mostly of Black Spruce (*Picea mariana*(Mill.)B.S.P. and Balsam Fir (*Abies balsamea*(L.) Mill) with White Spruce (*Picea glauca* (Moench) Voss) and Tamarack (*Larix Laricina* (Du Roi) K. Koch) occurring in pockets or as individual stems throughout the forest. Broadleaf trees, such as White Birch (*Betula papyrifera* Marsh.) occur sporadically in pure stands throughout the District and occur somewhat more commonly, similar to Trembling Aspen (*Populus tremuloides* Michx.), in mixed composition forest in association with other softwood species. White Pine (*Pinus strobus* L.) occur in isolated pockets of individual trees scattered through the northwestern portion of the District.

Wetlands are a common part of the landscape, but increase in predominance intermixed with barrens in the western portion of the District. Generally wetlands are considered to be those land areas that have a water table at, near or above the soil surface for a major portion of the year (Meades, S.J. 1990). Wetlands contain far greater biodiversity than other parts of the landscape, are very sensitive to heavy disturbance and deserve special protection from forestry or other types of heavy developments. The Canadian Wetland Classification System was used to classify the five classes of wetland in this area, including bog, fen, marsh, swamp and shallow water. Brief descriptions of these types of wetlands follow:

Figure 2.7 . Picture of bog

Bogs - extremely nutrient-poor (ombrotrophic or oligotrophic) wetlands which have a peat layer formed by the accumulation of primarily Sphagnum mosses.

Figure 2.8 . Picture Black spruce fen

Fens - minertrophic wetlands which are influenced by somewhat rich (mesotrophic) to very rich (eutrophic) ground water and/or seepage water, and which have a peat layer formed by the accumulation of primarily sedges and rushes.

Figure 2.9 . Picture of marsh

Marshes - nutrient-rich, non-wooded wetlands, adjacent to rivers, ponds or bays, which are periodically flooded. The vegetation is “grassy” in appearance, being composed primarily of emergent sedges, rushes, and grasses. Peat accumulation is herbaceous and minimal.

Figure 2.10 . Picture of Swamp

Swamps - nutrient-rich wooded wetlands, adjacent to rivers or ponds, which are periodically flooded causing water-logged soils. Peat accumulation is woody and often minimal.

Figure 2.11 . Picture of shallow water wetland

Shallow water wetlands - non-fluvial(flowing-river) bodies of standing water (ponds) less than 2 meters deep, with a vegetation of submergent aquatic vascular plants.

Terrestrial plant and animal communities are largely dependent on the successional (seral or development) stages of the forest. The type of disturbance regime which caused stand or partial-stand replacement has a significant influence on the succeeding forest structure and its accompanying plant and animal life. Some wildlife species can also have a significant impact on forest successional patterns and on the structure and diversity of the forest under-story. For example, wild-fire has played an historical successional role in stand replacement in the boreal forest. Removing wildfire from the Newfoundland ecosystem through suppression efforts and replacing it with harvesting causes a shift in successional patterns. Black spruce-feathermoss (moist soil conditions) would normally regenerate into a similar forest pattern following fire disturbance but would shift to primarily Balsam Fir forest type following cutting disturbance. Extensive browsing resulting from high densities of moose, an introduced species, is altering this pattern and causing these, as well as other Balsam Fir sites, to remain in early successional stages for extended periods. Moose browsing also has a huge impact on forest under-story structure and on the diversity of forest floral and fauna. Black Spruce-feathermoss (very dry soil conditions) would also usually regenerate into a similar forest pattern following fire disturbance but would shift to a Cladonia-Kalmia-Black spruce forest following harvesting. Subsequent clear-cut disturbance in this forest type could result in a further shift to Kalmia heath. Silvicultural intervention (site-preparation and planting) will ensure that reforestation occurs on these sites and that the succeeding stand development resembles that which was removed.

Many wildlife species are generalists and can adapt or use a wide variety of habitat types. Still, these species may have very specific seasonal requirements. An example of this is moose, which require a specific winter habitat providing an adequate combination of cover and browse. Other wildlife species have very specific habitat requirements.Newfoundland Marten and certain lichen species are examples of habitat specialists. Maintaining a significant portion of the landscape in each forest age

class accommodates the varied needs of different wildlife species and will promote animal diversity at the landscape level.

The forest matrix on the Bonavista Peninsula is dissected by a network of ponds and streams. The two larger watersheds in the District (Northwest River and Pipers Hole River) flow from the interior barrens near or at the northern and southern extremities of the District, respectively. The other systems are small in size and, collectively, provide an intricate drainage system on the peninsula.

Aquatic ecosystems of the boreal forest are heavily dependent on forest cover for temperature regulation, nutrient cycling and stream flow regulation. Consequently, theforest adjacent to riparian areas is critical in terms of the suitability and sustainability of these ecosystems as fish habitat and migration routes. Suitability of various streams and ponds as waterfowl breeding, feeding and resting areas is also dependent on forest cover. Also, some species have a unique requirement for the diverse richness offered in riparian areas. Riparian zones are the most environmentally sensitive portion of the landscape. It is imperative to protect riparian areas to maintain sensitive riparian habitats and to provide connectivity (wildlife corridors) throughout the landscape.

Fish Habitat is defined as spawning, nursery, rearing, food supply and migration areas upon which fish depend directly or indirectly to carry out their life processes. Forests play an important role in maintaining the integrity of aquatic ecosystems. Headwater areas (the upper most stream reaches) usually contain the most productive (spawning/rearing) fish habitat. Riffle and pool habitats are critical for early life stages of fish species and these areas are often located within highly productive forest areas.

The most popular group of freshwater fish in District 2 area are Salmonids and include the native Atlantic Salmon, Ouananish(landlocked version of Atlantic Salmon),Brook Trout, Arctic Char and the introduced Brown Trout and Rainbow Trout species. Salmonid populations exist as sea run (anadromous) or resident (land locked) populations. Other species of fish include but are not limited to, American Eel, Rainbow Smelt, and various species of Sticklebacks. The most sensitive fish habitats are scheduled salmonid systems and sea run systems. There are 13 scheduled salmon rivers located in the District (see Figure 2.12) which are listed below:

Scheduled Salmon Rivers Located in District 2

Northwest Brook and tributary streams, Port Blandford,
Salmon Brook, and tributary streams, Port Blandford
Southwest Brook and tributary streams, Port Blandford,
Salmon Cove River, Trinity Bay.
Trouty River, Trinity Bay.
Pope's Harbour River, Trinity Bay.
Shoal Harbour River and tributary streams, Trinity Bay
Deer Harbour River and tributary streams, Trinity Bay.
Come-by-Chance River, Placentia Bay
Watson's Brook, Placentia Bay
North Harbour River, Placentia Bay.
Black River below the falls, Placentia Bay
Piper's Hole River, Placentia Bay

Fish habitat requirements include access, adequate food supply, cover, proper substrate material, clarity, temperature, dissolved oxygen and adequate stream flow. Streamside vegetation located in riparian areas helps regulate water temperature, provides cover, contains food items for fish, protects the shoreline from erosion and helps maintain water quality by filtering out sediments and other contaminants.

The recreational fishery has provided social and economic benefits to Newfoundlanders for many years. According to a 1990 survey, the recreational sport fishery contributed about $57 million through angling by resident and non-resident anglers in 1990 alone (Buchanan et al. 1994). Some of the most popular angling sites in the province are located in District 2. Detailed information regarding18 river systems that flow through District 2 is available from the Departments of Fisheries and Oceans (see Figure2.12).

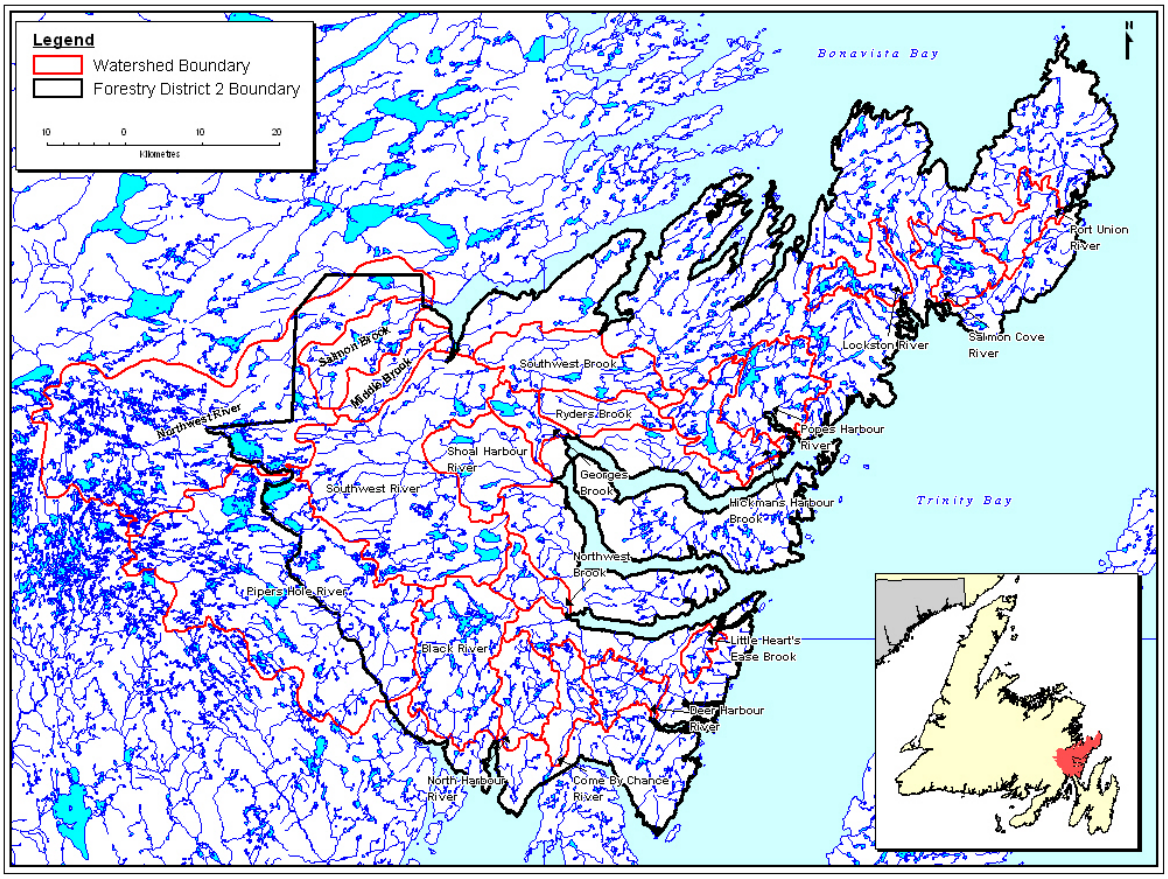

Figure 2.12 Watershed Boundaries District 02

2.2.2 Ecological Classification System

Forest ecosystem management is shifting from the stand level to a much broader landscape scale. Managers are shifting from a timber management view to a holistic view of the forest ecosystem. This shift necessitates the use of a framework which considers ecological relationships at different scales.

An ecological classification system provides this framework - it recognizes unique combinations of vegetation, soils, landforms, general climate, regional physiography, etc. Defining ecologically based land units facilitates mapping, evaluating the impact of different land uses on a particular landscape type and using landscape information in developing land use applications. There is also the additional benefit of integrating the databases of individual resources (eg. timber inventories and wildlife habitat surveys).

A hierarchical framework, or one which shows different orders or scales, of ecological land classifications is useful as a means of stratifying a land into increasingly smaller, ecologically similar units. The Canadian Ecological Land Classification provides that function in Canada . The largest scale in this system is the ecozone - which can be described as an area of large land mass representing very generalized ecological units, based on the consideration that the Earth's surface is interacting and continuously adjusting to the mix of biotic and abiotic factors that may be present at any given time. The boreal forest, which includes all the forested land in Newfoundland and Labrador, is an example of an ecozone.

The second level of ecological description is the ecoprovince - which include areas of the Earth's surface characterized by major structural or surface forms, faunal realms, vegetation, hydrology, soil, and climate zones. The Island of Newfoundland is an example of an ecoprovince.

In Newfoundland and Labrador, forest ecosystem classification has two levels: ecoregions and forest types. An ecoregion is defined as a large geographic area in which the relationship between plants and their environment is basically the same, provided that these sites have experienced a similar history of disturbance (Damman, 1970-83). The main factors used to differentiate ecoregions are the differences in vegetation and climate. Each ecoregion has its own characteristic plant communities and soil types, as influenced over the millennia by climatic topographic and geologicfactors as well as repeated disturbance regimes.

Within ecoregions, forest types are identified which represent stand level variations in soil moisture and nutrients (site productivity) due to changes in topography (Meades, 1996).

Figure 2.13 shows the nine ecoregions which occur in Newfoundland. These ecoregions can be further broken down into17 sub-regions. In addition, there are 10 ecoregions found in Labrador.

2.2.3 Ecoregions and Sub-regions

Forest Management District 2 is located in a transition zone between central ecoregions, which have been influenced by interior continental-like climatic conditions, and eastern ecoregions, which have a greater coastal climate influence. Also, the Bonavista Peninsula has a unique geological setting which has helped mold the ecosystem structure present there today - it has a much greater occurrence of shale and slate then is common in most of Newfoundland. As a result of the gradient climatical change as you move eastward through this District and the somewhat unique geological setting, three major ecoregions intersect on the Bonavista Peninsula (see figure 2.14) and actually come to an apex. These include the Central Newfoundland Ecoregion, the North Shore Ecoregion and the Maritime Barrens

Ecoregion.

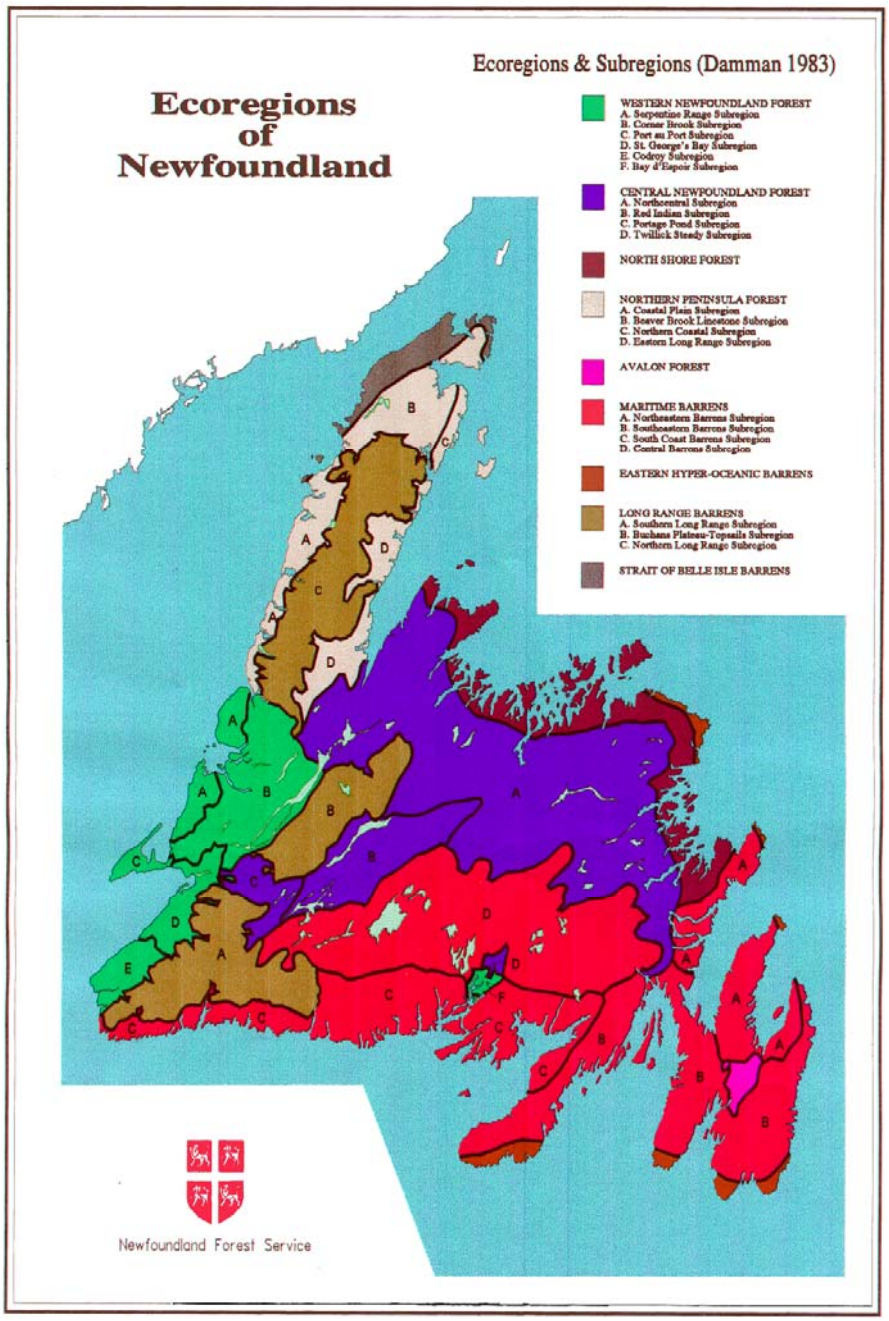

Figure 2.13 Ecoregions and subregions of insular Newfoundland.

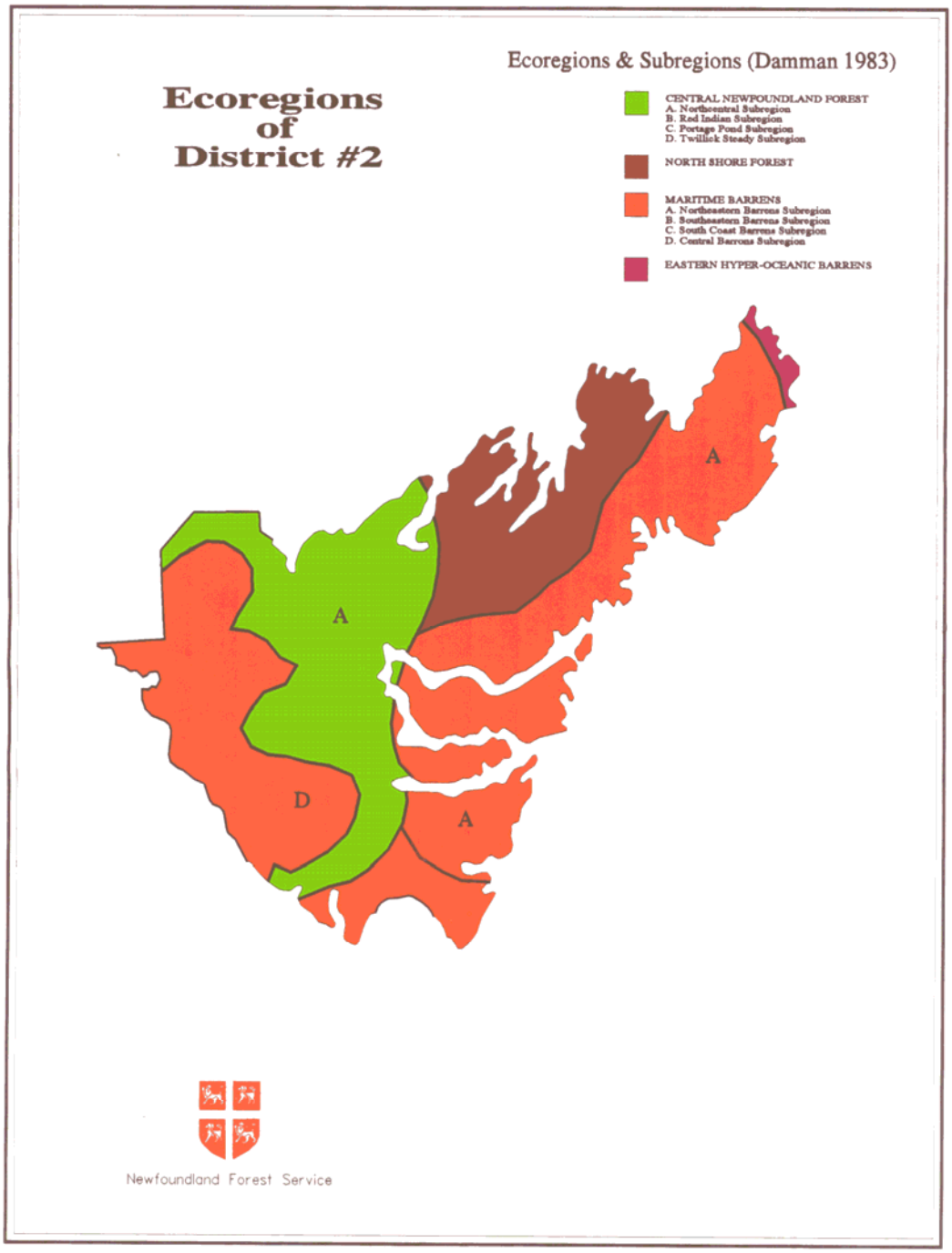

Figure 2.14 . Map of ecoregions and subregions which occur in Forest Management District 02.

There are portions of two subregions of the Maritime Barrens Ecoregion located in District 2, including the Northeast Barrens Subregion and the Central Barrens Subregion. In addition, the Eastern Hyper - Oceanic Barrens Ecoregion crosses the northeastern tip of the peninsula. Due to its strategic geographical positioning and the influences of climatic, geological and glacial factors, Management District 2 has a diverse ecological setting with a corresponding natural diversity of plant and animal communities.

The major features of the ecoregions and subregions found in District 2 are briefly described in this section.

Central Newfoundland Ecoregion (Northcentral Subregion)

The Central Newfoundland Forest (refer to Figure 2.15) has the most continental climate of any part of insular Newfoundland, having the highest summer temperatures and the lowest winter temperatures. However, late spring and early fall frosts are common. Due to the warm summer and the high evapo-transpiration losses, soils in the northern part of this ecoregion display soil moisture deficiency. Although the Hylocomium-Balsam Fir forest type is characteristic of this ecoregion, the fire history in the Central Newfoundland region has resulted in many Balsam Fir-Feathermoss forest types being converted to Black Spruce or Hardwood forest types. The removal or suppression of fire as a primary disturbance regime is favouring the establishment/reestablishment of Balsam Fir on the richer sites in this ecoregion and causing regeneration failures on some dry nutrient poor sites.

The Central Newfoundland Ecoregion has four subregions. Only a portion of the Northcentral Subregion lies within District 2. This subregion stretches from Clarenville in the east to Deer Lake in the west. It dissects District 2, forming a swath from Clode Sound on the northern boundary through the center of the District to Southwest Arm in the south, separating the interior barrens from the coastal ecoregions, and then swinging west to Piper's Hole River. The Northcentral Forest has higher summer temperatures, less rainfall and a greater occurrence of fire than any other region of insular Newfoundland. Pure Black Spruce forest dominates this area because of the prevalence of fire in the natural history of the ecoregion. Due to the low moisture levels, the coarse texture of the soils and the predominance of the Black Spruce forest type, this subregion is particularly susceptible to regeneration

Figure 2.15 . Picture of Central Newfoundland Forest

Figure 2.16. Picture of Northshore Forest

failure following harvest. In the absence of tree regeneration, succession on the nutrient poor coarse-textured till common to the Northcentral Subregion is often to Kalmia Heath

North Shore Forest Ecoregion

The North Shore Forest Ecoregion (refer to Figure 2.16) does not have any subregions. It forms a coastal band approximately 20-25 kilometres wide extending from the Bonavista Peninsula in the east to the Baie Verte Peninsula in the west. The North Shore Forest occupies the northern half of the Bonavista Peninsula, bounded by the Northeastern Barrens in the south and the Northcentral Forest in the west. Black Spruce and Balsam Fir forest form a continuous forest except where barrens dominate on coastal headlands. The vegetation growing season is shorter and cooler than in the central part of the island, but it also has a frost free season which is several weeks longer. The summers are relatively dry and warm and soil moisture deficiencies may occur. Similar to the Central Newfoundland Ecoregion, encroachment of ericaceous shrubs on drier nutrient poor sites after fire or cutting disturbance is common and presents a serious silvicultural problem. This problem is more prevalent after cutting.

Maritime Barrens Ecoregion

The Maritime Barrens Ecoregion extends from the eastern Peninsulas westward through south-central Newfoundland to Port-aux-Basques. It is divided into four subregions, two of which are partially located in Management District 2. The Maritime Barrens Ecoregion is characterized by cool, foggy and windy summers and relatively mild winters. Intermittent snow cover is common within the coastal portions of this ecoregion but increases in accumulation and duration in the interior barrens. The landscape pattern is one of almost pure Balsam Fir interspersed throughout extensive open heath-land. Productivity of the forest is better on long slopes which occur in infrequent valleys. A natural history of frequent wildfire occurrence in much of this ecoregion has had a significant influence in the development of this largely heath-covered landscape.

Northeastern Barrens Subregion:

The Northeastern Barrens (refer to Figure 2.17) occupy the eastern third of the District. It is, generally speaking, that area east/southeast of a line running from Knights Cove southwest to Harcourt; and then south along the western end of Random Island and the bottoms of Northwest Arm and Southwest Arm to Queen's Cove, and then southwest to Swift Current. This subregion has a lower frequency of fog and warmer summers than the other subregions of the Maritime Barrens, except for the Central Barrens. Portions of the landscape are, in fact, heavily forested - but these portions are interspersed throughout large expanses of soil/rock barrens, softwood scrub forest and local heath vegetation, usually along the coast. Balsam fir is the predominant tree species that occurs in the Northeastern Barrens. Natural regeneration of forests usually occurs after natural or cutting disturbance in this subregion. Fire is less prevalent than in other parts of the District. Natural forest succession usually occurs as a result of stand replacement insect or wind disturbances.

Figure 2.17 . Picture of Northeastern Barrens

Central Barrens Subregion:

This area occurs south of the Central Newfoundland Forest and north of the South Coast Barrens Subregion. In District 2, the Central Barrens (Figure 2.18) extends from the Northwest River south to Black River Pond in a strip of land bounded by the district boundary on the west and the Central Newfoundland Forest on the east. This subregion has warmer summers, less fog and more persistent snow cover then the other subregions in the Maritime Barrens Ecoregion. Forest patches, predominately composed of Balsam Fir Forest, are common throughout the barrens. Fire has played a significant role in the development of the ecology of the Central Barrens. Within District 2, this subregion is unique in that it provides the eastern range for the Middle Ridge caribou herd.

Figure 2.18. Picture of Central Barrens

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Eastern Hyper Oceanic Barrens Ecoregion

This ecoregion occurs on the extreme south coast of the Avalon and Burin Peninsulas and in the Bay de Verde, Cape Freels and Bonavista areas. In District 2, the Eastern Hyper Oceanic Barrens are located on the very tip of the Bonavista Peninsula (refer to Figure 2.19). Although at low elevation, this ecoregion has very cool summers due to the oceanic influence. The landscape is dominated by exposed coastal barren and blanket bogs and is completely without forest cover, except for Balsam Fir krummholz (ie. tuckamoor or low wind-swept scrub) (Figure 2.20). Arctic-alpine species occur even at sea level and are mixed with species common to southern coastal plain. This is a very unique ecological aspect of the oceanic barrens.

Figure 2.19 Picture of tuckamoor

Figure 2.20 Picture of Eastern Hyper Oceanic Barrens

2.2.4 Ecological Protection

The establishment of protected areas, areas representative of ecoregions or examples of special sites, is an important step towards Government's commitment to preserve this province's natural heritage. The Department of Environment and Conservation, Parks and Natural Areas Division, is currently developing a Natural Areas Systems Plan to improve the province's protected areas network. Protection under this planning process would normally come in the form of an ecological or a wilderness reserve under the authority of the Wilderness and Ecological Reserves Act. The objective of this Natural Areas Systems Plan is to complement the ecological protection provided in existing protected areas such as National Parks, Provincial Parks and Federal Migratory Bird Sanctuaries.. In addition to legislated parks and reserves, this plan will identify a number of areas which will prohibit forest harvesting to protect local special places.

The protected areas strategy for the province has three components. Component 1 reserves are large (>1000km^2) and provide the greatest degree of protection for wilderness and biodiversity. Component 2 reserves are designed to protect representative examples of ecoregions or sub-regions and usually range in size from 50-1000km^2. Component 3 reserves are established to protect special or unique ecological places and include such features as areas containing rare plants and animals (native red pine stands for example); areas of unique biological richness (such as seabird colonies); or areas containing rare natural history (fossil beds for example). All protected areas established under the Wilderness and Ecological Reserves Act have restrictions on land use development (e.g. hydro development, forest harvesting, mining and exploration activity, agriculture, new construction developments, etc). Some allow traditional activities like

hunting, fishing and camping to continue.

The Bay Du Nord Wilderness area is an example of a large Component 1 Rreserve (refer to Table2.1) which protects an expanse of the Maritime Barrens Ecoregion. Its eastern extremity includes the western barrens of Forest Management District 2.The Bay Du Nord Wilderness Area has restrictions on hydro development, forestry, mining and mineral exploration, agriculture, new roads, tracks, or building construction. Traditional activities like fishing and hunting are allowed and adventure tourism is promoted within the reserve. However, there are travel restrictions which affect use of aircraft and ski-doos within the area.There is a complete ban on the use of All Terrain Vehicles. At this point, there are no Component 2 or 3 Reserves established in Forest Management District 02. However, Terra Nova National Park is equivalent in scale to a Component 2 reserve and protects significant portions of the North Shore and Central Newfoundland Ecoregions. In addition to restrictions on development, this protected area prohibits hunting and all off-road motorized traffic. Lockston Provincial Park is a smaller protected area (<10km^2) with a level of protection similar to Terra Nova National Park. The Terra Nova Migratory Bird Sanctuary (located at the mouth of the Shoal Harbour River) is administered by the Canadian Wildlife Service of Environment Canada. Its function is similar to that of a Component 3 ecological reserve – in this instance it protects from hunting a strategic staging area used seasonally by migratory waterfowl. The eastern portion of Random Island is also being considered as part of the Natural Areas Systems Plan for designation as a Component 2 Ecological Reserve. In addition to these institutionally protected areas, the District has designated a number of areas where forest harvesting will be prohibited to protect local recreational and ecological values. These include packages of land around the White Hills Ski Resort, Kings Cove Lighthouse and Keels (where there is a small resident caribou herd). The District will also identify a body of white birch that will be excluded from future harvesting. pure white birch stands comprise only a small proportion (300ha or less than a quarter of one percent) of the forested landbase in the District.

Many of the province's ecoregions span Forest Management District and Regional boundaries. It is therefore necessary to conduct ecological reserve planning at a Provincial rather than a District or (administrative) Regional scale. Given that a representative example of an ecoregion may be protected in a neighbouring Forest Management District, it is not necessary to protect an example of an ecoregion in every District in which it occurs. However, ecosystem and natural areas planners must co-ordinate development activity so that it does not impair ecological flows that occur from District to District. Examples of ecological flows that span District boundaries in eastern Newfoundland include caribou migration from winter feeding to summer breeding habitat and egress of juvenile Newfoundland marten.

Figure 2.21 shows the range of the ecoregions/subregions that occur within District 2 and the areas within each ecoregion/subregion that are protected or are being considered for protection within or immediately adjacent to District 2. **Table 2.1** summarizes information pertaining to the size of the ecoregions and, within District 02, the current protection status of each.

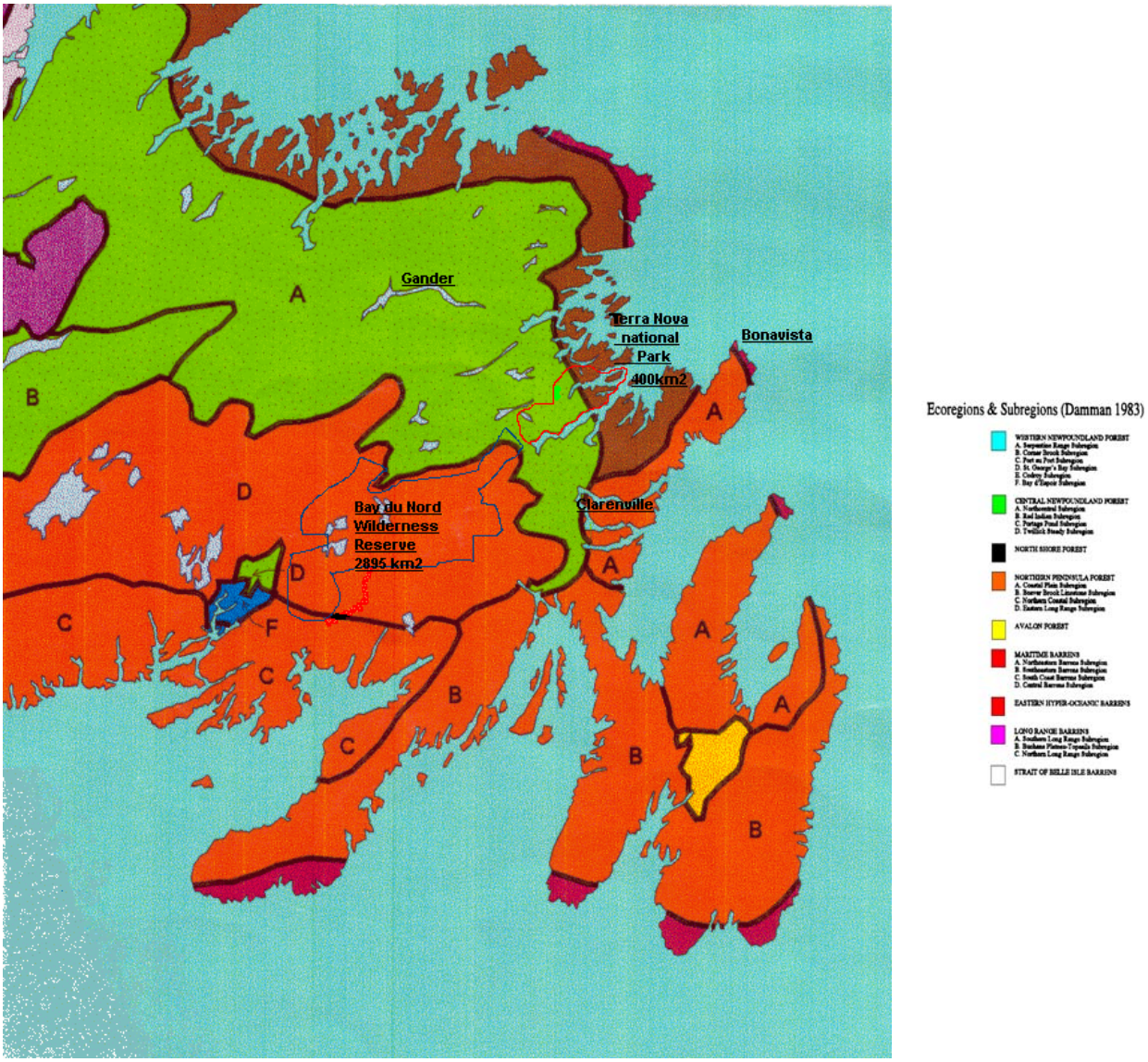

Figure 2.21 Range of ecoregions/subregions within District 2

Ecoregion	Area (in ha)	
	Province	**District**
Western NF Forest	994,527	nil
Central NF Forest Northcentral Subregion	2,872,68	**123,617** 123,617
Northshore Forest	550,662	**74,691**
Northern Peninsula Forest	854,851	nil
Avalon Forest	55,548	nil
Maritime Barrens Northeastern Barrens Subregion Southeastern Barrens Subregion Central Barrens Subregion	3,791,075	**274,938** 155,525 24,060 95,353
Eastern Hyper-Oceanic Barrens	16,033	**4,540**
Long Range Barrens	1,659,18	nil
Strait of Belle Isle Barrens	188,910	nil

Table 2.1(a) Breakdown of Province and District 02 by Ecoregion

Ecoregion	Protected area	Area (in ha)
Central NF Forest Northcentral Subregion	 Terra Nova National Park White Hills Ski Resort Cabin Dev. T'Railway Provincial Park Youth Group Camp Dev. Reserve – North Pond	**30,721** 28,000 363 168 1,665
Northshore Forest	Terra Nova National Park Keels Caribou Herd Kings Cove Light House Reserve	**13,000** 1,106 95
Maritime Barrens Northeastern Barrens Subregion Central Barrens Subregion Southeastern Barrens Subregion	 Lockston Path Provincial Park T'Railway Provincial Park Bay Du Nord Wilderness Reserve Piper's Hole Park T'Railway Provincial Park	**290,896** 773 15 289,500 596 12
Easter Hyper-Oceanic Barrens	The Dungeon Provincial Park	**2**

Table 2.1(b) Proportion of Ecoregions within Protected Areas in or adjacent to District 02.

The eastern extremity of three of Newfoundland's ecoregions/subregions are represented in District 2. These ecoregions, which include the North Central Subregion of the Central Newfoundland Ecoregion, the North Shore Ecoregion and the Central Barrens Subregion of the Maritime Barrens Ecoregion, stretch from west-central Newfoundland east along the north-northeast coast or through the interior to the Bonavista Peninsula. Both the North Shore Forest Ecoregion and the Central Newfoundland forest have large tracts of land currently protected on the eastern end of their ranges in the Terra Nova National Park, adjacent to District 2. Likewise, the Central Barrens Subregion has a huge tract of land protected within the Bay Du Nord Wilderness Reserve, a portion of which overlaps the southwestern portion of the district.

A significant proportion of the Northeastern Barrens Subregion of the Maritime Barrens Ecoregion is located within the boundaries of District 2. An ecological reserve providing representation of this subregion has not been established to date. A candidate area is being considered on the eastern end of Random Island. Likewise, a portion of the Eastern Hyper-Oceanic Barrens ecoregion occurs on the tip of the Bonavista Peninsula. No proposed reserves are being considered for this ecoregion in District 2 at this time.

In addition to establishing the representative natural reserves described above, there is also a need to identify, map and protect smaller unique and/or special ecological sites and other landscape attributes for wildlife/ecological considerations. These ecological features include the following:

- waterfowl staging areas - salt water staging areas used by migratory waterfowl like geese and ducks in flight to nesting areas during the spring break-up prior to melt of pond ice. Very high seasonal concentrations of waterfowl occur in these areas. The estuary of the Southwest River near Port Blandford is an example of a waterfowl staging area.

- osprey nesting sites - the osprey is a large, high order fish hawk that nest near coastal mud flats or interior fresh water systems with abundant fish stocks. Osprey are very sensitive to human activity, and in particular, logging activity. No harvesting can take place within 800 meters of a nesting site during the nesting season (March 15-July 31) and within 200 meters during other periods of the year. Known osprey nesting sites are shown in Appendix 1.0 of the Five Year Plan. Newly identified nesting sites will be mapped as they become known to District staff.

- eagle nesting sites - the bald eagle is the largest raptor that inhabits the ecosystems of Newfoundland. It dwells in coastal areas and usually nests on high cliff ledges or large over-story trees. Eagles are also very sensitive to human activity and need protection from encroachment on nesting areas. Similar to osprey sites, bald eagle nesting sites will also be given an 800 meter protected no-activity zone during the nesting season and a 200 meter no-cutting buffer during all seasons. Known bald eagle sites are also shown in Appendix 1.0 of the Five Year Plan and will be updated as new sites become known.

- migratory waterfowl breeding areas - these are wetlands used by Canada Geese and various other migratory wetland breeding species. The eastern extremity of the Central Barrens Subregion contains considerable small water systems and wetlands that are highly popular summer breeding destinations for migratory waterfowl.

moose yarding areas - these are areas of young forest, usually with a high stocking level of Balsam Fir, that are used very heavily by moose for browsing during periods of heavy snow cover in the winter season. Areas of high seasonal moose densities will be identified and monitored by DNR. Forestry activities within these areas will be modified or curtailed, depending on general moose population levels and the balance of values depended on and impacted by moose. (refer to section 5.1 Value 1.5. Objective 1.

- rare plant and lichen sites – Boreal Felt lichen (Erioderma pedicellatum) is currently listed as a ‘vulnerable species’ under the provinces Endangered Species Act (ESA) by the Species Status Advisory Committee (SSAC) and is listed as a species of ‘special concern’ by the Committee On the Status of Endangered Wildlife In Canada (COSEWIC) under the federal Species At Rick Act (SARA). However, its status is being reviewed as a result of the significant distribution of Erioderma lichen that has been discovered in Newfoundland during the past three years. A provincial working group committee has been established to make recommendations to government on future management of this species, using the best scientific, traditional and local ecological knowledge available. The Department of Natural Resources has also carried out surveys to map locations and

distributions of this species (reference with Departmental publications). Surveys have identified Boreal Felt lichen in Management District 2 (reference with Departmental publications). At known locations of this species the Department has adopted a policy to maintain at least a 20 meter buffer to support forest habitat. Other rare plant sites will be mapped as they are discovered and will be excluded from logging activity to protect the ecological integrity of the sites.

- riparian zones - these sensitive areas are the most biologically diverse portions of the District's landscape. Riparian areas generally have a greater diversity of plant life and wildlife habitat than other landscape elements. These areas often are used as wildlife corridors and provide protection and shade for streams and aquatic life. Trees within the riparian zone that fall across streams continue to provide shade and help create pools which enhance fish habitat. Riparian areas are protected through the Department's commitment to the Environmental Protection Plan, which calls for an uncut buffer around all streams and other water bodies.

- fens - fens are very rich sites with a high degree of biological diversity. Fens occur in small areas and in total make up a very small proportion of the landscape. The soils are very deep, highly organic and have very poor trafficability for forest harvesting equipment. Fens normally offer poor logging opportunities due to the low merchantable timber volumes and the soft ground conditions that are typical of these sites. Timber harvesting and other development, which could be detrimental to the natural landscape, should not occur on fens. These ecologically sensitive areas are not currently mapped. Efforts will be made to have these sites identified and mapped in the future and removed from harvest blocks during annual planning exercises. Bogs, marshes, and swamps have varying degrees of soil richness and biological diversity. However, these landscape elements are also very sensitive, have low trafficability and are very susceptible to extreme damage from commercial and domestic logging activity. Forwarding timber across these sites should only be permitted during periods of hard frost or when other measures are used to mitigate environmental damage

- wildlife corridors - a wildlife corridor has been designated in the western part of the District in the valley of the Northwest River. This proposed corridor, which extends west into the nearby Terra Nova River valley (in Management District 4), provides connectivity between two protected areas: the Terra Nova National Park and the Bay Du Nord Wilderness Reserve. The corridor will have restrictions on harvesting which will meet Newfoundland marten recovery plan objectives in eastern Newfoundland. This area is very strategic in the Province's marten recovery program. There is a nucleus population of 30-35 Newfoundland marten currently present in the park and in the upper Terra Nova watershed (east of Lake St. John). A further trans-location of marten to help improve the viability of this population is planned for the fall of 2005. Terra Nova National Park cannot accommodate the target population of 50 animals. It is necessary to maintain significant forest cover within the corridor to allow for dispersal of young marten to a broader range outside the park. Details of the wildlife corridor are provided in the Five Year Operating Plan.

The designation of a wildlife corridor does not necessarily preclude all future forest development activity. Wildlife corridors do not have to be static on the landscape. Planned disturbance would be avoided for several successive planning periods, but need not exceed a rotation. It is possible that connectivity corridors can move around the landscape as adjacent portions of landscape move through seral stages.

2.2.5 Forest Types

The only other level of ecological classification, next to the ecoregions and subregions, currently available for the forested landscape of Newfoundland is Damman's forest types. It is equivalent to the ecoelement in the national land classification system. Other levels of ecological description between the ecoregion and ecoelement have not been completed in this province.

Damman's forest types describe recurrent patterns of forest vegetation and soils that react in a similar way to natural or human disturbance and to silvicultural treatments. Vegetation is used as an indicator of soil fertility and moisture. Using tree cover, ground vegetation and soil characteristics, accurate projections can be made on forest succession, productivity, wildlife habitat, operational concerns and silvicultural prescriptions for each forest type.

There are six major forest types identified under the Damman classification system: including Balsam Fir; Black Spruce; Black Spruce Fen; Kalmia-Black Spruce; Hardwood; and Hardwood Thicket and Heath. The predominate forest types in this District are Balsam Fir and Black Spruce, comprising respectively 38 and 46% of the District's productive forest (refer to Figure 2.22). An additional 7% of the District is in the mixed softwood-hardwood working group and 7% is in an unclassified status. Only 2% is in a Hardwood Forest type. The forest type that occupies any given piece of soil in the District is dependent on the site conditions and the disturbance pattern that lead to its establishment.

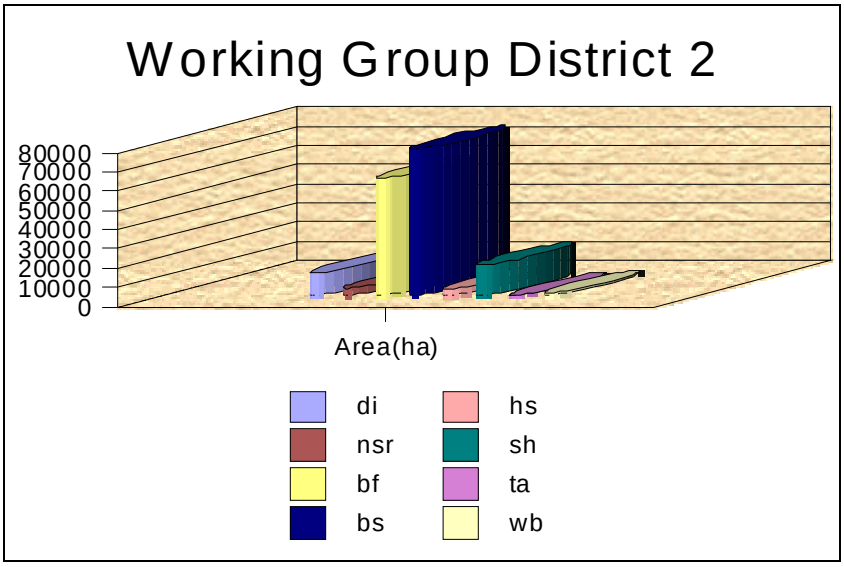

Figure 2.22 Forest Working Group Summary District 02