

**Preliminary Assessment of the  
Eigg Mountain - James River Study Area  
Antigonish and Pictou Counties  
Nova Scotia**

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**Department of Environment and Labour  
Protected Areas Branch**



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## 1.0 Introduction

The Eigg Mountain-James River study area is situated in the Pictou-Antigonish Highlands northwest of the town of Antigonish. The study area consists of a large, irregular block of Crown land (Map 1). The Crown land area is approximately 7950 hectares (ha) in size, of which 6660 ha is in a relatively natural condition, and approximately 1,280 ha are considered 'managed' forest land<sup>1</sup>. The majority of the Crown land area lies within Antigonish County. A small portion on the western edge of the area is within Pictou County.

The focus of this study is on the provincial Crown land block. Several private land inholdings are completely surrounded by the Crown land study area. These include a large, irregular inholding in the southern portion of the study area that is almost entirely owned by the Town of Antigonish, and an irregularly shaped inholding around Eigg Mountain itself, which is owned by 3 separate landowners. The Town of Antigonish property forms part of the James River Protected Water Area that supplies drinking water to the town. Collectively, these private in holdings have an area of approximately 1575 ha.

The majority of the study area is within the Pictou-Antigonish Hills Natural Landscape (#44), which consists of an upland area of rolling hills dissected by steep-sided ravines and gullies. In this landscape, rivers and streams are abundant, while lakes, ponds, and wetlands are uncommon. A minor portion of the Crown land area is within the adjacent McArras Brook Dissected Coast Natural Landscape (#43), which consists of smaller hills and undulating terrain on the Northumberland coast.

This report provides a preliminary assessment of the natural values of the Eigg Mountain-James River study area as a basis for determining if this area merits consideration as a candidate for protection.

## 2.0 Study Context

In the early 1990's, the Province conducted a review of all Crown lands as part of a comprehensive parks and protected areas system planning process. This process focused on Crown land areas greater than 2000 hectares in size that remained in a relatively natural condition, and were roadless. The Eigg Mountain-James River Crown land area did not meet these initial criteria, due to established road networks, and hence was not studied further at that time.

The criteria utilized during the systems planning process did not lead to the identification of any candidate protected areas in the Pictou-Antigonish Highlands Natural Landscape. Currently, there

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<sup>1</sup> Area of managed forest land was estimated from the Department of Natural Resources' GIS forest database, derived from 1990 air photography. Managed forest land includes the following categories: old field, plantation, clearcut, alders, treated land, and forest age classes from 1 to 15 years.

is one small (133 ha) provincial park in this landscape, at Beaver Mountain, southwest of Antigonish, but this park does not contribute to ecosystem representation because of its small size and altered condition.

On October 5, 1999, the Pictou County Naturalists and the Ecology Action Centre issued a press release calling for two areas of Crown land in northern mainland Nova Scotia, Eigg Mountain-James River, near Antigonish, and Gully Lake, near Kempton, Colchester County, to be designated as wilderness areas under the *Wilderness Areas Protection Act*. These groups stated a concern that there were no large protected areas on the northern mainland, and that these two proposed sites represent the best chance to establish protected wilderness areas in this region of the province. This initiative generated a high level of public interest and support as expressed through letters, e-mails, petitions, and the media.

Upon reviewing this matter, the Minister of the Environment directed the Department of the Environment (now Environment and Labour) to conduct “a preliminary review of the natural values associated with these areas, as a basis for assessing their merit as candidates for protection”.

This study represents a preliminary review. Basic ecosystem mapping of the study area was derived from 1997 air photography, and from 1990 forest inventory maps. An analysis of landscape conditions was conducted using a Geographic Information System (GIS) and data from the Department of Natural Resources’ (DNR) 1990 forest inventory database. Data on outstanding values were obtained from available sources, including maps, published literature, and personal communications with individuals familiar with the area. Ecosystem mapping and background research was conducted throughout the winter of 1999-2000. Preliminary field research was conducted in late May, 2000 and June, 2001.

The following report discusses the natural values of the Eigg Mountain-James River study area. The values assessed include: ecological value within a landscape context; representation value; watershed integrity value; outstanding natural features; and wilderness recreation and tourism values.

### **3.0 Ecological Value Within a Landscape Context**

The conservation value of a given parcel of land is influenced by the character and condition of the broader landscape in which it is situated. The following section evaluates the ecological value of the study area in the context of the broader natural landscapes within which it is found, with particular reference to landscape fragmentation and forest age-class distribution in the surrounding region.

### 3.1 Fragmentation Analysis

Fragmentation of natural ecosystems is a key determinant affecting the ecological integrity of natural landscapes, and has been cited as the principal threat to biodiversity in the temperate zone (Wilcove *et al.*, 1986). Progressive fragmentation caused by anthropogenic disturbance results in diminishing patches of 'natural' habitats embedded in a landscape matrix of disturbed, early-successional habitats, or non-habitats. Such early-successional, anthropogenically disturbed habitats often have little value to species which depended on formerly extant, late-successional habitats, or habitats maintained through characteristic natural disturbance regimes. Because of Nova Scotia's long settlement history, there exists today a predominance of early-successional, anthropogenically disturbed habitats, and a paucity of late-successional habitats evolved in accordance with natural disturbance regimes. Consequently, priorities for biodiversity conservation focus on maintaining and restoring networks of late-successional and/or naturally evolved ecosystems (termed 'natural' habitat in this study), their dependent species, and their associated ecological processes.

Fragmentation reduces biodiversity through several mechanisms: the reduction in available natural habitat reduces populations, and potentially entire species; highly segmented and isolated habitat patches inhibit natural movements and diminish dispersal potential; the reduction of habitat results in isolated smaller populations with increased probabilities of extinction; climatic and biotic edge effects further reduce the core area of functional habitat; and, the alteration of natural disturbance regimes leads to long-term changes in biotic communities (Noss and Csuti, 1997).

Roads and other linear developments are one of the most widespread contributors to fragmentation, and they can have a variety of direct negative ecological consequences for both terrestrial and aquatic ecosystems (Trombulak and Frissell, 2000). The density of roads and other linear developments, together with an analysis of remaining patches of natural habitat, serve as good indicators for understanding landscape fragmentation and the ecological value of a particular parcel of land.

As a whole, the region of Pictou and Antigonish Counties is relatively intensely developed, and highly fragmented by roads, power lines, and rail corridors. The density of roads and other linear development by landscape and study area is depicted in Table 1. The South River Low Hills is the most extensively fragmented, with a road/linear development density of 2.7 km/km<sup>2</sup>. By contrast the road density within the Eigg Mountain-James River Crown land area is 0.85 km/km<sup>2</sup>, less than half that of the surrounding Pictou-Antigonish Hills landscape, and less than one-third that of the South River Low Hills.

Maps 2 and 3 illustrate the road density for Landscapes 43, 44, and 45 of the northeastern mainland, and also depict the remaining patches of unfragmented natural habitat based on two thresholds: patches more than 600 m from roads, and patches more than 200 m from roads. The GIS was used to analyze the size distribution of these roadless patches. The interior-to-edge ratio was calculated by dividing the area of each individual patch by its perimeter. Because edge

habitats may contribute to negative effects on sensitive native biodiversity, patches that have a higher interior-to-edge ratio are preferred to patches of equal size with lower ratios. The results of these two analyses are displayed graphically in Figures 1 to 4.

According to the GIS analysis, as of 1990, there were two hundred habitat patches in the three selected landscapes of northeastern mainland Nova Scotia, that were more than 600 m from the

**Table 1: Road/Linear Development Density by Landscape and Study Area in Northeastern Mainland Nova Scotia**

<b>Landscape or Area</b>	<b>Road Density (km/km<sup>2</sup>)</b>
45 - South River Low Hills	2.7
43 - McArras Brook Dissected Coast	2.5
44b - Pictou-Antigonish Hills (Antigonish)	1.9
44a - Pictou-Antigonish Hills (Pictou)	1.8
Eigg Mountain-James River - Crown Land Area	0.85

nearest road or linear development (Figure 1, Map 2; NOTE: Roads in the Eigg Mountain-James River study area have been updated to 2000 with information provided by DNR.). Of these two hundred patches, the two largest were found within the study area, and are denoted as “Eigg Mtn A”, and “Eigg Mtn B”. These two patches are also ranked first and second in interior-to-edge ratio, indicating that they contain the two largest areas of unfragmented habitat within these three landscapes (Figure 2). The next largest area of habitat more than 600 m from roads or linear developments is less than one-sixth the size of the “Eigg Mtn A” patch.

When the analysis was repeated using a 200 m threshold, approximately fifteen hundred patches were identified (Figure 3, Map 3). “Eigg Mtn A” again ranked first in both size and interior-to-edge ratio (Figure 4). “Eigg Mtn B” ranked fourth in area, but again ranked second with respect to interior-to-edge ratio.

The maps and GIS analysis illustrate the significance of the study area as a relatively undisturbed natural habitat. The Eigg Mountain-James River study area is the least fragmented area in the three selected landscapes of the northeastern mainland, and it contains the two largest remaining patches of natural interior habitat. Within the Pictou-Antigonish Natural Landscape, there are only two additional areas of Crown land of similar size, and both of these are highly fragmented by logging roads.



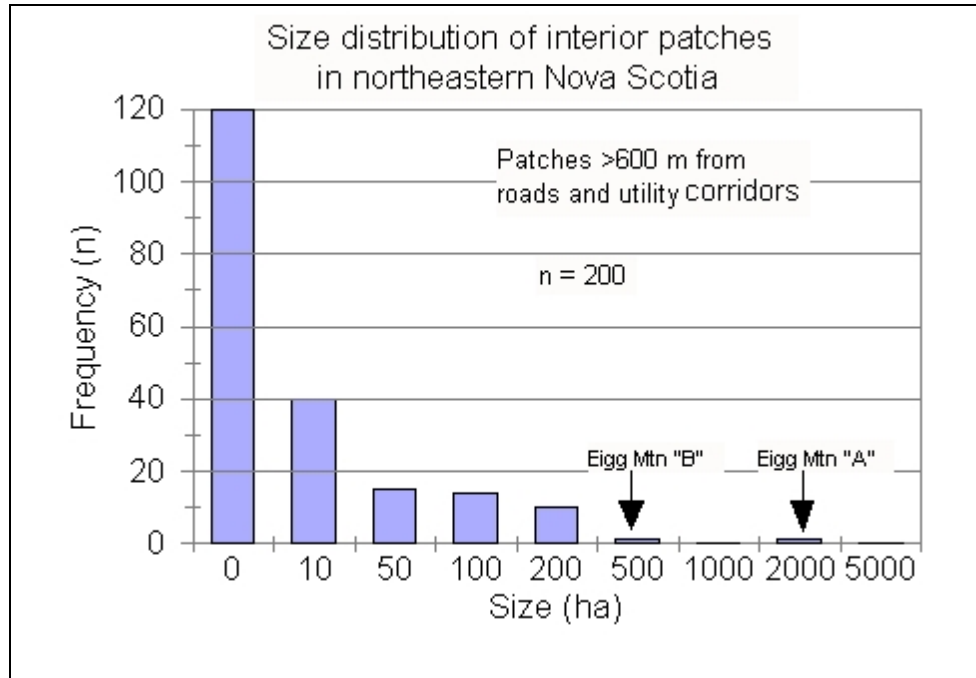


Figure 1: Size distribution of interior patches >600 m from roads or linear developments in selected landscapes in northeastern Nova Scotia.

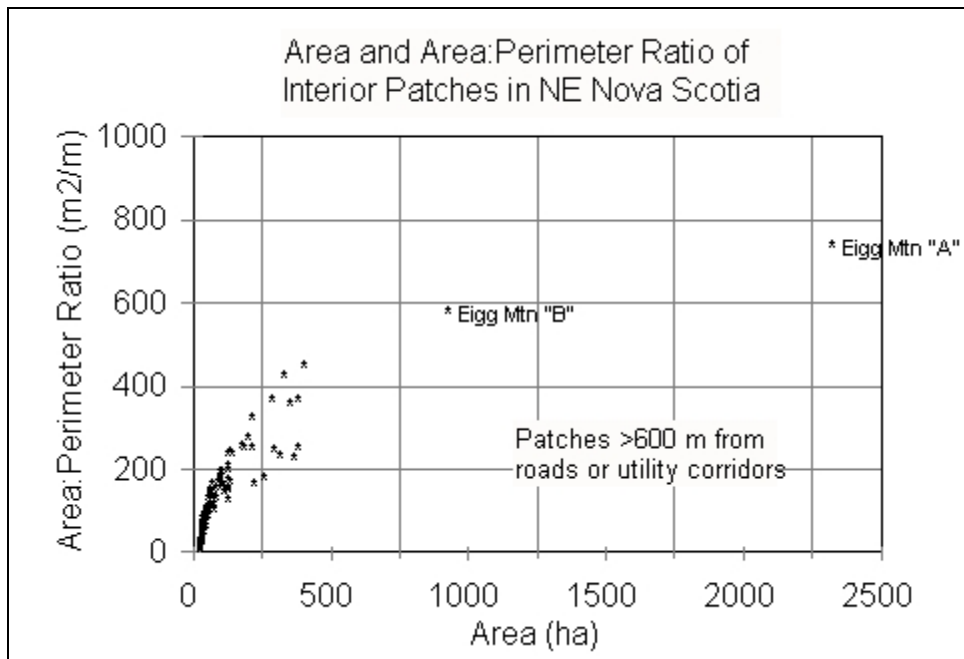


Figure 2: Area and area:perimeter ratio of interior patches >600 m from roads and linear developments in selected landscapes in northeastern Nova Scotia.

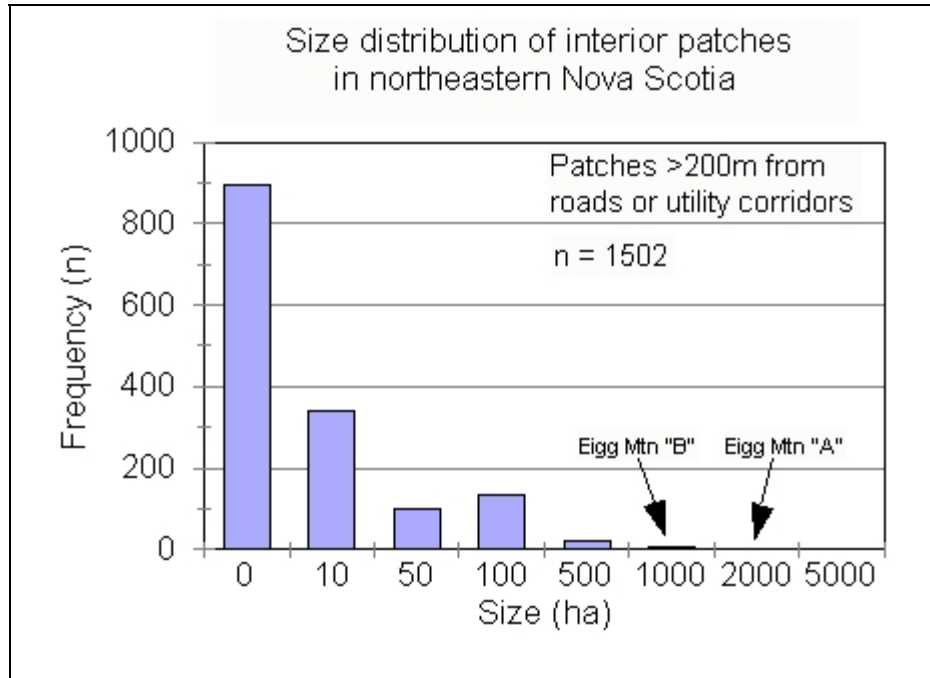


Figure 3: Size distribution of interior patches >200 m from roads and linear developments in selected landscapes in northeastern Nova Scotia.

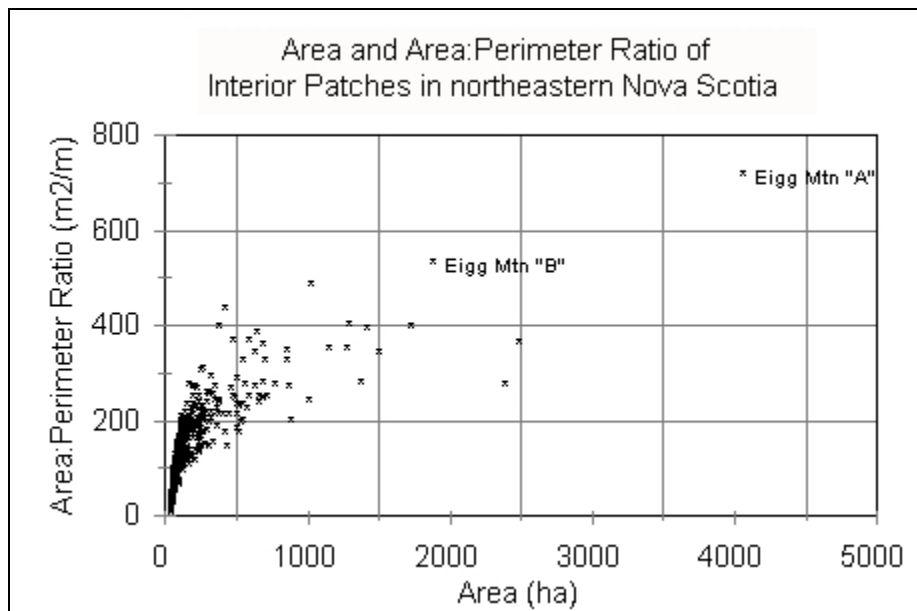


Figure 4: Area and area:perimeter ratio of interior patches >200 m from roads and linear developments in selected landscapes in northeastern Nova Scotia.

### **3.2 Natural Old Forest Analysis**

Map 4 depicts the distribution of forest by age-class in the region. Data were derived from the DNR 1990 forest inventory. According to these data, there are only a few small parcels of land in the region supporting forests more than 80 years in age. The majority of the land is within the 0-20-year age class. There are also large areas of forests between 21 and 60 years in age, but only a few small, scattered areas with stands between 61 and 80 years. There is also a considerable amount of forest classified as “uneven-aged”, some of which may be old and dominated by climax species.

Map 5 illustrates a more detailed view of forest age-class distribution in and adjacent to the Eigg Mountain-James River Crown land area. The Crown land area contains large areas of forest between 21 and 60 years old, and a considerable number of large, uneven-aged stands. The GIS analysis suggests that there are only a few stands in the 61-80-year age class, and only a single stand greater than 80 years of age. However some of the uneven-aged stands may also be old. Old-growth climax deciduous and mixedwood forests in this region would typically consist of trees of all ages due to the fact that natural, large-scale disturbances (that result in even-aged stands) are not a significant factor in forest development. In this regard, forest stands in two ravines within the study area were assessed during reconnaissance field work in May, 2000. Although no tree ages were determined, preliminary observations indicate that portions of both of these sites are at, or approaching an old-growth condition. The Crown land area also includes some forest areas that fall within the 0-to-20-year age class. Most of these areas represent old field forest succession, and succession following recent forest cutting.

This evaluation is based on data that are a decade old, and forest cutting has continued during the intervening period. Within the study area, it is understood that there has been only limited cutting, centered on the few existing roads. Consequently, much of the forest in this area may be a decade older than indicated. It should also be noted that the age estimates used are based on average canopy trees, and may not necessarily best represent the time elapsed since last major disturbance.

### **3.3 Discussion of Landscape Ecological Value**

The preceding review demonstrates that opportunities for maintaining relatively undisturbed, large, core natural areas within the northeastern mainland generally, and the Pictou-Antigonish Hills specifically, are limited. The majority of the region is relatively intensely developed and highly fragmented by roads. The Eigg Mountain-James River study area is the least fragmented natural site remaining within the landscape, Crown and private land included. Within Antigonish County, the Eigg Mountain-James River Crown land area provides the only remaining opportunity to establish a protected area of sufficient size to function as a large natural habitat patch and a forest biodiversity reservoir and refuge.

The study area also represents the most likely and suitable area within the landscape where old-growth forests could recover and develop with undisturbed interior forest conditions. All of the

expected climax species are abundant in the study area, and some of the oldest forests in the northeastern mainland occur there. Forests that are at, or approaching, an old-growth condition have been observed in two ravines on Crown land in the study area. Further road building and industrial development will likely lead to more habitat loss and fragmentation of the landscape, with no large, core areas of natural forest habitat remaining, and a predictable decline in native biodiversity, both in the study area itself and in surrounding, smaller, isolated patches left without a nearby source for recolonization in the event of local extinctions. The remaining natural areas on Crown land in the Eigg Mountain-James River study area therefore possess natural attributes that could contribute significantly to ensuring that old forest biodiversity values are maintained over the long term.

## **4.0 Representation Value**

### **4.1 Physical Topics Description and Representation**

#### 4.1.1 Landscape 44 - Pictou-Antigonish Hills

##### Bedrock Geology

The bedrock geology of the Pictou-Antigonish Highlands consists of a complex assemblage of volcanic, sedimentary, and minor intrusive rocks. Several volcanic and sedimentary sequences are recognized, ranging in age from late Precambrian (~600 million years old) to early Devonian (~400 million years old). Volcanic rocks include sub-aerial and shallow marine basalt and rhyolite flows and tuffs. Sedimentary rocks include fine-grained, clastic rocks interbedded with the volcanic sequences, and a thick sequence of younger, clastic sediments. The rocks record the early development of a sedimentary basin, associated with subduction and island-arc volcanism along an ancient continental margin (Murphy *et al.*, 1991).

The study area includes good representation of the late-Precambrian sedimentary and volcanic rocks of the Georgeville Group. The group is divided into at least eight formations (Murphy *et al.*, 1991). Four of these formations occur in the study area, and include a variety of rock types including siltstone, mudstone, conglomerate, wacke, and basalt. A narrow band of Silurian-age sedimentary rocks of the Beechill Formation (Arisaig Group) occurs within the study area, west of Browns Mountain. This formation consists of fine grained sedimentary rocks, and minor rhyolite volcanics.

The only component of the Georgeville Group with a large areal extent in the landscape that is not represented in the study area is the Keppoch Formation, which consists of a series of volcanics. The Arisaig Group is not well represented. More extensive strata of this Group, consisting of fine-grained, fossiliferous sedimentary rocks, occur in the landscape, and are exposed at Arisaig Provincial Park, on the Northumberland shore, north of Eigg Mountain.

A number of small intrusive rocks are scattered throughout the landscape, the largest being a granite pluton centered around Indian Lake in the headwaters of the Beaver River on the Keppoch Plateau. No intrusive rocks occur within the study area, although a moderately sized granite pluton occurs just south of the Crown land boundary, near James River.

Good bedrock exposures occur along many of the watercourses in the study area, such as the South Rights River, Powers Brook, James River, Knoydart Brook, and Vamey Brook. Outcrops also occur on some of the higher elevations with minimal till cover.

### Surficial Geology and Soils

The majority of the study area is covered by a thin veneer of Antigonish Highland Till. This stony, sand till is composed primarily of igneous, volcanic and metamorphic clasts derived from the underlying bedrock.

A fairly large area in the southeast section of the study area, on the east side of the James River, and north of Briery Brook, is dominated by glacially scoured bedrock, with only thin, discontinuous till cover. A number of glacial striations, indicating a dominant northwesterly flow direction, are recorded from this area (Stea and Myers, 1990). Bedrock is also exposed at Browns Mountain. In the southwestern portion of the study area, from James River west to the county line, surficial materials are primarily residuum (coarsely fragmented, weathered bedrock). The steep slopes, primarily within river ravines, consist of colluvium, including sand, gravel, silt, and talus formed from recent gravity erosion. A small, stratified sand and gravel, ice-contact deposit occurs along the James River west of James River Falls. A number of these ice-contact deposits are scattered throughout the natural landscape, and in places form terraces and kettle topography.

**Table 2: Physical Topics Representation for the Pictou-Antigonish Hills Natural Landscape**

PHYSICAL TOPICS	REPRESENTATION	SCORE
1. Geological Bedrock Types	Yes	2
2. Geological Processes Evidence	Yes	2
3. Glacial Features/Processes	Yes	1
4. Soil Types	Yes	1

0 Not Represented;      1 Well Represented;      2 Moderately Represented;  
 3 Poorly Represented;

The soils of the landscape are almost entirely composed of well-drained Thom soils, with minor constituents of Barney, Gibraltar, Kirkmount, and Cobequid soils. The Thom unit is composed of stony, coarse-textured, well-drained, acidic soils, derived from acidic igneous and metamorphic rocks (Cann and Hilchey, 1954). This soil type is well represented in the study area.

#### 4.1.2 Landscape 43 - McArras Brook Dissected Coast

##### Bedrock Geology

The McArras Brook Dissected Coast Natural Landscape (#43) is underlain primarily by a sedimentary sequence of the late-Ordovician-to-early-Devonian-aged Arisaig Group. The uppermost unit of the Arisaig group is the mudstone- and siltstone-dominated Knoydart Formation. This package is bounded to the southeast by the regional-scale Hollow Fault. In the northwest part of the study area, the Hollow Fault juxtaposes the Knoydart Formation and the late-Precambrian rocks of the Georgeville Group, and defines a prominent linear escarpment which drops away toward the coast to the northwest, from the Eigg Mountain upland area. The landscape boundary between landscapes 43 and 44 approximates, but does not exactly follow, the fault. The Knoydart Formation in the study area consists of fine-grained clastic sedimentary rocks, including siltstone, mudstone, and wacke. There are several exposures of the Knoydart Formation found along Knoydart Brook and its tributaries within the study area. The portion of the study area underlain by the Georgeville group within landscape 43 has representation of the James River Formation, consisting of various clastic sedimentary and volcanic units, and the Maple Ridge Formation, which is primarily mudstone. The remainder of landscape 43 is characterized by various clastic, volcanic and intrusive rocks ranging from early Cambrian to Carboniferous age; these units are not represented in the study area (Keppie, 2000).

##### Surficial Geology and Soils

The surficial geology of the landscape is characterized by a mantle of Eatonville till, and areas of exposed bedrock on the lowlands, and colluvial deposits along the Hollow Fault escarpment, and in the ravines that dissect the upland. Some Antigonish Highland till is present in the northeastern portion of the landscape. The portion within the study area is blanketed with Eatonville Till. A small deposit of ice-contact stratified drift occurs within Knoydart Brook's main tributary, which drains the northwest slope of Eigg Mountain. These are uncommon features in this landscape.

The soils of the McArras Brook Dissected Coast natural landscape consist primarily of well-drained Westbrook, Barney, and Thom soils, and well to imperfectly drained Woodbourne soils. The portion of the study area within landscape 43 contains Thom and Woodbourne soils.

Physical topics representation for the McArras Brook Natural Landscape is poor to moderate because of the small extent of this landscape contained within the study area.

**Table 3: Physical Topics Representation for the McArras Brook Dissected Coast Natural Landscape**

PHYSICAL TOPICS	REPRESENTATION	SCORE
1. Geological Bedrock Types	Yes	3
2. Geological Processes Evidence	Yes	3
3. Glacial Features/Processes	Yes	2
4. Soil Types	Yes	2
5. Coastal Landforms	No	0

0 Not Represented;    1 Well Represented;    2 Moderately Represented;  
 3 Poorly Represented

## 4.2 Ecosystem Description and Representation

### 4.2.1 Landscape 44 - Pictou-Antigonish Hills

There are twelve different ecosystem types delineated within the Pictou-Antigonish Hills Natural Landscape. The distribution of these ecosystems within the study area is illustrated on Map 6. The degree of representation of these ecosystems within the natural, unmanaged Crown land in the study area is summarized in Table 4.

The most common, and best represented ecosystem is the well-drained, tolerant-hardwood-dominated, mixed-wood rolling terrain. This ecosystem covers the majority of the high elevation, rolling upland in the northern and eastern portion of the study area. Several areas within this ecosystem have been harvested and converted to conifer plantations, and therefore its representation value is reduced relative to its potential value. The second-most common ecosystem is the well-to-imperfectly-drained, mixed-forest undulating terrain. This ecosystem occurs over most of the southwestern portion of the study area. As with the previous ecosystem, only moderate representation is achieved under current circumstances because of recent forest harvesting in a significant portion of this ecosystem. Well-drained, tolerant-hardwood-dominated mixed-wood canyons are also fairly common, and moderately represented. This ecosystem would be categorized as well represented if the watershed lands held by the Town of Antigonish were to be considered. Ecosystem 9 is not currently represented; potential representation could only be achieved through ecological restoration of already-harvested lands.

The tolerant hardwood ecosystems are dominated by sugar maple, with lesser quantities of yellow birch and beech. In mixed-wood ecosystems, other hardwood and conifer species also occur. Conifer species are dominated by red spruce, with lesser amounts of balsam fir. Scattered white pine and hemlock, including several large trees, were observed on aerial photographs, and during field reconnaissance. Abundant hemlock and pine regeneration was observed on upper slopes near

the James River canyon. The dominant tree species are the climax species for these forests. Their presence suggests that, if left undisturbed, these ecosystems could evolve into old-growth forest ecosystems.

**Table 4: Ecosystem Representation for the Pictou-Antigonish Hills Natural Landscape**

<b>Ecosystem Name</b>	<b>Representation</b>	<b>Score<sup>a</sup></b>
1. Lakes and Ponds	Yes	3
2. Rivers and Streams	Yes	3
3. Bogs	Yes	2
4. Fens	Yes	2
5. Imperfectly-to-poorly-drained, coniferous-dominated, undulating terrain	Yes	2
6. Well-drained, mixed-wood undulating terrain	Yes	3
7. Well-to-imperfectly-drained, mixed-forest undulating terrain	Yes	2
8. Well-drained deciduous rounded hills	Yes	3
9. Well-drained, deciduous-dominated mixed-wood, broad, flat-topped hills	No, but potential representation if area is restored	0
10. Well-drained, deciduous-dominated mixed-wood canyon	Yes	3
11. Well-drained, tolerant hardwood steep side slope	Yes	2
12. Well-drained, tolerant hardwood-dominated, mixed-wood rolling terrain	Yes	2

a - Score based on “natural”, unmanaged Crown land only (i.e. excludes clearcuts, plantations, and in holdings)  
 0 Not Represented; 1 Well Represented; 2 Moderately Represented; 3 Poorly Represented

#### 4.2.2 Landscape 43 - McArras Brook Dissected Coast

The McArras Brook Dissected Hills Natural Landscape contains nine different ecosystem types. The distribution of these landscapes within the study area is illustrated on Map 6. The degree of representation of these ecosystems within the study area is summarized in Table 5.

Only three of the nine ecosystems are represented within the study area, and these are only poorly represented. These are the well-drained, tolerant-hardwood - red-spruce undulating terrain at the foot of the Hollow Fault escarpment, and the well-drained tolerant hardwood hills that occur northwest of the Hollow Fault. The dominant tree species in these ecosystems are sugar maple and red spruce.



**Table 5: Ecosystem Representation for the McArras Brook Dissected Hills Natural Landscape**

<b>Ecosystem Name</b>	<b>Representation</b>	<b>Score</b>
1. Lakes	No	0
2. Rivers and Streams	Yes	3
3. Bogs	No	0
4. Fens	No	0
5. Imperfectly drained coniferous gently undulating terrain	No	0
6. Well-drained tolerant hardwood-red spruce undulating terrain	Yes	3
7. Well-drained tolerant hardwood hills	Yes	3
8. Well-drained mixed-wood hills	No	0
9. Well-drained tolerant hardwood canyon	No	0

0 Not Represented;    1 Well Represented;    2 Moderately Represented;    3 Poorly Represented

### **4.3 Discussion of Representation Value**

The evaluation of representation value is based largely on the concept that in the absence of potential impacts due to factors such as fragmentation, habitat loss, or introduction of exotic species, a protected area that includes most of the ecosystems of a natural landscape is likely to capture examples of the majority of biodiversity that occurs within that landscape. There may be native species found elsewhere in the landscape that are not included, and for which additional representation, replication, connection, or protection of specific uncommon, rare, or unique ecosystems or habitats may be desirable, but the number of such species should be small.

#### **4.3.1 Landscape 44 - Pictou-Antigonish Hills**

With the exception of one deciduous forest ecosystem that has been modified by harvesting and conversion to a conifer plantation, the Crown land area provides representation for all of the ecosystems found within the Pictou-Antigonish Hills Natural Landscape. Representation of several of these ecosystems would be augmented significantly if private inholdings were to be considered and earlier-harvested areas were restored to a natural forest condition. The largest portion of inholdings is held by the Town of Antigonish, and is designated as a protected water supply area pursuant to the *Environment Act*. Maintenance of the ecological values of these lands would significantly enhance the conservation value of the surrounding Crown land area by creating, in effect, a larger undisturbed core of natural, interior-forest habitat, and improved ecosystem representation.

Rivers and streams are only poorly to moderately represented. Larger rivers, such as the West River and Barneys River, occur within the landscape but are not represented in the study area.

The Eigg Mountain-James River Crown land area has significant representation values, incorporating examples or portions of all but one of the ecosystems found within the Pictou-Antigonish Hills Natural Landscape. This landscape is not currently represented in the existing parks and protected areas system. The significance of the study area is elevated by the absence of other comparable alternatives for the establishment of a representative protected area in the Pictou-Antigonish Hills Natural Landscape. The only other sizable parcels of public land identified within the landscape are managed for forest products, are highly fragmented by roads, and/or are dominated by early-successional forests. The remainder of the landscape is owned by a large number of private landowners, and it is unlikely that a number of individual private parcels could be assembled to establish a protected area with comparable representation value.

In summary, the Eigg Mountain-James River Crown land area provides the best opportunity to protect a representative example of the Pictou-Antigonish Hills Natural Landscape.

#### 4.3.2 Landscape 43 - McArras Brook Dissected Coast

The Eigg Mountain-James River Crown land area provides only poor representation of three ecosystems within the adjacent McArras Brook Dissected Coast Natural Landscape. Representation is limited by the small size of the Crown land area in this landscape. Although only poorly represented, the Crown land area is not insignificant to the protected areas system, as this landscape is not currently represented. There are several slightly larger Crown land parcels northeast of the study area that are within the same landscape. These lands may warrant consideration as areas with potential to provide, or augment ecosystem representation in this landscape.

## **5.0 Watershed Integrity Value**

### **5.1 Watershed Description**

The study area encompasses the headwaters of several watersheds (Map 7), including the James River Protected Watershed, designated pursuant to the *Water Act* in 1988 (the *Water Act* was subsequently repealed in 1995, and its provisions were incorporated into the *Environment Act*), that supplies drinking water to the Town of Antigonish. The Crown land area includes approximately 2480 ha, or 42.5% of this watershed. The study area, including the large internal land holdings owned by the Town of Antigonish, encompasses approximately 3,680 ha, or 63% of the watershed. Most of the remainder is in the lower watershed, downstream of the water supply intake.

Approximately 2120 ha within the study area is in the Powers Brook-South Rights River watershed, comprising 42% of this drainage area, mostly in the upper headwaters. The study area also includes approximately 46% (1110 ha) of the Knoydart Brook watershed, including much of the steep slopes along the Hollow Fault escarpment northwest of Eigg Mountain, and numerous deep ravines.

The James River, and Powers Brook-South Rights River watersheds are part of the larger West River watershed. The West River is one of the region's few healthy salmon rivers, with salmon returns in 1999 exceeding the estimated minimum spawning requirements (Scott, 2000).

All of the watersheds in the study area are characterized by a dendritic drainage pattern of long, winding rivers with numerous tributaries. Most of the watercourses are narrow, and occur within steep-sided, forested ravines and canyons.

## **5.2 Discussion of Watershed Value**

Healthy, undisturbed forest ecosystems can play an important role in maintaining and protecting water quality and quantity within watersheds. The relationship between vegetation cover and water flows in a watershed, and the potential effects of forest road construction and vegetation removal on mobilization of sediment, have been well documented.

Removal of tree cover generally causes increases in total flow and flood flow volumes in streams, and longer low-flow periods. This is due primarily to the reduction in the uptake of water by vegetation, so that instead of water being released into the atmosphere by evapo-transpiration, it is released directly into streams. In addition, soils which have been deforested can be less permeable, which inhibits percolation into groundwater, and results in increased loss of water through runoff (Freedman, 1989) and a lowered water table.

Long-term studies in both hardwood and softwood forests have shown that intensive forest management, particularly clear cutting, can dramatically increase stream flows in the surrounding watershed. Increased flows of up to 50% in hardwood forests and up to 110% in softwood forests have been documented (Huser *et al.*, 1996; Rosen *et al.*, 1996).

These studies illustrate the potentially dramatic effects of upstream harvesting on downstream water flows in streams and rivers. In watersheds such as the West, James, and South Rights Rivers, where land along the lower stretches has been cleared for forestry, agricultural, and urban development, remaining natural forests in their headwater areas play an important role in regulating water flows.

An undisturbed forested watershed is capable of maintaining high-quality water:

“Forest litter protects the soil from raindrop impact and helps maintain high infiltration capacity, so surface erosion is seldom a serious problem in undisturbed forests; tree roots

also help bind the soil mass, greatly reducing the hazard of mass soil movements even on steep slopes.” (Sharpe and DeWalle, 1980).

This is particularly the case for the forests of the Eigg Mountain area, which are dominated by tolerant hardwood and mixed-wood forest types. Natural disturbance regimes in these forest types consist of death of individual trees, creation of single-tree-sized gaps, and replacement of trees within those gaps. These natural processes do not cause significant pulses of nutrient or sediment inputs to surface waters. In this forest type, it is improbable that natural disturbances would include large-scale, stand-replacing disturbances detrimental to water quality.

Although a major portion of the James River watershed is designated as a protected water supply area, at present, forest harvesting, road building, and mining activities may be carried on, subject to approval under the watershed regulations (Appendix A).

The forests in the Eigg Mountain-James River study area encompass significant headwater portions of numerous watersheds. This strategic location in the upper reaches of the watersheds means the Crown land area maintained in a natural, undeveloped condition can play a critical role in regulating water flows to the surrounding region, and in maintaining good water quality.

## **6.0 Outstanding Values**

The following discussion on the outstanding values of the study area is preliminary, as limited field work has been undertaken to date. Further field inventories are required in order to accurately assess potentially unique or outstanding values of the area.

### **6.1 Significant Old Forests**

DEL’s systematic inventory of potentially significant old/unique forests (SOUF), based primarily on searches of DNR’s forest inventory database, identified two small, potential old forests on Crown land in the study area: one small spruce stand in the ravine of James River; and one small mixed climax coniferous-deciduous stand in the headwaters of Knoydart Brook, north of Eigg Mountain.

Air-photo interpretation, conducted as part of this study, identified an area of mature-to-early-old-growth, tolerant-hardwood-dominated mixed-wood forest within the James River canyon below James River Falls (Map 8). This old forest site appears mostly as uneven-aged stands in the provincial forest inventory (Map 5). Preliminary field observations in the area immediately upstream of the James River reservoir confirmed this characterization as evidenced by uneven-aged, tolerant hardwood forests with scattered large trees, and abundant coarse woody debris. These forests support a rich moss and lichen flora, and several lichen species indicative of old-growth forests were identified (Keith and Lynds, 2000). Potentially old-growth, tolerant hardwood forests were also observed on Crown land in the canyon of the South Rights River.

These forests have a multi-layered canopy, with scattered very large trees, and abundant coarse woody debris.

The majority of the study area is dominated by climax forests that have the potential to evolve into an old-growth condition. Most of this area is dominated by tolerant hardwoods, with a smaller portion being climax coniferous species (predominantly red spruce, with some balsam fir, eastern hemlock, and white pine), and mixed wood.

## **6.2 Significant Ecosites**

The air-photo interpretation conducted during this review identified four significant ecosites within the study area (Map 8). These include the old, tolerant-hardwood-dominated, mixed-wood canyon along the James River as discussed above; an open, tolerant-hardwood floodplain forest along the South Rights River; an uncommon fen in the headwaters of the James River; and an uncommon dwarf-treed bog in the headwater divide between the James River and the South Rights River watersheds.

Reconnaissance field work was conducted in the James River and South Rights River sites in May, 2000, and confirmed the presence of potentially old-growth climax forests in these sites. Protected Areas staff also noted a relatively species-rich and diverse amphibian fauna in the South Rights River canyon, with abundant egg masses, adult frogs, and tadpoles observed in small ponds and backwaters along the floodplain. Appropriately-timed field work is required to more fully assess the significance of these ecosites. Field work may also help to identify additional significant ecosites that are not readily apparent on air photos.

## **6.3 Rare or Uncommon Species**

There have been no comprehensive floral or faunal inventories conducted in the study area. There are no known occurrences of rare flora.

The only known recent faunal evaluations of the area were a moose survey conducted by DNR in 1995, and a preliminary freshwater mussel survey of Vincent's Lake conducted in 1999 (M. Pulsifer, pers. comm.). According to DNR staff, the Browns Mountain-Eigg Mountain-Maple Ridge area is an important habitat for moose. There is some evidence to suggest that moose in this area declined during the 1980's and '90's but are relatively stable at present. There is also evidence to suggest that moose densities have declined in Antigonish County coincidentally with the rapid proliferation of logging roads and logging over the past two decades (Pulsifer and Nette, 1995). On mainland Nova Scotia, moose is designated as a species-at-risk by DNR, indicating that it is, or may be, at risk of extirpation. The study area forms part of one of the three largest remaining concentration areas for moose in mainland Nova Scotia (along with the Cobequid Mountains and the Tobeatic). It is recognized that forest disturbances which produce abundant, palatable, early-successional vegetation in relatively small patches (i.e., within approximately 200 m of mature forest cover; T. Snaith, pers. comm.), such as some wildfires, insect defoliations, and

small-scale logging, can benefit moose in terms of food supply. However, logging, particularly larger-scale clearcutting and road proliferation, can also cause habitat loss for moose, through loss of thermal cover and increased accessibility of roaded areas to humans. Increased accessibility has been postulated to exert negative influences on moose through increases in human predation and disturbance. Research currently underway at Dalhousie University suggests that low road density is the most significant correlate of Moose presence in mainland Nova Scotia at the present time (T. Snaith, pers. comm.).

Most forest birds that breed in Nova Scotia have been observed in the study area (K. McKenna, pers. comm.). No work has been undertaken to determine whether the study area functions as a refuge for area-sensitive or forest-interior bird species, or as a reservoir from which recolonization of smaller, isolated forest patches may occur.

#### **6.4 Significant Earth History Features**

The variety of rock types, and the abundant exposures that occur throughout the river ravines, offer good opportunities for the interpretation of the geological history of the Pictou-Antigonish Hills. Similarly, surficial deposits associated with ravines of the James River and South Rights River are potentially of interest for natural history interpretation. Outcrops and landforms in association with other wilderness values are significant from a wilderness recreation perspective, because they provide the potential for field-based, descriptive, informative interpretation of observable features to the lay person.

#### **6.5 Discussion of Outstanding Values**

The above section documents the known outstanding or unique features of the Eigg Mountain-James River study area, based on available information and limited field work. Additional field work is required to more fully evaluate the significant features that have been identified. Field investigations may also reveal additional outstanding or unique features within the study area.

### **7.0 Wilderness Travel/Nature Tourism Values**

#### **7.1 Significant Recreation Resources**

The Protected Areas Branch inventory identified much of the study area as having significant recreational values (Map 8). The most important sites include the ravines of the major rivers, including the James River, the South Rights River, Knoydart Brook, Powers Brook, and East

Doctors Brook, and the high upland along the prominent Hollow Fault escarpment northwest of Eigg Mountain. This escarpment provides commanding views overlooking the Northumberland Strait and adjacent lowlands. The small area of Crown land adjacent to Vameys Lake was also identified in the lake frontage category.

The study area contains good potential for wilderness hiking and backpacking. Both day trips and overnight options could be developed, providing a range of hiking experiences, including forest trails through deep, shady river canyons, waterfalls, and rapids, broad, rounded deciduous hills, and flat, coniferous habitats on the highest uplands. The elevation of the study area provides many opportunities for panoramic views of the surrounding landscape.

## **7.2 Existing Recreational Use**

The Eigg Mountain-James River study area is known for its outdoor recreational values. The Cutie's Hollow trail, which extends from Browns Mountain to the James River Falls, is described in the book *Hiking Trails of Nova Scotia* (Haynes, 1995). Old roads and cart tracks leading from the coast of the Northumberland Strait are also popular routes used for hiking up to the Eigg Mountain area.

The Eigg Mountain area is also a popular mountain biking location. Trails are described in two recent guide books (Brown and deGooyer, 1996; Hale and Bishop, 1999). The most popular route follows old cart tracks and dirt roads up Doctors Brook to Maple Ridge, Eigg Mountain, and then back down along Knoydart Brook. It follows the "Old Trunk Road", and several modern logging roads, through the former settlement areas of Maple Ridge and Dunmaglass.

The study area is a popular location for bird watching and natural history appreciation, and members of the Pictou County Naturalists reportedly use the area for these purposes.

The study area is also a popular area for hunting. The Browns Mountain Sporting Club is located within the study area, approximately 1 km west of the James River Falls. Trails used by ATVs extend from the camp to Marshy Hope, and along portions of the James River.

The Eigg Mountain area was settled by Scottish immigrants from the Isle of Eigg. By the late 1800s there were at least six families living in the vicinity of Eigg Mountain (Brown and deGooyer, 1996). Remnants of their old farmsteads can still be seen in this area, and are features of interest for recreational users.

## **7.3 Recreational Value in a Regional Context**

The significance of the Eigg Mountain-James River study area as a publicly accessible wilderness recreation area is related to the surrounding regional context. Within the region, there are no large parks or protected areas where wilderness recreation can be pursued. Land tenure in the region is

dominated by small private holdings (65% of Pictou and Antigonish Counties), for which there is no certainty of availability for public recreational purposes.

There are only 4 provincial parks in Pictou County, and 7 provincial parks in Antigonish County. Together these 11 parks total approximately 1010 ha, representing 0.23% of the area of the two counties. These eleven properties include six wayside (picnic) parks, 3 outdoor recreation parks, and 2 natural environment parks. The single largest existing protected area in the two counties is Pomquet Beach Provincial Park (311 ha).

The wayside parks are established primarily for the convenience of the travelling public, and provide limited recreational opportunities (Arisaig has a 1.6 km interpretive trail). The remaining 5 parks include 4 beach parks with opportunities for coastal walking. Only Beaver Mountain Provincial Park includes developed hiking trails, and these are of short duration, totaling just six kilometers. Pictou County also contains 66.8 km of publicly owned, abandoned rail lines that are intended for use as trails, although these do not offer wilderness recreation opportunities.

**Table 6: Existing Provincial Parks in Pictou and Antigonish Counties**

<b>Park</b>	<b>Class<sup>1</sup></b>	<b>Area (ha)</b>	<b>Recreational Opportunities</b>
Arisaig	WS	27.5	1.6 km trail; picnic; interpretation
Bayfield	WS	3.55	beach
Beaver Mountain	OR	133.02	picnic, 6 km of hiking / ski trails
Pomquet Beach	NE	311.2	beach
Caribou-Munroes Island	NE	251.35	picnic, beach
Greenhill	WS	9.31	picnic
Melmerby Beach	OR	101.17	beach
Powells Point	WS	27.11	picnic
Rushtons Beach	WS	25.5	picnic, beach
Saltsprings	WS	27.3	picnic, camping
Waterside Beach	OR	94.7	beach

<sup>1</sup> WS - wayside; OR - outdoor recreation; NE - natural environment

Publicly-secured wilderness recreation opportunities presently available to residents of Pictou and Antigonish Counties, and visitors to the area, are limited. There are a number of coastal beach sites and walking opportunities, but very limited woodland trail opportunities. There are no designated public land opportunities for rigorous day hiking, extended back-country hiking and camping, or back-country skiing. There are no publicly-secured woodland recreational areas with wilderness character.



Although the distribution, quality, and adequacy of wilderness recreational opportunities varies across the province, only Pictou, Antigonish, Hants and Lunenburg Counties are without existing designated protected areas suitable for wilderness recreation. In most other regions of the province, existing or potential wilderness recreational opportunities are available within designated provincial wilderness areas or National Parks.

Interest in nature-based tourism has increased over the last decade, both amongst Nova Scotians and tourists visiting from out of province. Attracting tourists seeking nature and wilderness experiences has been an important element of numerous regional economic development strategies, and several communities in the province have entered into, or are contemplating, partnerships to develop wilderness recreational opportunities within designated wilderness areas. Currently, similar opportunities do not exist in Pictou and Antigonish counties. Attractive scenery is highly valued by the touring public, and therefore protecting key areas in their natural condition is a fundamental tourism strategy.

The Eigg Mountain-James River Crown land area offers high-quality woodland and wilderness recreational opportunities. The area's proximity to the towns of Antigonish, Pictou, and New Glasgow, the region's main population centres, enhances its value as a publicly-owned wilderness recreational resource. The predominance of tolerant hardwood forests in the study area also makes it a significant asset for the increasingly-important fall colour season. There are no other comparable areas of large, relatively undisturbed, publicly-owned land in Antigonish County with good potential for wilderness recreation.

## **8.0 Summary**

This preliminary report establishes that the Eigg Mountain-James River study area possesses significant ecological and wilderness recreational values.

The ecological value of the study area, which comprises a large patch of relatively undisturbed natural habitat, is perhaps most important in the context of the landscape setting within which it occurs. Natural patches, where fragmentation and anthropogenic disturbance are minimal, are essential to the maintenance of biodiversity. However, the degree of disturbance and fragmentation across landscapes in the northeastern mainland is extensive. The Eigg Mountain-James River study area is the only sizable and relatively intact natural area remaining in this part of the province.

The landscape representation value of the study area is also good. Most of the ecosystems within the Pictou-Antigonish Hills Natural Landscape occur in the study area. The physical topics (geology) associated with the landscape are also fairly well represented. The natural landscape is unrepresented in the existing protected areas system, and the Eigg Mountain-James River Crown land block is the best, relatively undisturbed example of this landscape, in an ecological condition

that is suitable for conservation purposes. Minor representation of the McArras Brook Dissected Coast Natural Landscape can also be achieved in the study area.

The study area incorporates a large portion of the James River Protected Watershed. The relatively undisturbed condition of the majority of the study area helps to ensure high quality water, which supplies the Town of Antigonish.

There are several unique or outstanding natural features found in the study area. Significant ecosites include early old-growth, mixed-wood forests in the James River canyon, tolerant-hardwood floodplain forests, and uncommon fens and bogs. The moose is the only species-at-risk documented to date in the study area, and the Eigg Mountain-James River study area is considered to be important habitat for moose. Remaining moose populations in mainland Nova Scotia appear to be associated with areas of low road density and appropriate habitat.

There is currently no publicly designated land capable of supporting wilderness recreation in Pictou and Antigonish counties. The study area has value as a wilderness recreation resource, and it appears to represent the best, and perhaps only, opportunity to secure a relatively large and undisturbed natural area for wilderness recreation and tourism in these two counties.

Based on this preliminary assessment, the Eigg Mountain-James River study area merits further consideration as a candidate for protection.

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Appendix A: Regulations Respecting the James River Protected Water Area