KEPPOCH-BEAVER MOUNTAIN RECREATION AREA

ENVIRONMENTAL STUDY REPORT

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EXECUTIVE SUMMARY

The aim of development is to modify a site or region for a particular purpose. With this aim comes the risk of impacting natural cycles and habitat. The development of any natural landscape for human use will have some impact on landscape hydrology and habitats for nonhuman species. Sites being developed for recreational use in particular are often places that present high sensitivity to disturbances. The purpose of this project is to determine which areas of the Keppoch – Beaver Mountain Recreation Area in Antigonish County, Nova Scotia, are the most and least suited for both general development (the development of permanent structures such as buildings and roads) and multi-season recreational uses (trails and other recreational infrastructure).

This project was completed using the environmental planning method. It involved three stages: inventory of landscape attributes, analysis of landscape conditions, synthesis to identify areas best or least suited for development, and recommendations for these areas. Development suitability was defined according to the landscape's sensitivity to disturbance, as follow:

- High sensitivity to development (not suitable)
- Moderate sensitivity to development
- No sensitivity (opportunity for development)

From this, recommendations for the most appropriate locations for development were made. It was found that the landscape's suitability for recreational use varies widely according to the intensity of the recreational use and the season in which it takes place. Recommendations were made for general development, as well as for high and low impact recreational use during winter, and the spring, summer and fall.

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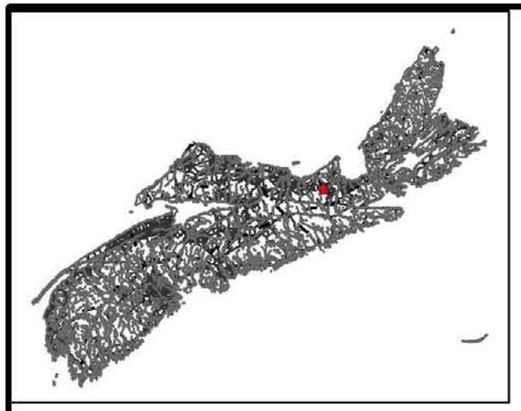

ANTIGONISH COUNTY

PICTOU COUNTY

N

W E

S

Legend

- Road
- Coastline & Water Features
- County Boundary
- Environmental Study Area Boundary

LOCATION MAP

KEPPOCH - BEAVER MOUNTAIN RECREATION AREA

ANTIGONISH COUNTY, NOVA SCOTIA

Map created by:

Plan 4001 - Fall 2006 Dalhousie University

Adrian Buckley
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Erica Chisholm-Keith
Natalie Seniuk

Date created : November 2006

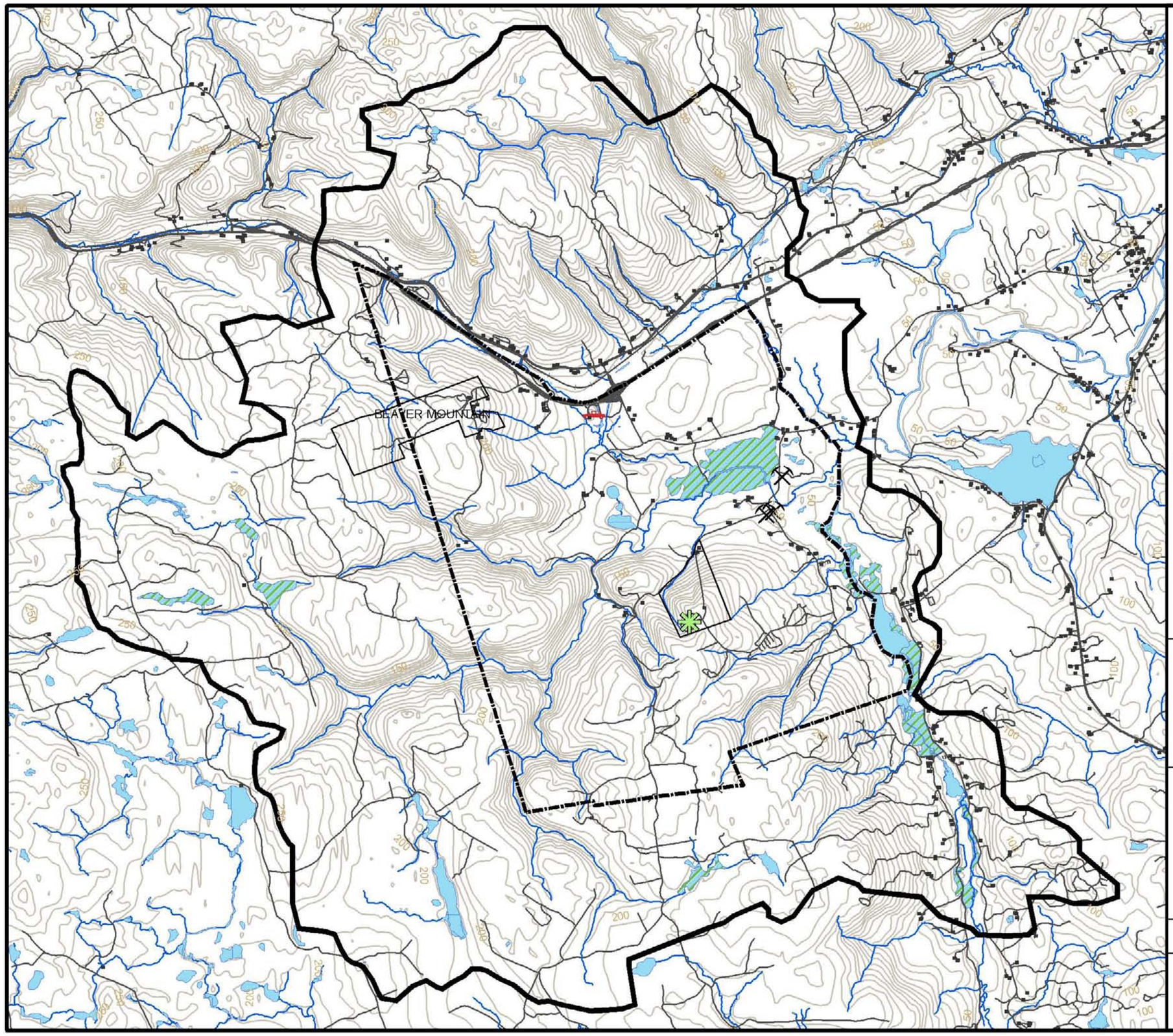
Scale 1 : 250 000

0 2 4 8 12 16 Kilometers

Location

Nova Scotia Topographic Database, Data Locator [electronic file]. ArcMAP. 1:10 000. Service Nova Scotia and Municipal Relations. 2004.

Significant Species and Habitats Database, [electronic file]. ArcMAP. Nova Scotia Department of Natural Resources. 2006.



N
W E
S

LEGEND

- Contour Line (interval = 10m)
- Building
- Railroad Line
- Arterial Road
- Collector Road
- Local Road
- Environmental Study Area Boundary
- Keppoch-Beaver Mountain Recreation Area Boundary
- Gravel Quarry
- Keppoch Ski Hill
- Race Track
- Water Course
- Water Body
- Wetland

BASE MAP

KEPPOCH - BEAVER MOUNTAIN RECREATION AREA

ANTIGONISH COUNTY, NOVA SCOTIA

Map created by:

Plan 4001 - Fall 2006 Dalhousie University

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Natalie Seniuk

Date created : November 2006

Scale 1 : 55 000

0 0.5 1 2 3 4 Kilometers

Base

Nova Scotia Topographic Database, Data Locator [electronic file]. ArcMAP. 1:10 000. Service Nova Scotia and Municipal Relations. 2004.

Significant Species and Habitats Database, [electronic file]. ArcMAP. Nova Scotia Department of Natural Resources. 2006.

INTRODUCTION

The Keppoch-Beaver Mountain Recreation Area Environmental Study is the group studio assignment for the Bachelor of Community Design Environmental Planning Honours program at Dalhousie University, Fall 2006. The purpose of the class is to provide students with an applied context for landscape analysis, while helping to fill a real need identified by a community. The Municipality of the County of Antigonish is the client providing this opportunity, and Dr. Patricia Manuel, of the School of Planning, is the supervising instructor. The Keppoch-Beaver Mountain Recreation Area is special to many people for its beauty and rural residential character. It is a sensitive environment for the very reasons that make it attractive to recreation, thus presenting a unique and interesting learning and planning opportunity.

The future of the Keppoch-Beaver Mountain Recreation Area is one of change and new opportunities. It is a proposed venue in the Municipality of the County of Antigonish`s bid for the 2011 Canada Winter Games. Winter recreation is therefore one of the themes within this project. Long-term multi-season and multi-purpose recreational plans also are being proposed for the area. Furthermore, the Municipality currently is developing a municipal planning strategy and land-use bylaw for on the area.

A number of studies, including a business plan concept, results of public consultation, and background analysis are available for The Keppoch-Beaver Mountain Recreation Area. These studies, however, do not specifically address environmental issues. A background analysis, prepared by Dalhousie University School of Planning graduate students Brad MacDonald and Amber Nicol during the summer of 2006, provided a strong foundation from which this project could grow. The Municipality of the County of Antigonish desired a more detailed and environmentally oriented landscape analysis for use in planning the Keppoch-Beaver Mountain Recreation Area.

Two boundaries are used in this project. The first is the smaller *planning area* (also referred to as the Keppoch-Beaver Mountain Recreation Area) as delineated by the Municipality. It consists of Highway 104 to the north, the St. James River to the east, the crown land boundary to the south, and the Pictou County – Antigonish County boundary to the west. The second is the larger *environmental study area*, delineated by tributary watersheds of the St. James River.

GOALS AND OBJECTIVES

The purpose of this project is to create an environmental inventory and analysis with recommendations to help guide multi-season recreational development in the area. In combination with other considerations for culture, healthy living, and education, this document will help to inform land use decisions. The goal of this project is to identify the opportunities and constraints presented by the natural environment, in order to protect more sensitive areas and take advantage of less sensitive ones, when developing the land. To ensure that the goals of the Municipality are balanced by goals that will preserve the sensitive characteristics of the landscape and maintain a high quality of life, three objectives were adopted to guide the research, analysis and recommendations for the project: water resource protection, sensitive habitat protection and recreation.

Water Resource Protection

One of the greatest concerns of residents in the area is water quality and quantity. An objective of this project was to consider how any development could affect water, and make the appropriate recommendations for its protection. Water systems are easily disturbed by human actions. Decisions regarding land suitability for development take into account the susceptibility of various landscape structures and conditions to disturbance and the impact that such disturbance could have on local hydrology. Areas which would degrade if directly disturbed include features such as lakes, streams, major gullies, wetlands, groundwater recharge areas and sensitive aquatic habitats. Areas immediately adjacent to these features in which disturbance could impact the quality of the hydrologic feature or habitat are highly sensitive.

The surface hydrology in the Keppoch- Beaver Mountain study area has a number of highly sensitive features. Water drainage from the western slopes flows through steep-sided gullies and through ravines deeply incised by streams. These areas are very susceptible to erosion, especially when the riparian zones (lands adjacent to a stream corridor) are altered by loss of vegetation or other disturbance. Gullies guide and regulate overland flow, and contain variable amounts of water with the seasons. Wetlands in the area are important for water retention and filtration and also are valued habitat lands.

Freshwater systems can be threatened by a number of things. Sedimentation is the accumulation of eroded materials in waterways, which can change aquatic habitat and affect water quality. Erosion control is the best way to prevent sedimentation and erosion, and it can be achieved by maintaining natural vegetation. Vegetation slows the entry of overland runoff into streams and traps sediment and nutrients carried in the overland flow. Steep slopes of any soil type or moderate slopes with coarse textured soils are prone to erosion when disturbed. Stream crossings are points of sedimentation and other pollution and should be kept to a minimum.[1]

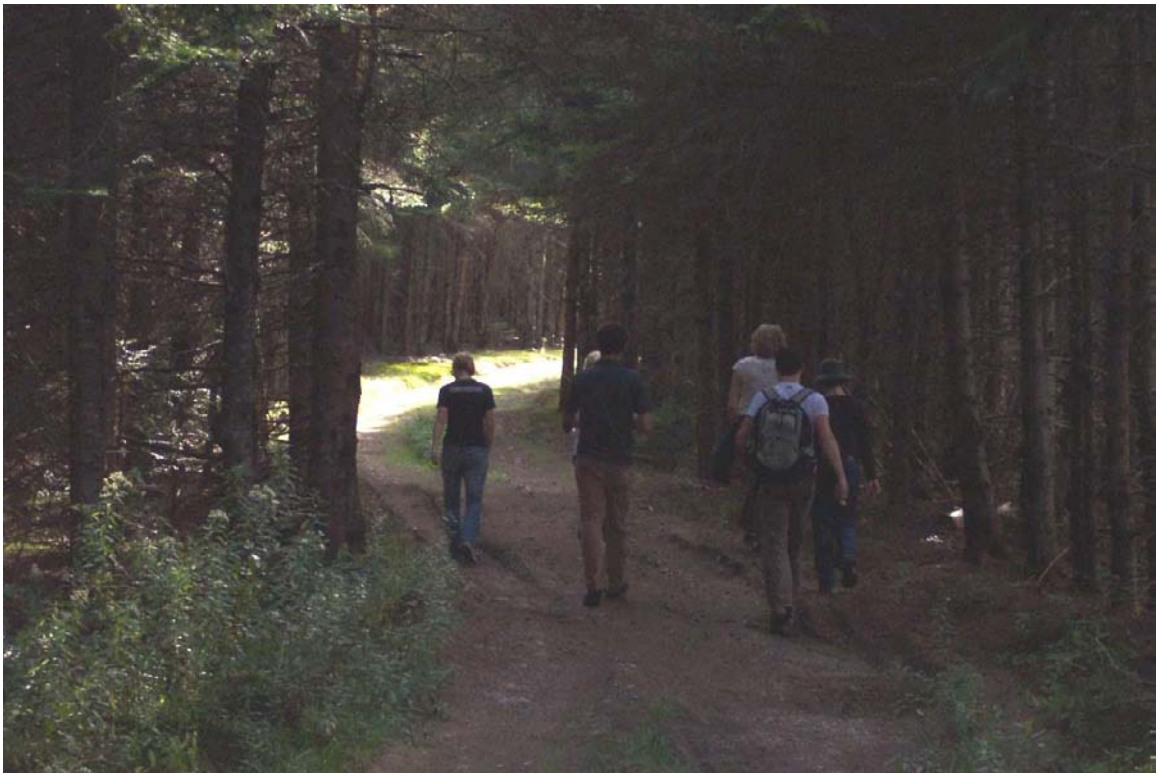
Sensitive Habitat Protection

The area is attractive for recreational use in part because of the rich wildlife community that exists here. There are a number of endangered or at risk species that have habitat within the area. Residents and visitors enjoy sharing the environment with these species, and want them to remain. An objective of this project is to protect the sensitive habitats of the area in the interest of recreational enjoyment and the survival of these species.

Recreation

There is great potential for recreational use in the area. An objective of this project is to consider the possible impact of recreational use, as well as the opportunities presented and the best locations for it. The objective was considered in the context of year-round recreation, the redevelopment of Keppoch Mountain Ski Hill, and the development of a link between Keppoch Mountain and Beaver Mountain.

APPROACH AND METHOD



Environmental Planning

Recreational use and general development suitability within the Keppoch-Beaver Mountain study area was mapped using the environmental planning overlay technique, facilitated by ESRI ArcGIS. Environmental planning arose in the late 1960s as a response to pollution and destruction of the natural environment. It is the process of making decisions about human land use based on the opportunities and constraints of the natural landscape. The environment is the central consideration directing land use decision making, rather than social, cultural or political factors.[2] The method has three stages:

- environmental inventory
- analysis
- synthesis and recommendations

The method of environmental planning was applied to this project using electronic mapping tools with the assistance of the Dalhousie GIS Centre. Data collection was done through a number of governmental electronic map data providers. These included the Nova Scotia Department of Natural Resources, Mineral Resources Branch Digital Products, and Service Nova Scotia and Municipal Relations. The Geographic Information System (GIS) ESRI ArcGIS version 9.1 was the primary tool used to view, organize, and analyze the spatial data. General terrain, vegetation, habitat and land use inventory mapping, as well as analysis and synthesis interpretations used ArcMap and ArcEditor. ArcHydro was used for delineating drainage patterns. The Spatial Analyst tool was used for mapping slope and slope aspect.

Data sources included:

- GIS databases and paper maps detailing topography, wildlife habitat, geology, soils, land and resource use, and land ownership.
- Reports specific to recreation planning.
- Consultation with an Area Advisory Committee member, staff at the Municipality of the County of Antigonish and the regional wildlife biologist with the Nova Scotia Department of Natural Resources Regional Division.
- Site visits.

The overlay method, also referred to as opportunities and constraints mapping, was first developed by Ian McHarg in his book *Design with Nature*[3]. It is a process of identifying and combining correspondences between features of the environment that support or constrain a specified land use. Features are mapped separately to represent 'layers' of the landscape, and include terrain, landscape materials, hydrology, micro-climate conditions, vegetation and habitat lands, and land use and valued cultural features. These features, either alone or in combination, affect landscape suitability for, or sensitivity to, development, always with reference to a landscape performance standard.[4] For this project, the landscape performance standard was the protection of landscape hydrology (water quality and quantity) and the protection of valued habitat lands.

Levels of constraint or opportunity are defined for each feature. These features are then looked at alone and in combination, as the interrelationship of attributes may create outcomes that are not apparent when considered individually. For example, on their own slopes greater than 25% are highly sensitive to disturbance. Moderate slopes of coarse texture soils are also highly sensitive to disturbance. Defining the conditions of constraint and opportunity for each feature is referred to as the 'rules of combination' method (Appendix B). These rules are mapped for each feature thereby creating new attribute layers that are the tools for the overlay method. These layers are viewed and interpreted in combination to identify constraints and opportunities that arise from combinations of conditions. Recommendations for land use decisions are formed according to these opportunities and constraints.

The environmental planning overlay method provides a holistic interpretation of the landscape to identify areas of opportunity for the specified land use while avoiding areas that are sensitive to disturbance. Development opportunity or development sensitivity can change depending on the land use, and the environmental planning method is used to guide planning and development for many types of land use. In this project it was used to guide the goals of recreation planning.

Recreation Planning

Recreation planning is concerned with the allocation, development and use of the landscape for recreation purposes. It can direct uses that are very informal and require very little, if any, infrastructure, through to highly organized and supported activities. The goal of recreation planning is to create a fun and challenging environment for recreational users, but also to minimize the impacts that recreational activity has on the natural landscape. Nature protection is a priority of recreational trail development[5] because those areas that are attractive for recreation also tend to be the most sensitive. Hence, the environmental planning method is well-suited to recreation planning purposes.

The recreation interest in this project is multi-season high and low intensity recreation activities. The focus is primarily on trail development to accommodate hiking, cross-country skiing, snowshoeing, bicycling, ATV riding and snowmobiling. The Keppoch-Beaver Mountain Recreation Area also supports downhill skiing, and recreation planning and development for this area includes expanding the infrastructure to re-develop this popular activity. Trails and ski hill infrastructure have different site requirements and place different pressures on landscape structures and processes. Ski hill infrastructure is considered in the analysis as `general development`, which includes the construction of permanent structures and residential or commercial style development. This means that the same rules of combination cannot be used for analyzing recreation and general development.

Project Method

This project was completed using a combination of the environmental planning and recreation planning methods. The attributes that often make a natural recreation area attractive and challenging (steep slopes, lakes and streams, old growth forest) are sometimes the same features that make an area highly sensitive to general development. A balance between conflicting interpretations of the landscape for general development and for recreation development had to be struck. Consequently, two categories of analysis were required.

The first analysis is referred to in this document as a general development analysis. It allows identification of areas that can support the development of permanent structures, as well as areas that are sensitive to disturbance from permanent structures and should be avoided. This analysis is also used to identify areas that can support expansion of the existing ski hill infrastructure and related activities (see Table 2, pg.32).

The second analysis is the recreation analysis. Two documents directed this analysis: The Nova Scotia Trails Federation *Trails Construction Manual*[6] and *So You Want to Build an All Terrain Vehicle Trail*[7] from the Wisconsin Department of Natural Resources. The Nova Scotia Trails Federation site inventory and analysis method uses the same principles as environmental planning. It differs in the definition of site suitability criteria, most notably slope. It employs a more lenient interpretation of development on steep slopes than is usually employed in general development interpretation. Table 1 illustrates the difference between slope suitability criteria for general and recreational development.

Table 1 - Slope Categories for General Development and Recreational Use

DEVELOPMENT SUITABILITY	GENERAL	RECREATIONAL	RECREATION CHALLENGE
Flat Suitable	0-3%	0-5%	Easy
Gentle Slope Suitable	3-8%	5-10%	Easy to Moderate
Moderate Slope Conditionally Suitable	8-15%	10-15%	Moderate
Steep Slope Not Suitable	15-25%	15-25%	Challenging
Very Steep Slope Not Suitable	25%+	25%+	Very Challenging

The multi-season, multi-use recreational focus for the study area required separate interpretations pairing seasonal conditions and use intensity. One set of interpretations focused on winter conditions, the other on the spring, summer and fall environments. Furthermore, activities of different use intensities were taken into consideration. High-impact activities like ATV riding, mountain biking (summer to fall) and snowmobiling (winter), were differentiated from low impact activities like hiking (summer to fall) and cross-country skiing and snowshoeing (winter). The result is four recreation analyses: high impact winter recreation, high impact three season recreation, low impact winter recreation, and low impact three season recreation (see tables 3-7, pg.34-36).

In general, recreation opportunities are those features that make a recreation area attractive and challenging. These include landscape attributes such as views and vistas, water features, and attractive or unusual vegetation. Challenge is found in rugged terrain, steep slopes, and cliffs. Constraints are those features that make an area sensitive to recreation development, such as erodable or dangerous slopes, sensitive stream crossings, delicate or rare habitat, and hazardous or uncomfortable climatic conditions. Occasionally, as noted above, interesting and challenging environments can be sensitive to disturbance.

The general categories for opportunities and constraints reflect landscape sensitivity to disturbance:

- High Sensitivity (Serious Constraint to Development) - Features or areas of the landscape that cannot tolerate disturbance or development without significant environmental implications. Disturbance to these areas will detrimentally affect water quality and quantity or available habitat for valued or rare and endangered species.
- Moderate Sensitivity (Moderate Constraint to Development) - Features or areas of the landscape that might tolerate disturbance or development if carefully controlled, or areas for which disturbance will have some environmental impact. Without controls and post-development remediation, disturbance to these areas can detrimentally affect water quality and quantity or available habitat for valued or rare and endangered species.

- No Significant Sensitivity (Opportunity for Development) - Features or areas of the landscapes that can support disturbance and development without adverse environmental effects. Disturbance to these areas will not detrimentally affect water quality and quantity or available habitat for valued or rare and endangered species. These areas may also afford particular development opportunities for specified land uses.

Areas of opportunity and constraint for general development and recreational use were used to create recommendations maps (see figures 3-12). Depending on the type of development, these maps illustrate the areas and corridors within which development might occur.

STORY OF THE LAND

The Keppoch-Beaver Mountain Recreation Area is 35 square kilometers, and is located 13 kilometres southwest of the Town of Antigonish in Antigonish County, Nova Scotia. The area is part of the Pictou-Antigonish Highlands of Nova Scotia. The rural community of Keppoch in and surrounding the recreation area has a population of approximately 300 people.[8]

The Keppoch-Beaver Mountain Recreation Area is defined by upland slopes in the west and south-west, and by agriculture in low-lying areas in the eastern sections. The area includes two small lakes (the Cameron Lakes), and a major river (the St. James). The site also includes Keppoch Ski Hill (currently closed), Beaver Mountain Provincial Park, a competition stockcar racetrack (the James River Speedway), several small communities, and numerous roads (primarily unpaved) and trails.

The area is a geologically ancient and complex landscape. The highly folded and faulted metamorphic and igneous rocks of the uplands and slopes are erosion resistant, while softer sedimentary rocks underlie the lowland valley.[9] The south-western upland area is comprised of very hilly terrain, marked by steep slopes (over 20%) cut by stream valleys and gullies. The uplands are covered by well to excessively drained soils that have developed from coarse glacial tills. These coarse soils are highly erosion prone when not protected by a vegetative cover.[10]

Steep slopes are dominated by hardwood stands, within which small patches of old growth and potential old growth forests can be found. The broad uplands are dominated by coniferous stands of spruce and fir. The forest cover is in various stages of succession due to past logging operations. The forestry industry remains active in the area. The summits of Keppoch and Beaver Mountains are both approximately 240 meters in elevation, are flat and broad, and include water collection areas in the form of wetlands and bogs. Many streams emerge from these upland collection areas. The uplands also provide a habitat for the endangered mainland moose, northern goshawk and bald eagle. This especially scenic portion of the area is popular for hiking, cross county skiing, mountain biking and some forms of motorized recreation.

The Cameron Lakes, located near the centre of the study area, are a central feature for area residents. They are the largest and most significant water bodies in the study area, and are valued for their water quality. Numerous streams flow into the Cameron Lakes from the higher terrain located on the western portion of the study area. Activities centered on the lakes include swimming, boating, and fishing. These lakes provide a habitat for the common loon, and various species of fish. The Cameron lakes are a study site for researchers and students at nearby St. Francis Xavier University. The forest surrounding the lakes is dominated by hardwood stands.

The Cameron Lakes drain to Beaver Meadow, a large wetland that serves as the main collection and filtration area for water in the area. The wetland has been used as pasture and livestock grazing for many years, and has lost much of its natural character. Agricultural use also occurs in the low areas along the St. James River and around Beaver Meadow. This use is supported by the gentle slope and sedimentary geology of the lowlands. The lowlands are covered with fine outwash till and fluvial deposits, which lead to the loamy, and comparatively fertile, moderately-drained soils. Some sites in these low lying areas are used for small-scale aggregate mining operations. The lowlands offer habitat for wintering deer and the short-eared owl but also present opportunities for recreational uses in the forms of walking and cycling which extend into the upland areas.

INVENTORY

Slope and Elevation

The terrain of the Keppoch-Beaver Mountain study area consists of hills, upland plateaus, steep slopes, deeply incised valleys, and broad lowland flood plains. Areas of high elevation to the west, as well as low areas to the east are relatively flat to gently sloping. In contrast, areas adjoining the relatively flat highland and lowland areas are composed of steep slopes. Elevation ranges from 250 metre plateaus in the northwest to 30 metres in the St. James River valley. This change in elevation occurs over a distance of approximately 4 kilometres.

(See Slope and Elevation maps, appendix A-1, 2, 3)

Geology

The Keppoch-Beaver Mountain study area is part of the Pictou-Antigonish highlands. The highlands have an ancient and complex geology revealing a history of mountain building, erosion, inundation by the sea, and glaciation. The study area also has a major fault that divides Nova Scotia into two geological groups that are fundamentally different from one another, the Avalon and Meguma Zones. These zones were different land masses that came together during the Devonian Period.[11]

The western and north-western upland areas are dominated by the Upper Precambrian Georgeville Group. This group of rock is characterized by a variety of huge igneous structures (basalt, granite) in folded and faulted metamorphic rock (slate). Smaller intrusions of fine grained igneous rock are also located in the north-eastern and south-western areas of the watershed. These intrusions are believed to be the necks of ancient volcanoes.[12]

The low-lying regions along the western portion of the watershed are dominated by the Lower Carboniferous Windsor Group. These rocks consist mainly of sedimentary rocks such as sandstone, mudstone, gypsum and limestone, and are rich with minerals such as salt and anhydrite.[13] Sedimentary rocks are much less resistant to weathering, and have been eroded over time. (See Geology map, appendix A-4)

Surficial Geology

The highlands of the Keppoch-Beaver Mountain study area are dominated by a stony till plain consisting of a shallow stone and sand mixture which is derived from both local and distant bedrock sources.[14] Fragments of rock were picked up by glacial action, and then released from melting ice sheets. The stony till plains are characterized by rapid drainage, susceptibility to erosion, and shallowness. Some valleys and areas of the lowlands are composed of colluvial deposits, a finer mixture of glacial deposits that moved as a result of down slope creep along steep slopes.[15]

The low-lying land near the eastern border of the study area is dominated by deposits left by streams flowing from glaciers. These deposits consist of gravel and sand, and are generally finer than deposits in the uplands. There are also some areas of stone, sand, and mud deposited by post-glacial streams. Areas closer to headwaters are coarser grained, while floodplains are composed of finer sediments.[16] (See Surficial Geology map, appendix A- 5)

Soil

The soils in the Keppoch-Beaver Mountain study area can be divided into two general areas: the lowlands and highlands. The lowland soil is typically well drained silty loam, derived from glacial or river (alluvial) deposits. There is one dark silty loam (Stewiacke) that is well suited to agriculture. The highlands account for a larger portion of the area, and are dominated by coarser sandy loams. All are derived from glacially deposited metamorphic rock materials. Relative to the lowlands, the highlands are stony, shallow, erode easily and drain excessively. There are also areas in the centre of the study area where bedrock is exposed.[17] (See Soils Map, appendix A-6)

Surface Hydrology

The Keppoch-Beaver Mountain study area watershed boundary represents the high points which divide areas of water flow and collection. Generally, water flows from the hilly terrain in the west and north-western areas to the eastern lowlands where it is collected in two main areas: Beaver Meadow and St. James River.

Headwater areas are found in the upland plateaus located in the south-western area of the watershed. Being largely flat, over land flow is slow in these upper plateaus, as well as within the lowlands to the northeast. Wetlands (fens, marshes, and bogs) form within these upper plateaus and lowland areas, and serve as water collection points. From the highland plateaus water moves slowly by way of gullies toward the steep slopes, where water flows faster and with increasingly defined direction. The steeply sloped areas are the main transportation corridors within the watershed. Water flow here is dendritic but modified by fault lines.

Once water reaches the lowland area the gradient changes abruptly. Streams flowing from the uplands discharge into three main areas: the Cameron Lakes (which feed the Beaver Meadow wetland), the Beaver Meadow wetland, and the St. James River. This wetland serves as the main water retention and filtration agent in the study area. (See Surficial Hydrology map, appendix A-7)

Microclimate

Most of the Keppoch-Beaver Mountain study area is north or east facing. The face of Keppoch Ski Mountain is north-west facing, as well as the highland area behind the ski hill. Plateaus and the St. James River valley are flat and receive even illumination year round.

Winds blow predominantly from the south or southwest in the summer. In the winter months the predominant direction is from the west and northwest.[18] These winter wind directions are roughly parallel to many of the steep valleys, causing the wind to channel and making these areas cooler. The same is true for slopes which face north or east. These areas also tend to be cooler during the summer because they are shaded by tree cover and sheltered from the warmer wind currents. (See Microclimate map, appendix A-8)

Vegetation

The main natural vegetation communities within the Keppoch-Beaver Mountain study area are forest stands, cultivated fields, abandoned old fields, barren areas, and wetlands. There are also several clear cut areas where recent forestry operations have occurred. Forest stands contain hardwood, softwood, and mixed-wood trees. Several of these stands contain old, and potential, old growth trees.

The hardwood stands in the study area are comprised mainly of red and sugar maple and yellow birch species. These stands usually are found in well drained, coarse textured soils in the upland plateaus of the study area.

Mixed-wood stands in the study area are comprised mainly of red spruce, white spruce and balsam fir softwoods with white birch. These stands are primarily found in well drained, coarse textured soils on slopes along rivers and streams throughout the study area.

Softwood stands in the study area are comprised mainly of black spruce, white spruce and white pine species. These stands usually are found in well-to-poorly drained, coarse and medium textured soils in the lowland areas around the Cameron Lakes and Beaver Meadow.

Cultivated fields are areas of human disturbance and continual maintenance in the landscape; they represent residential and agricultural land uses and occur mainly in lowland areas below the Keppoch and Beaver Mountains around the Cameron Lakes and St. James River.

An old growth stand of yellow birch and sugar maple grows upon a ridge in the upland plateau in the south-west corner of the planning area. The stand is over 110 years of age with trees exceeding 17 metres in height.

A potential old growth stand of spruce trees grows immediately west of the Pictou-Antigonish County line, south of Beaver Mountain. The stand is over 60 years of age with trees exceeding 15 metres in height.

Clear cut areas are where forestry operations recently have removed commercially harvestable trees from the landscape. These areas are scattered throughout the study area.

Abandoned old field sites, primarily in the lowland areas, signify past human cultivation of the land in which regeneration of the forest community is occurring. Alder and brush growth precedes encroachment by conifers and early-succession hardwoods during this regeneration.

Barren areas are sites of exposed bedrock, or top soil that is too thin to support the growth of forests. These areas occur throughout the study area. (See Vegetation map, appendix A-9)

Significant Habitat

The Keppoch-Beaver Mountain study area contains habitats that are (and potentially are) ideal for several species considered sensitive. A sensitive species is one that can only thrive in a particular habitat, and if its habitat is damaged, the species will have great difficulty surviving. There are four species of concern in the study area: mainland moose, white-tailed deer, the northern goshawk, and short-eared owl.

The habitat for mainland moose is primarily on the upper elevations of the Pictou area of the study boundary. Antigonish and Pictou County wildlife biologists interpret the mainland moose habitat differently. Consequently, moose habitat is scattered throughout the Antigonish side of the study area whereas all of the Pictou County side is identified as habitat.

White-tailed deer are very adaptable. They share much of the same habitat with the mainland moose, but are more readily found closer to human civilization and not exclusively in places of higher altitude. Deer wintering habitat, which is of primary concern, occupies the heavily wooded ravines between Beaver and Keppoch Mountains.

The northern goshawk favors heavily wooded areas and does not fly high.[19] The greater part of the highland territory and the wooded area near the Cameron Lakes is ideal habitat.

Old fields and areas of low brush are ideal habitat for short-eared owls.[20] The owl is found in two concentrations in the lowland portion of the study area. One is in Beaver Meadow, the second within the fields along the St. James River. (See Significant Habitat map, appendix A-10)

Significant Land Use

Corridors – Roads, Trails and Utility Lines

There is a significant network of formal and informal roads and trails through the Keppoch-Beaver Mountain study area. The major road is the 104 Trans Canada Highway, running west-east along the northern boundary of the planning area. Just north of Highway 104 runs a west-east rail line, and to the south runs a major power corridor. Old Beaver Road is the most significant local paved road. It exits the highway adjacent to the James River Speedway and continues to the east along Beaver Meadow. Most of the other roads and informal trails throughout the study area are dirt or gravel covered, including the Keppoch Ski Hill access road. Many of the dirt and gravel roads are logging roads which run into the interior. They follow gentle slopes between major stream valleys, slowly winding uphill in order to access the upland plateaus. Currently, there is no direct road or trail connection between Keppoch Mountain and Beaver Mountain Park, the two major recreation destinations in the area.

Settlement Patterns and Communities

Prior to the Great Depression, the Keppoch-Beaver Mountain study area was populated by family farms. Many of these farms have been abandoned over the years and replaced by residential hamlets with year-round residents, many of whom commute between the Keppoch area and the Town of Antigonish.[21] Houses are loosely clustered into small communities in the lowland areas. One of these communities is located adjacent to agricultural land by Beaver Meadow. Other communities are situated along the ravine at the base of the Keppoch Ski Hill, around the Cameron lakes, and adjacent to the farms on the banks of the St. James River. The most concentrated development in the study area is located along the local road north of Highway 104.

Natural Resource Uses

Natural resource use in the Keppoch-Beaver Mountain study area is based on renewable natural resources and primarily involves agriculture and forestry. Agricultural activities are scattered throughout the study area, with the largest pastures located in the north and north-eastern lowlands, Beaver Meadow, and along the south-east portion of Saint Josephs Road. Much of the pasture land borders the riparian zone of the St. James River, extending to the river edge. Agricultural activities include dairy and beef livestock grazing and pasturing, a hobby farm with sheep, berry operations, and maple stand sugaring. There are also numerous small scale vegetable gardens on residential lots.

Forest cutting occurs throughout the area on both leased provincial and private land. The forest cutting that occurs along both sides of Keppoch Road covers a relatively small area of private land, but is a complete clear cut. Provincial land in the study area is leased to an industrial forest company and covers a much larger area. The upland plateaus contain areas of selectively cut land.

Industrial

Two quarries operate in the eastern section of the study area along Saint Josephs Road, west of the St. James River. These operations are mining of sand and gravel deposits that underlie the area. One is located near the base of Keppoch Mountain.

Recreational

There are diverse recreational activities that take place in the Keppoch-Beaver Mountain study area. They are widespread and take advantage of the winding roads, timber roads through wooded areas, trails, lakes and streams. Residents and visitors from the Antigonish region hike, bird watch, mountain bike, fish, hunt, swim, boat, snowmobile, ride ATVs, cross country ski, and snowshoe in the area. Many of these activities are informal and occur on unmanaged land.

Beaver Mountain Provincial Park is the most structured recreation facility within the study area. In addition to access roads, parking areas, washrooms and picnic sites the park offers groomed trails for hiking in summer and cross-country skiing in the winter. Although it is not currently in operation, the Keppoch Ski Mountain is lightly managed; vegetation along the ski runs is cut back and access is maintained in anticipation that the hill will operate again in the near future.

Commercial

Commercial activity in the study area is limited. There is an auto body shop, a small scale wood-working operation, a hobby shop and the James River Speedway. (See Significant Land-Use map, appendix A-11)

ANALYSIS

Potential development in the Keppoch-Beaver Mountain Recreation Area takes many forms. The environmental impacts are not always the same, especially in the context of recreation development. General development differs from recreational use, and the effects on the environment also differ between seasons, activities, and type of recreation.

Analysis has been undertaken for two main types of use. The first is general development, and the second is recreational use. Recreational use has been divided into four categories: low impact winter use, low impact three season use, high impact winter use, and high impact three season use.

The landscape features which were used to analyze the study area have been divided into three main categories:

- Hydrology – these are landscape features that relate to water within the study area, including lakes, streams, wetlands, gullies, riparian areas, and flood prone areas.
- Terrain – these landscape features include slope, slope aspect, geology, soils, and microclimate
- Habitat and Vegetation – these landscape features include significant species habitat as well as vegetation.

The matrices used to make decisions relating to landscape sensitivity can be found in appendix B. These outline all of the rules of combination considered in detail. The following tables outline the decisions made according to general development and the four types of recreational development.

Table 2 - General Development

This analysis assesses landscape features in terms of their sensitivity to general development. General development includes the construction of permanent structures such as roads and buildings.

HYDROLOGY	**High sensitivity**	Lakes, streams, gullies, wetlands Riparian and lakeshore habitats	These hydrological features are very important to water quality and quantity, as well as providing habitat for many species of animals and plants. Lakes, streams and gullies transport water, while wetlands filter and store it.[22] Development within these sensitive areas can lead to water contamination, reduced flows, channel erosion and loss of species.[23] The areas immediately adjacent to these features are also highly sensitive, and are protected by the Nova Scotia provincial legislative standard of a 20 metre management buffer for slopes up to and including 20%.[24]
	Moderate sensitivity	Lakes, streams, gullies, wetlands Riparian and lakeshore habitats Flood prone areas and potential floodplains	The areas between 20 and 30 metres from highly sensitive hydrological features are moderately sensitivity. The protective management buffer is therefore extended for two reasons. Firstly, farther from the feature the environment is less sensitive to impact. Secondly, there is considerable debate surrounding hydrological buffer zones. Recommendations range as high as 83 metres.[25] These areas are considered part of the stream system. They can be hazardous to development, just as development is detrimental to the flood prone area.[26]
TERRAIN	**High sensitivity**	Slopes greater than 15%.[27]	This designation is a general policy for environmental planning. Any slope greater than 15% requires significant reshaping of terrain by cut, fill and potential blasting. Alteration of slopes leads to deforestation, erosion and alteration of drainage.[28] Any development that requires a right-of-way should be constrained to 15%, since no roads should be developed on slopes greater than 15%.

TERRAIN cont…	**High sensitivity cont…**	Exposed bedrock	Construction on exposed bedrock requires blasting, which can affect both surficial and ground water quality and quantity.[29]
		Folds and fault lines	These are commonly ground water recharge zones, especially in regions with impervious igneous bedrock. Construction on these areas can have consequences for water quality and quantity.[30]
	Moderate sensitivity	Slopes of 8- 15%	This designation is a general policy for environmental planning, as these slopes require careful construction. Some reshaping of slopes by cut and fill is required, and deforestation, erosion and alteration of drainage are all potential disturbances. [31]
		Stewiacke soil on slopes up to 15%	These silty soils on relatively flat land constitute the best areas for agriculture, and should therefore be maintained for this use.[32]
		Fine grained soils on slopes up to 3%	These are water retention areas and help to control water quality and quantity. If these areas are developed, surficial water flow may increase causing erosion.[33]
		Coarse grained soils on slopes up to 3%	These are areas where soils absorb water and are potential ground water recharge areas. Development on these areas may lead to decreased infiltration, and drying of soils.[34]
		Alluvial and glaciofluvial deposits on slopes up to 3%	These are areas where water is absorbed and are potential ground water recharge areas. Development on these areas may lead to decreased infiltration.[35]
		Colluvial deposits on slopes greater than 15%.	When deforested, these areas are susceptible to severe erosion.[36]

TERRAIN cont…	**Opportunity**	Slopes of 3-15%	Providing that no other sensitivities to disturbance have been identified within this slope range, the environment has a low sensitivity to disturbance.
VEGETATION/ HABITAT	**High sensitivity**	Deer wintering area moose, goshawk, and short-eared owl habitats Potential and Old Growth Forest	These are areas where wildlife lives and should be exempt from development because such activity could result in loss of species. Wildlife is an important ecological, cultural, recreational and educational feature of the area.[37] Old growth forests are essential to the natural forest diversity of the province, have significant cultural meaning and are important habitats for interior woodland species.[38]

Table 3 - High Impact Winter Recreational Use

This analysis assesses landscape features in terms of their sensitivity to winter recreational use. This includes high impact activities such as snowmobiling.

HYDROLOGY	**High sensitivity**	Lakes, streams, gullies, wetlands Riparian and lakeshore habitats	These hydrological features as well as their riparian habitats are very important to water quality and quantity, as well as providing habitat for many species of animals and plants. Lakes, streams and gullies transport water, while wetlands filter and store it.[39] Disturbance and destruction of these sensitive areas can lead to water contamination, reduced flows, channel erosion and loss of species.[40] The areas immediately adjacent to these features are also highly sensitive, and are protected by the Nova Scotia provincial legislative standard of a 20 metre management buffer for slopes up to and including 20%.[41]

TERRAIN	**Opportunities**	All terrain	Due to ground freeze and snow cover, terrain features have a low sensitivity.
VEGETATION/ HABITAT	**High sensitivity**	Deer wintering area moose, goshawk, and short-eared owl habitats	These are areas where wildlife lives and should be exempt from high impact recreational uses because such activity could result in loss of species due to habitat destruction as well as noise pollution. Wildlife is an important ecological, cultural, recreational and educational feature of the area.[42]

Table 4 - Low Impact Winter Recreational Use

This analysis assesses landscape features in terms of their sensitivity to winter recreational use. This includes low impact activities such cross-country skiing.

HYDROLOGY	**Opportunity**	Lakes, streams, gullies, wetlands Riparian and lakeshore habitats	Due to ice cover, ground freeze, and snow cover, these features have a low sensitivity to disturbance in winter. They also offer enjoyable recreational opportunities such as skating, ice fishing and cross county skiing.
TERRAIN	**Opportunity**	Microclimate All terrain	Land shielded from open exposure to north winds. Due to ground freeze and snow cover, terrain features have a low sensitivity
VEGETATION/ HABITAT	**High sensitivity**	Deer wintering area moose, goshawk, and short-eared owl habitats	These are areas where wildlife lives and should be exempt from low impact recreational use. Loss of species could occur as a result of habitat destruction as well as noise pollution. Wildlife is an important ecological, cultural, recreational and educational feature of the area.[43]

Table 5 - High Impact Three Season Recreational Use

This analysis assesses the landscape features in terms of their sensitivity to high impact recreational use during the spring, summer and fall. This includes high impact activities such as ATV riding and downhill mountain biking.

HYDROLOGY	**High sensitivity**	Lakes, streams, wetlands, and gullies Riparian and lakeshore habitats Flood prone areas and potential floodplains	These hydrological features as well as their riparian habitats are very important to water quality and quantity, as well as providing habitat for many species of animals and plants. Lakes, streams and gullies transport water, while wetlands filter and store it.[44] Development within these sensitive areas can lead to water contamination, reduced flows, channel erosion and loss of species.[45] The areas immediately adjacent to these features are also highly sensitive, and are protected by the Nova Scotia provincial legislative standard of a 20 metre management buffer for slopes up to and including 20%. [46] These areas are part of the stream system. They can be hazardous to development just as development is detrimental to the flood prone area.[47] High impact recreational use as well as development of infrastructure for such activities is detrimental to these areas.
	Moderate Sensitivity	Lakes, streams, gullies, wetlands Riparian and lakeshore habitats	The areas between 20 and 30 metres from highly sensitive hydrological features are moderately sensitivity. The protective management buffer is therefore extended for two reasons. Firstly, farther from the feature the environment is less sensitive to impact. Secondly, there is considerable debate surrounding hydrological buffer zones. Recommendations range as high as 83 metres.[48]
TERRAIN	**High sensitivity**	All slopes greater than 15% Fine soils on slopes greater than 5%	These slopes are sensitive to high impact three season development.[49] Infrastructure development adversely affects slope stability.[50] These fine-grained soils are generally silty and loamy,[51] and demand extra care when used by

			ATVs.[52]
TERRAIN cont…	**Moderate sensitivity**	Slopes of 5-10%	These slopes may require protective measures to prevent erosion.[53]
		North or east facing slopes over 5%	All are likely to be saturated with water due to lack of sunlight. Saturated soil is both difficult for ATV drivers and is sensitive to high impact use. These areas are not well suited for development because they will likely require extensive remediation.[54]
	Opportunity	Slopes up to 5%	Areas where slopes are below 5%, especially those that face south and west, are generally drier, allowing them to be more stable against high-impact usage.
VEGETATION/ HABITAT	**High sensitivity**	Moose, goshawk, and short-eared owl habitats	These are areas where wildlife lives and should be exempt from high impact use because it could result in loss of species due to habitat destruction as well as noise pollution. Wildlife is an important ecological, cultural, recreational and educational feature of the area.[55]
		Potential and old growth forest	Old growth forests are essential to the natural forest diversity of the province, have significant cultural meaning and are important habitats for interior woodland species.[56]

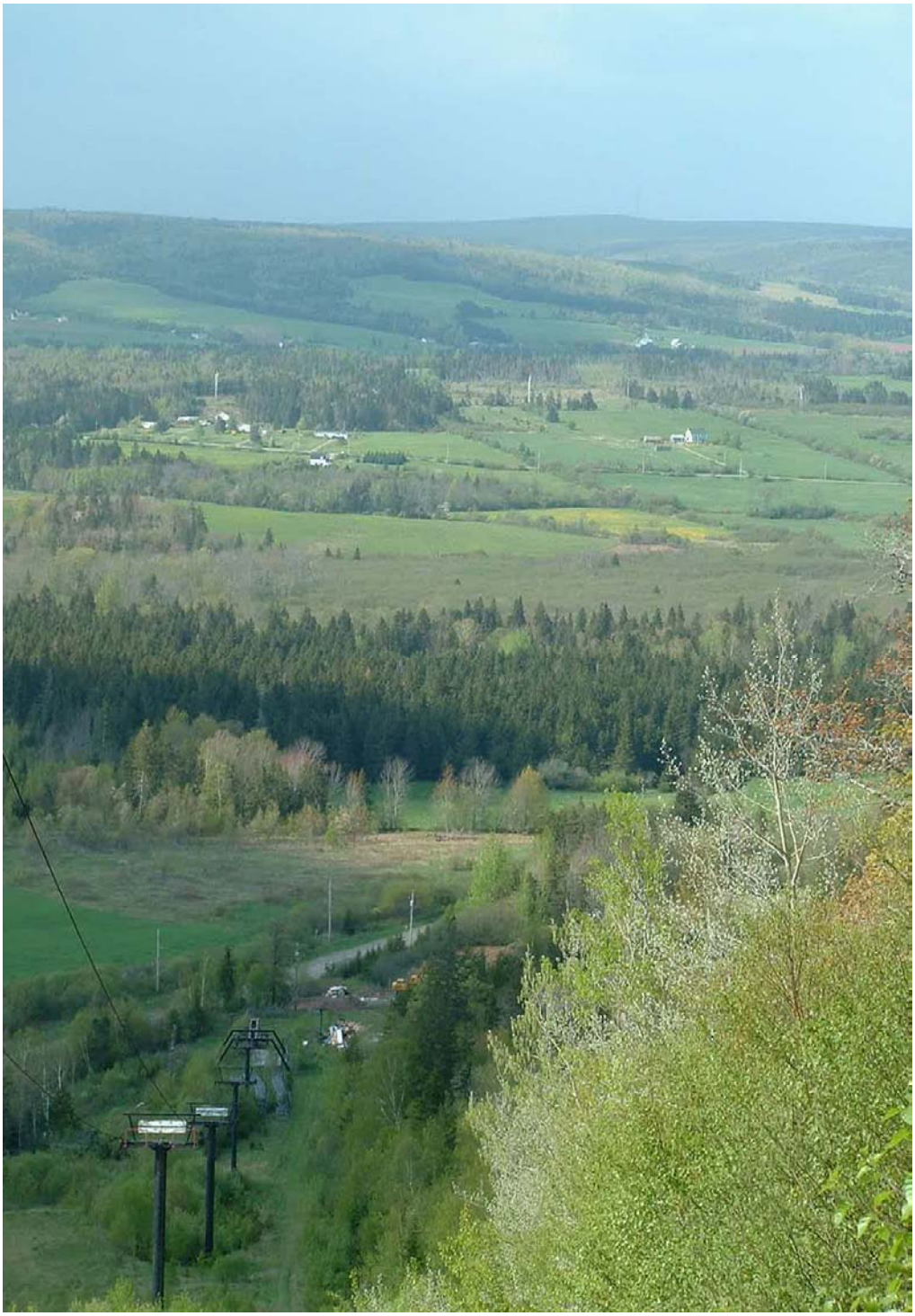
Table 6 - Low Impact Three Season Recreational Use

This analysis assesses landscape features in terms of their sensitivity to low impact recreational use during spring, summer and fall. This includes low impact activities such as hiking.

HYDROLOGY	**High sensitivity**	Lakes, streams, gullies, wetlands bordered by slopes greater than 5%	All slopes over 5% within 20 metres around wetlands, streams, lakes, and gullies. It becomes difficult to build boardwalks and other structures that mitigate environmental impact on slopes greater than 5%.
	Moderate sensitivity	Lakes, streams, gullies, wetlands	The areas between 20 and 30 metres from highly sensitive hydrological features are moderately sensitivity. The protective management buffer is

HYDROLOGY cont…		Riparian and lakeshore habitats	therefore extended for two reasons. Firstly, farther from the feature the environment is less sensitive to impact. Secondly, there is considerable debate surrounding hydrological buffer zones. Recommendations range as high as 83 metres.[57]
TERRAIN	**High sensitivity**	Cleared or barren land combined with coarse soils on slopes greater than 25%	Areas where these three features coincide are unsuitable for recreational use and construction because they are highly susceptible to erosion.[58]
	Moderate sensitivity	Slopes greater than 25% combined with coarse soils	This designation is a general policy for environmental planning, as these slopes require careful construction. Some reshaping of slopes by cut and fill is required, and deforestation, erosion and alteration of drainage are all potential disturbances.[59]
		Cleared south or west facing slopes greater than 25%	These slopes have a heightened risk of erosion in the summer; the sun could cause them to dry out.
	Opportunity	Slopes of 3-25%	Providing that no other sensitivities to disturbance have been identified within this slope range, the environment has a low sensitivity to disturbance.
VEGETATION /HABITAT	**Moderate sensitivity**	Deer wintering area moose, goshawk, and short-eared owl habitats	These are areas where wildlife lives and should be exempt from development because such activity could result in loss of species. Wildlife is an important ecological, cultural, recreational and educational feature of the area.[60]

SYNTHESIS AND RECOMMENDATIONS



General Development

The purpose of the general development synthesis is to identify areas of sensitivity (constraints to development) and opportunity for the development of buildings and infrastructure. It includes the impact of the structures themselves, as well as the practices used to prepare the land and construct them. The results of the general development synthesis can be referred to in Figure 3.

Approximately half of the Keppoch-Beaver Mountain study area presents a high sensitivity to general development. One quarter of the area is moderately sensitive to general development, and one quarter presents no significant sensitivity to the disturbances of general development. The majority of the highly sensitive land is located in the central and western portions of the study area, in the upland slopes and plateaus. This pattern is due largely to significant moose and deer habitat. Other highly sensitive areas are scattered throughout the study area, and are mainly because of water features, as well as old growth forest, steep slopes or geological constraints.

Areas of moderate sensitivity occur throughout the eastern lowland section of the study area and surround the locations of high sensitivity in the middle of the study area. Areas of moderate sensitivity are places with important bird habitat, flood prone areas, or soils that combine with other factors to create a high risk of erosion. Almost all of the land along the St. James River is moderately sensitive to development.

Areas of opportunity that can most easily handle disturbances of general development occur in the eastern lowlands of the study area; generally where commercial and residential development already exists. Areas that are recommended for general development are based on these opportunities and constraints. Areas recommended as opportunities for general development are highlighted in green and they pose no significant risk to the health or sustainability of the environment. Areas of moderate sensitivity to development may be developed but with local government policies and agreements ensure the health and sustainability of the environment. From this, it is recommended that general development be restricted to three areas:

- the lowland eastern section of the study area;
- the upland plateaus to the north; and
- the upland plateaus to the south.

N
W E
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LEGEND

- Building
- Railroad Line
- Arterial Road
- Collector Road
- Local Road
- Environmental Study Area Boundary
- Keppoch-Beaver Mountain Recreation Area Boundary
- Water Course
- Water Body
- Wetland
- Opportunity for Development
- Moderate Sensitivity to Development
- High Sensitivity to Development

GENERAL DEVELOPMENT
OPPORTUNITIES AND CONSTRAINTS

KEPPOCH - BEAVER MOUNTAIN RECREATION AREA

ANTIGONISH COUNTY, NOVA SCOTIA

Map created by:

Plan 4001 - Fall 2006 Dalhousie University

Adrian Buckley
Shawn MacDonald
Jesse Sparks
Erica Chisholm-Keith
Natalie Seniuk

Date created : November 2006

Scale 1 : 55 000

0 0.5 1 2 3 4 Kilometers

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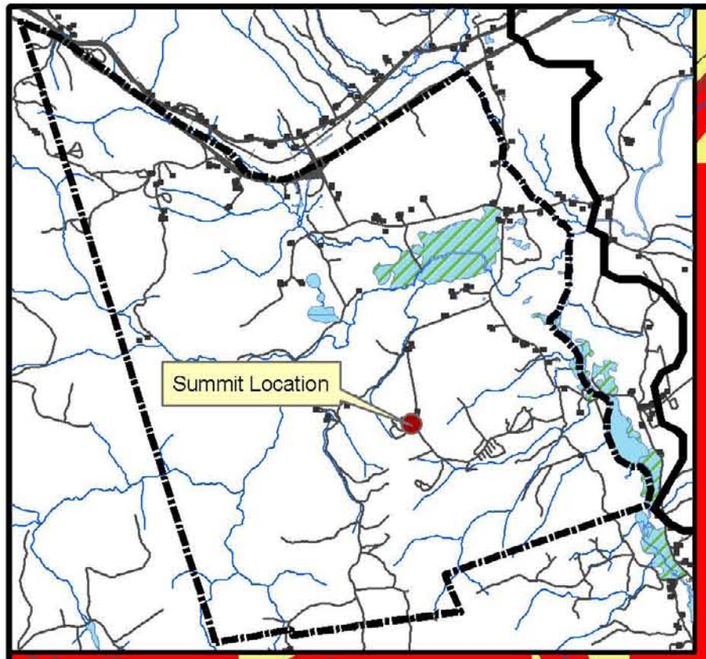
Keppoch Ski Hill Summit Lodge

The Municipality of the County of Antigonish currently has a concept plan for a summit lodge at Keppoch Ski Hill. This plan is part of the proposed reopening of the facility. It consists of a 20, 000 square foot building and 300 parking spaces placed on the plateau south of the ski hill. This site is surrounded by some sensitive areas, but the plateau itself is not highly sensitive to development. With a footprint of 32,400 square feet, the proposed lodge should not have a detrimental impact on the environment.

There are two distinct areas on the summit that are feasible for lodge development. The first and smallest of the two has a low sensitivity to development and offers an area large enough to support the proposed structure, but does not offer enough area to support parking. The second and larger area of the two has the greatest opportunity for development and lowest sensitivity to disturbance, and offers sufficient space for structures and parking.

The summit of Keppoch Mountain already presents an opportunity for a right-of-way to the site from the south. It is suggested that this right-of-way be utilized and expanded in order to minimize disturbance of sensitive areas in the lower-lying regions of the site.



Area of Low Sensitivity to Summit Lodge Development
Adequate Space for Structures but not Parking
On or Near Right-of-Way
8,100 m/square
87,000 ft/square

Area of Low Sensitivity to 'Summit Lodge' Development
Adequate Space for Structures and Parking
On or Near Right-of-Way
24,300 m/square
262,000 ft/square

90m

90m

180m

N
W E
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LEGEND

- Building
- Railroad Line
- Arterial Road
- Collector Road
- Local Road
- Environmental Study Area Boundary
- Keppoch-Beaver Mountain Recreation Area Boundary
- Property Boundary
- Water Course
- Water Body
- Wetland
- Opportunity for Development
- Moderate Sensitivity to Development
- High Sensitivity to Development

PROPOSED SUMMIT LOCATION GENERAL DEVELOPMENT

KEPPOCH - BEAVER MOUNTAIN RECREATION AREA

ANTIGONISH COUNTY, NOVA SCOTIA

Map created by:

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Scale 1 : 5 500

0 0.05 0.1 0.2 Kilometers

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High Impact Winter Recreational Use

Areas not suited for high impact winter recreational use include the entire portion of the study area in Pictou County that is moose habitat, and a swath of deer wintering habitat which follows the ravines between Keppoch and Beaver Mountains. Scattered throughout the site are additional locations of deer wintering and moose habitat. High impact recreation such as snowmobiling may cause the loss of species from these areas. As well, all drainage corridors, lakes and wetlands and the area 20 metres adjacent to them are not suited for high impact winter use. The results of the High-Impact Winter Recreation Use synthesis can be referred to in Figure 5.

The remaining landscape has no significant sensitivity to high impact winter recreational use. The planning area offers a substantial amount of land suitable for high impact winter recreation. Areas of concern for high-impact winter recreation are places for deer and moose to “wintering” and watercourses that flow throughout the study area. High-impact winter recreational use is not recommended in riparian areas.

N
W E
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LEGEND

- Building
- Railroad Line
- Arterial Road
- Collector Road
- Local Road
- Environmental Study Area Boundary
- Keppoch-Beaver Mountain Recreation Area Boundary
- Water Course
- Water Body
- Wetland
- Opportunity for Recreational Use
- High Sensitivity to Recreational Use

HIGH-IMPACT WINTER RECREATIONAL USE
OPPORTUNITIES AND CONSTRAINTS

KEPPOCH - BEAVER MOUNTAIN RECREATION AREA

ANTIGONISH COUNTY, NOVA SCOTIA

Map created by:

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N

W E

S

LEGEND

- Building
- Elevated View Areas
- Keppoch Ski Hill
- Bridge Crossings
- Railroad Line
- Arterial Road
- Collector Road
- Local Road
- Beaver Mountain
- Environmental Study Area Boundary
- Keppoch-Beaver Mountain Recreation Area Boundary
- Hemlock Ravine
- Water Course
- Water Body
- Wetland
- Opportunity for Recreational Use
- High Sensitivity to Recreational Use

HIGH-IMPACT WINTER RECREATIONAL USE

TRAIL RECOMMENDATIONS

KEPPOCH - BEAVER MOUNTAIN RECREATION AREA

ANTIGONISH COUNTY, NOVA SCOTIA

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Low Impact Winter Recreational Use

In general the study area presents few limitations to low impact winter recreational use due to sensitive terrain, hydrology, or habitats. The only area of concern is the swath running between Keppoch and Beaver mountains. This area is sensitive because of its value as a deer wintering habitat.

Within the planning area there is a complete corridor of land that is suitable for low impact winter recreational use. This allows a trail network to be developed connecting two major landmarks, Beaver Mountain and Keppoch Mountain. A number of scenic opportunities could be incorporated into proposed trails. These include potential views as well as the Cameron Lakes and a hemlock ravine.

In reference to the Canada Winter games, as there are very few limitations to low-impact winter use, accommodations for any proposed trails should be are viable.

N
W E
S

LEGEND

- Building
- Railroad Line
- Arterial Road
- Collector Road
- Local Road
- Environmental Study Area Boundary
- Keppoch-Beaver Mountain Recreation Area Boundary
- Water Course
- Water Body
- Wetland
- Opportunity for Recreational Use
- Moderate Sensitivity to Recreational Use
- High Sensitivity to Recreational Use

LOW-IMPACT WINTER RECREATIONAL USE

OPPORTUNITIES AND CONSTRAINTS

KEPPOCH - BEAVER MOUNTAIN RECREATION AREA

ANTIGONISH COUNTY, NOVA SCOTIA

Map created by:

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Significant Species and Habitats Database, [electronic file]. ArcMAP. Nova Scotia Department of Natural Resources. 2006.

N
W E
S

LEGEND

- Building
- Railroad Line
- Arterial Road
- Collector Road
- Local Road
- Elevated View Areas
- Keppoch Ski Hill
- Beaver Mountain
- Environmental Study Area Boundary
- Keppoch-Beaver Mountain Recreation Area Boundary
- Hemlock Ravine
- Water Course
- Water Body
- Wetland
- Opportunity for Recreational Use
- Moderate Sensitivity to Recreational Use
- High Sensitivity to Recreational Use

LOW-IMPACT WINTER RECREATIONAL USE

TRAIL RECOMMENDATIONS

KEPPOCH - BEAVER MOUNTAIN RECREATION AREA

ANTIGONISH COUNTY, NOVA SCOTIA

Map created by:

Plan 4001 - Fall 2006 Dalhousie University

Adrian Buckley
Shawn MacDonald
Jesse Sparks
Erica Chisholm-Keith
Natalie Seniuk

Date created : November 2006

Scale 1 : 55 000

0 0.5 1 2 3 4 Kilometers

Cann, D.B. and J.D. Hilchey. “Soil Survey of Antigonish County, Nova Scotia: Report 6 of Nova Scotia Soil Survey,” National Soil DataBase, Detailed Soil Surveys [electronic file] ArcMAP. 1:10 000. *Agriculture and Agri-Food Canada*. 2000.

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High Impact Three Season Recreational Use

Areas of sensitivity to the impact of high intensity recreational use dominate the study area. All land in the study area west of the Pictou County boundary is highly sensitive to high impact recreation as are all streams, water-bodies, wetlands and steep slopes. The north facing slopes of Keppoch and Beaver Mountain are also areas of low tolerance for high impact recreation. The results of the High-Impact Three Season Recreation Use synthesis can be referred to in Figure 9.

Areas somewhat more tolerant to high impact recreational use account for most of the remainder of the study area and include all areas north of Highway 104, Beaver Mountain slopes and the central portion of the study area, extending to the community along the St. James River.

Areas that can support high impact three season recreational are limited. They include primarily the high plateaus in the south of the study area. Land to the east of the St. James Raceway is also generally suited for this level of use as are several areas in the central portion of Beaver Mountain and at the summits of hills to the north of Highway 104.

The planning area is generally unsuitable for high impact three season recreational uses and development, such as ATV and mountain bike trails. Only four areas are suitable for this level of recreational use: the summit of Beaver Mountain, along Highway 104 just east of the St. James Raceway, at the foot of Keppoch Mountain immediately south of Beaver Meadow, and adjacent Addington Forks Road directly north of Beaver Meadow. Opportunities include beautiful views from the Beaver Mountain summit and areas of deciduous trees which offer wonderful autumn colours.

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- Water Body
- Wetland
- Opportunity for Recreational Use
- Moderate Sensitivity to Recreational Use
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HIGH-IMPACT THREE-SEASON RECREATIONAL USE
OPPORTUNITIES AND CONSTRAINTS

KEPPOCH - BEAVER MOUNTAIN RECREATION AREA

ANTIGONISH COUNTY, NOVA SCOTIA

Map created by:

Plan 4001 - Fall 2006 Dalhousie University

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Jesse Sparks
Erica Chisholm-Keith
Natalie Seniuk

Date created : November 2006

Scale 1 : 55 000

0 0.5 1 2 3 4 Kilometers

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LEGEND

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- Water Body
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- Hemlock Ravine
- Deciduous Forest
- Opportunity for Recreational Use
- Moderate Sensitivity to Recreational Use
- High Sensitivity to Recreational Use

HIGH-IMPACT THREE-SEASON RECREATIONAL USE

TRAIL RECOMMENDATIONS

KEPPOCH - BEAVER MOUNTAIN RECREATION AREA

ANTIGONISH COUNTY, NOVA SCOTIA

Map created by:

Plan 4001 - Fall 2006 Dalhousie University

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0 0.5 1 2 3 4 Kilometers

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Low Impact Three Season Recreation Use

There are few limitations to low impact three season recreational uses within the study area. The greatest restrictions apply to watercourses bordered by moderate to steep slopes. These sensitive hydrological areas are protected by a 20 metre buffer adjacent or surrounding the feature. All other hydrological features are considered moderately sensitive and are protected by buffers of 30 metres since flatter areas do not impact as greatly on riparian areas. Distinct wildlife habitats are considered moderately sensitive in order to prevent disturbance of identified sensitive species. Opportunities for low impact three season recreational use dominate the study area east of the Pictou county boundary. The results of the Low-Impact Three Season Recreation Use synthesis can be referred to in Figure 11

The planning area is generally suitable for low-impact spring, summer and fall recreational uses. The area indicated on the recommendations map presents the best opportunity to link Keppoch and Beaver Mountains. Opportunities in this corridor include hardwood stands (autumn foliage), potential views from both Keppoch and Beaver Mountains, and proximity to streams.

Caution must be taken near hydrological features. They can be traversed but structures such as low-impact footbridges should be installed. In the riparian areas, boardwalks should be installed to prevent impact on the sensitive habitat.

The Cameron Lakes lie in the middle of the corridor and presents an area that requires caution. The areas surrounding or adjacent all of the water features in this area can accommodate low-impact recreation. However, boardwalks should be installed. The Nova Scotia Trails Federation provides guidelines for constructing stream crossings and boardwalk structures.

The steeply sloping north face of Keppoch Mountain is very erosion-prone. The Nova Scotia Trails Federation has guidelines on how to safely accommodate low-impact recreation in all three of these sensitive areas.

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LOW-IMPACT THREE-SEASON RECREATIONAL USE

OPPORTUNITIES AND CONSTRAINTS

BEAVER - KEPPOCH MOUNTAIN RECREATION AREA

ANTIGONISH COUNTY, NOVA SCOTIA

Map created by:

Plan 4001 - Fall 2006 Dalhousie University

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LOW-IMPACT THREE-SEASON RECREATIONAL USE

TRAIL RECOMMENDATIONS

BEAVER - KEPPOCH MOUNTAIN RECREATION AREA

ANTIGONISH COUNTY, NOVA SCOTIA

Map created by:

Plan 4001 - Fall 2006 Dalhousie University

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[14] Ibid.

[15] Source: Y. H. Brown, Conley, and R.R. Stea. Legend for the Surficial Geology of the Province of Nova Scotia, Map 92-4. 1:500 000. Nova Scotia Department of Natural Resources, Mines and Energy. 1992.

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[26] Marsh, *Landscape Planning,* 192.

[27] Ibid., 80.

[28] Ibid., 77.

[29] Ibid.,136.

[30] Ibid., 134.

[31] Ibid., 80.

[32] Ibid., 76.

[33] Ibid., 149.

[34] Ibid.

[35] Ibid.

[36] Cann, "Legend for the Soil Survey of Antigonish."

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[39] Marsh, *Landscape Planning,* 381.

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[41] Government of Nova Scotia, *Wildlife Habitat and Watercourses Protection Regulations.*

[42] Pulsifer, interviewed by authors.

[43] Ibid.

[44] Marsh, *Landscape Planning,* 381.

[45] Ibid., 257.

[46] Government of Nova Scotia, *Wildlife Habitat and Watercourses Protection Regulations.*

[47] Marsh, *Landscape Planning,* 192.

[48] Palone and Todd, *Chesapeake Bay Riparian Handbook*, 6.

[49] Wisconsin Department of Natural Resources, *So You Want to Build an ATV Trail.* 7.

[50] Marsh, *Landscape Planning.* 86.

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[53] Ibid., 7.

[54] Ibid., 7.

[55] Pulsifer, interviewed by authors.

[56] Ibid.

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APPENDIX A

N
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- Railroad Line
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- Collector Road
- Local Road
- Environmental Study Area Boundary
- Keppoch-Beaver Mountain Recreation Area Boundary
- Water Course
- Water Body
- Wetland

Slope

- 0 - 3 % (Flat)
- 3+ - 8 % (Moderate)
- 8+ - 15 % (Moderate/Steep)
- 15+ - 25 % (Steep)
- >25 % (Very Steep)

SLOPE - DEVELOPMENT

KEPPOCH - BEAVER MOUNTAIN RECREATION AREA

ANTIGONISH COUNTY, NOVA SCOTIA

Map created by:

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Adrian Buckley
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Natalie Seniuk

Date created : November 2006

Scale 1 : 55 000

0 0.5 1 2 3 4 Kilometers

Slope

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Slope

- 0 - 5 %
- 5+ - 10 %
- 10+ - 15 %
- 15+ - 25 %
- >25 %

SLOPE - RECREATION

KEPPOCH - BEAVER MOUNTAIN RECREATION AREA

ANTIGONISH, NOVA SCOTIA

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Elevation

<30m	150 - 170m
30 - 50m	170 - 190m
50 - 70m	190 - 210m
70 - 90m	210 - 230m
90 - 110m	230 - 250m
110 - 130m	250 - 270m
130 - 150m	270 - 290m

ELEVATION

KEPPOCH - BEAVER MOUNTAIN RECREATION AREA

ANTIGONISH COUNTY, NOVA SCOTIA

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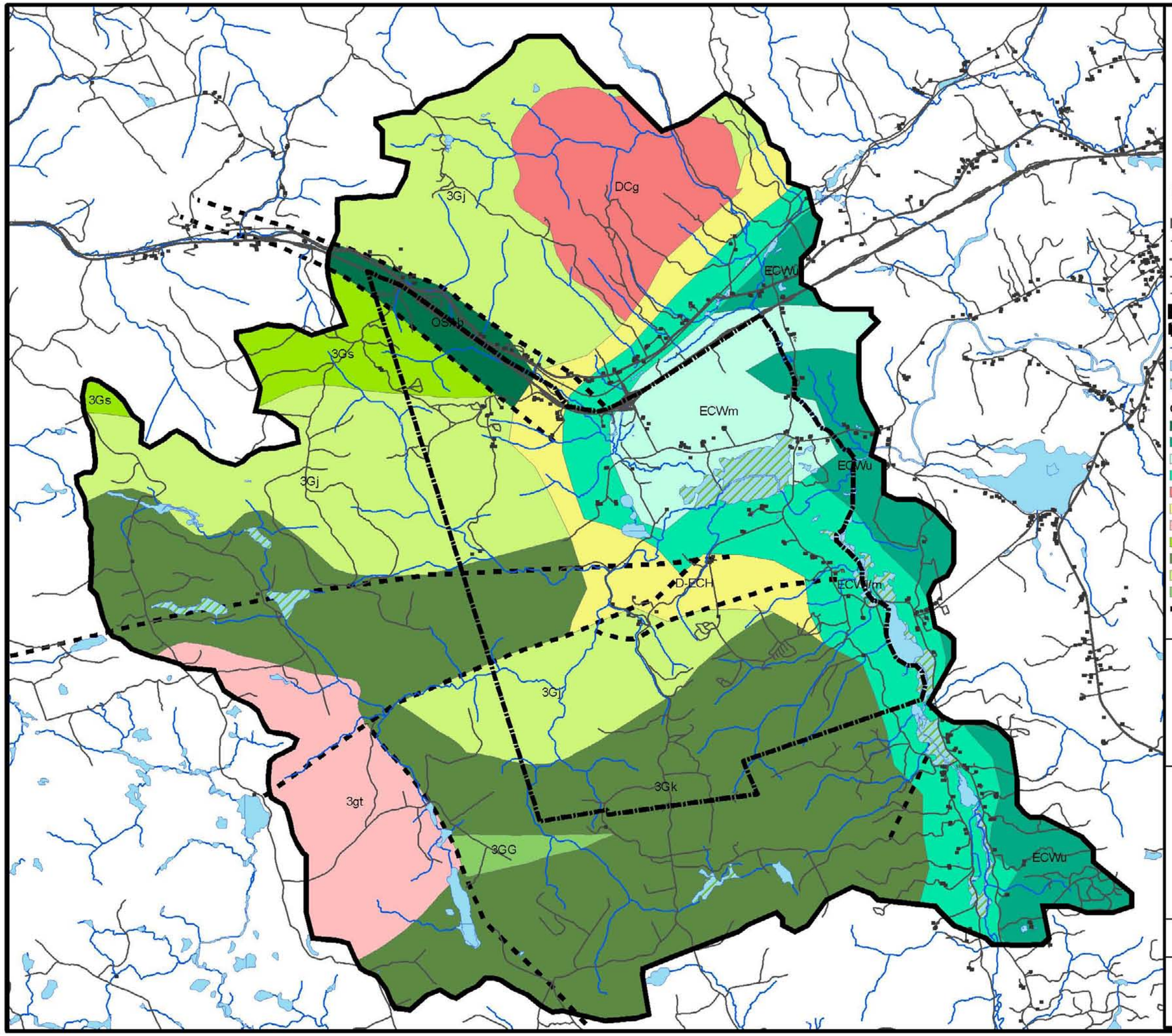

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Geology

- Bears Brook OSAb (sedimentary)
- Upper Windsor Group ECWu (sedimentary/metamorphic)
- Middle Windsor Group ECWm (sedimentary/metamorphic)
- Lower & Middle Windsor Group ECWl/m (sedimentary/metamorphic)
- Granite DCg (igneous)
- Horton Group - undivided D-ECH (sedimentary)
- Granitoid 3gt (igneous)
- South Rights Formation 3Gs (metamorphic)
- Keppoch Formation 3Gk (metamorphic)
- James River Formation 3Gj (metamorphic)
- Georgeville Group 3GG (igneous/metamorphic)
- Fault Line

GEOLOGY

KEPPOCH - BEAVER MOUNTAIN RECREATION AREA

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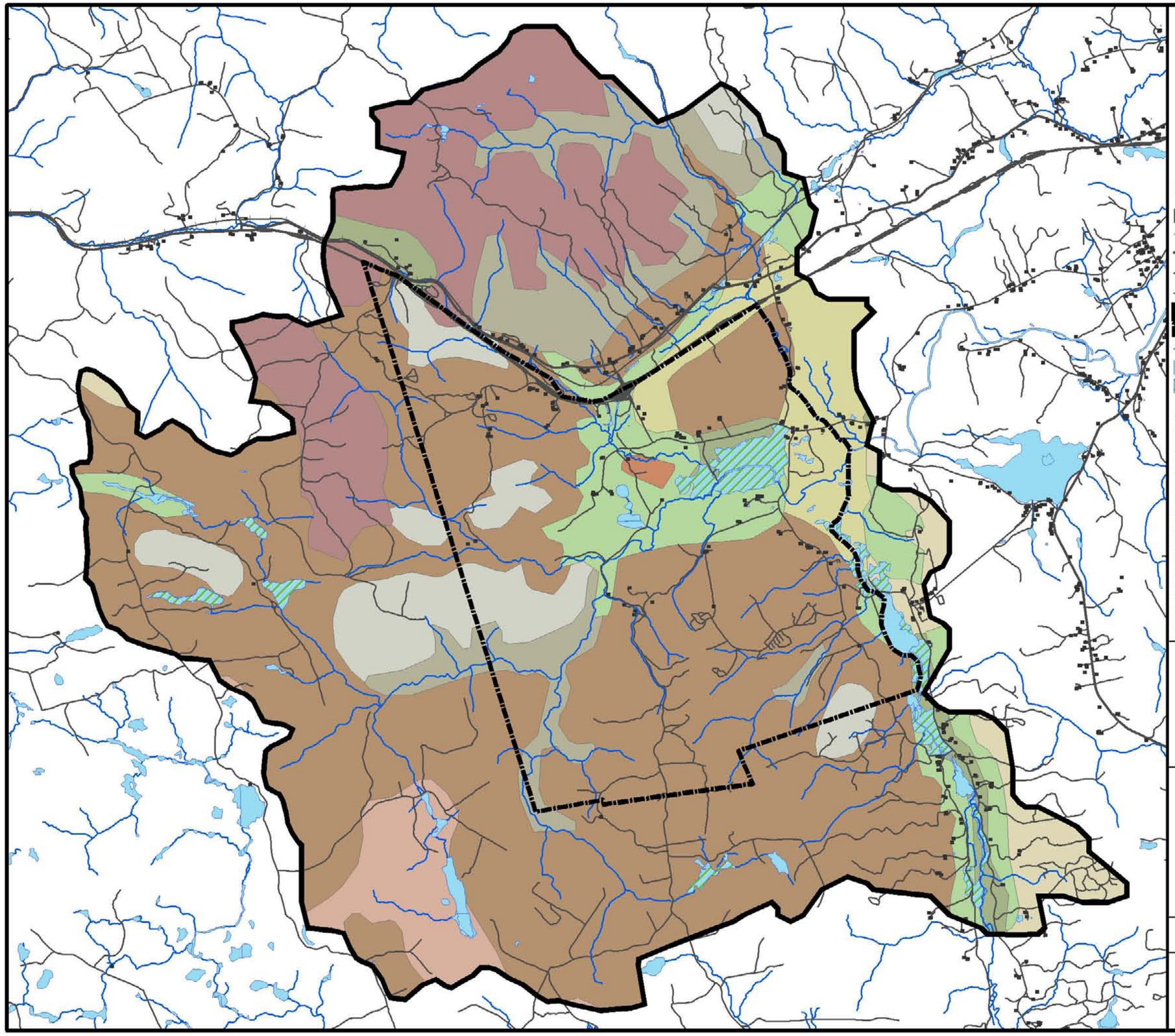

N
W E
S

LEGEND

- Building
- Railroad Line
- Arterial Road
- Collector Road
- Local Road
- Environmental Study Area Boundary
- Keppoch-Beaver Mountain Recreation Area Boundary
- Water Course
- Water Body
- Wetland

Surficial Geology

- Alluvial Deposits
- Bedrock
- Colluvial Deposits
- Glaciofluvial Deposits (Kames and Eskers)
- Glaciofluvial Deposits (Outwash Fans)
- Hummocky Ground Morraine
- Organic Deposits
- Residuum
- Silty Till Plain (Ground Moraine)
- Stony Till Plain (Ground Moraine)

SURFICIAL GEOLOGY

KEPPOCH - BEAVER MOUNTAIN RECREATION AREA

ANTIGONISH COUNTY, NOVA SCOTIA

Map created by:

Plan 4001 - Fall 2006 Dalhousie University

Adrian Buckley
Shawn MacDonald
Jesse Sparks
Erica Chisholm-Keith
Natalie Seniuk

Date created : November 2006

Scale 1 : 55 000

0 0.5 1 2 3 4 Kilometers

Surficial Geology

Mineral Resources Branch Digital Products. Glacial Surficial Geology [electronic file]. ArcMAP. 1:100 000. Nova Scotia Department of Natural Resources Canada. 2001-2005.

Nova Scotia Topographic Database, Data Locator [electronic file]. ArcMAP. 1:10 000. Service Nova Scotia and Municipal Relations. 2004.

Significant Species and Habitats Database, [electronic file]. ArcMAP. Nova Scotia Department of Natural Resources. 2006.

N
W E
S

LEGEND

- Building
- Railroad Line
- Arterial Road
- Collector Road
- Local Road
- Environmental Study Area Boundary
- Keppoch-Beaver Mountain Recreation Area Boundary
- Water Course
- Water Body
- Wetland

Soil

- Brown loam (Woodbourne)
- Brown loam - stoney (Millbrook)
- Silty loam (Dufferin)
- Dark reddish-brown silty loam (Stewiacke)
- Light brown sandy loam (Hebert)
- Brown sandy loam (Kirkmount)
- Dark brown sandy loam (Cobequid)
- Dark brown sandy loam (Wyvern)
- Gravely sandy loam (Thom)
- exposed bedrock

SOILS

KEPPOCH - BEAVER MOUNTAIN RECREATION AREA

ANTIGONISH COUNTY, NOVA SCOTIA

Map created by:

Plan 4001 - Fall 2006 Dalhousie University

Adrian Buckley
Shawn MacDonald
Jesse Sparks
Erica Chisholm-Keith
Natalie Seniuk

Date created : November 2006

Scale 1 : 55 000

0 0.5 1 2 3 4 Kilometers

Soils

Cann, D.B. and J.D. Hilchey. “Soil Survey of Antigonish County, Nova Scotia: Report 6 of Nova Scotia Soil Survey,” National Soil DataBase, Detailed Soil Surveys [electronic file] ArcMAP. 1:10 000. *Agriculture and Agri-Food Canada*. 2000.

Nova Scotia Topographic Database, Data Locator [electronic file]. ArcMAP. 1:10 000. *Service Nova Scotia and Municipal Relations*. 2004.

Significant Species and Habitats Database, [electronic file]. ArcMAP. Nova Scotia Department of Natural Resources. 2006.

N
W E
S

LEGEND

- Building
- Railroad Line
- Arterial Road
- Collector Road
- Local Road
- Environmental Study Area Boundary
- Keppoch-Beaver Mountain Recreation Area Boundary
- Water Course
- Water Body
- Wetland
- Major Gullies
- Discharge Area
- Recharge or Retention Area
- Flood Prone Area

SURFICIAL HYDROLOGY

KEPPOCH - BEAVER MOUNTAIN RECREATION AREA

ANTIGONISH COUNTY, NOVA SCOTIA

Map created by:

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Adrian Buckley
Shawn MacDonald
Jesse Sparks
Erica Chisholm-Keith
Natalie Seniuk

Date created : November 2006

Scale 1 : 55 000

0 0.5 1 2 3 4 Kilometers

Surficial Hydrology

Nova Scotia Topographic Database, Data Locator [electronic file]. ArcMAP. 1:10 000. Service Nova Scotia and Municipal Relations. 2004.

Significant Species and Habitats Database, [electronic file]. ArcMAP. Nova Scotia Department of Natural Resources. 2006. [wetlands,. shp files]

N
W E
S

LEGEND

- Building
- Railroad Line
- Arterial Road
- Collector Road
- Local Road
- Environmental Study Area Boundary
- Keppoch-Beaver Mountain Recreation Area Boundary
- Water Course
- Water Body
- Wetland
- Prevailing Winter Wind Direction
- Prevailing Summer Wind Direction
- Flat Area
- North Facing
- East Facing
- South Facing
- West Facing

MICROCLIMATE

KEPPOCH - BEAVER MOUNTAIN RECREATION AREA

ANTIGONISH COUNTY, NOVA SCOTIA

Map created by:

Plan 4001 - Fall 2006 Dalhousie University

Adrian Buckley
Shawn MacDonald
Jesse Sparks
Erica Chisholm-Keith
Natalie Seniuk

Date created : November 2006

Scale 1 : 55 000

0 0.5 1 2 3 4 Kilometers

Microclimate

Nova Scotia Topographic Database, Data Locator [electronic file]. ArcMAP. 1:10 000. Service Nova Scotia and Municipal Relations. 2004

Significant Species and Habitats Database, [electronic file]. ArcMAP. Nova Scotia Department of Natural Resources. 2006. [wetlands,. shp files]

N
W E
S

LEGEND

- Building
- Railroad Line
- Arterial Road
- Collector Road
- Local Road
- Environmental Study Area Boundary
- Keppoch-Beaver Mountain Recreation Area Boundary
- Water Course
- Water Body
- Hardwood (red maple, sugar maple, yellow birch)
- Mixed (red spruce, white spruce, balsam fir, white birch)
- Softwood (black spruce, white spruce, white pine)
- Cultivated Field (areas of human disturbance)
- Wetland
- Old Growth Forest
- Potential Old Growth Forest
- Old Field <25% Crown Closure
- Brush <25%Tree Cover
- Alder >75%cover
- Alder <75%cover
- Clear Cut <25%Crown Closure
- Barren

VEGETATION

KEPPOCH - BEAVER MOUNTAIN RECREATION AREA

ANTIGONISH COUNTY, NOVA SCOTIA

Map created by:

Plan 4001 - Fall 2006 Dalhousie University

Adrian Buckley
Shawn MacDonald
Jesse Sparks
Erica Chisholm-Keith
Natalie Seniuk

Date created : November 2006

Scale 1 : 55 000

0 0.5 1 2 3 4 Kilometers

Vegetation

Mark Pulsifer, Regional Biologist Antigonish County. Department of Natural Resources Nova Scotia. [electronic file] ArcMAP. November 9th, 2006.

Nova Scotia Forestry Inventory, Antigonish County. Department of Natural Resources Nova Scotia [electronic file] ArcMAP 1:10 000. 1996.

Nova Scotia Topographic Database, Data Locator [electronic file]. ArcMAP. 1:10 000. Service Nova Scotia and Municipal Relations. 2004.

Significant Species and Habitats Database, [electronic file]. ArcMAP. Nova Scotia Department of Natural Resources. 2006.

N
W E
S

LEGEND

- Building
- Railroad Line
- Environmental Study Area Boundary
- Keppoch-Beaver Mountain Recreation Area Boundary
- Arterial Road
- Collector Road
- Local Road
- Water Course
- Water Body
- Wetland
- Potential Deer and/or Moose Habitat
- Northern Goshawk Habitat
- Potential Deer Wintering Habitat
- Potential Short Eared Owl Habitat

SIGNIFICANT HABITAT

KEPPOCH - BEAVER MOUNTAIN RECREATION AREA

ANTIGONISH COUNTY, NOVA SCOTIA

Map created by:

Plan 4001 - Fall 2006 Dalhousie University

Adrian Buckley
Shawn MacDonald
Jesse Sparks
Erica Chisholm-Keith
Natalie Seniuk

Date created : November 2006

Scale 1 : 55 000

0 0.5 1 2 3 4 Kilometers

Significant Habitat

Mark Pulsifer, Regional Biologist Antigonish County. Department of Natural Resources Nova Scotia. [electronic file] ArcMAP. November 9th, 2006.

Nova Scotia Topographic Database, Data Locator [electronic file]. ArcMAP. 1:10 000. Service Nova Scotia and Municipal Relations. 2004.

Significant Species and Habitats Database, [electronic file]. ArcMAP. Nova Scotia Department of Natural Resources. 2006.

N
W E
S

LEGEND

- Building
- Railroad Line
- Arterial Road
- Collector Road
- Local Road
- Environmental Study Area Boundary
- Keppoch-Beaver Mountain Recreation Area Boundary
- Gravel Quarry
- Water Course
- Water Body
- Wetland
- Residential
- Commercial
- Forestry
- Agricultural
- Recreational
- Other

SIGNIFICANT LAND USE

KEPPOCH - BEAVER MOUNTAIN RECREATION AREA

ANTIGONISH COUNTY, NOVA SCOTIA

Map created by:

Plan 4001 - Fall 2006 Dalhousie University

Adrian Buckley
Shawn MacDonald
Jesse Sparks
Erica Chisholm-Keith
Natalie Seniuk

Date created : November 2006

Scale 1 : 55 000

0 0.5 1 2 3 4 Kilometers

Significant Land-Use

Jeff Stewart. Project Manager - Keppoch Beaver Mountain Recreational Area. Municipality of the County of Antigonish. Interview. November 9th, 2006.

Nova Scotia Topographic Database, Data Locator [electronic file]. ArcMAP. 1:10 000. Service Nova Scotia and Municipal Relations. 2004.

Significant Species and Habitats Database, [electronic file]. ArcMAP. Nova Scotia Department of Natural Resources. 2006. [wetlands,. shp files]

APPENDIX B

General Development Analysis Logic Matix

Attribute	High Sensitivity to Development				Moderate sensitivity to development			
	Stand alone	Buffer (metres)	Relative	Buffer (metres)	Stand alone	Buffer (metres)	Relative	Buffer (metres)
SLOPE								
< 3%								
3 - 8%								
8 - 15%								
15 - 20%								
20 - 25%								
> 15%								
> 20%								
> 25%								
SOILS								
Cobequid								
Dufferin								
Herbert								
Kirkmount								
Millbrooke								
Stewiacke								
Thom								
Woodbourne								
Wyvern								
SURFICIAL GEOLOGY								
Organic Deposits								
Colluvial Deposits								
Alluvial Deposits								
Glaciofluvial Deposits (outwash fans)								
Glaciofluvial Deposits (Kames and Eskers)								
Hummocky Ground Morraine								
Stony Till Plain								
Sitly Till Plain								
Residuum								
Bedrock		20						
GEOLOGY								
Arisaig Group								
Georgeville Group								
Horton Group								
Upper Windsor Group								
Lower/Middle Windsor Group								
Middle Windsor Group								
Granite Outcrop								
fold + fault lines								
SURFICIAL HYDROLOGY								
wetlands		20				20-30		
lakes		20				20-30		
streams		20				20-30		
gullies		20				20-30		
discharge areas								
recharge areas								
retention areas								
flood prone areas								
SLOPE ASPECT								
north facing								
west facing								
south facing								
east facing								
VEGETATION								
barren								
cleared								
SENSITIVE HABITAT								
deer wintering area								
deer + moose habitat								
goshawk habitat								
short-eared owl habitat								
old growth forest								
potential old growth forest								

B - 2

High Impact Winter Recreational Use Analysis Logic Matix																
Attribute	High sensitivity to development								Moderate sensitivity to development							
	Stand Alone	Buffer (metres)	Relative					Buffer metres	Stand Alone	Buffer (metres)	Relative					Buffer (metres)
SLOPE																
0-5%																
5-10%																
10-15%																
15-25%																
25-40%																
>5%																
>10%																
> 15%																
> 20%																
> 25%																
SOILS																
Cobequid																
Dufferin																
Herbert																
Kirkmount																
Millbrooke																
Stewiacke																
Thom																
Woodbourne																
Wyvern																
SURFICIAL GEOLOGY																
Organic Deposits																
Colluvial Deposits																
Alluvial Deposits																
Glaciofluvial Deposits (outwash fans)																
Glaciofluvial Deposits (Kames and Eskers)																
Hummocky Ground Morraine																
Stony Till Plain																
Sitly Till Plain																
Residuum																
Bedrock																
GEOLOGY																
Arisaig Group																
Georgeville Group																
Horton Group																
Upper Windsor Group																
Lower/Middle Windsor Group																
Middle Windsor Group																
Granite Outcrop																
fold + fault lines																
SURFICIAL HYDROLOGY																
wetlands		20m														
lakes		20m														
streams		20m														
gullies		20m														
discharge areas																
recharge areas																
retention areas																
flood prone areas																
SLOPE ASPECT																
north facing																
west facing																
south facing																
east facing																
VEGETATION																
barren																
cleared																
SENSITIVE HABITAT																
deer wintering area																
deer + moose habitat																
goshawk habitat																
short-eared owl habitat																
old growth forest																
potential old growth forest																

B - 3

Low Impact Winter Recreational Use Anlysis Logic Matrix																
Attribute	High sensitivity to development								Moderate sensitivity to development							
	Stand Alone	Buffer (metres)	Relative					Buffer (metres)	Stand Alone	Buffer (metres)	Relative					Buffer (metres)
SLOPE																
< 3%																
3 - 8%																
8 - 15%																
15 - 20%																
20 - 25%																
>5%																
>10%																
> 15%																
> 20%																
> 25%																
SOILS																
Cobequid																
Dufferin																
Herbert																
Kirkmount																
Millbrooke																
Stewiacke																
Thom																
Woodbourne																
Wyvern																
SURFICIAL GEOLOGY																
Organic Deposits																
Colluvial Deposits																
Alluvial Deposits																
Glaciofluvial Deposits (outwash fans)																
Glaciofluvial Deposits (Kames and Eskers)																
Hummocky Ground Morraine																
Stony Till Plain																
Sitly Till Plain																
Residuum																
Bedrock																
GEOLOGY																
Arisaig Group																
Georgeville Group																
Horton Group																
Upper Windsor Group																
Lower/Middle Windsor Group																
Middle Windsor Group																
Granite Outcrop																
fold + fault lines																
SURFICIAL HYDROLOGY																
wetlands																
lakes																
streams																
gullies																
discharge areas																
recharge areas																
retention areas																
flood prone areas																
SLOPE ASPECT																
north facing																
west facing																
south facing																
east facing																
VEGETATION																
barren																
cleared																
SENSITIVE HABITAT																
deer wintering area																
deer + moose habitat																
goshawk habitat																
short-eared owl habitat																
old growth forest																
potential old growth forest																

B - 4

High Impact Three Season Recreational Use																
Attribute	High senstivity to development						Moderate sensitivity to development									
	Stand Alone	Buffer (metres)	Relative			Buffer (metres)	Stand Alone	Buffer (metres)	Relative							Buffer (metres)
SLOPE																
0-5%																
5-10%																
10-15%																
15-25%																
25-40%																
>5%																
>10%																
> 15%																
> 20%																
> 25%																
SOILS																
Cobequid																
Dufferin																
Herbert																
Kirkmount																
Millbrooke																
Stewiacke																
Thom																
Woodbourne																
Wyvern																
SURFICIAL GEOLOGY																
Organic Deposits																
Colluvial Deposits																
Alluvial Deposits																
Glaciofluvial Deposits (outwash fans)																
Glaciofluvial Deposits (Kames and Eskers)																
Hummocky Ground Morraine																
Stony Till Plain																
Sitly Till Plain																
Residuum																
Bedrock																
GEOLOGY																
Arisaig Group																
Georgeville Group																
Horton Group																
Upper Windsor Group																
Lower/Middle Windsor Group																
Middle Windsor Group																
Granite Outcrop																
fold + fault lines																
SURFICIAL HYDROLOGY																
wetlands		20m						20-30m								
lakes		20m						20-30m								
streams		20m						20-30m								
gullies		20m						20-30m								
discharge areas																
recharge areas																
retention areas																
flood prone areas																
SLOPE ASPECT																
north facing																
west facing																
south facing																
east facing																
VEGETATION																
barren																
cleared																
SENSITIVE HABITAT																
deer wintering area																
deer + moose habitat																
goshawk habitat																
short-eared owl habitat																
old growth forest																
potential old growth forest																

Low Impact Three Season Recreational Use Analysis Logic Matrix																																
Attribute	High sensitivity to development																Moderate senstivity to development															
	Stand Alone	Buffer (metres)	Relative													Buffer (metres)	Indepe ndent	Buffer metres	Relative													Buffer (metres)	
SLOPE																																
0-5%																																
5-10%																																
10-15%																																
15-25%																																
25-40%																																
>5%																																
>10%																																
> 15%																																
> 20%																																
> 25%																																
SOILS																																
Cobequid																																
Dufferin																																
Herbert																																
Kirkmount																																
Millbrooke																																
Stewiacke																																
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Organic Deposits																																
Colluvial Deposits																																
Alluvial Deposits																																
Glaciofluvial Deposits (outwash fans)																																
Glaciofluvial Deposits (Kames and Eskers)																																
Hummocky Ground Morraine																																
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Sitly Till Plain																																
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Horton Group																																
Upper Windsor Group																																
Lower/Middle Windsor Group																																
Middle Windsor Group																																
Granite Outcrop																																
fold + fault lines																																
SURFICIAL HYDROLOGY																																
wetlands																20m		20-30m														
lakes																20m		20-30m														
streams																20m		20-30m														
gullies																20m		20-30m														
discharge areas																																
recharge areas																																
retention areas																																
flood prone areas																																
SLOPE ASPECT																																
north facing																																
west facing																																
south facing																																
east facing																																
VEGETATION																																
barren																																
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SENSITIVE HABITAT																																
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potential old growth forest																																