
Socio-Economic Analysis of
Five Bridge Lakes Candidate Wilderness Area

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1.0 INTRODUCTION

On October 19, 2009, the province announced its intent to designate Crown lands of the Five Bridge Lakes area within Halifax Regional Municipality (HRM) under the *Wilderness Areas Protection Act*. This 8,255 hectare (20,398 acre) candidate wilderness area is located on the Chebucto Peninsula, between Highways 103 and 333.

Designating this candidate wilderness area will help the province meet its goal of legally protecting 12 per cent of Nova Scotia's landmass by 2015, up from the current 8.6 per cent. This goal is one of a series of goals outlined within Nova Scotia's *Environmental Goals and Sustainable Prosperity Act* (2007, c.7). This legislation recognizes that the health of our environment, economy, and people is interconnected. Meeting a variety of goals, including the 12 per cent land protection goal, is intended to help Nova Scotia fully integrate environmental sustainability and economic prosperity.

Before a candidate wilderness area is designated, the *Wilderness Areas Protection Act* requires a period of public consultation. This ensures that interested parties and individuals can comment on the candidate wilderness area before final decisions are made. Nova Scotia Environment (NSE) completed this consultation between February and April 2010.

In addition, a socio-economic study of the effects of designation is required, which must be made available to the public before designation. This report outlines the expected socio-economic effects of designating the candidate Five Bridge Lakes Wilderness Area (hereafter referred to as the CWA).

Final decisions on a boundary and other matters will be made once all information and comments have been considered.

1.1 Wilderness Areas in Nova Scotia

What is a Wilderness Area?

Wilderness areas are provincially-significant protected areas which are designated under Nova Scotia's *Wilderness Areas Protection Act* (1998, c.27, amended: 2005, c.56, s.18; 2009, c. 30). Wilderness areas protect many of Nova Scotia's most cherished wild spaces. They are used for scientific research, education and a variety of recreation and nature-tourism related activities such as hiking, canoeing, sea-kayaking, snowshoeing, sport fishing, and hunting. NSE is responsible for the planning, designation, and management of Nova Scotia's wilderness areas. NSE works in partnership with other departments, the Nova Scotia Mi'kmaq, and through agreements with organizations. In 1998, 31 areas were designated under the *Wilderness Areas*

Protection Act (the Act). Today, 37 WAs protect approximately 314,680 hectares (ha), which represents approximately 5.7% of the land area of Nova Scotia.

The purpose of the Act is “to provide for the establishment, management, protection and use of wilderness areas, in perpetuity, for present and future generations, in order to achieve the following primary objectives:

- maintain and restore the integrity of natural processes and biodiversity;
- protect representative examples of natural landscapes and ecosystems; and
- protect outstanding, unique, rare and vulnerable natural features and phenomena,

and the following secondary objectives:

- provide reference points for determining the effects of human activity on the natural environment;
- protect and provide opportunities for scientific research, environmental education and wilderness recreation; and
- promote public consultation and community stewardship in the establishment and management of wilderness areas,

while providing opportunities for public access for sport fishing and traditional patterns of hunting and trapping” (s.2).

Activities such as wilderness recreation, nature tourism, environmental education, and scientific research are encouraged. Sport fishing and traditional patterns of hunting and trapping are also generally permitted.

Designation of a wilderness area places a number of restrictions on the use of the land (s.17 of the Act). Commercial resource development, such as forestry and road development, is not permitted in a wilderness area. Mineral exploration and mining is not permitted, except where pre-existing, valid mineral rights are held. Where this is the case, activities associated with mineral exploration and/or development may be conducted, subject to standard environmental approvals, and under the terms of a license issued by NSE. Such activities may not contribute to degradation of the WA. New exploration licenses will not be issued. The use of bicycles and motorized vehicles (including motorboats and aircraft) is generally prohibited in wilderness areas, but may be permitted in limited circumstances, as outlined in the Act. A number of other activities are also prohibited, except in certain circumstances, as outlined in the Act. For example, trails and related structures for wilderness recreation may be built and maintained within wilderness areas, if approved under the Act. Camping and camp fires are permitted provided that campers abide by certain standards to minimize environmental impacts.

1.2 New Candidate Wilderness Areas

A candidate wilderness area is an area of land that the province is proposing to designate as a wilderness area. Before government makes final decisions, NSE conducts a review of the candidate area, which includes consultation with other governmental departments, public consultations, meetings with stakeholders, and consultation with the Nova Scotia Mi'kmaq.

A socio-economic analysis of the anticipated effects of designating a candidate wilderness area is prepared as part of this review process. Under Section 15(4) of the *Wilderness Areas Protection Act*, before the designation of a wilderness area,

“...a socio-economic analysis of the impact of designation of a wilderness area shall be prepared for every wilderness area designated on Crown land after this Act comes into force, [and] the analysis shall be completed and made available to the public before the designation ...”

This study presents the preliminary results of a socio-economic analysis of the anticipated effects of designating the candidate Five Bridge Lakes Wilderness Area. It considers a comprehensive range of social and economic benefits and costs that may be associated with designation, with a goal of providing decision-makers, stakeholders, and the public with the information to support informed discussion and judgment respecting the designation of this CWA. This study will be finalized once public and stakeholder comment, and input from the Nova Scotia Mi'kmaq, has been fully reviewed.

1.3 Socio-economic Analysis of Designating Wilderness Areas ¹

To complete a socio-economic analysis of the effects of designating a candidate wilderness area, the current situation must be understood. The current situation may include information, as available, on at least the following:

- characteristics of land use activities (e.g., types of land use activities, land management, frequency and extent of land use, use patterns);
- characteristics of user groups (e.g., distinct types of users, linkages between user groups and communities);
- economic value of current land uses (e.g., gross output and/or value added to the economy from forestry, mining, tourism and recreation);
- social, cultural and heritage values associated with the land; and,
- ecosystem service benefits provided by the area (e.g., atmospheric carbon sequestration, water regulation, maintenance of biodiversity, etc).

¹ The design and content of this socioeconomic analysis borrows significantly from previous socioeconomic analyses complete by Jacques Whitford Ltd. (Jacques Whitford 2004; Jacques Whitford 2008).

Once the current situation of an area is known, the next step is analysis of the expected effects of designating a wilderness area. Having such information can be important for making good decisions regarding the appropriate designation and management of a wilderness area.

A traditional approach would be to examine the commercial activities that use the land in question. This may typically include a description of the commercial revenues generated, the value added to the larger economy by the activities (GDP impact), and the direct and indirect employment.

More appropriately, one can broadly examine a more complete range of social values associated with the environment, working towards the development of a full accounting of the potential costs and benefits of designation. This means focusing not only on commercial uses, but also on the values that can be attributed to recreational uses, hunting and fishing, education and research (also known as information values), Mi'kmaq values, ecological services (*e.g.*, biodiversity maintenance, sequestration of atmospheric carbon dioxide, maintenance of water quality) and the existence of the wilderness area (*i.e.*, the values that people have for an area simply from knowing it exists, although they may never actually use the area).

Descriptions of these various values can be monetary, quantitative (but non-monetary), or qualitative. Quantitative measures are thought to be desirable because they are perceived to be more objective than qualitative descriptions. Monetary estimates, if they can be reasonably made, are particularly useful in that they permit a direct comparison of different values using the same measure (*i.e.*, dollars). However, there are limitations to placing numerical significance on many types of values, particularly social, cultural and heritage values for which there are no meaningful quantitative measures readily available (Glicken 2003). In particular, the use of monetary estimates may assume the substitutability of natural, social and economic values; whereas, it has been argued that some values are not substitutable and, in the case of ecological services, may not be replaceable at all (*e.g.*, Ekins *et al.* 2003). Qualitative evaluation should, therefore, be incorporated to provide context and a deeper understanding of the values of individuals and communities.

Once the current values of the study area are described, the next step is to examine how these values may be affected by designation of a CWA. Changes in the management and regulatory regime associated with the designation of a new wilderness area may result in substantial changes to the benefits that are received from the land. The prohibition or exclusion of certain activities within a new wilderness area can result in the loss of the benefits associated with those uses. Restrictions in the level of other activities may also lead to a reduction in benefits, although, in the long-term, it is possible that these can be offset by increases within a broader regional context. The exclusion or restriction of some activities may also result in an increase in the benefits associated with other competing activities. For example, a reduction in the use of an area for forestry may ultimately lead to an increase in recreation benefits or ecosystem service benefits.

In short, there are socio-economic trade-offs and interdependencies that should be considered in making decisions regarding the management and designation of land. However, the results of this

study should not be reduced to a cost-benefit analysis that is, in turn, used as the basis for a designation decision. As outlined in Section 1.1, the purpose of wilderness area designation is to help meet provincial environmental objectives that include maintaining ecological integrity and biodiversity, protecting representative examples of natural landscapes and ecosystems, and protecting natural features and phenomena, while also providing a protected land base for wilderness recreation, nature tourism and other low-impact uses. A CWA is initially identified based on the ability of the area to help achieve these objectives.

In this context, the role of the socio-economic analysis is to provide information on the costs and benefits associated with designation so that there is a more complete level of knowledge regarding the impacts. Using this information, decision-makers can proceed with designation, with or without mitigation measures; or, if they believe that the socio-economic costs are too high, they can decide not to designate an area. Compensatory interventions may also be considered, so that losses associated with reduced activities in a designated area may be replaced by increased activities elsewhere. When an area is designated, decisions must also be made regarding those activities that are restricted but may be permitted. The results of the socio-economic analysis help identify those activities that have particular importance.

It is important to note that the socio-economic analysis focuses on a description of the predicted change in values from the current status (not designated) to the new status (designated). It assumes that the areas are effectively managed in accordance with the *Wilderness Areas Protection Act* and other applicable legislation and policies. For some types of values, it is clear how they will be affected by designation (*e.g.*, prohibited activities). However, for others, it is not possible to reasonably predict quantitatively how the values will change, although the direction of change can be predicted. For values that are expected to be afforded greater protection with wilderness area designation, these may best simply be characterized as being at less of a risk of being adversely affected.

1.4 Study Layout

This socio-economic study of the effects of designating the candidate Five Bridge Lakes Wilderness Area was completed by NSE with input from the Nova Scotia Department of Natural Resources (NSDNR). We used information from:

- extensive fieldwork;
- other departments;
- over 100 written responses during the public consultations;
- meetings with stakeholders ;
- and discussion and communication with the Nova Scotia Mi'kmaq,

This socio-economic study was prepared for review by the public to ensure results are based on best available information and local knowledge. Following this Introduction (section A), the socio-economic study of the effects of designation is organized in four major sections:

- 2.0 *Identifying the Socio-economic values,*
- 3.0 *Values of the Candidate Five Bridge Lakes Wilderness Area,*
- 4.0 *Summary Tables, and*
- 5.0 *Conclusion.*

Section 2.0 examines particular values (e.g. tourism, forestry, recreation, etc.), the provincial context of those values, and how these values may be affected by the designation of a CWA. Section 3.0 examines if and how the values identified in Section 2.0 are relevant to the candidate Five Bridge Lakes Wilderness Area, based on the most current information available. In this section, we analyze the values for the CWA and how they are likely to be affected by designation. In Section 4.0, we present a summary of the values and how they are likely to be affected, with and without designation of the CWA.

2.0 IDENTIFYING THE SOCIO-ECONOMIC VALUES

The socio-economic values used in this study were selected based on those used in earlier studies of the effects of designating new wilderness areas in Nova Scotia, completed by Jacques Whitford Ltd. (now Stantec Ltd.) for Nova Scotia Environment, and on further review of current literature. For each value, a provincial context and how the individual value may be affected by designation is given. The values in this report are divided into five categories: commercial, individual, Mi'kmaq, societal, and ecosystem services. This section of the report provides an overview of each socio-economic value, including the Nova Scotia context; and identifies how wilderness area designation generally affects each value. How designation is expected to affect these values within the candidate Five Bridge Lakes Wilderness Area is reported in Section 3.0.

TABLE 2.1 Selected Value Categories

Value Category	Values
Commercial Values (direct use)	Forestry
	Mining
	Energy
	Tourism
	Research and Education
Individual Values (direct use)	Vehicle Use
	Sport Fishing, Hunting and Trapping
	Hunting and Trapping
	Outdoor Recreation
Mi'kmaq Interests and Values	Mi'kmaq values
Societal Values (non-use)	Cultural and Heritage
	Existence
Ecosystem Services Values (indirect use)	Biodiversity Conservation
	Maintaining Natural (ecological) Processes
	Climate Change Mitigation and Adaptation

Other categories of values have been identified in the literature, but these are not distinguished in the approach taken for this study. For example, the impact of green space on property values has been addressed in other studies. However, research conducted to date has primarily concentrated within urban or residential development areas, and impacts have been shown to be specific to location, the type of land development in question, and market conditions. Given the state of knowledge, it is not possible to examine the property value issue, as adjacent

property values can increase or decrease, depending on a number of factors. The positive value of health impacts associated with the use of parks and protected areas has also, to a limited extent, been addressed in the literature. As a direct use benefit, wilderness areas can support healthy life-styles and governments' strategic objectives regarding the health of the population. Again, limits to the state of knowledge and the amount of secondary information available for this CWA prevent a reasonable examination of these values within the scope of this study.

2.1 Commercial Values

Commercial values are values directly attributable to economic production or activities that use the natural resources of a candidate wilderness area (CWA). The commercial activities in candidate wilderness areas considered for this analysis are: forestry, mining, energy, tourism, and research and education.

2.1.1 Forestry

Within the province of Nova Scotia, the forestry industry has traditionally been a major source of employment and revenue. Overall contribution of the forestry sector to the economy remains significant with a total impact of \$700 million to the provincial GDP, providing employment to approximately 11,000 people and generating exports exceeding \$1 billion or 17 per cent of Nova Scotia export trade (NSDNR 2008).

The forestry industry has faced new challenges in recent years, with out migration of skilled workers to the west, rural populations shrinking, reduction in new housing starts, reduced demand for newsprint, increased demand for biomass energy, increased energy costs (fossil fuels and electricity) and profit margins narrowing significantly as a result of the rising Canadian dollar. All of these factors, combined with increased competition for woodlands for other purposes (e.g., other industrial development, residential development, recreation and environmental use), are challenges for this corner stone industry in Nova Scotia.

The Nova Scotia government intends to release a new Natural Resources Strategy, including policies on forest, minerals, parks, and biodiversity. The goal is to protect our natural resources, while supporting jobs and the economy. The Natural Resources Strategy is expected to directly affect the approach and way forests are managed in Nova Scotia. Forestry activities are prohibited in wilderness areas under Section 17 of the *Wilderness Areas Protection Act*. Limited exceptions may be made under section 19 of the Act, which allows the Minister to carry out limited forest management to support the preservation or restoration of indigenous biodiversity of a wilderness area, including the protection of property, the health or safety of humans and the suppression of forest fires. Commercial forest harvesting and silviculture are not permitted within wilderness areas. Designation of a wilderness area can therefore affect the availability of wood supply to the forest industry.

2.1.2 Mining

The mining sector in Nova Scotia includes activities such as mineral exploration, mine development, mineral production, secondary processing, provision of goods and services to the industry and mine site rehabilitation. Including primary and processing activity, total provincial employment associated with the sector (including direct and spin-off) is 6,340 jobs per year, and total contribution to the GDP is \$488.6 million, of which 350 jobs and \$270.3 million originated from primary extraction alone (NSDNR 2006). Direct provincial employment in the mineral industry totalled 1,600 full time employees with an estimated total payroll of approximately \$96 million, including wages and benefits. In 2006, approximately \$11 million was spent by mineral exploration companies in search of mineral deposits throughout Nova Scotia (NSDNR 2006). In recent years, the province of Nova Scotia has seen direct revenue of \$2.4 million annually from actions relating to exploration (i.e. licenses) and mineral production (i.e. mineral lease rentals, royalties, and taxes on non-mineral production) (NSDNR 2006).

Nova Scotia has produced gold, coal, gypsum and anhydrite, salt, barite, limestone and dolomite, clay, silica sand, dimension stone, slate, peat moss, lead, zinc and aggregate resources. As of October 13, 2010, 56,667 claim blocks covered 888,558 hectares of Nova Scotia, meaning that approximately 16 % of the province was under mineral exploration license.

Mineral exploration licences provide the exclusive right to explore and are the initial step in evaluating mine development potential for an area. Work is required each year to maintain individual exploration licenses and work requirements increase incrementally through time. The province collects application fees (also required for renewals) and files work requirement reports on these areas. Mineral rights can include work carried out on another person's or company's claim under an option agreement. Areas for which mineral rights have historically been held repeatedly and for longer periods of time can be used as an indicator of higher mineral potential. Based on this and geoscience and exploration data, NSDNR has developed a mineral potential Atlas for the province of Nova Scotia. This can be used to evaluate relative impacts of land protection or other competing land uses on access to mineral resources.

Mineral exploration, development, and quarrying are prohibited in wilderness areas under Section 17 of the *Wilderness Areas Protection Act*. Under Section 25, pre-existing rights, such as exploration licenses, may be honoured if the activity does not contribute to the degradation of the wilderness area.

The designation of a wilderness area will therefore generally close the area to exploration, mining and resource extraction, except where pre-existing rights are honoured.

2.1.3 Energy

Nova Scotia's has some of the best wind and tidal energy resources in the world, along with both onshore and off-shore petroleum resources (NS-DOE 2010a).

Nova Scotia has enjoyed significant economic benefits from off-shore petroleum activity. As of March 2008, Nova Scotia has received approximately \$900 million in royalties from the Sable Offshore Energy project and expects to receive up to \$3 billion over the life of the project. In addition, Nova Scotia received a Crown share (a negotiated revenue sharing with the Federal government) of more than \$860 million for the Sable Offshore Energy Project as well as other projects, including the Cohasset Panuke project and Deep Panuke project (NS-DOE 2010b). Most of the money has been used to reduce Nova Scotia's debt, with money also set aside for offshore energy R&D, education, and land acquisition for conservation. A Crown share revenue contribution of \$23 million to the Nova Scotia Crown Share Land Legacy Trust is helping increase our inventory of protected lands, and moves us closer to the province's goal of legally protecting 12 per cent Nova Scotia's landmass by 2015.

Onshore oil & gas exploration in Nova Scotia dates back to the 1800s, with oil wells drilled in Cape Breton. Interest in on-shore petroleum exploration has grown, especially in the past 10 years. Onshore exploration is focused on gas, shale gas and coalbed methane.

Onshore oil & gas exploration and production in Nova Scotia is targeting the sedimentary Maritimes Basin. Conventional exploration is focused on two key rock units: the Horton and Windsor Groups, while the younger deposits of the Cumberland Group are of interest for coalbed methane exploration. No commercial on-shore oil or gas production is presently occurring in Nova Scotia.

In 2009, Nova Scotia released an Energy Strategy and its companion Climate Change Action Plan, which includes an aggressive target for renewable energy of 25 per cent by the year 2015, and 40% by 2020. Of the 12,000 GWh of electricity the province consumes each year, only about 11 per cent currently comes from renewable sources (NS-DOE 2010e). The new Energy Strategy calls for increased use and development of new renewable tidal, wind, hydro, and biomass energy. The strategy also calls for increased use of relatively clean, domestic natural gas, with decreased reliance on use of imported coal and oil.

Nova Scotia currently has about 280 megawatts of wind energy capacity, representing about 14% of the province's electricity requirements (NS-DOE 2010d). Over the next few years, Nova Scotia Power and independent producers intend to develop several additional wind farms. As many as 168 turbines may be operating in Nova Scotia by 2012 (Nova Scotia Power 2011).

A "Nova Scotia Wind Atlas" is available to help wind energy developers identify suitable locations for wind farms or turbines (NS-DOE 2010e). The Atlas, which was developed by the Nova Scotia Department of Energy and other partners, considers both the large utility scale level (for large wind farms and large wind turbines with hub heights of 80 m) and the private or small business level (for single turbines with hub heights of 30 or 50 m). Generally, sites with average wind speeds of 7 metres/second (25 km/h) or greater are considered best for wind energy development.

Under Section 17 (1d) of the *Wilderness Areas Protection Act* (1998), petroleum and energy developments, including wind farms, are prohibited in wilderness areas. Under Section 25, pre-existing rights may be honoured if the activity does not contribute to the degradation of the wilderness area. With some exceptions, the designation of a wilderness area will therefore generally prevent energy development within the area (whether it is renewable energy such as wind or whether it is non-renewable energy such as petroleum). Designation may also indirectly affect energy projects by limiting routing of new transmission or distribution utility lines or pipelines throughout the province.

2.1.4 Tourism

Tourism is an important industry in Nova Scotia with an estimated \$1.33 billion in business revenue generated from tourism-related activities in 2007, up from \$1.1 billion in 1998. In 2007, Nova Scotia welcomed more than 2 million visitors and tourism made up 7% of Nova Scotia's workforce.

The Nova Scotia Tourism Partnership Council strategically set outdoor adventure as one of Nova Scotia's core experiences in their 2008 tourism strategy. The tourism products that customers desire while visiting Nova Scotia include scenic touring, outdoor and nature activities, Acadian experiences, golfing, cuisine and wine-production related activities, and outdoor recreation which includes: kayaking, canoeing, biking, hiking, whale watching, birding and recreational walking. Wilderness areas provide a protected land base that is suitable for delivering many of the desired outdoor and nature tourism products.

One of the objectives of the *Wilderness Areas Protection Act* is to support wilderness recreation. The Act defines wilderness recreation as non-motorized, outdoor recreational activities that have minimal environmental impact, including nature-based tourism. This includes activities such as kayaking, canoeing, hiking, cross-country skiing, snowshoeing, bird watching, and recreational walking. Bicycle use can be authorized in certain circumstances.

The designation of a wilderness area secures a long-term, protected land base for wilderness recreation and related nature tourism. Trails and other related infrastructure may be developed within wilderness areas. Designation therefore generally enhances tourism values or opportunities of an area.

2.1.5 Research and Education

Natural environments are important as sites for research and education. Species and ecosystems have value as sources of information that cannot be obtained elsewhere. This information can be in the form of something as specific as the genetic make-up of unique populations of species, or the composition of unique natural chemicals. At a broader scale, research in natural areas is important to increase our knowledge of how ecosystems are

structured and how they function. This becomes important knowledge in managing our interactions with the environment.

Protected areas are particularly useful for such research because the extent of human impacts is limited. As such, these areas can serve as long-term reference sites for research activities. Use as field sites for education at all levels (elementary to post- secondary) also contributes to awareness among the general population regarding habitat management issues and natural heritage values.

NSE, through the Protected Areas Branch, actively encourages partnerships in support of ecological research in protected areas. Sixteen Maritime universities and research institutions have conducted research in the province's protected areas (wilderness areas and nature reserves) since 2003.

2.2 Individual Values

Individual values are those values that occur directly to individual users and for which there is no direct commercial sale for the use itself. This includes outdoor recreation involving: the use of motorized vehicles (snowmobiles, ATVs and other off-highway vehicles); use of bicycles; fishing, hunting and trapping; and other outdoor recreational uses such as walking and hiking, canoeing, kayaking and cross-country skiing.

2.2.1 Vehicle and Bicycle Use

The use of bicycles and motorized vehicles, including ATVs, snowmobiles, motorboats and aircraft, is generally prohibited in wilderness areas. Some vehicle and bicycle use may be permitted in limited circumstances, as provided by the *Wilderness Areas Protection Act*.

Bicycle use may be approved on specific routes through a management agreement with a group or organization.

Vehicle – or bicycle - use in a wilderness area may be authorized by a license to provide access to²:

1. Private land owners whose land is surrounded by a wilderness area;
2. Researchers for scientific research;
3. Campsite lease holders to enable maintenance or removal of their lease structures;
4. Recognized individuals, interests, or companies to use or maintain existing legal interests

² Vehicles (not including bicycles) can also be used by hunters or guides for the annual moose hunt in Polletts Cove-Aspy Fault Wilderness Area until January 1, 2012.

A license can also be issued to allow use of a motorboat or an aircraft to access a campsite lease, or to enable access for wilderness recreation, sport fishing, hunting, or trapping. In the absence of a licensing program, current policy permits the use of motorboats for sport fishing, provided you carry a fishing license.

In new wilderness areas, or in additions to existing wilderness areas, certain routes or trails can be designated for continued vehicle use through an agreement with a group or organization, if the route is an important link within the regional trail network.

As a result of restrictions on motorized vehicle or bicycle use, designation of a wilderness area may inconvenience existing vehicle or bicycle users of the area and could potentially disrupt valued connections within regional route or trail networks. Impacts can be moderated by applying available vehicle use provisions of the Act.

For example, NSE currently holds a trail management agreement with the Snowmobilers Association of Nova Scotia (SANS), governing use and maintenance of five routes within four wilderness areas. Similarly, an agreement is in effect with the All-terrain Vehicle Association of Nova Scotia (ATVANS) for four wilderness area routes. Under the agreement with ATVANS, members of the Nova Scotia Off-Road Riders Association (NSORRA) are also permitted to use the four designated ATVANS routes.

2.2.2 Sport Fishing, Hunting, and Trapping

Nova Scotia has a long history of sport fishing, hunting, and trapping.

The recreational, freshwater fishery in Nova Scotia targets indigenous species such as Brook Trout, Atlantic Salmon, Gaspereau, American Shad, Striped Bass, Yellow Perch and White Perch, along with introduced species such as Smallmouth Bass, Rainbow Trout, Brown Trout, Chain Pickerel, and Lake Whitefish. Some of Nova Scotia's existing wilderness areas are considered important refugia for Brook Trout and other native species.

There were a total of 57,000 licensed anglers (local and non-resident) in Nova Scotia in 2008 (NSFA, 2009) plus at least 15,000 - 17,000 young people under the age of 16 living in licensed angler's households that fished (NSFA, 2000). Non-residents make-up approximately 4% of the licensed anglers, with just over half of the non-residents being from other regions in Canada (NSFA, 2000). In 1999, expenditures related to the freshwater fishery of Nova Scotia amounted to \$21.3 million, with an average per active angler of \$365 for resident and \$806 for non-resident (NSFA, 2000). The largest portion of these expenses (69%) is spent on food, lodging, and transportation (NSFA, 2000).

Hunters in Nova Scotia are able to harvest white-tailed deer, black bear, Canada geese, ducks, and upland game such as pheasants, ruffed grouse, and hare. A moose season is in effect within Cape Breton Island. The deer hunt is one of the most important of the province, with an annual harvest of about 10,000 in recent years. The number of deer taken by bow hunting has increased from 220 in 2001 to 436 in 2009. The popularity of bear hunting has also increased, with 248 taken in 1994, ranging to 1101 in 2009. Nova Scotia residents spent \$30.6 million hunting wildlife in 1996. The average hunter spent \$512 during the year, or \$25 per day of participation (Environment Canada, 1996)

Trapping in Nova Scotia also has a long history, with some 1,400 trappers currently active. The primary species of interest include beaver, muskrat, otter, mink, bobcat, fox, raccoon, squirrel, weasel, coyote, and fisher. Despite the current low prices for fur, this industry puts \$1,000,000 directly into trappers' pockets on a yearly basis (Fisher n.d.)

Fishing, hunting and trapping are generally permitted within wilderness areas, with the exception of hunting bear over bait. These activities would largely continue after designation. Changes in use patterns may occur with restrictions on the use of off-highway vehicles, which may be used to gain access to forests, lake systems or the coast.

2.2.3 Outdoor Recreation

Outdoor recreation use, as defined for this study includes a number of activities such as hiking, camping, nature viewing (*i.e.*, bird watching, nature photography), boating (*i.e.*, canoeing, kayaking), and other sporting activities (*i.e.*, cross-country skiing, snowshoeing, and geocaching). These activities are consistent with and among those defined as "wilderness recreation" under the Act. One of the objectives of the Act is to protect and provide opportunities for such activities in a wilderness setting. Trails and other infrastructure may be developed in wilderness areas to support such activities.

These outdoor recreation interests are represented by a number of local and provincial groups or organizations that promote and organize outdoor recreation. Many of the groups place an emphasis on low impact use, outdoor education, appreciation for the conservation of species and habitats, and awareness of natural history.

Wilderness recreation, as defined by the *Wilderness Areas Protection Act*, includes bicycle use. However, bicycle use is a special case, in that it is generally prohibited in wilderness areas, except on designated routes, or by license under limited circumstances. Bicycle use is considered elsewhere in this report, under "Vehicle and Bicycle Use."

Research by Costanza et al. (1997) provides a rough indication of potential value of natural areas for recreation. They estimated a value of \$36/hectare/year for boreal/temperate forest, \$491 hectare/year for wetlands, and \$230/hectare/year for lakes.

Designation of a wilderness area often secures a high quality land base for wilderness recreation, and hence designation will generally have a positive impact on these values.

2.3 Mi'kmaq Interests and Values

The Nova Scotia Mi'kmaq have a long history of hunting, fishing, gathering, occupation and use of Nova Scotia's lands and waters, including within existing or proposed wilderness areas.

The Mi'kmaq have asserted treaty and aboriginal rights, including aboriginal title, over lands and natural resources that may be affected by the Province's decisions respecting selection, designation and management of protected areas, including lands designated under the *Wilderness Areas Protection Act*.

While designating new wilderness areas creates a management regime which helps protect nature, this management regime may also conflict with certain land use activities valued by the Mi'kmaq.

Nova Scotia, Canada, and the Mi'kmaq of Nova Scotia have initiated negotiations to determine how aboriginal and treaty rights should apply under modern circumstances. In addition to those discussions, the province consults with the Mi'kmaq of Nova Scotia on decisions that have the potential to adversely impact asserted Mi'kmaq rights, consistent with the Mi'kmaq-Nova Scotia-Canada Consultation Terms of Reference.

With respect to provincially-designated wilderness areas, discussions are currently ongoing between the Province and the Mi'kmaq to explore:

- how potential conflicts between the *Wilderness Areas Protection Act* and Mi'kmaq interests can be resolved; and,
- how to integrate Mi'kmaq interests in planning and managing wilderness areas.

The same issues are being considered for provincially-designated nature reserves and parks.

The list of Mi'kmaq uses currently under discussion include, but are not limited to: hunting, fishing and trapping; harvesting of plants for medicinal, craft or food purposes; sacred sites; overnight encampments and structures; forest use; and vehicle access.

Designation of a wilderness area may secure or enhance some of these Mi'kmaq uses or activities, but may also restrict or prohibit these. In addition, designation is expected to help protect sites of archaeological and cultural heritage values, which occur within a wilderness area. While a precise evaluation of the socio-economic effects of designating a wilderness area on Mi'kmaq interests and values is currently not possible, available information does allow for a reasonable estimate of effects.

2.4 Societal Values

Societal values (non-use values) are those values that occur broadly to the benefit of all of society and that are not attributed to an individual's use of the environment. This includes cultural and heritage values and existence values.

2.4.1 Cultural Heritage Values

Heritage is that which society inherits from previous generations and deems worthy of taking special measures to preserve for future generations, including our tangible and intangible cultural and natural heritage. Tangible cultural heritage includes artifacts, buildings, and records (Nova Scotia Tourism, Culture and Heritage, 2008). Therefore cultural heritage values focus on the past or current use of an area and can include specific sites or physical structures.

Nova Scotia's heritage provides an understanding of the province's uniqueness and diversity, and a sense of identity and community. Nova Scotia Tourism, Culture, and Heritage (NSTCH) released a Heritage Strategy for the Province in 2008. This strategy acknowledges the importance of heritage to Nova Scotians and involves three major areas of government focus over the next five years to ensure that Nova Scotia's natural and cultural heritage is preserved and promoted now and for future generations. The three strategic directions for the government of Nova Scotia are:

- To better coordinate the efforts of those who share responsibility to preserve, protect, promote, and present Nova Scotia's heritage;
- To improve the development and sustainable management of the full range of the province's significant heritage; and
- To increase public recognition of the value and relevance of the province's rich heritage.

This strategy also identified the importance of protected areas (including heritage rivers) in preserving heritage assets and heritage resources including tangible and intangible, cultural and natural resources.

Cultural heritage values are held intrinsically by citizens and contribute to the rich history of the Province. Through legislation, such as the *Special Places Protection Act* and the *Nova Scotia Museum Act*, the Province is protecting and enhancing archaeological and cultural heritage. These values are also afforded protection under the *Parks Act*, the *Minerals Act*, and the *Treasure Trove Act*. Sites of significance can also be protected under the *Wilderness Areas Protection Act*. Archaeological significance is used as a key indicator in examining the cultural and heritage values in CWAs. Nova Scotia's longstanding tradition of hunting, fishing, and recreation activities in a wilderness setting are also cultural and heritage values.

The designation of wilderness areas protects existing cultural and heritage values including archaeological sites, remains of old structures, and cemeteries. Wilderness areas also protect the lands and waterways valued for hunting, fishing, and wilderness recreation.

2.4.2 Existence Values

Existence values are spiritual and psychological values, where people may hold values for particular natural areas simply because they exist, even though they may not visit or use the land in question. These subjective values relate to society's willingness to pay just for the existence of certain natural assets such as pristine forests, wildlife, and other ecosystem function (Stanley 1997).

There are a number of existence (non-use) benefits that can be provided by wilderness areas. These include:

- Strengthening cultural identity and heritage values in Nova Scotia by contributing to the protection of landscapes and ecosystems that people identify with, such as scenic coastlines, highlands, lakes and forests;
- Inspiring writers, poets, musicians and artists; and
- Inspiring a philosophy of life that recognizes certain ethical values relating to natural landscapes, and that encourages conservation and lifestyle choices to sustainable development and quality of life for Nova Scotians.

Bequest values are also included in this category. People hold these values because of their desire to conserve natural environments for future generations. In an extended capital accounting framework, these bequest values have real economic value, as depreciation of natural capital assets will occur at the expense of future generations. For example, the harvest of forest land today will be shown as present income on this analysis, but may result in a depreciation of the existence value associated with the remaining forest if further loss of species or ecosystem diversity occurs over time.

Several surveys conducted in the past decade provide some indication of Nova Scotians' views on existence values of protected areas. Sanderson et al. (2000) conducted a survey of 606 respondents within the Nova Forest Alliance Model Forest Area of central Nova Scotia. NFA asked a number of questions on respondents' perspectives of environmental issues, including a statement on protected areas: "There is too little designated wilderness in Nova Scotia". The results indicated that 60% agreed with the statement; of the remaining respondents, 11% disagreed, and 29% responded that they did not know.

More recently, a survey commissioned by Ecology Action Centre (EAC) found that the majority of Nova Scotians believe more publicly owned Crown land should be protected in Nova Scotia. The poll, conducted by Corporate Research Associates, included a representative sample of 400 adult residents from across the province, and had a 96% response rate (EAC 2004). The formal question sent out for response was the following:

“Some people say that protecting more wilderness areas in Nova Scotia is necessary to conserve native plants and animals for outdoor recreation. Others say there are already enough protected areas, and that to create more would be too costly, particularly for resource-based industries such as forestry and mining. All things considered, do you personally believe there should be more, the same amount, or fewer protected wilderness areas on publicly owned Crown land in Nova Scotia?”

The results indicated that 69% believed that there should be more protected areas, 28% believe that the number of protected areas should remain the same, and 3% believe that there should be less protected areas.

Survey results will be affected by the specific wording of the question that is posed (and it should be noted that the Corporate Research Associates question led individuals to consider use values, rather than existence values *per se*). However, the surveys provide a strong indication of the relative value those individuals in Nova Scotia place on protected areas, as it can be expected that many of the respondents would never have visited a wilderness area or plan to do so in the foreseeable future.

The designation of a wilderness area will generally enhance the existence and bequest values of the designated lands.

2.5 Ecosystem Service Values

Services provided by ecosystems contribute to society, both directly and indirectly (Wilson et al. 2004; Wilson 2008). As emphasised by “The Millennium Ecosystem Assessment³,” biodiversity is the foundation for ecosystem services, and ecosystem services are, in turn, critical to the sustainable production of goods and life-support systems. As such, the environment should be viewed as a service provider (Olmsted 2010, p.15).

The socio-economic values of ecosystem services are discussed as three categories for convenience, recognizing these are interrelated:

- biodiversity conservation (i.e., helping to ensure the diversity of plant and animal life that contributes to a well-functioning ecosystem and, in turn, supports many commercial and individual values; as well as ecological processes);
- maintaining ecological processes (i.e. regulation of water & water quality in streams and lakes, air quality/clean air, nutrient cycling, decomposition, and energy flow); and,

³ The Millennium Ecosystem Assessment (MA) was conducted by the United Nations in 2001 to assess the consequences of ecosystem change for human well-being and the scientific basis for action needed to enhance the conservation and sustainable use of those systems and their contribution to human well-being. Their findings, contained in five technical volumes and six synthesis reports, provide a state-of-the-art scientific appraisal of the condition and trends in the world’s ecosystems and the services they provide (such as clean water, food, forest products, flood control, and natural resources) and the options to restore, conserve or enhance the sustainable use of ecosystems.

- climate change mitigation (e.g., the carbon sequestration function performed by forests, thus offsetting greenhouse gas production) and adaptation (resistance and resilience building).

Ecosystem services have real value to humans and our economy. Valuation of these ecosystem services is challenging compared to directly used ecosystem goods (e.g. wood products, minerals, plants, or animal furs). There has been an increasing effort over the last 10-15 years to better quantify the value of ecosystem services. As noted by Costanza et al. (1997), “The issue of valuation is inseparable from the choices and decisions we have to make about ecological systems.” A number of valuation methods that can be used include market price, damage cost avoided (or replacement cost), or contingent valuation (“willingness to pay”). The quality and amount of information and research available for different ecosystem services are variable; for example, considerable research has examined atmospheric carbon and climate change processes.

In this section, we highlight values of selected ecosystem services, with emphasis on research of Costanza et al. (1997), based on their study in the scientific journal *Nature*, and from a study in Ontario by the Lake Simcoe Conservation Authority (closest Canadian study) for ecosystem services other than climate change. Both studies provide estimates based primarily on contingent valuation. For climate change mitigation, we present both market price and damage cost avoided valuations, based on work of the Intergovernmental Panel on Climate Change (IPCC) and other studies.

It is important to note that ecosystem service values described in this study are not complete. Other ecosystem service functions may also be important but are not assessed here because the available information is insufficient. Thus, the total value of ecosystem service benefits will likely be underestimated in this report.

2.5.1. Biodiversity Conservation

Biodiversity is the variety of life and all its processes, and includes the range of living organisms within an ecosystem, their genetic differences, and the communities in which they naturally occur. A genetically diverse ecosystem will have greater resilience and a greater ability to adapt to environmental change. Maintaining a diverse assemblage of species is critical for the long-term survival of forests and other ecosystems, and the ecosystem services these provide.

Forests, together with associated wetlands and waterways, form complex functioning ecosystems. They provide a wide range of forest functions, including: protection of soils, watersheds, biodiversity, habitat for species, aesthetic quality and recreational opportunities, climate regulation and sequestration of carbon from the atmosphere, and the provision of the high quality, wide diameter, clear timber that characterizes older forests. Taken as a whole, it is important to maintain biodiversity itself to ensure continuation of this complex set of functions and relationships.

A variety of species are dependent on older forests for their survival, using large snags, cavities, and fallen logs as habitat. Studies have found that forest fragmentation and edge effects caused by clear cutting and roads can have severe impacts on species that:

- require large territories and/or large, uninterrupted tracts of forests;
- are susceptible to predation and parasitism by 'edge-loving' species;
- are sensitive to human contact;
- or do not traverse large openings.

Nova Scotia examples include American marten, northern goshawk, northern flying squirrels, and black-throated green warbler.

Wetlands also play a significant role in sustaining biological diversity. Several factors contribute to the importance of wetlands compared to other ecosystems (Mitsch and Gosselink, 2000; Millennium Ecosystem Assessment 2003):

- wetlands represent a transition between terrestrial and aquatic habitats, supporting both aquatic and terrestrial species;
- some wetland types have exceptionally high productivity, supporting a large and complex food chain;
- some wetlands support a unique set of conditions requiring specialized adaptation for survival (*e.g.*, anoxic, acidic, low nutrient soils);
- wetlands themselves are diverse, and grouping the species found in any wetland class represents a large range of species; and
- as wetlands are less adaptable to human use compared to forests and meadows, they serve as refugia for various wildlife.

Some select ecosystem services that specifically relate to individual species and their habitats include pollination, biological control, seed dispersal, and habitat refugia. These services are valuable to society and potentially worth \$100's per hectare per year. To illustrate, Costanza et al. (1997) and Wilson (2008) provided some estimated values of these services for forest and wetland ecosystems (Table .5.1)

Table 2.2: Biodiversity conservation services

Biodiversity Conservation Ecosystem Service	Temperature/Boreal Forest (CA \$/ha/yr)	Wetlands (CA \$/ha/yr)
Pollination	951 ⁴	
Seed dispersal (birds)	537 ⁴	
Biological Control	5 ⁵	
Habitat Refugia	0	587 ⁵

The designation of a wilderness area helps protect existing native biodiversity, including related ecosystem services, and can help with recovery of species that depend on older forests and large natural areas. Designation can complement other tools that can help protect biodiversity, such as: the federal *Species at Risk Act*, *Migratory Birds Convention Act*, and *Canada Wildlife Act*; and the provincial *Endangered Species Act*, *Conservation Easement Act*, and *Wildlife Act*.

2.5.2 Maintaining Natural Processes

In addition to their role in conserving biological diversity, natural ecosystems also maintain natural (ecological) processes, such as atmospheric gas regulation/air quality, disturbance regulation, water regulation, maintenance of water supply, soil formation, and waste treatment.

Gas Regulation/ Air Quality

Gas regulation involves the regulation of the atmospheric chemical composition and includes maintaining the CO²/O² balance, and O³ (provides UVB protection). Natural areas, such as protected areas, can also help maintain air quality by the removal, interception, and storage of pollutants (e.g. carbon monoxide and sulphur dioxide).

Disturbance Regulation

Natural ecosystems have a built-in resilience to natural disturbances. Ecosystems have stored ability and integrity to deal with environmental fluctuations. Intact ecosystems can assist in storm protection, flood control, drought recovery, and other environmental variability.

Water Regulation

The water regulation functions provided by forests and wetlands include filtering and intercepting water, controlling run-off and removing air pollutants, along with significant erosion and sediment control functions. This, in turn protects water quality in streams and lakes. Additionally, riparian habitats are particularly important for preventing turbidity and sedimentation in streams, and to moderate water temperatures to maintain suitable habitats for fish.

Water Supply

There is also growing evidence that undisturbed forested areas can help maintain quality water supplies for municipalities and that protection of watersheds can result in long-term cost savings. Research by Dudley and Stolten (2003) shows that a significant number of the world's largest cities use protected areas as a way to help maintain drinking water quality. Of 105 cities they examined, over one third have protected areas in a significant part of their water supply watershed.

One example of how protected areas can help maintain drinking water quality is the city of New York. The city faced an \$8-\$10 billion investment in a new filtration plant but instead invested \$1.8 billion in protecting the Catskills watershed, which supplies drinking water to the city (Postel and Thompson 2005). The Catskill State Park protects almost 100,000 hectares in the Catskill watershed but the city is also actively acquiring land to set aside as recreational parks and conservation easements. The park, along with other watershed management practices, is estimated to save the city \$300 million in annual operating costs (Stroud Water Research Center 2000). According to Myers (1997), the price of water from a forested catchment (with undisturbed forest) increases twofold after a forest is logged, and fourfold after uncontrolled logging.

Soil Formation

Forest ecosystems assist with soil formation through the weathering of rock and the accumulation of organic matter. Forest ecosystems also assist in nutrient cycling through the storage, internal cycling, processing, and acquisition of nutrients (e.g. nitrogen fixation or phosphorus cycling).

Ecosystems also play a role in preventing loss of soil by wind, runoff, or other removal processes, and through the storage of silt in lakes and wetlands. Erosion control was not given a value in Costanza et al. (1997) and Wilson (2008) only gave an erosion value for agricultural woodland (\$5.60/hectare).

Waste Treatment

Forests and wetlands provide valuable waste treatment through the recovery of mobile nutrients and removal or breakdown of excess nutrients and compounds (Costanza et al. 1997).

The designation of a wilderness area generally protects existing ecological processes services.

As with biological conservation services (see 2.5.1), these services are valuable and can have values of \$100's - \$1,000 per hectare per year. Costanza et al. (1997) provided some estimated values of these services for forest, wetland, and lake/river ecosystems (Table 2.4).

Table 2.3: Ecosystem process services values for major biomes (Costanza et al. 1997)

Ecosystem Service	Temperate/Boreal Forest (\$CA/ha/yr ⁴)	Wetlands (\$CA/ha/yr ⁵)	Lakes/Rivers (\$CA/ha/yr)
Gas regulation/air quality	0	354	0
Disturbance regulation	0	9,680	0
Water regulation	0	40	7,280
Water supply	0	10,200	2,830
Soil formation	13	0	0
Waste treatment	116	2,220	889

2.5.3 Climate Change Mitigation and Adaptation

Many ecosystems, including forests and wetlands, can accumulate and store atmospheric carbon dioxide. Carbon storage is the total amount of carbon contained in an ecosystem at a given time, and carbon sequestration generally refers to the rate of carbon uptake (e.g. annual uptake) by an ecosystem after subtracting the carbon released to the atmosphere due to respiration, disturbance, and decomposition (Wilson 2008). Through these processes, ecosystems can contribute to climate change mitigation and adaptation, if properly managed. While climate change mitigation could be discussed under the “ecological processes” heading, it is treated separately here because of the important role it can play in mitigating human caused release of carbon to the atmosphere.

Forests represent an accumulation of biomass. As they grow, they sequester carbon dioxide, and can thus help offset carbon sources from the destruction of forests (e.g. urban development, conversion to agricultural land, the burning of fossil fuels, and other human activities). The amount of carbon that a forest can store changes over time. Generally, newly planted or regenerating forests will have the highest rates of carbon uptake or capture, but overall low storage. It was previously debated whether older forests continue to accumulate carbon or release more carbon than they store to the atmosphere (Odum, 1969; Pregitzer and Euskirchen 2004; Luysaert et al. 2008; Lewis et al. 2009; Morton et al. 2010). Research by Luysaert et al. (2008) showed that old-growth forest are usually carbon sinks and steadily accumulate carbon for centuries. These old-growth forests will generally only lose their carbon

⁴ All values were converted to Canadian dollars (2010). (We used an equal exchange rate from US dollars, and used the Consumer Price Index [CPI] to adjust to 2010. (<http://www.measuringworth.com/uscompare/>))

⁵ All values were converted to Canadian dollars (2010). (We used an equal exchange rate from US dollars, and used the Consumer Price Index [CPI] to adjust to 2010. (<http://www.measuringworth.com/uscompare/>))

once disturbed (either natural or human) (Luyssaert et al. 2008). The conversion from old-growth to young forests produces a net loss of carbon (i.e. carbon source) to the atmosphere, even when the carbon uptake of new forests is taken into account (Kurz *et al.* 1998; Schilze *et al.* 2000). Older forests contain a greater amount of biomass than young or second growth forests (Harmon *et al.* 1990.)

The Carbon Budget Model (CFS-CBM), developed by the Canadian Forest Service, can be used to estimate the amount of carbon currently store in a forest area. This model incorporates the individual forest stand characteristics, including species, age, area, growth and yield data, and disturbances. Carbon storage includes both above ground biomass, below ground biomass, litter, all deadwood, and soil organic carbon. The CFS-CBM was used by Morton et al. (2010) to look at carbon storage in four wilderness area in Nova Scotia. Morton et al. (2010) found a range of 234 - 340 metric tonnes of carbon / hectare (t C/ha) of forest carbon stored. Other studies by Kurz and Apps (1999) and Kurz et al. (1992) found from 165- 220 t C/ha in eastern Canada forests.

Accounting for the long-term storage of carbon in wood products from harvesting, and considering the total carbon storage in plant biomass and soils typical of the forest types found in Nova Scotia, the difference in the long-term storage of carbon between managed (harvested) and unmanaged, natural forest is estimated to be 15 to 30t C/ha (Kurz *et al.* 1998; Kulshreshtha *et al.* 2000). We can then use this figure as the potential difference in carbon storage when comparing management of an area as a wilderness area or managing the area for forest harvesting and wood products.

In addition to sequestering and storing carbon, wilderness areas can also play an important role in climate change adaptation, since our climate is expected to continue changing even if effective mitigation measures are implemented globally. Roles in climate change adaptation include:

- Providing habitat where species may adapt to changing climate patterns and sudden climate events by providing refugia and migration corridors;
- protecting people from sudden climate events and reducing vulnerability to floods, droughts and other weather-induced problems;
- Indirectly, in supporting economies to adapt to climate change by reducing the costs of climate-related negative impacts;
- Providing ecosystems services such as oxygen, clean water, and nursery grounds for fisheries.

Wetlands also play an important role in the sequestering and storing carbon in their soils and peat. Different wetland types accumulate and store carbon at different rates (Wilson 2008). In a review of recent research, Morton et al. (2010) found that the rate of carbon accumulation was 0.24-0.73 t C/ha/yr for wetlands in eastern Canada. The carbon storage ranged from 1,510 t C/ha to 1,640 t C/ha for selected wetlands in Nova Scotia (Morton et al. 2010). These values demonstrate the value wetlands play in addition to forests in sequestering and storing carbon.

Infilling and peat extraction of wetlands are threats to the ecological services of wetland carbon sequestering and storage.

There are a number of ways to approach the valuation of carbon sequestration and storage. Valuation can be calculated using the *damage cost avoided* or the *market value* of carbon trading. For this socio-economic analysis, values for both *avoided cost* and market value are calculated to provide an estimate of the value of carbon storage in protected areas.

According to the 2007 IPCC (Intergovernmental Panel on Climate Change) report, the mean cost of global damages due to the level of carbon dioxide in the atmosphere in peer-reviewed studies was C\$43/tC₆ (IPCC 2007). The *market value* of carbon varies considerably, from cents to hundreds of dollars. However, a reasonable estimate of market value of carbon credits is C\$15/tC as used by the Alberta Climate Change and Emissions Management Fund (Goddard, et al. 2010; Alberta Environment 2010).

These carbon value estimates are most useful in a comparison of management options. As identified earlier, there is predicted to be between 15 to 30t C/ha (Kurz *et al.* 1998; Kulshreshtha *et al.* 2000) more carbon in a protected forest compared to a forest managed for timber. This difference (15 to 30t C/ha) multiplied by the values (C\$43/tC and C\$15/tC) multiplied by the amount of forest, provides reasonable estimates of the value of protecting woodlands in terms of carbon sequestration and storage.

Regardless of the method of valuation of carbon sequestration and storage, managing land as a wilderness area is predicted to increase climate change mitigation values. The protection of forests, wetlands and other ecosystems helps ensure continued and increased carbon sequestration and storage in the area.

While the resulting benefits (i.e. reduction in climate-related damages) are largely global, local benefits may be realized if carbon markets are established which recognize the role of land protection in storing atmospheric carbon. In that case, carbon storage due to land protection may result in direct monetary value to Nova Scotia.

While difficult to value, climate change adaptation values of protected lands may also provide local benefits by helping make local lands and coastal ecosystems more resilient to climate change.

6 Note this value is lower than damage cost avoided used in previous socio-economic analyses on designating new wilderness areas by Jacques Whitford Ltd. (now Stantec Ltd.). We felt this new value best represents the most current information on avoided cost for carbon.

3.0 ANALYSIS OF CANDIDATE FIVE BRIDGE LAKES WILDERNESS AREA

3.1 General Description

3.1.1 Geographical Description

The 8,255 hectare (20,398 acre) candidate Five Bridge Lakes Wilderness Area (CWA) is located on the Chebucto Peninsula, between Highways 103 and 333, within Halifax Regional Municipality (HRM). These lands are situated in the undeveloped interior of the Chebucto Peninsula, and extend to Blind Bay Provincial Park Reserve, on the Atlantic coast (Figure 3.1). The area's scenic and rugged landscape includes a mix of forest, barrens, interconnected lakes, and wetlands. A new wilderness area on these Crown lands will protect valued wildlife habitat and high quality wilderness recreation opportunities, all within minutes of Atlantic Canada's largest urban centre.

3.1.2 Biophysical Description

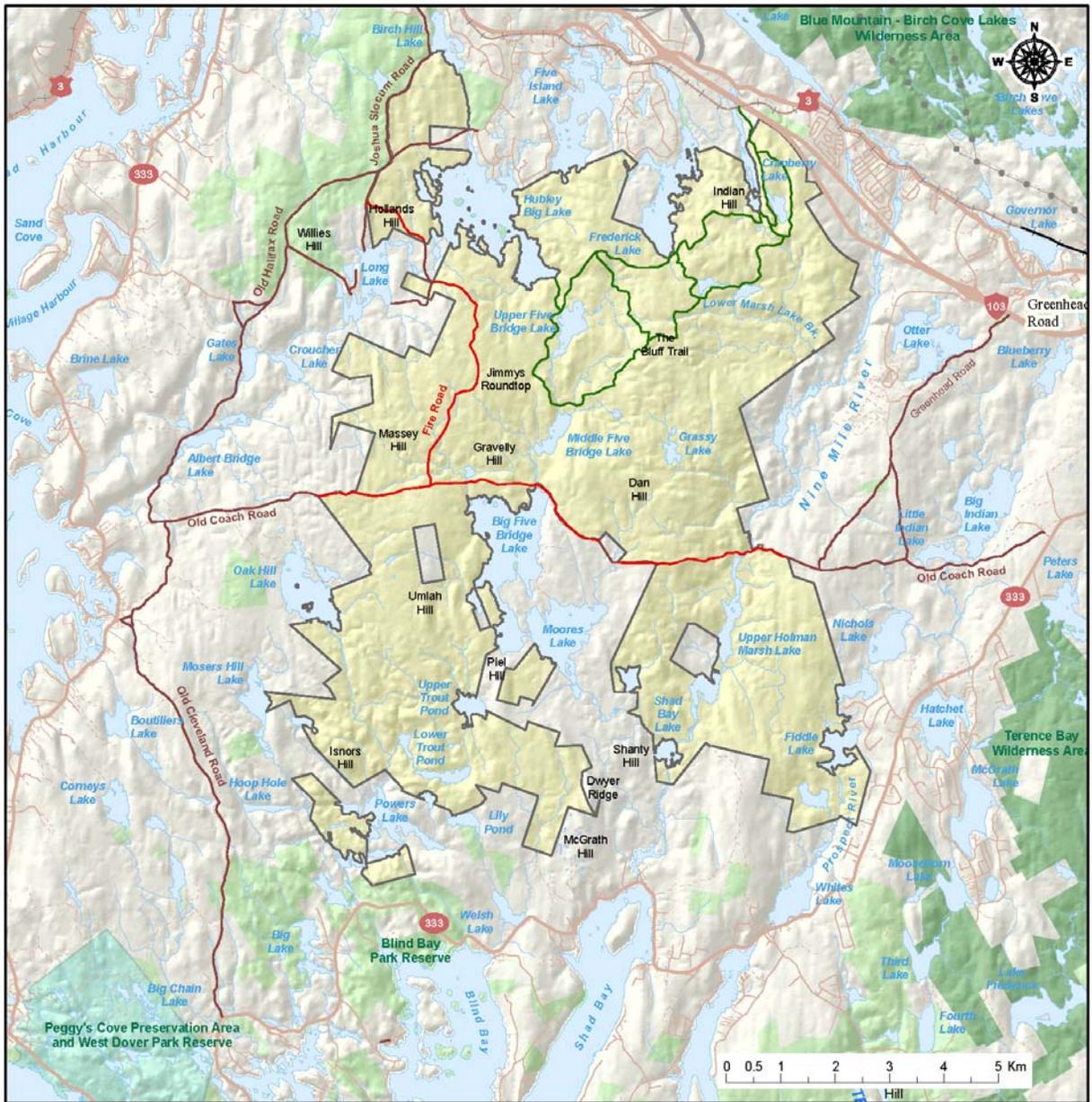
The area is part of the Atlantic Coastal Climatic Region with cool summers, warm winters, high rainfall, and frequent heavy fog. It is composed of four main ecosystem types: forest (63%), barrens (30%), wetlands (5%), and lakes (2%). The majority of the CWA is within Nova Scotia's "South Mountain Rolling Plain – Natural Landscape," with a small portion (167 hectares) within the "Pennant Granite Barrens - Natural Landscape" (NSEL, 2002). The elevation of the area ranges between 15 m and 130 m above sea level.

The geology of the Five Bridge lakes CWA is predominately granites from the late Devonian period. The surficial geology is comprised of hummocky ground and stony till plain, with abundant bedrock exposed on the eastern side of the CWA, near Blind Bay; near The Bluff Wilderness Trail; and locally elsewhere.

The CWA is dominated by softwood forest type (42% of the area); with smaller amounts of mixedwood forest (16%) and hardwood forest (5%) (Figure 3.2). Most of the forest is less than 15m in height (primarily due to the shallow soils), with only a few pockets of tall, mature or old forest.

3.1.3 Encumbrances and In-held Land

The CWA is entirely Crown land, and has been administered by the Nova Scotia Department of Natural Resources (NSDNR). The CWA borders and nearly surrounds lands owned by HRM, near Big Five Bridge Lake and Moores Lake. Although the CWA does not include private land, four separate private properties are either surrounded by CWA lands or by CWA lands and a watercourse (see Figure 3.3). These are private land in-holdings.



Five Bridge Lakes Candidate Wilderness Area



-  The Bluff Hiking Trail System
-  OHV Routes on Existing Old Roads
-  Potential Trail Management Agreement on OHV Route
-  Five Bridge Lakes CWA
-  Existing Wilderness Areas
-  Crown Land

Map produced by the Protected Areas Branch of NS Environment, January 2011.

The information shown here was obtained courtesy of the NS Geomatics Centre (SNSMR) and the NS Department of Natural Resources.

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This map is a geographic representation only. NS Environment accepts no liability.

Figure 3.1: Five Bridge Lakes Candidate Wilderness Area

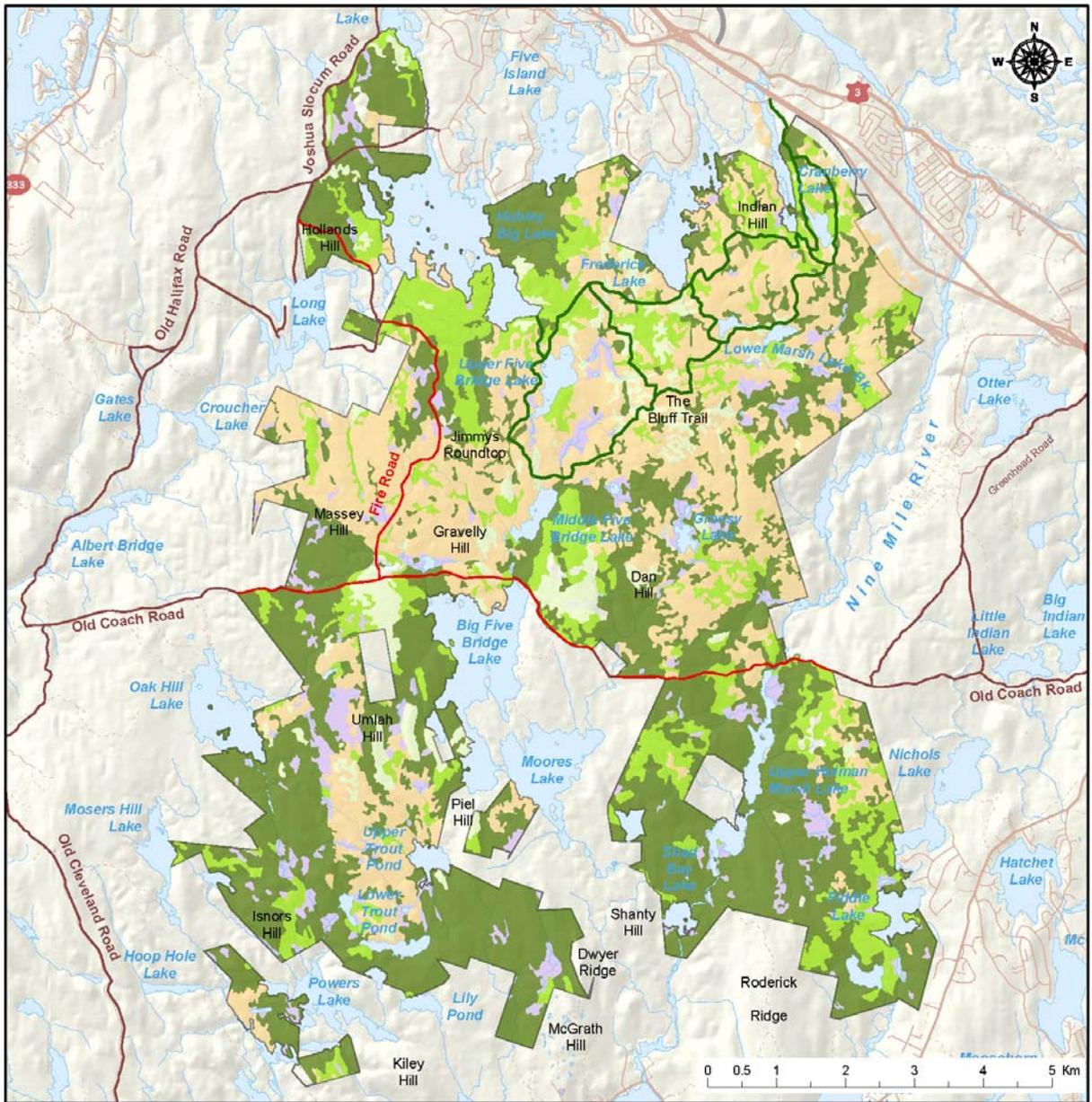


Figure 3.2: Five Bridge Lakes Candidate Wilderness Area Land Cover

Seven campsite leases exist within the CWA (see Figure 3.3). Campsite lease holders are permitted to maintain and use camp structures within the leased site. These leases can be honoured under the *Wilderness Areas Protection Act*. Access to several of these campsite leases is by boat across Frederick Lake, and access to the other sites is via routes that cross CWA lands.

Parts of two old K-class roads cross the CWA: about 1 km of the Old Halifax Road and about 8 km of the Old Coach Road. These roads are currently administered by the Nova Scotia Department of Transportation and Infrastructure Renewal (TIR). As K-class roads, they are unmaintained, rugged, and not suitable for use by ordinary vehicles. Another unmaintained old road, known as the “Fire Road,” connects the two K-class roads, and is administered by NSDNR. Several shorter sections of forest access road also occur within the CWA. Most of these are old and in very poor condition.

None of the CWA is under license for forest management, and no current mineral or energy exploration licenses are in effect.

Most of the 30 km Bluff hiking trail system occurs within the north-eastern part of the CWA. Woodens River Watershed Environmental Organization (WRWEO) manages this trail under an agreement with NSDNR.

No other encumbrances, agreements, or other legal land use interests are in effect within the CWA. The Province will not make new land use commitments while the CWA is under consideration for protection.

3.2 Values Analysis

3.2.1 Commercial Values

3.2.1.1 Forestry

Documentation of historic forestry activities within the CWA is limited. In the 1950’s, Laurie Fraser operated a small woods camp just East of Five Bridges on the Old Coach Road, where he harvested some hardwood and trucked the wood out to Glen Margaret (Wheadon nd). In the late 1970s, some hardwood timber harvesting occurred in the Dan’s Hill area. This produced about “... seven cords to an acre as compared to the 30-35 cords to the acre in the Mersey country, so naturally the Crown lost money on that venture” (Wheadon nd p. 4).

In 1973, a major forest fire burned over 800 hectares of woodland south of Hubley Big Lake. Some of these lands, west of the Fire Road, were planted with red pine in 1977 (Wheadon nd). These plantations are poor quality today.

Today, about 5,212 hectares of the 8,255 hectare Five Bridge Lakes CWA are classified as forest, which is generally of low merchantable quality. After operational restrictions are considered, only 3,148 ha of the CWA, or 39%, is potentially available for forest harvesting (see table 3.1). The volume of wood in this “working forest” is 236,277 m³, including 178,673 m³ of softwood.

Of that working forest, less than half (1,549 ha or 48%) has volumes greater than 89 m³/hectare. Volumes less than this are typically not economically viable to harvest by woodlot owners (NSDNR 2010). The volume of wood in this productive working forest (great than 89 m³ per hectare) is 147,952 m³, including 87,771 m³ of softwood. The potential value of wood in the CWA has been calculated for both the regular working forest (with the usual operational restrictions) and for “productive” forest only (forest with greater than 89 m³/ha and usual operational restrictions).

To determine the potential value of wood in the CWA, the current provincial stumpage fees (with no overhead) were calculated using NSDNR’s Forest Inventory Database (FID). Value was calculated for the following products based on the FID volumes of the working forest: softwood pulpwood (9 - 16 cm); hardwood pulpwood (all sizes); and softwood studwood (17 – 24 cm). There were no stands in the inventory with sawlogs sized diameters (greater 25 cm).

At a current stumpage value (as of January 2011), the potential maximum value of the wood (and thus revenue to the Province) is \$2,495,033. See table 3.2 for a breakdown of stumpage values by product. If only the more productive forest is considered (greater than 89 m³/ha) then the value of the wood (and thus revenue to the Province) is \$1,289,158. See table 3.3 for a breakdown of stumpage values by product.

TABLE 3.1 Land Base Classification Area Summary: Five Bridge Lakes CWA

Forest Land Base Classification Area Summary (ha and %)	
Total area	8,255 ha or 100%
Total forest area	5,212 ha or 64%
Non-Forest	3,043 or 36%
Operational restrictions (watercourse buffers, islands, slope, low site productivity)	1,765 ha or 21%
Policy Restrictions – (Old-growth Forest)	299 ha or 4%
Total potentially harvestable forest	3,148 ha or 39%
harvestable softwood	1,970 ha or 24%
harvestable mixedwood	837 ha or 10%
harvestable hardwood	341 ha or 4%

Table 3.2 Potential value of wood products in regular working forest (with the usual operational restrictions) within Five Bridge Lakes CWA.

Wood Product	Volume ⁷	Stumpage (2010/2011)	Value Total
Pulpwood Softwood	▪ 173,756	▪ \$11.79	▪ \$2,048,583
Pulpwood Hardwood	▪ 57,604	▪ \$5.91	▪ \$340,439
Studwood Softwood	▪ 4,917	▪ \$21.56	▪ \$106,010
Total	▪ 236,277		▪ \$2,495,033

Table 3.3 Potential value of wood products in productive forest (greater than 89 m³/ha and usual operational restrictions) within Five Bridge Lakes CWA.

Wood Product	Volume ⁸	Stumpage (2010/2011)	Value Total
Pulpwood Softwood	▪ 89,976	▪ \$11.79	▪ \$1,060,817
Pulpwood Hardwood	▪ 20,699	▪ \$5.91	▪ \$122,331
Studwood Softwood	▪ 4,917	▪ \$21.56	▪ \$106,010
Total	▪ 115,592		▪ \$1,289,158

Designation of Five Bridge Lakes CWA will prohibit future commercial harvesting of wood products, with estimated potential loss of provincial stumpage value of about \$1,300,000 to \$2,500,000.

3.2.1.2 Mining

Most past mineral exploration in the CWA focused on the potential for tin, tungsten, copper, molybdenum and uranium deposits. Several mineral occurrences have been discovered in the CWA, mostly consisting of minor uranium occurrences, however, no economic deposits were discovered. With the existing legislated ban on uranium exploration and mining, established in 2009, the CWA is considered to have decreased potential for economic deposits. Several areas within the CWA are underlain by fine-grained granitic rocks and have good potential for use as crushed stone aggregate resource.

Because the mineral development potential of the CWA lands is considered low to moderate, potential loss of economic opportunity and revenue caused by wilderness area designation is relatively modest. The greatest economic opportunity may be for aggregate development, though alternative sites appear to be available within HRM.

⁷ Wood volumes from NSDNR Forest Inventory Database

⁸ Wood volumes from NSDNR Forest Inventory Database, for only stands with greater than 89 m³/ha

3.2.1.3 Energy

No on-shore petroleum developments are currently planned within the CWA, and no licenses are in effect within the area. The underlying rock types for the CWA, which are mostly granites from the late Devonian period, are not known to host petroleum deposits. According to the province's Petroleum Potential Mapping for Nova Scotia (Nova Scotia Department of Natural Resources, Mineral Resources Branch and Department of Energy 2010), the CWA has low potential for petroleum resource development

According to modelling undertaken for the province's Wind Atlas, wind speeds throughout much of the CWA average between 6.01 – 6.50 metres /second at 80 metres above ground level. In lower lying areas, these figures drop to 5.51 – 6.0 m/s. A small area along the east side of Hubley Big Lake may have values of 6.51 – 7.0 m/s. Overall, wind speed suitability for wind energy development within the CWA is moderate (around 6 m/s). Current HRM municipal land use zoning for the entire CWA prohibits wind energy development.

Significantly higher wind energy potential (wind speeds of 8.0 – 10 m/s) occurs along the nearby coastal sections of the Chebucto Peninsula (Figure 3.5). These values are considered excellent for wind energy development.

During NSE's consultation process for the CWA, Three Brooks Home Owners Association, with support from Birch Bear Run Homeowners Association, expressed interest in exploring the feasibility of developing a community based wind energy co-op on the eastern side of Hubley Big Lake, within the CWA, where predicted wind speeds are higher than in the immediate surroundings (moderate to good potential as compared to moderate potential).

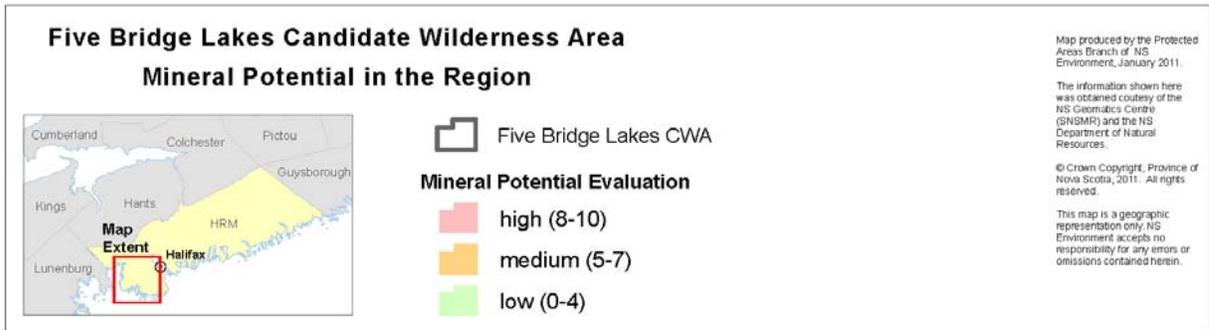
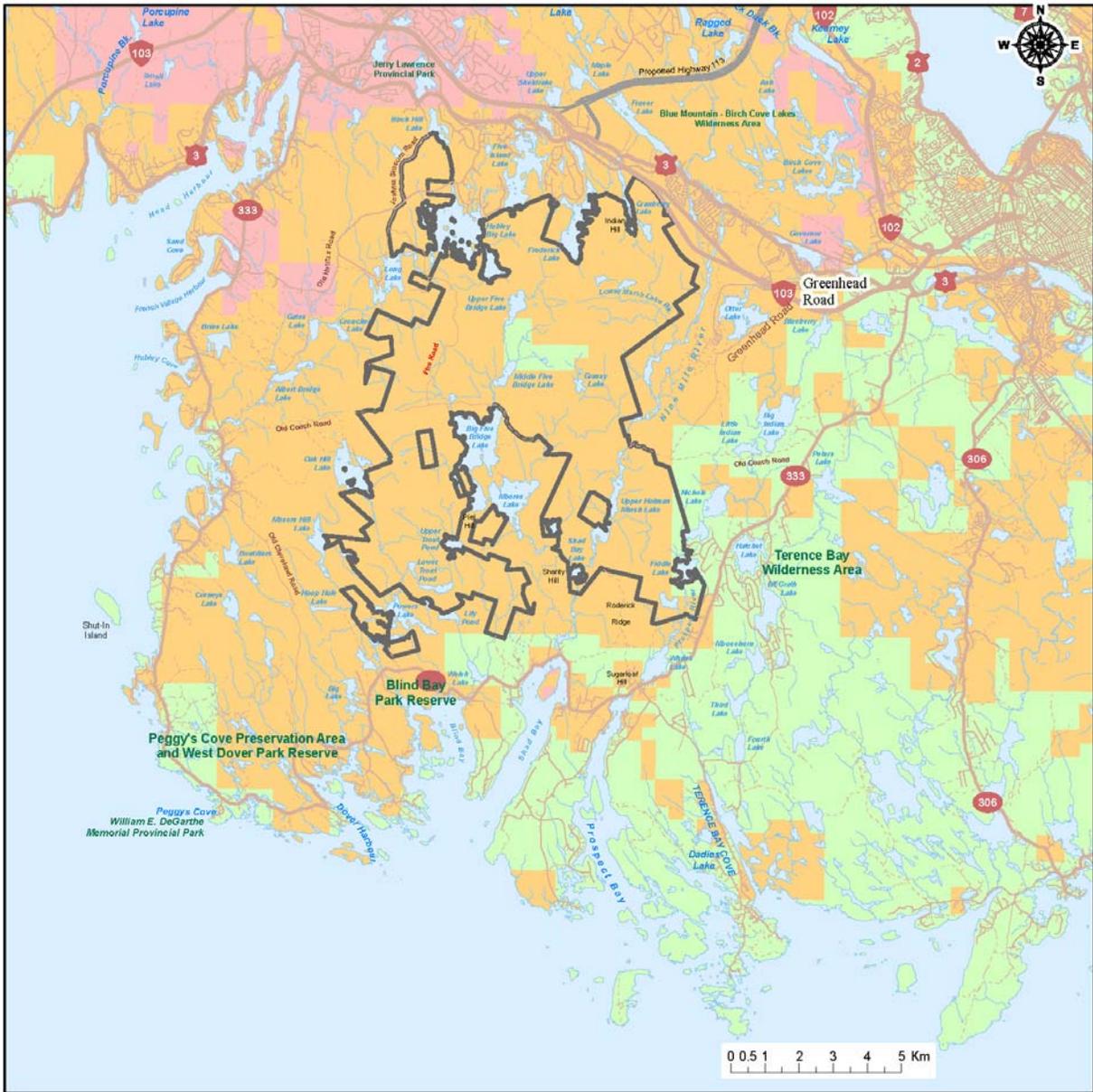


Figure 3.4: Five Bridge Lakes Candidate Wilderness Area Mineral Potential in the Region

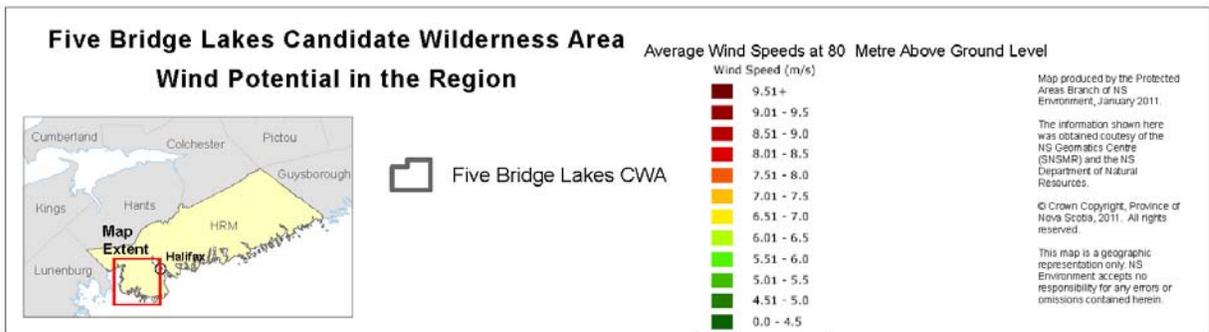
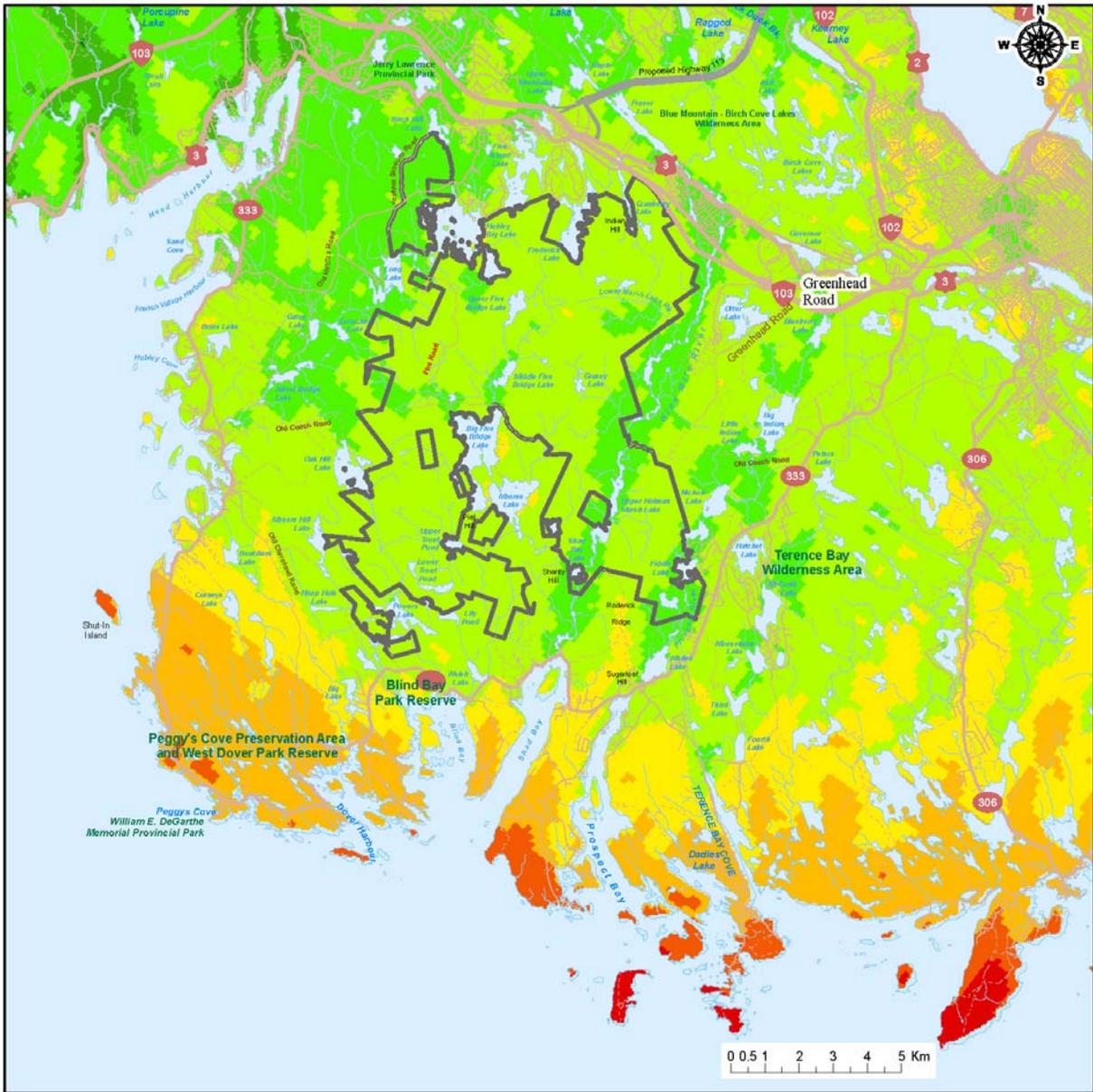


Figure 3.5: Five Bridge Lakes Candidate Wilderness Area Wind Potential in the Region

Because the petroleum development potential of the CWA lands is low, potential loss of economic opportunity and revenue caused by wilderness area designation is negligible. There may be some limited potential for wind energy development within the CWA. Designation of the CWA under the *Wilderness Areas Protection Act* would prohibit wind power development and any other potential energy development.

3.2.1.3 Tourism

The candidate wilderness area is uniquely positioned to connect people with nature. With its scenic beauty, wildlife, natural setting, and near-urban location, the area offers exceptional outdoor education and wilderness recreation opportunities. Activities such as hiking, camping, canoeing, swimming, trail-running, bird watching, and cross-country skiing can all be enjoyed within a short distance from downtown Halifax. The CWA also offers good angling opportunities, particularly for Speckled (Brook) Trout.

Although there is no specific documentation of tourism use of Five Bridge Lakes CWA, the Tourism Industry Association of Nova Scotia (TIANS) recently reported that “the proximity of this protected wilderness area to Halifax is an extremely important feature to the tourism industry,” and that “Designation of this area would add value to Nova Scotia establishing itself as a leader in environmentally sustainable tourism.” TIANS also identified the value of the existing trail networks and canoe/kayak routes in the area (TIANS, April 28, 2010). Tourism opportunities within the CWA could also complement those of nearby Peggy’s Cove.

A local conservation group, Five Bridge Lakes Wilderness Heritage Trust (2010), recently published “A Walking Guide to the Old St. Margarets Bay Road,” also known as the Old Coach Road. This is an unmaintained, loose-surface road, which offers some limited tourism opportunities.

The most notable existing tourism product within the CWA is The Bluff Wilderness Hiking Trail (see Figure 3.1), which offers more than 30 km of high quality, managed backcountry hiking trail (see: www.wrweo.ca/BluffTrail/index.html). This trail was developed by Woodens River Watershed Environmental Organization (WRWEO) with authorization from the Nova Scotia Department of Natural Resources. This trail has been rated as one of the eight best urban escapes in Canada by *Explore: Canada's Outdoor Magazine* (May 2008). The Bluff Wilderness Hiking Trail includes trailhead parking, and connects at the trailhead to the regional, shared-use BLT (Beechville-Lakeside-Timberlea) Trail. According to WRWEO, a good weekend during the summer may attract between 200-300 people using some portion of The Bluff Wilderness Trail. How much of this use may be considered “tourism use” (in contrast to local recreational use by Nova Scotians, discussed later) is not known.

The CWA offers opportunities to develop and manage additional land and water trails for wilderness recreation. Predicted effects on tourism values of designation are positive, as

protection is expected to lead to expanded outdoor recreation opportunities and related infrastructure. Designation may also support marketing of existing tourism opportunities.

3.2.1.5 Research and Education

Educational initiatives help to increase community awareness and cultivate a societal value of understanding and nurturing natural systems. The proximity of this CWA to the large HRM population provides an excellent opportunity to provide such educational initiatives to school age children, university and college students, and the public.

The CWA also has potential as a natural laboratory for research, particularly due to its proximity to HRM's numerous post secondary institutions. Current access opportunities for research are modest, including along unmaintained old roads, managed trails and by boat along some waterways. The area has already been a focus of a number of research and environmental monitoring projects initiated by the Woodens River Watershed Environmental Organization (WRWEO), including a study on the water quality of selected lakes, and a study on brook trout habitat. There has also been research in the area on PCB levels in the Woodens River system.

As well, NSDNR monitors the small population of endangered mainland moose which resides within the CWA and on adjacent lands, and NSE has recently confirmed the presence of mountain sandwort (*Arenaria groenlandica*) and two rare lichens (*Sticta fuliginosa* and *Pannaria rubiginosa*).

Designation of the CWA will protect these lands from development, which will enhance their value for future research and educational purposes.

3.2.2 Individual Values

3.2.2.1 Vehicle and Bicycle Use

Several old, unmaintained roads within the CWA are well used for all-terrain vehicle (ATV) riding and receive limited snowmobile, dirt bike, 4X4, and bicycle use. These routes provide motorised access to the large, interior lakes and provide valued connections within the regional off-highway vehicle trail system.

Most important among these is an 8 km section of the Old Coach Road (also known as Old St. Margarets Bay Road), which passes, from east to west, through the middle of the CWA and along the north side of Big Five Bridge Lake (Figure 3.1). Another 6.7 km section of old forest access road, known as the Fire Road, connects Old Coach Road, in north-south fashion, to the Old Halifax Road near the west side of Hubley Big Lake. This route is commonly used to access the Old Coach Road and Big Five Bridge Lake area. A very short, 1 km section of the Old Halifax

Road is also included within the CWA, near the northwest end of Hubley Big Lake. This route is in very poor condition and receives much less vehicle use.

Other, more limited vehicle use occurs on some side trails within the CWA, including on a winter access route that seasonally crosses the ice of Upper Holman Marsh Lake, linking the Shad Bay area directly to the Old Coach Road. When the ice is out, this route provides much more limited vehicle access, crossing about 700 m of the CWA to the south end of Upper Holman Marsh, primarily for sport fishing and other boat use.

During the public consultation for the CWA, numerous ATV and other vehicle users spoke of the importance of key routes within the CWA. Both Safety-Minded ATV Association and All-terrain Vehicle Association of Nova Scotia (ATVANS), emphasised the importance of both the Old Coach Road and the Fire Road for ATV and off-road bike use, and offered to enter into a trail management agreement with NSE to permit ongoing route maintenance and use. Some public interest was also expressed for including the winter connector to Shad Bay.

Closure of all of these routes to vehicle use would significantly affect current human use patterns within and around the CWA. Recognizing this, Chebucto Wilderness Coalition has also supported ATVANS' request for continued vehicle access on the Old Coach Road and The Fire Road. As outlined in consultation materials, NSE is prepared to consider use of trail management agreements that will permit continued vehicle use on these routes.

Several campsite lease holders also rely on vehicles to access their campsite leases within the CWA (for locations see Figure 3.3). Under the *Wilderness Areas Protection Act*, vehicle access to campsite leases within a wilderness area can be licensed for maintenance and removal of structures. A licensing program has not yet been developed by NSE. In the absence of licensing program, current policy allows vehicle access across wilderness area lands on existing, direct routes.

Vehicle access to land inholdings can be licensed under the *Wilderness Areas Protection Act*, subject to conditions. Until owners of land inholdings are contacted by NSE about licensing, existing policy allows for vehicle access to land inholdings (see also S.2.2.1) on an existing, direct route. Other private/HRM lands in the area (including several camps on Big Five Bridge and Moores Lakes) may also be impacted by reduced vehicle as the result of the CWA.

While some current vehicle users will be inconvenienced, it is expected that designation of the CWA will create relatively modest socio-economic impacts if regionally important connector routes remain available for vehicle use, through either trail management agreements or exclusion of routes from the wilderness area.

Currently, the CWA receives a small amount of bicycle use on the existing, old roads. Impacts of designation on bicycle use should be very low, particularly if bicycle use is accommodated on the Old Coach Road and Fire Road. The potential will also remain to develop other bicycle use routes within the CWA, using trail management agreements.

Designation of the CWA will protect the lands in a natural, undeveloped condition, which is much of the attraction of the area to OHV and bicycle users.

3.2.2.2 Sport Fishing, Hunting, and Trapping

The CWA offers some good angling opportunities for Speckled (Brook) Trout, along with hunting of deer, bear, small game (e.g. snowshoe hare, ruffed grouse, and pheasant), and waterfowl. Given the available information, it is not possible to reasonably estimate the level of sport fishing, hunting and trapping activities within the CWA.

The predicted impacts (either positive or negative) associated with designation of the CWA are minimal, as hunting, fishing, and trapping are generally permitted within wilderness areas. Since bear baiting is not permitted in wilderness areas, designation of the CWA may reduce the number of bears harvested in the region. During public consultation for the CWA, it was reported that one bear hunting station was registered in the CWA in the past (Wheadon, nd).

While some individuals may be inconvenienced due to restrictions on the use of vehicles, designation may also attract individuals who prefer to fish, hunt, or trap in a wilderness setting, with minimal reliance on vehicle access.

3.2.2.3 Outdoor Recreation

Hiking, trail running, canoeing, kayaking, swimming, nature appreciation, and camping are all popular activities within the CWA. During the winter months, limited cross-country skiing, snowshoeing, and ice-skating are known to occur.

The major wilderness recreation attractions within the CWA include canoe routes and hiking trails. During NSE's public consultation process, Canoe Kayak Nova Scotia (CKNS) reported that its members regularly travel the waterways of the CWA (April 29, 2010 letter). The CKNS website includes some route descriptions for the area. CKNS is a non-profit society of approximately 250 members, which is focussed on promoting safe, recreational canoeing, and kayaking in Nova Scotia.

As noted, Woodens River Watershed Environmental Organization (WRWEO) built and now maintains a 30 km system of outstanding hiking trails within the CWA, known as The Bluff Wilderness Hiking Trail. This trail system is popular for hiking, trail running, and other activities. In addition, Five Bridge Wilderness Heritage Trust has published a walking guide to the Old Coach Road (Old St. Margarets Bay Road) to celebrate the cultural and natural history of this old road.

The CWA's 7 campsite leases are used for a variety of recreational activities, including sport fishing, boating, swimming and general camp use. NSE expects to honour these leases as pre-existing legal interests under the *Wilderness Areas Protection Act*. Designation of the CWA is not expected to affect use and enjoyment of these campsite leases, though vehicle access may be limited (see S.2.2.1 and 3.2.2.1).

Designation will help conserve the existing wilderness, and the above-mentioned recreational activities are permitted within wilderness areas. The recognition of this area as a wilderness area may attract additional use. There may be restrictions on camping sites and trail creation, although there is potential for further authorized development of these. Overall, designation will help ensure that the lands within the CWA will not be developed and that near urban, wilderness recreation opportunities are protected.

3.2.3 Mi'kmaq Values

The Mi'kmaq of Nova Scotia have a long history of hunting, fishing, gathering and seasonal occupation on the Chebucto Peninsula, including within Five Bridge Lakes CWA.

The Mi'kmaq are being consulted on the planned designation of Five Bridge Lakes Wilderness Area. While the Mi'kmaq have indicated support for the protection of these Crown lands, they are particularly concerned about the moose population of the Chebucto Peninsula. It should be noted that although the Mi'kmaq have expressed support for designation of the CWA, they continue to assert aboriginal rights, including title, and treaty rights as these relate to wildlife, wildlife habitat, hunting, fishing, lands, and cultural/archaeological resources.

As noted, designation of the CWA is expected to help protect any archaeological and cultural resources.

A variety of activities valued by the Mi'kmaq are ordinarily permitted within wilderness areas, including hunting, fishing, trapping, camping, and berry or mushroom picking (personal use).

Some land use activities that may be associated with Mi'kmaq interests, including Aboriginal and Treaty rights, are generally prohibited, or at least restricted under the *Wilderness Areas Protection Act*. For example, the Act generally prohibits building permanent hunting camp structures, and generally prohibits public vehicle use. The method of hunting or fishing may therefore be affected by designation.

As noted, discussions are ongoing between the province and the Nova Scotia Mi'kmaq to explore: (1) how potential conflicts between the *Wilderness Areas Protection Act* and Mi'kmaq interests can be resolved; and, (2) how to integrate Mi'kmaq interests in planning and managing wilderness areas. The same issues are being considered for provincially-designated nature reserves and parks.

Designation of Five Bridge Lakes Wilderness Area should provide good opportunities to bring Mi'kmaq perspectives to information, signage and management initiatives related to these Crown lands.

3.2.4 Societal Values

3.2.4.1 Cultural Heritage

The Five Bridge Lakes CWA contains a variety of cultural heritage features, which are especially valued locally. No records of Mi'kmaq use were identified for this study, though these lands certainly would have been used.

Traces of settlements, old roads, and resource use hint at the importance of the area in the past. These patterns of human use were knit together by the Old Coach and Old Halifax roads, now used primarily for recreation access. The Old Coach Road was once an important route connecting the villages of St. Margaret's Bay to Halifax. People traveled by horse and buggy and transported goods between Glen Margaret and Goodwood. Homesteads were established along the road on lands granted from the Crown. The Bennett farm was a traditional stopping point known as the old Halfway House. Evidence of it and other homesteads remain today as rock walls, foundations, and small apple orchards. Once known as Price's Lake, Five Bridge Lake was named after four small pole bridges over the divided brooks and one larger bridge over the outflow of Five Mile Pond. These bridges on Old Coach Road are all at the head of Five Bridge Lake.

Since 1955, the Department of Lands & Forests (now Natural Resources), has maintained an important presence in this part of HRM, with a base at nearby Lewis Lake. Forestry activities within the CWA have included plantation research and firewood harvest. Some road improvement provided better access for fighting forest fires and other purposes.

The area also has a long history of wilderness travel for hunting, trapping, fishing, and wilderness recreation. The opportunities provided by this area for such uses over time contribute to the cultural heritage of the province.

Community appreciation of this cultural heritage partly accounts for the emergence of very active community-based organizations that have advocated for protection and stewardship of the CWA and area Crown lands. These organizations include, but are not limited to Woodens River Watershed Environmental Organization (WRWEO), Five Bridges Wilderness Heritage Trust, and the Chebucto Wilderness Coalition.

Overall, with the designation of the CWA, it is expected that current cultural and heritage values will be maintained, including sites of historical value and our tradition of wilderness use. There is also the potential for increased appreciation of these values if protection and promotion of the CWA attracts more visitors to the CWA.

3.2.4.2 Existence

People place value on just knowing that there is a natural wilderness area in their neighbourhood, and near HRM's urban core. During the public consultation for this CWA, NSE heard that having a near-urban wilderness area will help make HRM an attractive municipality

to live and work in. All of the previously-mentioned organizations and associations that use the CWA are concerned with the preservation and conservation of the area for its intrinsic value, and would like it to be used and enjoyed by future generations.

Many of these organizations have worked for years, seeking conservation and protection of the area, and particularly the Crown lands. In 1995, the Woodens River Watershed Environmental Organization (WRWEO) was founded, initially with a focus on the health of Woodens River. In 2001, the work of WRWEO led to the creation of the Five Bridges Wilderness Heritage Trust (“The Trust”), with the goal of protecting the CWA and other Crown lands. At the same time, the Nova Scotia Public Lands Coalition included these Crown lands in its campaign for protection of Nova Scotia’s publicly owned “endangered wilderness hot spots.” In 2008, over 35 community groups, including WRWEO, The Trust, and Safety-Minded ATV Association, formed the Chebucto Wilderness Coalition to advocate for protection of these lands as a wilderness area under the *Wilderness Areas Protection Act*. All of this long-term support and concern for protection of the CWA clearly reflects the existence value of the area to citizens of the region.

Designation of the CWA will help ensure the protection and conservation of the existence values into the future.

3.2.5 Ecosystem Services Values

3.2.5.1 Biodiversity Conservation

The 8,255 hectare Five Bridge Lakes CWA encompasses a diverse mosaic of ecosystems. Granite bedrock gives rugged character to the area’s lakes, waterways and wetlands; and accounts for the generally shallow and stony soils, or exposed bedrock. Scattered, egg-shaped hills, known as drumlins, are formed by thick deposits of glacial debris (till). With their smooth contours and unique red oak – yellow birch – red maple forest, these drumlins stand out within the otherwise rugged landscape.

Representation

The CWA will protect a representative portion of Nova Scotia’s largest natural landscape, known as ‘South Mountain Rolling Plain’. Although there are already protected areas (i.e. Blue Mountain Birch Cove Wilderness Area and Terence Bay Wilderness Area) in this landscape, the CWA provides additional representation of unique features. About two-thirds of the land area is forested, primarily with coniferous and mixed forest, except on drumlins. Extensive barrens and semi-barrens occupy much of the remainder, along with some wetlands. The character of these ecosystems is shaped by the near-coastal climate and by the rugged terrain and soils.

Roadless Habitat

The CWA consists of large patches of roadless habitat, separated only by several old, unmaintained loose surface roads. The largest roadless patch is larger than 3,000 hectares

(7,500 acres), and two others are larger than 1,000 hectares (2,500 acres). Roadless areas are important for species that avoid human disturbance, development, or roads.

Forest

Small pockets of regionally uncommon red oak and old red spruce have been documented within the CWA. Some oak trees appear to be at least 200 years of age. Most of the current forest has developed after forest fires or logging, and includes red maple, white birch, aspen, red oak, yellow birch, balsam fir, black spruce, red spruce, and pine. Some pine stands were planted.

Connected Waterways

As already noted, the CWA contains numerous lakes, wetlands, and stretches of river. Wetland types include bog or fen, marsh, and swamp. The two largest wetlands are a 26 hectare (65 acre) bog or fen, and a 22 hectare (55 acre) marsh. These undeveloped wetlands and waterways are important habitat for fish, waterfowl, and other water-dependent species.

Rare and Uncommon Species

Approximately 25 moose reside in and near the CWA. Moose are endangered in mainland Nova Scotia and are easily disturbed by humans. Moose tracks, scat and evidence of browsing can be found.

One recent record for both the Canada warbler and olive-sided flycatcher suggests probable nesting in the area (Maritime Breeding Bird Atlas, 2010). These birds are sensitive to human activities. Mountain sandwort, a rare plant of rock barrens has also been reported, as have two rare lichens (*Sticta fuliginosa* and *Pannaria rubiginosa*). Broom crowberry is abundant on exposed bedrock ridges.

Historical records exist for Atlantic salmon in Nine Mile River and in Woodens River, downstream of the CWA (Atlantic Canada Conservation Data Centre, 2009). Other documented species include the provincially threatened common nighthawk, and species considered rare or uncommon, including the yellow nodding ladies' tresses, northern goshawk, and rusty blackbird. There is a historic record of the provincially endangered Rockrose (Canada Frostweed) outside the CWA, in the Five Island Lake area.

In addition to supporting these and many other species, the forest and wetlands of CWA provide important services including pollination, seed dispersal, biological pest control, and habitat refugia. Based on the studies outlined in Section 2.5, the biological conservation services provided by this CWA could be worth from \$1,000s to \$1,000,000s annually. Although it is difficult to accurately quantify these services, it is important to note they potentially have real value as intact natural ecosystems (i.e. protected) which may rival the value of the goods that could be extracted from them (i.e. wood products or minerals).

With designation of the CWA, biological conservation values are predicted to be preserved and maintained. Designation helps ensure the protection of flora, fauna, and ecosystems within the CWA.

3.2.5.2 Maintaining Natural Processes

The CWA has significant value for maintaining ecological processes. These ecosystem services, including atmospheric gas regulation, disturbance regulation, water regulation, water supply, soil formation, and human waste treatment, have regional, provincial, and global value.

Forest account for 5,212 hectares or 64% of the CWA and help maintain ecological processes, such as soil formation and human waste treatment. Wetlands account for 448 hectares or 5% of the CWA and are important in maintaining ecological processes. Wetlands play a role in all gas regulation, disturbance regulation, water regulation, water supply, and human waste treatment. Lakes account for 199 hectares, or 2% of the CWA, and help maintain water regulation and water supply. The CWA is currently not being used to supply drinking water.

Studies identified in section 2.5 provide some guidance for estimating the potential value of these ecological processes services provided by forest, wetlands, and lakes. When all of these ecological processes services (e.g. gas and water regulation, etc.) are considered, they are potentially worth from \$10,000s to \$1,000,000s annually for this CWA.

With designation of the CWA, these ecological process services are predicted to be conserved and maintained.

3.2.5.3 Climate Change Mitigation and Adaptation

Five Bridge Lakes CWA is approximately 8,255 ha in size, including 5,212 ha of total forest area. With designation, the forest of the CWA is likely to store more carbon than if the lands were managed for timber or other uses. This carbon storage has value for climate change mitigation. The present value of the carbon (compared to timber management option, is estimated to be approximately \$3.4 to \$ 6.7 million for damage cost avoidance.⁹ Using the carbon credit market value estimate, protection has a present value of approximately \$ 1.2 million to \$2.3 over the managed forest option (see Section 2.5.1 for methodological details, including assumptions).¹⁰

Wetlands within the CWA may also serve a climate change mitigation role. While these wetlands would likely be little affected if the area were managed for timber harvest, they could be affected by other future land development (e.g. suburban expansion, quarrying, etc.).

Overall, designation of the CWA is predicted to increase climate change mitigation values. The protection of forests and wetlands will likely help ensure continued and increased carbon sequestration in the area.

Although climate change adaptation was not evaluated, it is reasonable to assume that adaptation values (based on the described benefits in Section 2.5.1) would decrease if the area were not designation a CWA.

⁹ Calculated as damage avoidance value of (\$43/tC) x (15-30tC/ha) x (5,212 ha).

¹⁰ Calculated as carbon market value of (\$15/tC) x (15-30tC/ha) x (5,212 ha).

4.0 SUMMARY

4.1 Summary of values

A summary of potential changes to current values with designation of Five Bridge Lakes CEA (Table 4.1)

TABLE 4.1 Summary of socio-economic values for Five Bridge Lakes CWA.

Value	Current Situation	Without Designation	With Designation
Forestry	<ul style="list-style-type: none"> 39% of the area is harvestable 	<ul style="list-style-type: none"> Area remains available for forest harvesting. Stumpage value may be realized 	<ul style="list-style-type: none"> Maintain or increase forest diversity and age. Estimated loss of stumpage value between \$1.3 and \$2.5 million
Mining	<ul style="list-style-type: none"> No current mineral exploration projects Low to moderate mineral development potential 	<ul style="list-style-type: none"> High quality granite aggregate extraction potential Potential for future exploration 	<ul style="list-style-type: none"> Loss of future exploration and potential mineral development (metallic and industrial mineral)
Energy	<ul style="list-style-type: none"> No current energy projects Low potential for energy development 	<ul style="list-style-type: none"> Limited wind energy development potential 	<ul style="list-style-type: none"> Loss of potential, small community wind project at east side of Hubley Big Lake
Tourism	<ul style="list-style-type: none"> Likely modest amount of existing tourism use - includes hiking on managed trail system. Close proximity to urban core facilitates tourist access 	<ul style="list-style-type: none"> Continued hiking use likely 	<ul style="list-style-type: none"> Potential increase in nature tourism use as area is managed and promoted
Research & Education	<ul style="list-style-type: none"> Used by groups for research and educational purposes. 	<ul style="list-style-type: none"> Less opportunity for research and education if land is developed or harvested 	<ul style="list-style-type: none"> Increase opportunities for research and education.
Vehicle & Bicycle Use	<ul style="list-style-type: none"> ATV (and some 4x4) use on select routes in and around the CWA as part of a regional trail network Some mountain bike use, primarily on ATV routes 	<ul style="list-style-type: none"> Current ATV and mountain bike use (managed as per Crown land and OHV acts, etc.) 	<ul style="list-style-type: none"> Use of essential connector routes may be authorized by trail management agreement(s). Some routes lost - particularly side trails Mountain bike use could be authorized Enforcement of unauthorized ATV use may increase

TABLE 4.1 Summary of socio-economic values for Five Bridge Lakes CWA.

Value	Current Situation	Without Designation	With Designation
Sport Fishing, Hunting & Trapping	<ul style="list-style-type: none"> ▪ Trout fishing popular ▪ Some hunting ▪ Some trapping likely 	<ul style="list-style-type: none"> ▪ Current use patterns likely to continue in foreseeable future ▪ Risk of decline of trout or other populations due to future land uses and increasing human access 	<ul style="list-style-type: none"> ▪ Fishing, hunting, and trapping generally permitted within wilderness area. ▪ Possible change in use patterns and levels due to restrictions on ATV and other vehicle use ▪ Help protect trout population and maintain near-urban angling usage. ▪ Maintain hunting and trapping opportunities
Outdoor Recreation	<ul style="list-style-type: none"> ▪ Existing, informal wilderness recreation use ▪ High use of Bluff Hiking Trail (up to 300 per day on summer weekends) ▪ Some canoeing, kayaking & camping use ▪ Limited winter use for skiing or snowshoeing 	<ul style="list-style-type: none"> ▪ Likely decline in use over time if land is developed or harvested 	<ul style="list-style-type: none"> ▪ Protects existing uses and allows for new opportunities for increased use (e.g. additional trails). ▪ Likely increase in use of Bluff Wilderness Trail because of increased promotion of wilderness area
Mi'kmaq Interests and Values	<ul style="list-style-type: none"> ▪ Some current traditional use of area ▪ Potential for Mi'kmaq archaeological sites 	<ul style="list-style-type: none"> ▪ Risk that the Mi'kmaq values of this area will be negatively impacted if development occurs ▪ Potential damage to sensitive archaeological and historic sites 	<ul style="list-style-type: none"> ▪ Overall benefit to identified values, though possible loss of value for select activities, such as vehicle access or building of hunting camps
Cultural Heritage	<ul style="list-style-type: none"> ▪ Place of special value for local and HRM residents ▪ History of homesteading, fishing, hunting, canoeing and wilderness travel 	<ul style="list-style-type: none"> ▪ Risk that the cultural heritage of this area may be negatively impacted if development occurs ▪ Potential damage to sensitive archaeological and historic sites 	<ul style="list-style-type: none"> ▪ Helps protect sites of cultural value ▪ Protects wilderness recreation heritage
Existence	<ul style="list-style-type: none"> • Grassroots campaign to protect area for over a decade • Desire to maintain wildlife and landscape for use and enjoyment of future generations 	<ul style="list-style-type: none"> ▪ Expected loss of biodiversity and decline in wilderness use values as competing resource use and development occurs. 	<ul style="list-style-type: none"> ▪ Conservation of existing ecosystems, flora and fauna

TABLE 4.1 Summary of socio-economic values for Five Bridge Lakes CWA.

Value	Current Situation	Without Designation	With Designation
Biodiversity Conservation	<ul style="list-style-type: none"> ▪ Large, remote and relatively roadless area ▪ Rare or threatened species include common nighthawk, rare lichens, mountain sandwort, and mainland moose 	<ul style="list-style-type: none"> ▪ Existing biodiversity threatened as competing resource use and development occurs 	<ul style="list-style-type: none"> ▪ Maintain and potentially increase biodiversity within the CWA lands ▪ Help protect endangered, threatened, or rare species.
Maintaining Natural Processes	<ul style="list-style-type: none"> ▪ Value of ecosystem services provided by forests, lakes and wetlands might range from tens of \$1,000s to more than \$1 million annually. 	<ul style="list-style-type: none"> ▪ Likely decline in ecosystem services as competing land use and development occurs (e.g. less water regulation in the area and increased risk of poor water quality & erosion, etc.) 	<ul style="list-style-type: none"> ▪ Help secure and maintain valuable ecosystem services, such as gas regulation/air quality, water regulation, water supply, soil formation & erosion control, and waste treatment
Climate Change Mitigation & Adaptation	<ul style="list-style-type: none"> ▪ Existing carbon sequestering function of forest and wetlands 	<ul style="list-style-type: none"> ▪ Likely decline in carbon sequestration by forest and wetlands over time as land use and development occurs 	<ul style="list-style-type: none"> ▪ Protection of forests and wetlands helps ensure continued carbon storage and increased carbon sequestration in the area. ▪ With protection, the present value of carbon storage potentially exceeds well over \$1 million compared with other land use options.

4.2 Estimated Changes with Designation

The previous sections of this report describe the socio-economic values associated with Five Bridge Lakes CWA, as well as the estimated changes with designation. A range of socio-economic values (Table 4.1) was examined. This information can be used to support decisions regarding the appropriate management of the land parcels, and to examine the potential trade-offs involved with designation.

Table 4.2 summarizes the direct impacts on the various socio-economic values that can be expected to occur with designation. The trade-off analysis relies on both quantitative and qualitative information. A simple framework is presented to help understand how the proposed boundary delineations and possible changes in permitted activities may affect socio-economic values.

One important consideration in making land use decisions is understanding who benefits from the various identified values. This is often called “the distribution of benefits.” Benefits may be enjoyed by:

- 1) Individuals world-wide (*i.e.*, global values);
- 2) The Province of Nova Scotia as a whole;
- 3) Regional (*i.e.* counties and municipal centres) and/or
- 4) Local users, landowners and lease holders.

Decision-making may weight the value of these benefits differently. For example, local or regional benefits may be favoured over global values.

TABLE 4.2 Direct Impacts on Socio-economic Values with Designation and Distribution of Benefits.

Value	Five Bridge Lakes Candidate Wilderness Area	Distribution of Benefits
Forestry	<ul style="list-style-type: none"> Loss of identified value (approximate net present value based on potential stumpage fees of \$1.3 to 2.5 million) 	<ul style="list-style-type: none"> Potential regional (employment and local spending) and provincial (spending and provincial revenues) benefits
Mining	<ul style="list-style-type: none"> Loss of potential, unknown value in area considered to have moderate mineral development potential 	<ul style="list-style-type: none"> Regional and provincial
Energy	<ul style="list-style-type: none"> Loss of potential value; the area is considered to have moderate wind energy development potential. 	<ul style="list-style-type: none"> Regional and provincial
Tourism	<ul style="list-style-type: none"> Increase in identified value (unknown magnitude) 	<ul style="list-style-type: none"> Regional (employment and local spending), and provincial (provincial revenues).
Research and Education	<ul style="list-style-type: none"> Increase in identified value (unknown magnitude) 	<ul style="list-style-type: none"> Local and provincial.
Vehicle and Bicycle Use	<ul style="list-style-type: none"> Loss of identified vehicle use value is small provided primary connector trails remain available; bicycle use can be authorized 	<ul style="list-style-type: none"> Local, regional (including non-market benefits and local spending).
Sport Fishing, Hunting and Trapping	<ul style="list-style-type: none"> Little impact on identified values, though patterns of use may change due to vehicle use restrictions 	<ul style="list-style-type: none"> Local, regional (including non-market benefits and local spending).
Outdoor Recreation	<ul style="list-style-type: none"> Increase in identified value (unknown magnitude) 	<ul style="list-style-type: none"> Local, regional, and provincial
Mi'kmaq Interests and Values	<ul style="list-style-type: none"> Overall benefit to identified values, though possible loss of value for select activities, such as vehicle access or building of hunting camps 	<ul style="list-style-type: none"> Regional and provincial
Cultural Heritage	<ul style="list-style-type: none"> Increase in identified value (unknown magnitude) 	<ul style="list-style-type: none"> Regional and provincial
Existence	<ul style="list-style-type: none"> Increase in identified value (unknown magnitude) 	<ul style="list-style-type: none"> Provincial and global
Biodiversity Conservation	<ul style="list-style-type: none"> Increase in identified value (unknown magnitude) 	<ul style="list-style-type: none"> Regional, provincial, and global
Maintaining Natural Services	<ul style="list-style-type: none"> Increase in identified value (unknown magnitude) 	<ul style="list-style-type: none"> Regional and provincial
Climate Change Mitigation and Adaptation	<ul style="list-style-type: none"> Increase in identified value (by present value of \$1.2 to 6.7 million) 	<ul style="list-style-type: none"> Primarily global

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