Assessing the Potential for Afforestation on Private Lands in Nova Scotia
Interim Report

Nova Scotia Power Inc. Vegetation Management
and
Canadian Forest Service Feasibility Assessment
Of Afforestation for Carbon Sequestration

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TABLE OF CONTENTS

1.0 Introduction

Nova Scotia Power Inc. (NSPI) has partnered with the Canadian Forest Service (CFS) through the Feasibility Assessment of Afforestation for Carbon Sequestration (FAACS) initiative to investigate and develop mechanisms to promote afforestation/reforestation on private lands across Nova Scotia. Through this pilot project, FAACS is seeking insight to support the development of the operational scale programming for afforestation/ reforestation which could help Canada's commitments to greenhouse gas reductions under the Kyoto Protocol.

Involvement with private landowners was sought out to establish afforestation/ reforestation projects. Criteria set for project qualification was: 1-hectare minimum plantation size, no significant amount of advanced regeneration, and a consensual agreement that trees must be left free-growing for 20 years.

2.0 Provincial Afforestation/Reforestation Potential

Abandoned farmland was the area targeted for afforestation/reforestation. This land was sought after for two reasons: 1) eligibility of forestland to qualify under Kyoto requires land be non-forested prior to 1990; and, 2) land of least value creating a greater willingness of participation by landowners.

The amount of abandoned farmland in Nova Scotia was calculated from data provided by the Department of Agriculture. The department conducted an Agricultural Land

Identification Project (ALIP) during 1998-99. In this project, farm-related data was collected whereby agricultural land was categorized into six different classes (Table 1).

Table 1. Agricultural Land Identification Project Landuse Categories	
AL	Agriculture - Long term (pasture, orchard, blueberry, vineyard, raspberries, blackberries)
AR	Agriculture - Rotation crops (hay, forage, grains, corn, vegetables, strawberries, ginseng etc.)
AS	Agriculture - Support (equipment dealers, feed supply, production/processing facilities, farm markets, etc.)
I	Agriculture - Inactive (not farmed currently but readily returned to agricultural production, ie. In goldenrods and/or alders)
IT	Agriculture - Inactive Transition (land being converted to agricultural production but not yet growing a crop ie. new land clearing, new blueberry fields etc.)

The "inactive" class was used to quantify the amount of abandoned farmland in Nova Scotia (Table 2). It is estimated that 6,111 fields make up the approximately 25,000 ha. of inactive farmland in Nova Scotia. The average field size was calculated to be 3.91 hectares.

Table 2. Amount of Abandoned Farmland in Nova Scotia.			
County	Area (ha.)	Number of Fields	Average Field Size
Annapolis	1349	385	3.50
Antigonish	761	233	3.26
Cape Breton	1100	226	4.87
Colchester	2648	596	4.44
Cumberland	2609	452	5.77
Digby	1317	494	2.66
Guysborough	143	42	3.40
Halifax	809	155	5.22
Hants	1844	505	3.65
Inverness	2999	601	4.99
Kings	1974	625	3.16
Lunenburg	988	329	3.00
Pictou	3742	837	4.47
Queens	107	41	2.61
Richmond	380	96	3.96
Shelburne	119	28	4.25

Victoria	564	143	3.95
Yarmouth	1040	323	3.22
Total	**24,493**	**6111**	**3.91**

3.0 Gauging Landowner Interest

A number of different approaches were taken to identify potential participants for afforestation/reforestation projects. These activities include: setting up information kiosks, group emails, targeted phone calls, and personalized letters and visits.

The kiosk was displayed at climate change forums organized by Clean Nova Scotia, and other events at Dalhousie University, and a Blueberry Growers Association conference. Appendix 1 shows the information provided on the display and brochures.

Overall the amount of interest generated from attending these events was low. Those who did express interest in afforestation did not qualify. Discussion with individuals related more to landscaping, replanting cutovers, establishing hedgerows, general information on tree silvics. No area was secured through the kiosk display approach.

Email messages were posted to a Maritime environmental discussion group called Sustainable Maritimes (www.chebucto.ns.ca/lists/sust-mar/). This group has approximately 600 subscribers with environmental information posted daily. There were 3 respondents from the posting – 1 who wanted to help with planting and the 2 others requested more information, but were since not heard from.

Targeted phone calls were conducted by using a Geographic Information System (GIS) to identify landowners of abandoned farmland. An overlay of the ALIP data and Nova Scotia property information produced landowner names. A phone directory search was then used to get phone numbers of the individuals. Contact was attempted with landowners from August through to December 2003.

Factors most commonly expressed by landowners regarding project participation were: preference to maintain as agricultural land, eventual development of land (residential, commercial), current farming practices, and uncertain future ownership. Anecdotally, a strong correlation existed between older aged landowners and inactive fields. Many did not want to commit to a project time frame of 20 years. Others were not willing to alter current landuse practices.

Overall, very little interest was generated in talking over the phone with landowners regarding their participation in afforestation/reforestation. Most seemingly understood the project to be a tree planting activity that would eventually produce fiber. The environmental benefits in the context of climate change mitigation did not seem to be a concept of interest or concern for individuals spoken with. Those who did express interest had the minimum amount of land eligible (1hectare) and were situated in parts of the province where the economics of establishing projects were not feasible.

The final approach involved sending out personalized letters and brochures to landowners providing general information on afforestation / reforestation. No initiative was taken by

those who received the letter to contact the afforestation project coordinator seeking involvement. Upon follow-up visits, landowners did acknowledge receiving the letters. Further discussion ensued, resulting in some landowners agreeing to become involved in afforestation / reforestation projects. The greater success of this approach over the others can be attested to the more personalized effect letters and face-to-face contact have.

4.0 Plantation Establishment

Plantation sites on private land have been secured totaling 16 hectares, as agreed upon in the proposal. The land is scheduled to be site prepared and planted in the spring of 2004. Agreements and maps will be included in a revised version of this document upon completion of this work.

There were two afforestation projects established on NSPI transmission right-of-ways. One project was established on transmission line 5022 (69 kV), located near Coldbrook (Figure 1). The area was site-prepared with a broadcast Roundup herbicide application on July 17-18, 2003. The plantation was established in five sections on October 9, 2003 covering 14.24 hectares. Species planted were Alder, Dogwood, and Sumac at a 7 x 7ft. spacing. A 50 m^2 permanent sample plot was established to establish a biomass baseline and monitor the plantation growth over time.

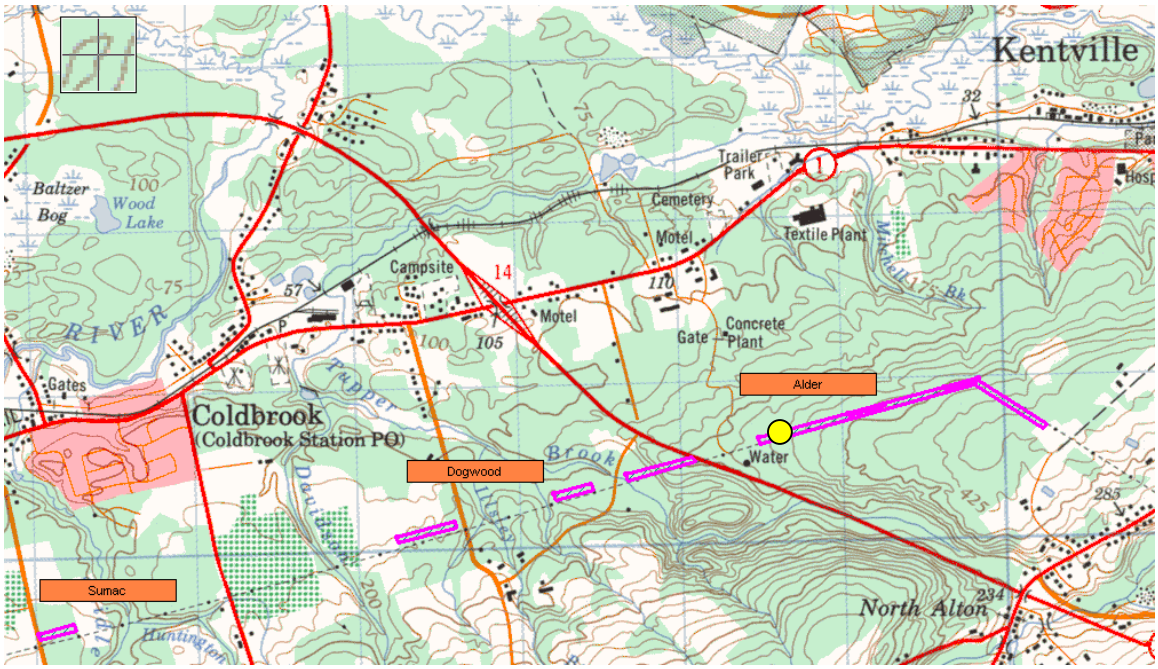

Figure 1. Nova Scotia Power Inc. small tree plantation (fuchsia outline) and permanent sample plot (yellow dot) on line 5022, Coldbrook, Nova Scotia.

The second project was established on transmission line 7005 (238 kV) in North River, approximately 13 km northeast of Truro. The area was site prepared with a broadcast application of Roundup during the week of August 25-29, 2003. Alder and Dogwood were planted on October 6 and 7, 2003 at a 7 x 7 ft. spacing covering 15.19 hectares.

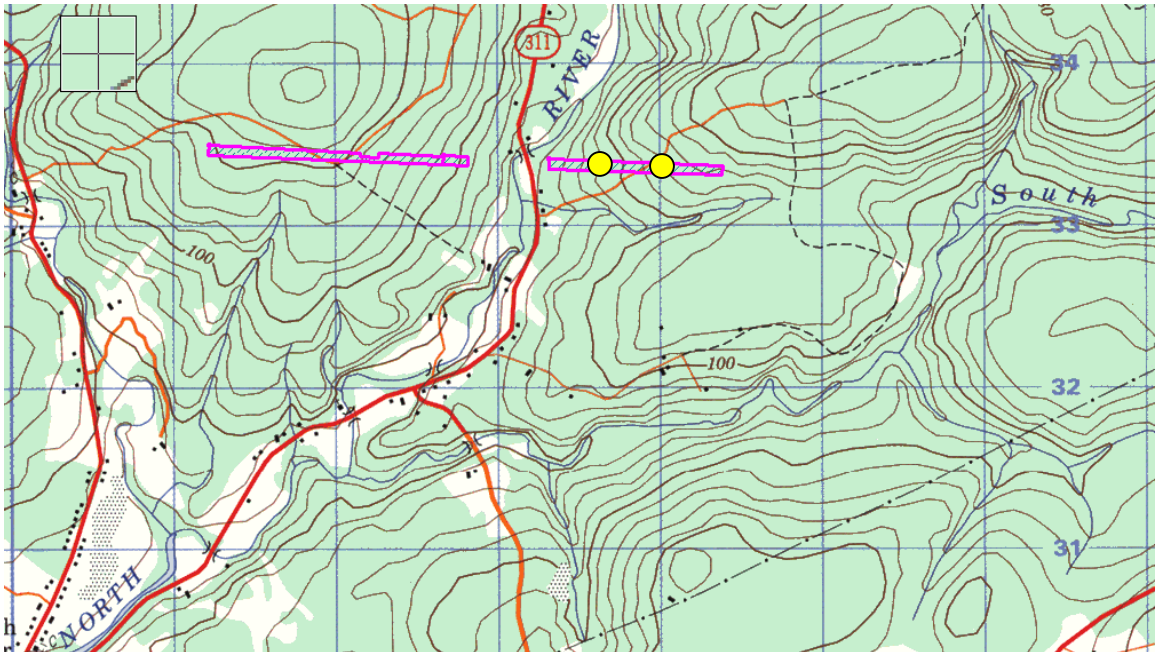

Figure 2. Nova Scotia Power Inc. small tree plantation (fuchsia outline) and permanent sample plot (yellow dots) on line 7005, North River, Nova Scotia.

5.0 Plantation Establishment Costs

The cost of afforestation in Nova Scotia was approximately $1520 ha^{-1}. Individual costs incurred for afforestation/reforestation are a combination of: site preparation $495 ha^{-1}, stock acquisition $375 ha^{-1}, planting $150 ha^{-1}, and plantation tending $150 ha^{-1}. Costs can vary dependant upon factors such as terrain, stock type, and desired plant spacing.

6.0 Coordinated Research

NSPI has been involved in a number of additional research activities related to climate change. With NSPI being one of the five largest landholders in the province, collaboration with Alex Mosseler, a research scientist at CFS, sought to identify lands in Nova Scotia for planting pitch pine (*Pinus rigida*). Locations visited were Shannon Lake (south of Middleton), Port Hastings, Mount Uniacke, Heatherton, Hopewell, and Onslow. Pitch pine is a species in decline; Alex's research seeks to understand the effect climate change has on this species and their ability to adapt. Also, a workshop was attended related to modeling the economics of afforestation in Canada. This workshop was put on by Dan McKenney and Denys Yemshanov of the Great Lakes Forestry Centre, Canadian Forest Service. The workshop explored a cost/benefit information system designed to explore ecological, biological, and the economic aspects of afforestation on agricultural and unforested lands in Canada.

7.0 Forest Carbon Management (FCM) Pilot Series

Through participation in the FCM pilot series, research was conducted to assess the carbon storage potential that existed for afforestation/reforestation projects both on privately owned abandoned farmland and on transmission line right-of-ways. Assuming a spruce plantation on abandoned farmland with a stocking of 2400 stems ha^{-1}, the net carbon sequestration after 20 years was estimated to be 5.28 $tC\ ha^{-1}$ (19.37 $tC0_2\text{-}e\ ha^{-1}$). Whereas, alder small tree plantations on right-of-ways at a stocking of 2400 stems ha^{-1} were estimated to sequester 16.43 $tC\ ha^{-1}$ (60.29 $tC0_2\text{-}e\ ha^{-1}$) over a 20 year period. A significant difference exists between projects. Alder plantations are capable of initially producing much more biomass then spruce plantations, resulting in a greater amount of carbon stored. Net carbon stored from alder plantations will begin to plateau after 20 years at which time spruce plantations will continue to sequester carbon, until maturity is reached at 120 years. A mature white spruce plantation is estimated to store 143.4 $tC\ ha^{-1}$ (526.21 $tC0_2\text{-}e\ ha^{-1}$). However, with a 120-year timeframe permanence becomes a contentious issue as the level of uncertainty increases regarding forecasted carbon stock gains. Gaining a greater amount of carbon stored initially is advantageous economically; providing a more cost-effective means of offsetting carbon emissions; and temporally; buying more time for progress in reducing emissions from industry and transport related activity.

Appendix 1
Afforestation / Reforestation NSPI FAACS Display


Planting Trees for a Healthier Environment
The science
CO_2 (carbon dioxide) makes up most of the greenhouse gases in our atmosphere and is a major cause of global warming and climate change. CO_2 is produced through the burning of fossil fuels like gasoline, oil and coal.
Carbon storage (or sequestration) is the removal and capture of carbon from the atmosphere. This happens naturally through the process of photosynthesis in green plants and trees.
Photosynthesis is the process in plants and trees where sunlight converts CO_2 into oxygen and energy rich compounds. These compounds feed the plant, the carbon is stored and oxygen is released back into the atmosphere.
Get Involved
Tree planting (or afforestation) improves nature's ability to store carbon over long periods of time. Afforestation can take place on previously unforested lands or areas that have not supported tree growth for many years.
Land areas larger than 2.5 acres (1 hectare) in urban and rural settings are suitable for tree planting. These properties may include unutilized agricultural land, tracks of unforested or under-forested land and land next to electricity transmission corridors.
Electricity transmission corridors are traditionally cleared of all vegetation. Nova Scotia Power is now planting low-growing trees in some of its right-of-ways. This provides a cost-effective and environmentally-friendly alternative to cutting and herbicide use.
Trees of all types are useful for carbon storage, including hardwoods, softwoods and shrubs. Trees will store carbon over their entire lifetime.
POWER
Natural Resources Canada
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