

## An estimation of the potential carbon sequestration in Mom's Forest

### Summary

In 2009, the Carbon Farmer Inc. afforested\* 64.3 ha (159 ac) of land situated approximately 15 km northeast of Manning, Alberta. The land was originally cleared for farming in stages during the 1960's and 1970's and was in crop cultivation until approximately 1995 when it was planted into brome grass for forage and seed harvest. The site consist of approximately 52.6 ha (130 ac) of grey wooded soil and 12.1 ha (30 ac) of muskeg.

It is estimated that Mom's Forest captures 9,622 tC and saves 35,281 t CO<sub>2</sub>e during the first 60 years (or 588 t CO<sub>2</sub>/year on average).

### Introduction

In 2009, the Carbon Farmer Inc. afforested 64.3 ha (159 ac) of land situated approximately 15 km northeast of Manning, Alberta (Supplementary material, Figure 3). The land was originally cleared for farming in stages during the 1960's and 1970's and was in crop cultivation until approximately 1995 when it was planted into brome grass for forage and seed harvest. The site consists of approximately 52.6 ha (130 ac) of grey wooded soil and 12.1 ha (30 ac) of muskeg. The land was reforested by Folklore Forestry under the auspices of the Woodlot Association of Alberta (WAA) 2009 Seedling Program. In total, 127,170 lodgepole pine seedlings were planted on the site (approximately 1,972 seedlings / ha).

### Assumptions

To estimate the amount of carbon sequestered by the afforestation, one needs to estimate the carbon that would have accumulated without the afforestation (baseline) and subtract that amount from the amount of carbon that accumulates with the afforestation (project).

### Baseline

The baseline is assumed to be the continuation of the present state – brome grassland. For the ease of modelling, I have assumed no difference between the grassland and the muskeg. This may be a conservative assumption since the grasslands have relatively high amount of soil organic carbon. To model the grassland, I have assumed a net annual production of 1.7 bdt / ha with a root-to-shoot ratio of 2.8<sup>1</sup>. A 50% annual mortality was selected to give a long-term average soil organic carbon of 103 tC / ha. This is very close (109 tC / ha) to the value used by the Canadian Forest Service in estimate the soil organic carbon in Luvisolic soils in this region<sup>2</sup>.

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\* I am using here the term used in Alberta for afforestation. The internationally accepted definitions of afforestation and reforestation are different. Internationally afforestation is the conversion of land which has been non-forest land for more than 50 years to forest, while reforestation is the conversion of land which has been non-forest for less than 50 years. Replanting of land that was forest and was harvested, but was not converted to grassland or cropland is called forest management. Using the internationally accepted definition, this land has been **reforested**.

## Project

The project consists of afforestation on the land with lodgepole pine. As we have no prior information as to the site quality from a forestry perspective, I have assumed a mid-range yield curve (SI 20) for lodgepole pine in the Prince George Region, Fort St. John Forestry District, BWBS ecosystem using the TIPSYS 4.1 program<sup>3</sup>. For the afforestation on the muskeg areas, I have assumed a lower site index (SI 10), so as to be conservative. In both cases, I assumed no special forest management (e.g., thinning) during the 60 years of the carbon simulation.

## Estimate

Using a version of the GORCAM model<sup>4</sup> that is modified to include temperature and precipitation dependent decomposition<sup>5, 6</sup>, stand level carbon models (per hectare) were developed for the two selected yield curves (Supplementary information, Figure 5).

The total net carbon sequestration over 60 years is shown in Figure 1. Mom's Forest captures 9,622 tC in 60 years. The majority of this (70%) will be stored in living trees and roots. The remainder will be stored in decaying matter in the dead wood, litter and soil. During the first 60 years, Mom's Forest saves 35,281t CO<sub>2</sub>e or approximately 588 t CO<sub>2</sub>e per year (Figure 2).

Since the forest site index is not known, a range potential of total sequestration has been provided (Supplementary information, Figure 6). The range between minimum and maximum is rather large. The minimum was estimated assuming that the entire forest is SI 10. The maximum estimate assumes that the forest, not planted on muskeg, grows with SI 30.

Figure 1: Total net carbon sequestration

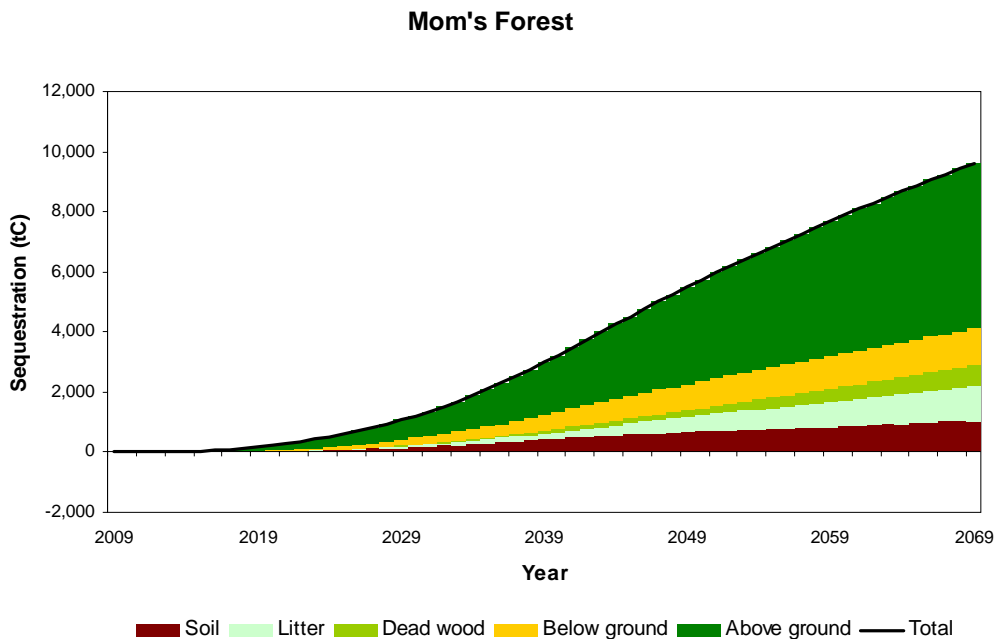
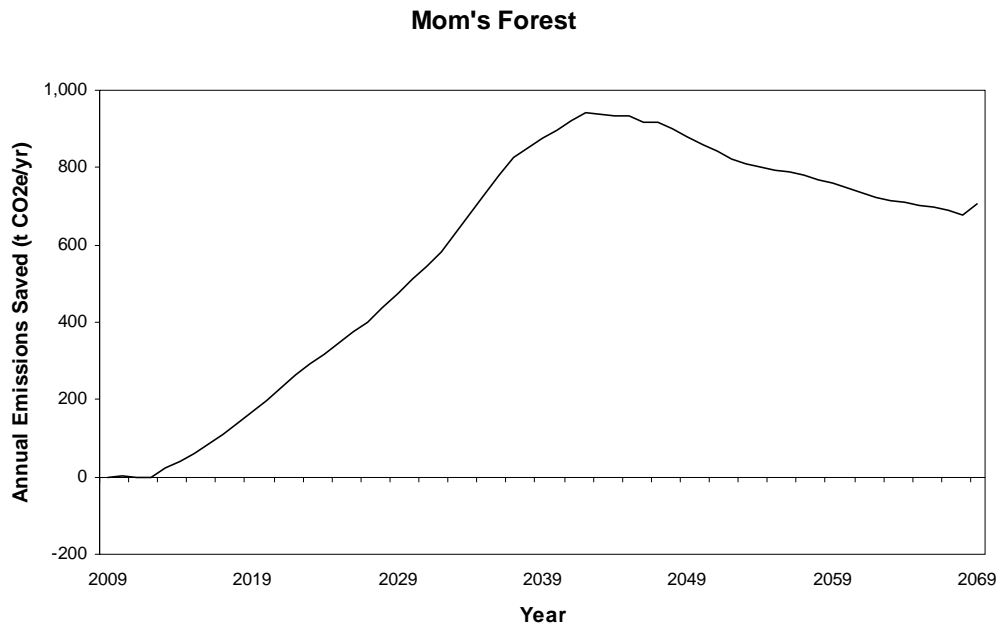


Figure 2: Annual emissions saved



## Supplementary material

Figure 3: Location of Mom's Forest

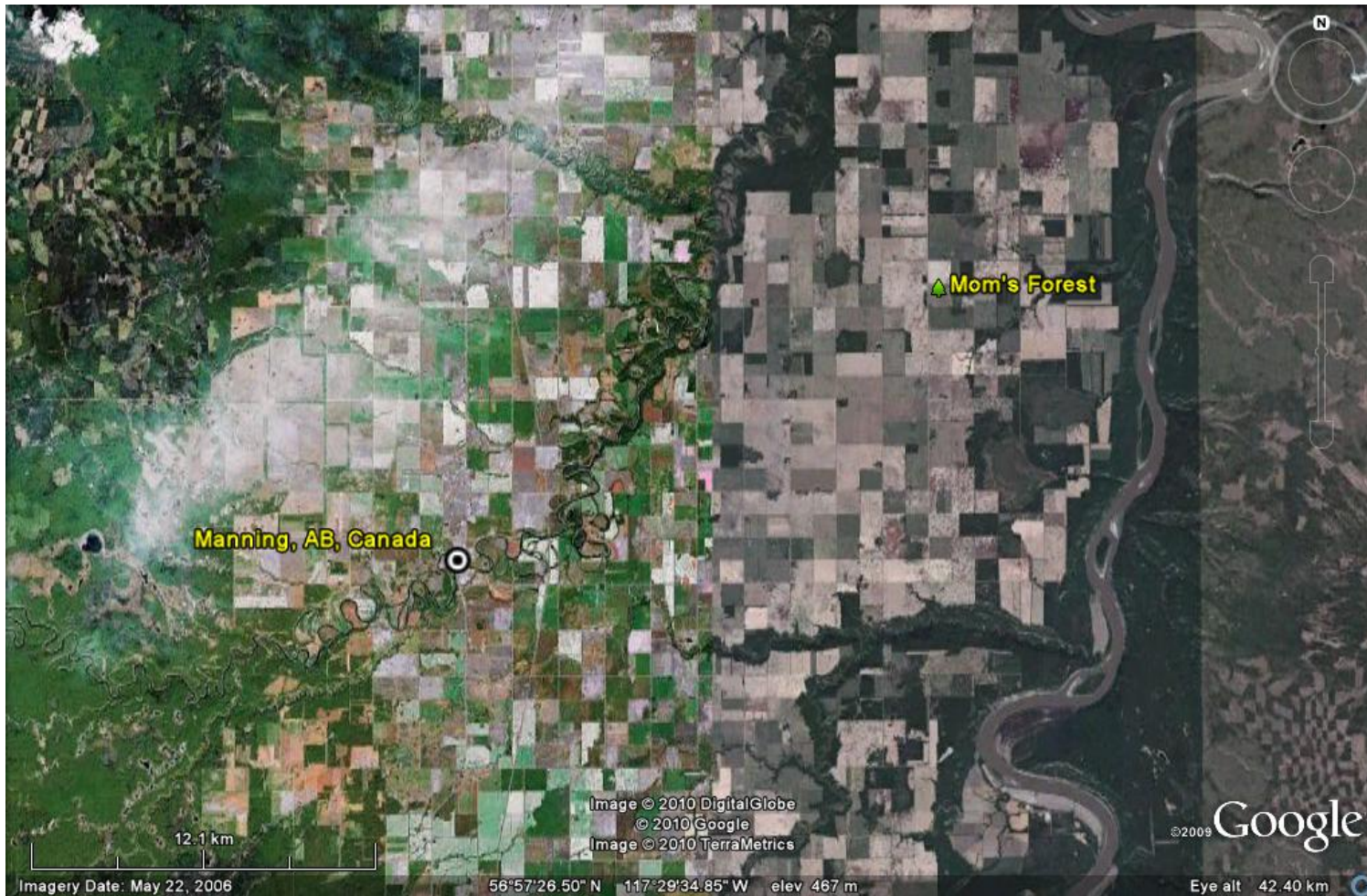


Figure 4: Detailed site map



Figure 5: Stand level net carbon sequestration

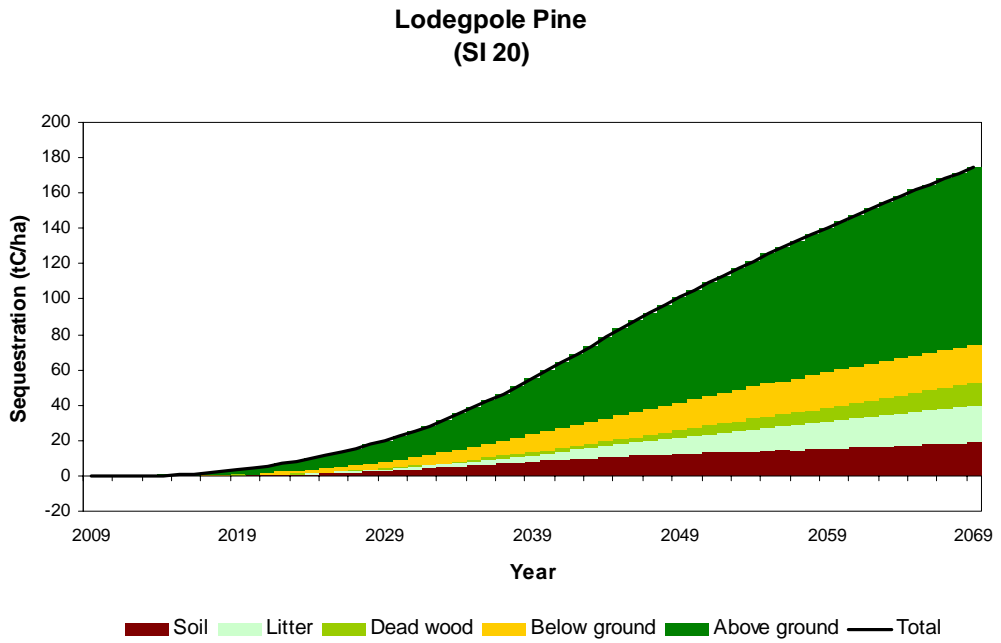
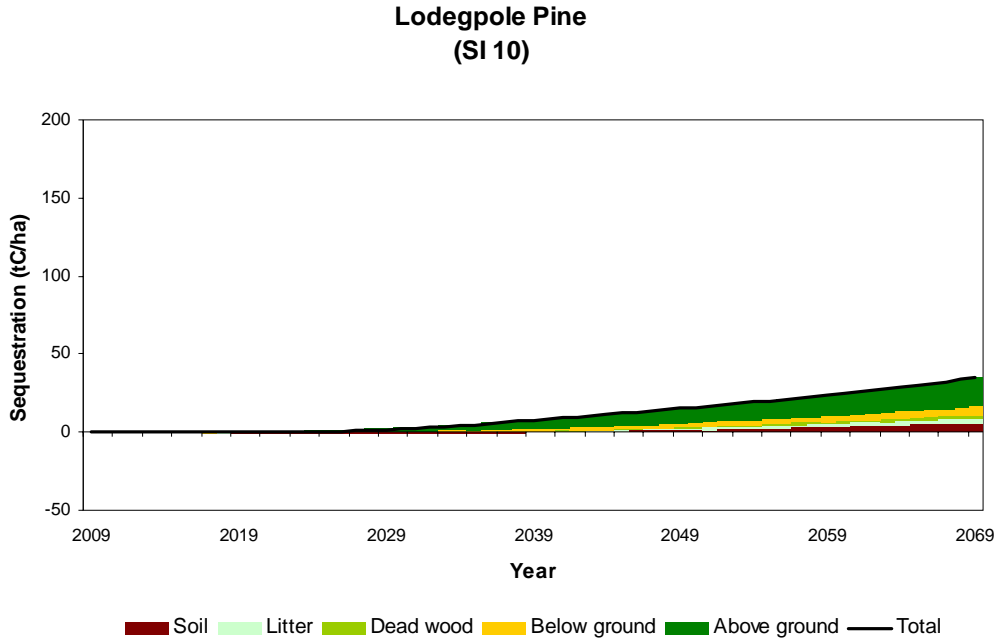
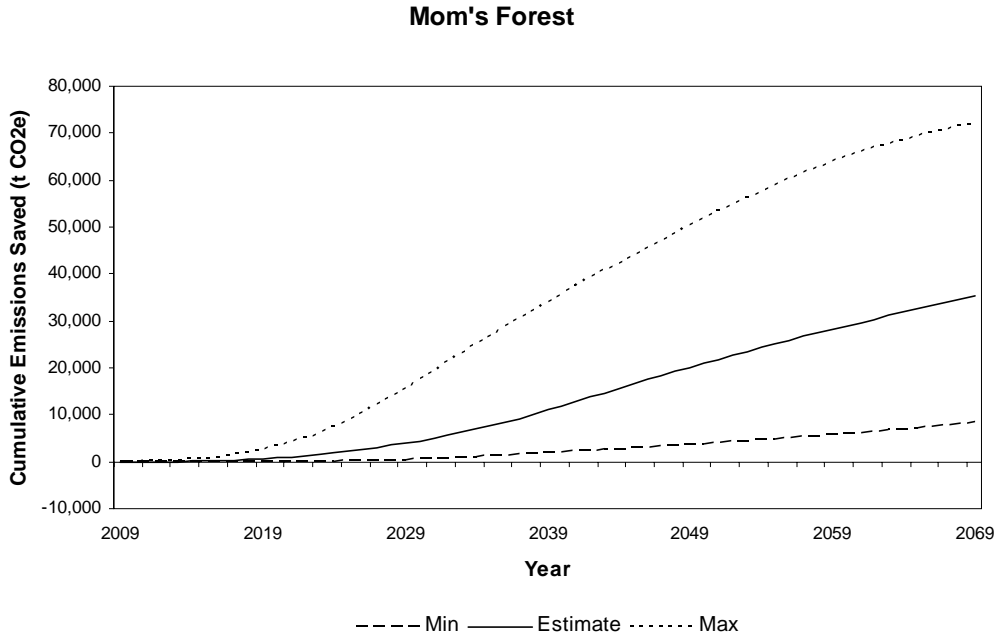


Figure 6: Cumulative emissions saved

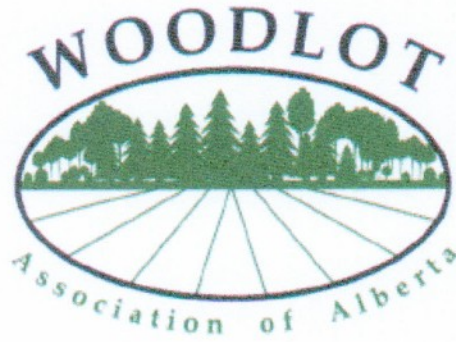


### **Woodrising Consulting Inc.**

This analysis has been provided by Neil Bird (Woodrising Consulting Inc.) Woodrising is a Canadian environmental consulting company that has developed expertise specifically in the areas of carbon sequestration from land use, land-use change and forestry activities, and landfill gas generation and capture. Since 1993, they have worked on projects in Africa (Kenya and Uganda), Latin America (specifically Bolivia, Chile, Ecuador, Honduras, Mexico, and Peru), India, Pakistan, China and Canada. Since 2007, Neil Bird has been a member of the CDM Executive Board's Afforestation / Reforestation Working Group.

### **References**

- <sup>1</sup> Intergovernmental Panel on Climate Change (IPCC), 2003. Good Practice Guidance for Land Use, Land-Use Change and Forestry. Published by the Institute for Global Environmental Strategies (IGES) for the IPCC. <http://www.ipcc-nggip.iges.or.jp> Tables 3.4.2 and 3.4.3
- <sup>2</sup> Shaw, C.H., E. Banfield and W. Kurz. 2008. Stratifying soils into pedogenically similar categories for modeling forest soil carbon. *Can. J. Soil. Sci.* 88. 501-516.
- <sup>3</sup> <http://www.for.gov.bc.ca/hre/gymodels/tipsy/index.htm>
- <sup>4</sup> Schlamadinger B and G. Marland. 1996. The role of forest and bioenergy strategies in the global carbon cycle, *Biomass and Bioenergy* 10: 275-300.
- <sup>5</sup> Siltanen R, Apps M, Zoltai S, Mair R and W Strong. 1997. A soil profile and organic carbon data base for Canadian forest and tundra mineral soils, Canadian Forest Service, Northern Forestry Centre.
- <sup>6</sup> Moore T, Trofymow J, Taylor B, Prescott C, Camiré C, Duschene L, Fyles J, Kozak L, Kranabetter M, Morrison I, Siltanen M, Smith S, Visser S, Wein R and S Zoltai. 1999. Litter decomposition rates in Canadian forests, *Global Change Biology* 5: 75-82.



Woodlot Association of Alberta  
18104 – 105 Ave.  
Edmonton, AB T5S 2T4  
9 October 2009

Mr. Brad Rabiey  
The Carbon Farmer Inc.  
11033 101 St.  
Peace River, AB T8S 1L5

Dear Mr. Rabiey:

The following is a record of the tree seedlings planted by our consultants on your property as part of the WAA 2009 Seedling Program:

Date of planting: 19/07/09

Number planted:

Species: Lodgepole Pine – 127,170

Species: White Spruce - 0

The location of planting is shown on the accompanying map.

An evaluation form for our program will be sent to you next year and we ask that you complete and return it.

This program was made possible by Millar Western Forest Products Ltd. and the Forest Resource Improvement Association of Alberta.

Sincerely,

A handwritten signature in blue ink, appearing to read "Jamie Giberson", is written over a light blue horizontal line.

Jamie Giberson, President  
Woodlot Association of Alberta

# Rabiey



## **Folklore Contracting Planting Block Summary 2009**



<i>Treat. Unit</i>	<i>Seedlot</i>	<i>Stock Type</i>	<i>Species</i>	<i>Total Trees</i>
	33-59-22-5-2000	410A	PI	31320
	33-59-22-5-2001	410A	PI	95850
<b>Total Trees</b>				<b>127170</b>