

A Forest Carbon Inventory

for the

Little Hogback Community Forest

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Created by the 2008 Land Stewardship Program

Report Prepared by LANDS Interns Gwen Kozlowski and Maureen Whalley



Project Overview

As interest in climate change grows, people have begun to look closer at where carbon comes from and where it goes. This has spawned interest in carbon markets as a means to mitigate climate change. The future of carbon markets will rely on having a solid understanding of where carbon is in the environment. One of the carbon “banks” that is relatively easily accessed and managed are our forests. Forest biomass - in the form of trees, their roots, dead and downed logs, small plants, and soils - all take up and release carbon. With that in mind, forests and soils have a large influence on atmospheric levels of carbon and knowing how much a forest can sequester and store is of interest because it will help us to better understand climate change.

Not only does carbon sequestration provide useful information about our changing climate, but it is one of the newest marketable ecological services. With the emerging carbon market, the Little Hogback Community Forest is interested in learning more about what their forest has and what it can provide. Therefore, the LANDS interns calculated a coarse-scale measurement of the biomass (and subsequently – carbon) found on the 115 acre parcel of land. With this information, the Little Hogback group may be able to profit in yet another way from sustainably managing their land.

Project Partner: The Little Hogback Community Forest

With the rising cost of land and increasing pressures on single land owners to subdivide, the Little Hogback Community Forest’s unique ownership model provides an alternative. Sixteen shareholders own the 115 acre parcel of land located in Monkton, Vermont. This innovative model was created in partnership with Vermont Family Forests and the Vermont Land Trust in 2007. The goals of the community owned forest are to protect forest health and provide affordable land to local people. The Vermont Land Trust holds an easement that prohibits subdivision and development, and in turn each of the shareholders is entitled to firewood, timber, and recreational uses on the land. They can use their share or sell it for profit. The active management and overall forest health is overseen by a forester from Vermont Family Forests.

Methods

To figure out the amount of carbon stored in a forest, the amount of biomass must be calculated first. Biomass was measured by standing trees and downed logs. These measurements were then extrapolated in a computer program, North East Decision Model (NED) to determine the total amount of above and below ground biomass and subsequently the amount of carbon stored. Since this is such a new field, methods and equations are still being developed to convert the volume of coarse woody debris that was found into an amount of biomass. Carbon is also present in other components of the forest, such as soil and fine roots. However, this report only looked at trees and wood debris.

Standing Trees

The first part of the inventory measured the above ground biomass. Using GIS, a forest cruise with 53 predetermined plot center points were placed throughout the parcel boundaries. This method produced unbiased point centers and quick sampling time. (The plot centers layer is available from UVM). Groups navigated to each point using GPS devices and compasses. However, a handful of the southernmost points were rejected due to poor proximity of roads or residential areas.

Samples were conducted at each point using variable radius plots and a 10-factor prism. Trees that were deemed “in” the plot were recorded and their diameter at breast height (DBH) and species noted. Trees that were border line were counted every other occurrence. The decay class of each tree was also noted (1-7; 1 being completely live, 7 being the most advanced stage of standing decay). Only merchantable trees with a diameter greater than five inches were counted.



Figure 1. Interns measuring diameter at breast height

Coarse Woody Debris

Coarse woody debris (CWD), another essential component to the inventory, is the dead and decaying trees on the forest floor. It is crucial in the nutrient cycling process, provides habitat for small mammals, and is also where a large amount of carbon is stored.

CWD was sampled using sixty meter transects that ran north-south. The same center points used for the standing tree plots were also used to determine the starting point of transects. Roughly every other point was sampled, so that transects would not overlap. Again, some points in the southern end of the parcel were rejected due to their close proximity to roads or residential areas.

The measuring tape was laid on the ground and anytime it crossed a piece of CWD, that piece of debris was counted; its diameter, where the tape crossed, was measured (in cm) and the decay class (1-5, with 5 being the most decayed) was noted. If a large piece of wood was split or the tape crossed it twice, only the first crossing was counted. Only debris over ten centimeters in diameter (approximately 5 inches) was counted.



Figure 2. Interns measuring coarse woody debris

All of the data acquired above was then entered into MS Excel files. The total biomass (above and below ground) of the standing trees was calculated using a computer program, NED. The volume of coarse woody debris was calculated in MS Excel.

Results

The total biomass for the 115 acre parcel, which includes above and below ground, was calculated to be 4750.0 tons. The average biomass per acre was 41.3 tons. To figure out the amount of carbon from biomass is a simple division of two because carbon makes up 50% of the biomass. From this, the amount of carbon per acre was determined to be 20.7 tons/acre. A paper published by the North East Foresters' Association calculated that a typical forest in the northeast has 116 tons of carbon/acre. The discrepancy can be explained because their measurement included coarse woody debris and carbon stored in the soil (a very large carbon sink), while this measurement is only relative to tree biomass greater than 5 inches.

The average volume of coarse woody debris was calculated to be 320.0 m³/hectare. New formulas and equations are still being developed to extrapolate this volume into an amount of biomass, and hence amount of carbon.

Table 1. Biomass (above and below ground)

Total biomass	4750.0 tons/115 acres
Average biomass per acre	41.3 tons/acre

Table 2. Carbon

Amount of carbon per acre	20.7 tons/acre
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Table 3. Volume of Coarse Woody Debris

CWD	320.9 m ³ /hectare*
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This is only a coarse measurement of the amount of carbon found in the Little Hogback Community Forest. These numbers will also provide insight to a class that will be taught at the University of Vermont by Professor Deane Wang in the fall of 2008. The class will be conducting a more precise measurement and will hopefully provide greater insight.

Although there are discrepancies, this inventory is at the cusp of a new developing field that has implications for land conversation projects across the nation. There are still many questions left to be answered about the future of carbon markets. This was an innovative project for a unique community partner and interns learned first hand about collecting data and debated what the future may hold.

*CWD measurements are typically given in metric; 4588.06 ft³/ acre

About the LANDS Program

The field of conservation is rapidly evolving to meet the growing demands of society. New ideas, strategies, and players are changing how we conserve and steward land. The Land Stewardship Program (LANDS) is one of these new ideas. During the great depression, the conservation corps model was pioneered as a means to promote stewardship in the nation and provide jobs for the unemployed. That idea has since been reinvented 116 times by local and state corps across the United States. However, the general theme is the same -- young people learning *and* growing through service. LANDS is an innovative corps designed to train tomorrow's cutting-edge conservationists. The LANDS Program is a pilot partnership between the University of Vermont and the Student Conservation Association. This year marks the 2nd phase pilot year, following a successful first year.

LANDS is unique for several reasons. The program serves a wide range of land conservation partners, ranging from national to local organizations. The principal partners for LANDS are land trusts, a growing movement in the conservation field. In addition, LANDS crew interns work on projects that are more technical than traditional crew work. They draft management plans, map invasive species, measure forest carbon content, and even find time to build trails. LANDS interns are advanced undergraduates in the natural resources field and come from all over the world with a range of skills and interests. Utilizing the service-learning model, the program simultaneously assists organizations in need of service, and students in need of training. It is a unique opportunity for undergraduate students to gain experience in their field while providing valuable support to partnering organizations.

At a time when we must re-devote ourselves to conservation education and service at all levels, the LANDS Program is a valuable resource for students and conservation organizations alike.

http://www.uvm.edu/~conserve/lands_website/

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