PROPOSAL FOR GEOMORPHOLOGY PROJECT

NATALIE HAVLIN, SUSAN KING, ALLISON B.

OCTOBER 12, 2001

TITLE: Longterm Effects of Deforestation and Farming on Soil Infiltration Rates and Soil Stratigraphy

ABSTRACT: We will study four locations in an attempt to determine whether or not, and to what extent soils are affected by farming and deforestation. The four sites under examination will be Williams Woods, Charlotte, VT, the farm adjacent to Williams Woods, Charlotte, VT, the lower section of Mt. Philo, Charlotte, VT, and Shelburne Pond, Shelburne/Charlotte, VT. We will also attempt to determine how long it takes for soil to return to its natural state after it has been farmed or deforested. We have hypothesized that infiltration rates of soils are affected by farming and deforestation and that given enough time, soil will return to its natural state. We also believe that soil stratigraphy will vary between sites that have been farmed or deforested and those that have not.

STATEMENT OF THE PROBLEM

This project will focus on the effects of deforestation and farming on the soil. The general questions arising from such a focus follow. Are there different stages of soil development? Is soil more fertile in its natural state or after farming? Does deforestation and farming affect the infiltration rate of the soil? If farming and deforestation do affect the infiltration rate and fertility of the soil, how long does it take for the previously deforested and farmed soil to return to its original/natural infiltration rate and fertility? Some of the variables that we will have to work with are type of soil and bedrock, the vegetation growing in the soil, and the saturation of the soil.

SIGNIFIGANCE

An investigation that leads to an understanding of the human impact on soil has great educational and societal benefits. The results of such a study may influence how humans interact on a micro-level through farming and on a macro-level through economic landscape development. If, as the researchers expect, farming affects the infiltration rate and fertility of soil, this project could be a tool for initiating investigations into the stage of soil development of areas that may be farmed. This project may also add to the understanding of how deforestation affects the landscape. With the evidence gathered by

this investigation, the public will have greater information concerning effects of clear-cutting and the instillation of large tracts of farmland.

MATERIALS AND METHODOLOGY

The way in which we will investigate our hypothesis and the questions it raises is through direct sampling and historical research. The first step in this process is the identification of four research areas. The four areas selected are Williams Woods in Charlotte, the farm adjacent to Williams Woods in Charlotte, Mount Philo in Charlotte, and Shelburne Pond on the border of Charlotte. Through historical deforestation and farming records, as well as geologic records (Chittenden Soil Survey and Vermont Surficial and Bedrock maps), these four sites have been verified in relation to the time at which they were farmed, similar soil type, similar bedrock, similar elevation and similar type of farming. Williams Woods will function as our control area (a site that has not been touched by deforestation or farming) and the farm adjacent to Williams wood is currently in use. The lower sections of Mount Philo and area around Shelburne Pond have both been deforested and farmed in the past. Shelburne Pond was farmed in the late 1800s and the lower sections of Mount Philo were farmed from the late 1800s until the late 1900s.[1]

After retaining permission from the landowners for each site, exact locations and elevations will be measured using GPS and an altimeter. Following this measurement, a soil pit at each site will be dug and an infiltration rate experiment will be installed at each site. The soil pits will be used to understand the stratigraphy of each of the sites. Special emphasis will be placed on the percentage of differing grain size, the thickness of the layer (especially the Organic layer and the AP layer), and the pH of all the layers. The pH will be determined using conventional methods of comparing the pH of the soil layer to the pH scale included in pH testing kits. The infiltration experiments utilizing a tin can will be used to measure the degree of infiltrating precipitation. This will be measured by the amount of water that has wet the soil and the percentage of wet soil over time. To measure infiltration, the volume of water over the time it takes to infiltrate down in the soil will be measured. In terms of measuring this in a natural setting, if rainfall does not occur at a convenient time, we will produce such a setting ourselves. This will be accomplished by calculating the volume of water in a large container and measuring the time it takes for the water to infiltrate down in the soil.

The fourth measurement to be taken is the time at which these sites were deforested and farming occurred. This will be measured by cores from trees. Tree cores indicate the age of a tree. This will help determine how long a site has been reforested. The fifth measurement will be the measurement of carbon from each pit. Using the loss-on-ignition technique, we will be able to determine the amount of carbon remaining in the soil. This will give an accurate description of the age of the pit. The final steps in this project will

[1] Historical information concerning these four sites have been obtained from Walter Poleman's "Landscape Natural History" handouts and sections of historical records collected by the Nature Conservancy and the University of Vermont Environmental Program.

be taking photographs of each soil pit and the comparison of the data from the four sites and the analysis of the results.

EQUIPMENT

Due to the scope of our project we will need to use a GPS, soil pit kit (including pH testing kit), carbon counting instruments, a tree corer, few tin cans and measuring devices (rulers and measuring tapes).

REFERENCES

Allen, George W. Soil survey of Chittenden County, Vermont. Washington, Supt. of Docs., U.S. Govt. Print. Off., 1974

Albers, Jan. Hands on the land : a history of the Vermont landscape . Cambridge, Mass. : MIT Press, c2000.

Wessels, Tom, Reading the forested landscape : a natural history of New England Woodstock, Vt. : Countryman Press, 1997.

Leonard, Deacy Ford. Century farms of Vermont. Montpelier, VT: Vermont Historical Society, 1986.

Anzuoni, Helen. Farm lands inventory. Burlington, VT : Chittenden County Regional Planning Commission, 1983.

Poleman, Walter. Class Materials for "ENVS 195: Landscape Natural History." Fall 2000, University of Vermont.

Addition information has been obtained from the Nature Conservancy of Vermont.