Detailed Geomorphic Mapping of Late Glacial to Historic Sediments in the Huntington River Drainage Basin

Project Proposal
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Introduction

General geologic mapping of the state of Vermont has identified glacial events and post-glacial sedimentation. During the last approximately 200 years, European settlement, clear-cutting of forests for agriculture and logging may have caused a very significant amount of soil loss to erosion. In order to understand where this eroded sediment resides, it is necessary to map surface features on a larger scale than previously done. Eventually, certain characteristics may be identified which better differentiation of this sediment from that which was deposited prehistorically.

Very little detailed geomorphic mapping has been done in the Winooski River drainage basin especially with consideration to sedimentation since settlement of this area. Using this information, it may be easier to map and interpret other sub-drainages. For this particular study, I have chosen Huntington River drainage basin was chosen. My senior thesis will involve detailed geomorphic mapping of Huntington River drainage basin, particularly late glacial to historic sedimentation.

Project Significance

This project will provide more insight into post-glacial fluvial processes in the form of detailed inventory of geomorphic forms of a particular drainage basin. This project will also be significant to archaeologists. They will have more information specifically regarding characteristics of prehistoric and historic sedimentation. Determination of different types of soil erosion in this area is also significant agriculture, planning, etc.

The Study Area

Data from column samples from the lower drainage basin of the Huntington River drainage basin are already available (Consulting Archaeology Program, University of Vermont). This is part of the reason why this drainage basin was chosen over other sub-drainages of the Winooski. In considering other alternatives, there is certainly more varied surficial geology in other drainage basins. However, because the Huntington River is only about 20 miles long and the drainage basin is about 80 miles square, it appears to be a more manageable study area for a senior thesis.

As a general overview of the study site, it appears that the major surficial deposit of this watershed is kame terraces surrounded by glacial till (VT Geologic Survey). Approximately the lower 1/3 of the river flows through sediment referred to as "recent alluvium" (VT Geologic Survey).

Previous work conducted in the Piedmont Region identifies the eroded, historic sediment to reside in one of two places. Either it had completely left the drainage system (on the continental shelf somewhere), or it resides at break's in slope at the junction of several streams (Costa, 1975). If this were to be used as a model, there are several places within the Huntington River drainage that fit these criteria.

Methods

This project will be in 4 parts. Research, field work, laboratory testing, and final write up. The following will be the resources included for background research.

Aerial photos will be used to identify the areas more probable of containing historic eroded sediment. Also, they will be used to define the extent of the drainage basin and active and dormant drainage patterns within the watershed. The use of 1937 aerial photos will be useful in distinguishing dormant fields with second succession growth forest. This may provide clues as to where sediment is coming from. Infrared photography will be useful in determining wetter areas along slopes, if this historic sedimentation tends hold water longer than surrounding sediment. Aerial photos will also provide the mapping base along with topographic maps. The above information will be taken into consideration with mapping done in the field. As well as providing a mapping base, topographic maps will also be used to construct topographic profiles of the basin. These maps may also provide information about active or abandoned gravel pits or quarries that could provide soil samples.

Other research includes historic research and collecting hydrological data. Historic research will be necessary to better define time and extent of logging and agriculture and therefore extent of clear-cutting in this drainage basin as well as other pertinent historic development information. Appropriate hydrological data will be used from adjacent watersheds and other similar watersheds in the Winooski River drainage that has hydrologic data regularly collected. This data, including discharge, sediment load, and bed load, will give insight to how this river moves sediment and therefore to river valley development. Other soil profiles constructed in this area will also be used as well as the general soil surveys. Previous work on surficial (and general) geology as well as any other pertinent work will be used.

Field work will involve mapping, sampling (with sample profiles), and photography. Mapping will include superimposing significant fluvial, and glacial geomorphic features over the existing drainage system obtained from topographic maps and aerial photos. Elevations of terraces (kame and fluvial terraces) will be taken as part of mapping as well as slope concavity, steepness (especially of alluvial fans), and existence of knicks or steps. Escarpments and other areas of denudation will also be mapped. Floodplain features will include axes of levees, oxbows, alluvial bars, etc. Exposed bedrock will be mapped as well. Evidence of different erosion types, such as rill, sheet and gully, will be

mapped. Depending on availability and time, soil samples will be obtained from good examples of various sections of the drainage basin to supplement data from soil samples already gathered. OCR (Oxidized Carbon Ratio) tests will be done on any organic material retrieved, specifically for historic material (Frink 1992). OCR dating is a relatively new dating technique based on percentage of carbon oxidation over time that appears to have about a 3% error. Since OCR is a new technique, C-14 dating will be taken as well. Other testing will include pH, chemical analysis, and mineralogy.

Final Write-up

The final write-up will include interpretation of late glacial to historic depositional sequence as well as final geomorphic maps including some interpretation drainage basin, hydrology overlay, and historic land use overlay as well as other pertinent information.

Consulting Archaeology Program, University of Vermont. Unpublished report on VT-CH-619 lent by gracious permission.

Costa, John, 1975, Effects of agriculture on erosion and sedimentation in the Piedmont Province, Maryland: Geological Society of America Bulletin, v. 86, p. 1281 - 1286.

Demek, Jaromir, ed. Manual of Detailed Geomorphological Mapping. Acedemia, 1972.

Frink, Douglas S. 1992. The chemical variability of carbonized organic matter through time. Archaeology of Eastern North America 20:67-79.

USGS Camels Hump 15' quadrangle. 1948.

Surficial Geology Map. Vermont Geologic Survey. 1970.

Budget

-topographic, surficial geology and other pertinent maps
-airphotos of the study area: 1974, 1937 flights
-sample testing (c-14, ocr, chemical analysis on about 20 predicted samples
-film

Estimated Time Frame of Research

The time frame for field work, laboratory testing and write up are:

Field work	mid July to late August
Lab analysis	late August to October
Maps due	December, end of fall semester, 1994
Final write-up due	April, 1995