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No 28978

THE EFFECTS OF COLONIAL DISTURBANCE AND SUBSEQUENT REFORESTATION ON THE VERMONT LANDSCAPE

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Multiple lines of evidence indicate that colonial deforestation in Vermont destabilized hillslopes and increased rates of alluvial sedimentation. According to US Census Bureau data, colonial deforestation in Chittenden County, Vermont reached its maximum in 1880 with 75% of the land cleared. Shortly after, large-scale emigrations from Vermont farms resulted in a rapid rise in forested areas. New data indicate that the effects of human-induced disturbance were, in some places, relatively short-lived and that hillslopes may have stabilized soon after large-scale abandonment of agricultural lands.

Three specific geomorphic features within the 2800 km² Winooski River Basin indicate high rates of erosion concurrent with colonial deforestation. 1) Studies of historic maps have shown that following 1869, the Winooski Delta prograded between 480 and 600 m into Lake Champlain. By 1894, following the rapid abandonment of agricultural land, the delta had retreated at least 200 m (J. Severson, unpub. MS, UVM). 2) A radiocarbon date (100+/-50, Livermore), from an 8 ky ¹⁴C year-old alluvial fan higher in the basin, indicates that between 15-20% of the fan was deposited within the last 300 years. 3) In Town Line Brook, a 400 m long tributary of the Winooski River, there are 3 active and at least 9 inactive landslides ranging in height from 14 m to 37 m. The failures have occurred in glacial marine silt inter-bedded with fine sand lenses and overlain by glacial lacustrine deltaic sands. Inactive slides can be recognized by discreet, arcuate headscarps suggesting that they have been active in the recent past; however, tree cores, taken from trees on 6 of these inactive slides, indicate that 5 slides have been stable for >80 to >110 years. The hillslope stabilization reflected by the age of these trees is coincident with the initial reforestation of Vermont (≈ 1880) and the observed retreat of the Winooski Delta.

Data are consistent with rapid landscape response to disturbance and reforestation. For example, in Town Line Brook, currently active slides generate about 150 m³ y⁻¹ whereas the long-term erosion rate in the tributary since the retreat of the Champlain Sea and incision of the delta is < 15 m³ y⁻¹. If analogies to modern slides are accurate, the tree core data suggest that presently inactive slides were generating large amounts of sediment about the same time the Winooski Delta increased in size. The reforestation of these slides and many others like them in NW Vermont appears to have occurred rapidly, reducing the sediment supply which most likely caused the earlier delta expansion.

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