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No. 7849

ALLUVIAL FANS IN VERMONT AS RECORDERS OF CHANGES IN SEDIMENTATION RATES DUE TO DEFORESTATION

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Colonial deforestation in Vermont resulted in destabilization of hillslopes and increases in erosion and sedimentation. Alluvial fans serve as a recorder of hillslope erosion and provide volumetric information about sediment loss from the associated drainage basins. Well developed soil horizons in fan deposits provide a marker for periods when little deposition occurred on the fans.

The Huntington River valley in northwest Vermont contains a relatively dense assortment of 22 small fans ($< 10^3 \text{ m}^2$), most of which are fed by ephemeral streams emanating from well-defined drainage basins. The majority of the fans are deposited atop former Huntington River terraces and acquire their source material from higher terraces. Most recently, we have trenched a group of three fans on the lowest river terrace, which are located within several hundred meters of each other. Generalized stratigraphies of trench walls differentiated units consisting primarily of sand and silt and poorly sorted, poorly consolidated gravel. Careful examination, revealed thin beds of sediment representing specific episodes of deposition. Well developed paleosols occur in most of the trenches and contain disseminated organic matter and charcoal. Wood samples collected from 4 meters below the surface of two fans have been radiocarbon dated and provide constraining ages of < 100 (GX-21329) and 2500 ± 60 (CAMS-22994) ^{14}C years. The date of < 100 ^{14}C years implies that one fan is composed entirely of sediment deposited since the onset of extensive farming in Vermont. The date of 2500 ± 60 ^{14}C years obtained from other fan has been augmented by a second date of 840 ± 60 (CAM-22995) ^{14}C years at a depth of 1.87 meters. A comparison of these two dates and their respective positions in the stratigraphy of the fan, reveals that rates of deposition have nearly doubled in the last 840 years. This increase may be attributed to accelerated erosion and sedimentation since the arrival of Europeans.

Our results are consistent with earlier findings [1] in regard to fans in the Huntington region, which attribute modern depositional increases to extensive clear-cutting and farming. The existence of cumulative plow layers in the fans confirms the historical use of the area for agriculture. The decline of the farming industry in this part of Vermont has permitted significant forest regrowth in recent years, most notably on hillsides. The restabilization of the hillsides provides an explanation for the apparent recent decrease in sedimentation on the fans.

[1] Church, A. and Bierman, P., GSA abs, 26, 7, A-301, 1994; GSA abs, 27, 1, A-36, 1995

alluvial fans, deforestation, erosion, sedimentation, Vermont

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