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Soil stability and plant diversity in eco-engineering

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Slopes affected by superficial sliding and subsequently re-stabilised with eco-engineering measures were investigated, particularly related to soil stability and plant diversity. The sites are situated in three different areas of beech-fir-spruce forest associations of the higher montane zone of Switzerland. Climatic and site characteristics, in paraticular soil properties after the sliding event, of the three investigation areas are very similar. However, the number of species (shrubs and trees) used for the initial planting as well as the year of application of the eco-engineering measures differ substantially.

In the investigation area Dallenwil-Wirzweli the biological measures taken in 1981 were restricted to one tree species, namely White Alder (*Alnus incana*). In Klosters, where measures were taken in 1983 as well as in the Arieschbach valley, where eco-engineering was applied in 1998, the initial planting consisted of 15 species either. Investigations in 2005/2006 revealed neither obvious differences among the three areas nor distinct correlations related to the diversity of the initial planting on the on hand and the development of the vegetation cover and soil stability on the other hand.

During the available time of development, the soil aggregate stability increased by 30 to 39%. Compared to the corresponding climax association, the relative values of soil aggregate stability varied between 90 and 120%. Concurrently, the dry unit weight decreased between 1.1 and 3.1 kN/m^3. The cumulative vegetation cover varied from 110 to 150%. Due to processes of soil development a distinct shift in the grain size distribution was noticed, from a well sorted gravel with clay and sand (GW-GC) to a silty gravel with sand (GM) in Dallenwil-Wirzweli and a silty to clayey gravel with sand (GC-GM) in Klosters and the Arieschbach valley.

Furthermore, in all three investigation areas succession processes were observed that are comparable to average rates of natural secondary succession. The number of shrub and tree species recorded in 2005/2006 varied between 12 and 16. According to the recommendations for silvicultural maintenance of protective forests, the shrub- and tree layer consisted of 75 to 100% of the required plant species in view of the potential target association.