Geophysical Research Abstracts,
Vol. 10, EGU2008-A-06806, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-06806
EGU General Assembly 2008
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Soil bioengineering Contribution of *Alnus* ssp. to Landslide Stabilisation in terms of Biomass Productivity and Evapotranspiration

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At Bad Goisern (Austria) *Alnus incana* (L.) Moench, *Alnus glutinosa* (L.) Gärtn. and *Alnus x pubescens* TAUSCH were used to re-establish a vegetation cover after a large-scale slide that occurred in 1982. Alders are indigenous pioneer trees of the European deciduous and boreal forests. Their ability to bind atmospheric nitrogen, their adaptability allowing them to grow on dense and hydromorphic soils and their high potential of self-regeneration by developing root suckers and stump sprouts are greatly appreciated for reclamation work at erosion or slide sites. Recently, studies were carried out to help improve the scant knowledge of biomass development under extreme soil conditions and on slide-prone sites. Stand biomass and LAI (leaf area index) represent fundamental indicators for the stand water balance of the former slide site. An assessment of above-ground biomass components allowing a quantification of the growth performance of alders planted for stabilisation purposes are presented. The current soil and soil moisture conditions and the components of the water balance are discussed.

All investigations were executed separately for the untreated, fully coppiced and semi-coppiced stand. Various biometric parameters were evaluated to characterise the stand structures. Regression analyses were used to create allometric functions for assessing above-ground tree components and the total stand biomass. The analyses were carried

out separately for pole stage, juvenile trees (diameter at breast height dbh$\leq$4cm) and coppiced trees. Soil moisture at two different depths was registered throughout the year using CS 615-water content reflectometers. Precipitation throughfall was measured directly to calculate interception rates. A simplified water-balance equation was used to compute evapotranspiration for the investigated vegetation periods 2001 and 2002.

The soil of the former landslide is classified as a Clayic Stagnosol (Thaptomollic) and is characterized by high clay fractions of up to 90 %. High quantities of expandable, water retaining clay minerals (smectite, vermiculite) lead to highly moist conditions throughout the year (volumetric water content < 75 %).

At 7,023 stems ($>$20cm height) per hectare the basal area of the pole stage (dbh$>$4cm) was found to be 10.41 m^2 ha^{-1}. The total stand biomass added up to 18 ton ha^{-1} having an LAI of 1.5. The per-stump biomass productivity of coppiced trees was higher for the fully coppiced stand (0.57 kg) than for the semi-coppiced stand (0,19 kg). European alder produced more biomass within the first two years (93,6 % of the total regenerated biomass) than grey alder and the hybrid. We assume that their regeneration was restricted due to inhomogeneous stump distribution and light competition.

At excessive precipitation rates (994.6 mm, June to November 2002) the change in soil water storage for the untreated stand was low ($<$ $\pm$10,1mm). Interception rates were higher for the untreated stand (26.0 mm including herb layer), but the herb layer and the resprouting trees of the coppiced stand were found to contribute significantly to rainfall interception two years after coppicing (21.3 %). Evapotranspiration accounted for up to 734.1 mm demonstrating that the established alder stand represents a relevant support to the stabilisation of the landslide in terms of hydrological aspects.