

# THE INFLUENCE OF VEGETATION ON EROSION FOLLOWING RESTORATION IN HIGH ZONES

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## INTRODUCTION

As before, thousands of hectares of ground are levelled annually as a part of opening up tourism for the necessary infrastructural adaptations, and are now in need of restoration. A significant part of recultivation measures is due to the construction and adaptation of ski runs and lifts. But many necessary technical measures for the protection of facilities, which are mainly within the sphere of responsibility of the torrent- and avalanche barrier authorities, also take up large areas. All of the measures described lead to intensive construction activity each year, which subsequently engender restoration of the areas subjected to intervention. With increased altitude, restoration becomes increasingly more difficult due to a rapidly worsening climate and soil conditions. Only sufficient vegetation development with a sufficient ground cover stabilises topsoil in the long term, and reduces erosion to an acceptable degree. In the short term, only the choice of recultivation technique is decisive for the degree of erosion in the restoration area. In the long term, a stable, sufficient protective plant stock for the topsoil in high zones is possible only through the establishment of sitespecific vegetation.

## MATERIALS AND METHODS

In 1999 an international EU project was started under the direction of the HBLFA Raumberg-Gumpenstein with the participation of further research groups and firms from Austria (office of the Provincial Government of Tyrol, Kärntner Saatbau), Italy (provinces of Pordenone and Vicenza), Germany (University of Kassel) and Switzerland (Association for High Zone Restoration). The aim was to make possible for the first time an exact scientific comparison of the standard state of technology, high-quality application techniques and site-specific seed. At six different sites, the development of the vegetation from site-specific seed mixtures and a commercial mixture was compared over a period of four years. The aim of the work was a scientifically exact comparison of site-specific and conventional seed mixtures and their influence on sustainable restoration in high zones.

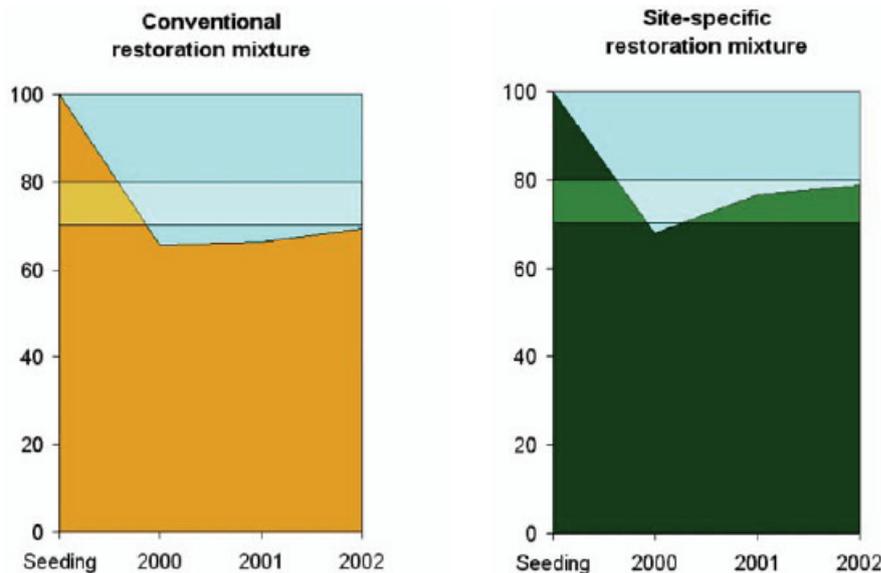
## RESULTS AND RELEVANCE TO PRACTICE

If one assesses the development of the entire ground cover on average in all trial sites, the commercial mixture achieved somewhat more than a 60% overall cover in the fourth year of vegetation, thus still not achieving the target value of a 70% vegetation cover to stabilise erosion conditions. Compared to the commercial mixture, the entire cover comprising the site-specific restoration mixtures achieved a significantly higher share of 79%. The site specific restoration mixtures therefore achieved a comparably clearer and more stable turf. In respect of the adaptation of the observed species to climate and site, the last named mixtures showed

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clearly better cover, sustainability and correspondingly lasting erosion protection. The essential long-term aim of recultivation in high zones lies in the establishment of resistant, easily maintained and sufficiently dense and enduring vegetation. This aim can only be achieved with the use of a site-specific seed mixture. With the use of such seed mixtures, a single fertilisation measure during sowing is generally sufficient to achieve a stable vegetation cover of more than 70%.



**Figure 1: Average overall percentage cover compared to conventional and site-specific restoration mixtures (seeding = mixture composition weight in %) on six trial sites at altitudes from 1,245 to 2,350 metres, average of all sites (KRAUTZER et al. 2006)**

Only in exceptional cases are further fertilisation measures necessary to achieve satisfactory vegetation density. Only site-specific grasses and herbs can form mature seeds in high zones, which provide an essential basis for long-living, enduring plant stocks from such restorations. Turf damage can in this way rapidly heal. Site-specific leguminosae ensure a sufficient nitrogen supply to the grasses and are another essential component of sustainable restoration mixtures. Careful restoration with site-specific seed can be made without subsequent maintenance when needed, and without the danger of choking or other limitations. In practice, this enables a strong decrease of necessary maintenance measures, which is especially desirable in restoration within the sphere of torrent- and avalanche barriers. Site specific seed mixtures are more expensive than seed mixtures of the species from low zones. But by comparison in the medium-term, with the saving of sowing volumes, fertilising, subsequent repair and maintenance a clear saving in costs is possible.

## LITERATURE

Krautzer, B., Wittmann, H., Peratoner, G., Graiss, W., Partl, C., Parente, G., Venerus, V., Rixen, C., Streit, M., 2006: Site-Specific High Zone Restoration in the Alpine Region. The Current Technological Development. Federal Research and Education Centre Raumberg-Gumpenstein, Irtding, Austria, Veröffentlichung 46, 135 Seiten

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