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# Durability of timber check dams used for toe protection in view of sustainable slope stabilisation by soil bioengineering

Christian Rickli (1) and Frank Graf (2)

(1) Swiss Federal Institute for Forest, Snow and Landscape Research WSL, Birmensdorf, Switzerland (christian.rickli@wsl.ch), (2) WSL Institute for Snow and Avalanche Research SLF, Davos Dorf, Switzerland (graf@slf.ch)

Soil bioengineering is widely applied in slope stabilisation, particularly in steep and remote torrent catchments. An indispensible requirement for long-term success of the measures applied is the protection and stabilisation of the toe. On this understanding, a most appropriate and efficient measure is torrent control by check dams, commonly made of wood from adjacent forests. In the large majority Norway Spruce (*Picea abies*) or, if available in sufficient quantities, Silver Fir (*Abies alba*) is used in the subalpine regions of Switzerland.

However, the life span of wooden constructions in general and of check dams in particular is limited by geomorphological processes and decay. Regarding fungal decay only sparse scientific information is available on its impact on the strength of the wooden components and the stability and functionality of the entire control structure. Related to that, in practice, it has been discussed controversially time and again if either Norway Spruce or Silver Fir is more suitable and, if the wood has to be built in with or without bark to better resist against fungal decay.

Seen from the angle that fungal colonisation and durability of timber structures in torrent control depend both on environmental conditions and construction characteristics we monitored and examined a series of timber check dams in this respect.

In 1996 a series of timber check dams was built in order to address open questions of construction issues. Of the totally 15 constructions, eight were built of Norway Spruce and seven of Silver Fir. Furthermore, for half of the check dams of each wood type, the bark of the logs was removed prior to assembly. The scientific investigations included i) assessment of fungal colonisation, ii) identification of decayed zones with a practical approach as well as with a drilling resistance measuring device. Within each check dam the two wing sections (left [1] and right [4]) and the left [2] and right [3] part of the water section were distinguished.

Preliminary results indicate that colonisation of decay fungi, addressed by occurring fruit-bodies started in 1999, three years after construction. The first potential decay fungi, *Gloeophyllum sepiarium*, occurred on both wing sections on check dams built of Norway Spruce without bark. Only four years later (2003), a first decay fungus, *Physisporinus sanguinolentus*, produced fruit-bodies on Silver Fir logs without bark on both wing sections as well as on Norway Spruce logs with bark on wing section 1. Additionally, on Silver Fir check dams hyphal strands (2007) and fruit-bodies (2009) of *Armillaria sp*. were recorded from the wing sections 1 and 4 of logs with and without bark. With *Postia caesia* and *Gleoephyllum trabaeum* two further potential decay fungi were found both restricted to the wing sections of Norway Spruce logs without bark.

Drilling resistance analysis revealed decay on 11 of the 15 check dams. Wood quality was markedly worse in the water sections with permanently high water saturation compared to the occasionally dry wing sections. In contrast to the practical approach, drilling resistance measurement detected more decay in Norway Spruce than in Silver Fir logs. However, no consistent results were found concerning the influence of bark removal, by neither method. Future investigations and sound statistical analysis are needed to confirm the observed trends.