

Sediment transport due to windthrow event in the Tatra Mountains, Poland

Dariusz Strzyżowski (1) and Joanna Fidelus-Orzechowska (2)

(1) Jagiellonian University, Cracow, Poland (dariusz.strzyzowski@doctoral.uj.edu.pl), (2) Institute of Geography, Pedagogical University, Cracow, Poland (jfidelus@up.krakow.pl)

Mountain areas are frequently affected by strong wind events which cause damage in forest stands by snapping or uprooting of trees. Uprooting contributes to sediment transport by displacement of soil material attached to a root system of a tree.

The aim of the study was to investigate geomorphic effects of tree uprooting and to calculate sediment flux by windthrow for the area of Tatra National Park. Research was conducted within the Tatra Mountains, in the Tatra National Park. Windthrow event occurred on 25 December 2013. The field work was conducted from September to November 2015 within 7 research polygons with the total area of 0.97 ha. Type of the damage (uprooted, partly uprooted, snapped), dimensions of a root plate, slope inclination, aspect, angle of tree fall, and tree diameter were determined for every damaged tree. Also, basing on GIS analysis, area of the windthrow and directions of fallen trunks for the whole area of Tatra National Park were determined.

In total 252 damaged trees were investigated. 66% of them were uprooted, 25% were snapped, and 9% were partly uprooted. Slope inclination, aspect, and tree diameter did not influence type of the damage significantly. Mean volume of a root plate is 2.7 m^3 , and the amount of uplifted material is $378.4 \text{ m}^3 \text{ ha}^{-1}$. Totally within the Tatra National Park area 297.9 ha of the forest were affected. 77% of the tree trunks were fallen in downslope direction. Sediment flux by windthrow event in 2013, for the forested part of the Tatra National Park is at the order of magnitude of $10^{-4} \text{ m}^3 \text{ m}^{-1}$.