



## Soil properties in high-elevation ski slopes

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The development of winter sports determines an increasing impact on the high altitude ecosystems, as a consequence of increased participation and an increasing demand of high quality standards for skiable areas. The construction of a ski slope is associated with a certain impact on soil, which varies as a function of the degree of human-induced disturbance to the native substrata. In this work, we provide a description of the characteristics of alpine tundra ski-slope soils and their nutrient status, contrasted with undisturbed areas.

The study site is located in the Monterosaski Resort, Aosta Valley, NW Italy (45°51' N; 7°48' E). We chose 5 sites along an altitudinal gradient between 2700 and 2200 m a.s.l.. Per each site, one plot was established on the ski slope, while a control plot was chosen under comparable topographic conditions a few meters apart. Soils were described and samples were collected and analysed for main chemical-physical properties. In addition an evaluation of N forms, organic matter fractionation and microbial biomass was carried out.

Soil depth ranged between 10 to more than 70 cm, both on the ski slope and in the undisturbed areas. A true organo-mineral (A) horizon was firstly identified at 2500 m a.s.l., while a weathering horizon (Bw) was detected at 2400 m a.s.l.. However, a Bw horizon thick enough to be recognised as diagnostic for shifting soil classification order from Entisols to Inceptisols (USDA-Soil Taxonomy) was detected only below 2400 m a.s.l.. Lithic Cryorthents were predominant in the upper part of the sequence (above 2500 m a.s.l.), both in the ski slope and the undisturbed areas; Typic Cryorthents were identified between 2500 and 2400 m a.s.l., while Inceptisols were predominant between 2400 and 2200 m a.s.l.. Chemical-physical properties will be discussed focusing on the main differences between ski slope and undisturbed soils, as determined by the ski slope construction.

Pedogenetic processes at high altitude are strongly limited by extreme climatic conditions, resulting in low resistance and resilience with respect to any human-induced changes; therefore, it is key to quantify the impact of ski slope construction and management on such fragile pedo-ecosystems.

**KEYWORDS:** alpine tundra, pedogenesis, ski slope construction, ski slope management