Plant Species Composition Reveals Temporal and Spatial Dynamics of Snow Slides in the San Juan Mountains, Colorado

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Abstract. Approaches from landscape ecology offer practical methods to characterize avalanche paths based on patterns of plant species composition and evidence of past disturbance. Combined with snow system monitoring data and records of historical avalanche incidents, landscape patterns of plant diversity can be used to quantify and map the frequency and magnitude of snow slide events. Below treeline, forest vegetation can shelter slopes, slowing the redistribution of snow due to wind and shading the snow surface from solar radiation. Intact forest vegetation can influence the formation of slabs and potentially prevent the initiation of snow slides. However, many avalanches occur high above treeline in steep alpine terrain. Once a snow slide is initiated, the mass of moving snow can mobilize anything in its path. Near Silverton, Colorado, a series of snow storms in January of 2005 resulted in many avalanche paths running full track at 30 and 100 year return frequency. Many avalanches cut fresh trimlines, widening their tracks by uprooting, stripping, and breaking mature trees. Powerful avalanches deposited massive piles of snow, rocks, and woody debris in their runout zones. Cross-section discs and cores of representative downed trees were used to detect dendro-ecological signals of past snow avalanche disturbance, including variation in the relative width of annual growth rings, formation of traumatic resin ducts, development of reaction wood in response to tilting, and impact scars from the moving snow and associated wind blast. Preliminary results of plant diversity and disturbance measurements along the elevation gradient of an avalanche path near Silverton indicate that avalanche activity contributes to the high local plant species diversity, influences patterns of forest cover, and provides opportunities for new seedling establishment.