

Practical methods for using vegetation patterns to estimate avalanche frequency and magnitude

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Practitioners working in avalanche terrain can benefit from learning about and characterizing the avalanche paths that they are dealing with. A worker may never witness an extreme event, but understanding extreme events is important for categorizing avalanches that occur within a given season. Historical records of avalanche incidents and direct observations are the most reliable evidence of avalanche activity, but patterns in vegetation can be used to further quantify and map the frequency and magnitude of past events. We surveyed published literature to evaluate approaches for using vegetation sampling to characterize avalanche terrain to identify the benefits and caveats of using different practical field methods to estimate avalanche frequency and magnitude. Powerful avalanches can deposit massive piles of snow, rocks, and woody debris in runout zones. Large avalanches (relative to the path) can cut fresh trimlines, widening their tracks by uprooting, stripping, and breaking trees. Discs and cores can be collected from downed trees to detect signals of past avalanche disturbance recorded in woody plant tissue. Signals of disturbance events recorded in tree rings can include direct impact scars from the moving snow and wind blast, development of reaction wood in response to tilting, and abrupt variation in the relative width of annual growth rings. The relative ages of trees in avalanche paths and the surrounding landscape can be an indicator of the area impacted by past avalanches. Repeat photography can also be useful to track changes in vegetation over time. We conclude that several vegetation ecology methods can be used in combination to characterize local avalanche frequency.