

Avalanches



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General Information

An avalanche is a mass of loosened snow or ice that suddenly and swiftly slides down a mountain, often growing as it descends and collects additional material such as mud, rocks, trees and debris. Snow avalanches can occur whenever snow is deposited on slopes steeper than approximately 20 to 30 degrees.

Avalanche-prone areas can be determined with some accuracy since they typically follow the same paths year after year. However, unusual weather conditions can produce new paths or cause avalanches to extend beyond their normal paths.

The Cascade Range has a long history of avalanche activity. The Cascade Range receives extensive precipitation due to its size and orientation to the flow of Pacific marine air. In this type of maritime climate, it is common for air temperatures to rise above freezing and for precipitation to change from snow to rain during mid-winter storm cycles. Temperatures can change several degrees within minutes, thus causing abrupt changes in precipitation type. These conditions frequently cause the release of avalanches.

The time of avalanche release depends on the condition of the snow-pack, which can change rapidly during rainfall. Research done at Snoqualmie Pass showed that most natural avalanches occurred less than one hour after the onset of rain. In these cases the snow-pack was initially weak. In cases where the snow-pack was stronger, avalanche activity was delayed or did not occur. Between 1900 and 1995, over 180 people have been killed by avalanches in Washington state. This total far exceeds deaths from any other natural cause.

Vulnerability

In the Cascade Mountains, the avalanche season begins in November and continues until the last remnants of snow have melted in early summer. In the high alpine regions, this hazard continues year round. Hundreds of thousands of avalanches are thought to occur each year in the Cascade and Olympic Mountains. Each year, more and more people are recreating, working and building in potentially hazardous areas with little caution or preparation. The increasing development of recreational sites in the mountains brings added exposure to the people using these sites and their associated structures.

Effects

Avalanches can cause loss of life, damage property, and disrupt transportation corridors. In a severe winter, avalanches can close mountain highways. Recreation and ski areas can also close due to avalanches or the threat of avalanches. Figures are not available to document monetary losses due to avalanches, but such expenses are a regular winter occurrence for transportation arterials and ski areas. Losses are also realized by the timber industry, homeowners, power companies, recreation resorts, snow-mobilers, skiers, and mountaineering groups. In 1986 the Washington State Department of Transportation estimated an annual loss figure for government agencies of \$330,000. However, this figure does not include salary costs for personnel employed directly in avalanche control.

Conclusions

Due to fatalities and impacts on transportation and recreation, much effort is put into avalanche control each year. The Washington State Department of Transportation (WSDOT) is primarily responsible for avalanche control along highway corridors. The WSDOT's snow and ice removal budget is approximately \$20,000,000 per year. Most of this money is used to remove avalanches from the state's six highways traversing the Cascades. Additionally, avalanches are often artificially triggered in order to mitigate problems that would arise from larger natural avalanches. Avalanche control is difficult because it needs to be done when the snow is sufficiently unstable so that avalanches can be triggered artificially, but not so unstable that large avalanches release naturally while the highway is open to traffic. Therefore weather forecasting support is an important component of mitigation efforts.

Extensive funding goes into avalanche control and removal because it is extremely difficult to accurately predict avalanche hazards. Forecasters need data on temperature, type of precipitation, weather to the west of the area, and properties of the snow such as depth, settling rate, and moisture content in order to make predictions. This information varies with geographic location and therefore extensive monitoring is required.

Due to the ongoing threat to the public, education efforts should be increased. People should understand the warning signs and climatic indicators of the avalanche cycle. The Northwest Weather and Avalanche Center has information and issues forecasts for back country areas during the avalanche season.