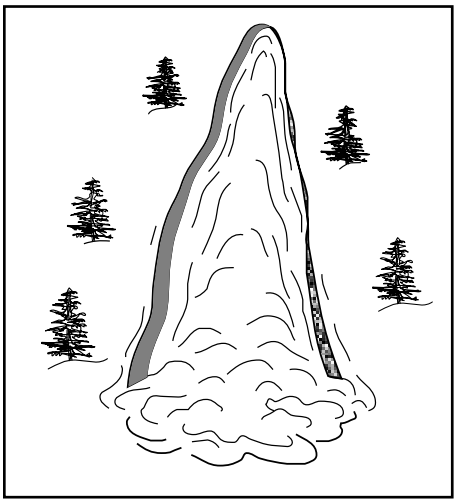
AN AVALANCHE PRIMER

Types

Avalanches come in two types: loose-snow and slab. Loose-snow avalanches (also called point-release) occur in a snow cover that has little or no cohesion. They start at a point and fan out as they slide downhill. Though numerous,



Loose-snow or point-release avalanche

they are generally small and harmless, but can become large, especially in wet snowpacks.

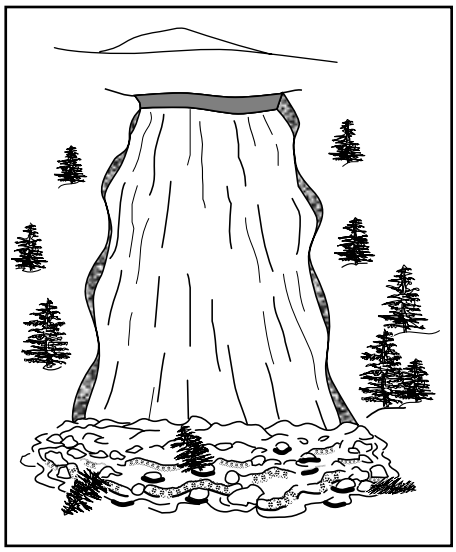
Slab avalanches form and release in a snow cover that is cohesive. Each snow grain bonds to its neighbor, forming a slab layer. The slab can hold itself in place until stress exceeds strength, causing the slab to fail and an

Fifteen-foot crown of large slab avalanche

avalanche to release. Slab avalanches are far more dangerous than loose-snow avalanches because they move more snow at higher speeds and forces.

Both loose-snow and slab avalanches can form in dry, damp, or wet snowpacks.

Loose-snow avalanche in motion

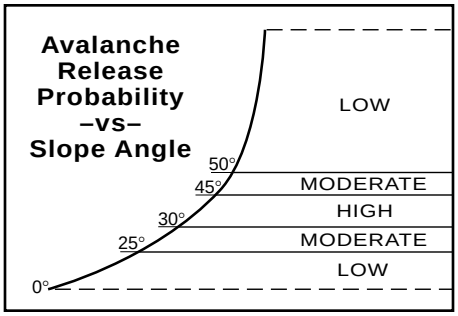


Slab avalanche

Ingredients

There are four ingredients of a slab avalanche:

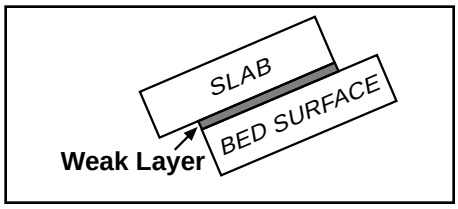
Slope: 90 percent of avalanches release on slopes of 30–45 degrees. It is this range of slope angles that produces the most critical balance between stress and strength.



Slab: A cohesive layer of snow that is under stress as gravity tries to pull it downhill becomes the material for an avalanche.

Weak layer: For an avalanche to release, there must be a layer beneath the slab that slips (shear failure) or collapses, making it much easier for the slab to break loose from its final anchors at the top and sides.

Three-foot crown (fracture line) of slab avalanche



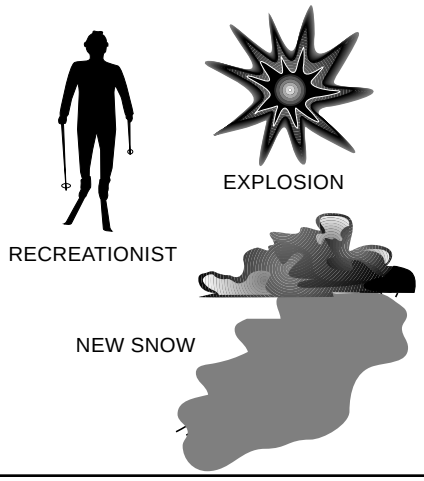
Trigger: A trigger is the additional load of new snow, falling cornice, animal, person, or explosive charge that tips the balance of stress to exceed strength.

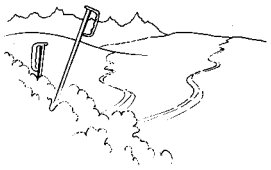
Once the trigger causes the weak layer to fail (via shear or collapse), slab tensile stress suddenly increases, and tensile cracks shoot through the slab. The slab starts to slide away and accelerates down the track. The slab blocks break into chunks and particles, and the faster avalanches throw a powder cloud into the air that moves ahead of the denser snow flowing along the ground.

Small avalanches may fracture 1–2 feet deep and 50–100 feet wide, and travel at 30 mph; medium avalanches may break 3–6 feet deep and 200–500 feet wide, and move at 50–60 mph; large avalanches can be 6–10 feet deep, thousands of feet wide, and roar along at more than 100 mph. Large avalanches may set more than 500,000 cubic meters of snow in motion, and have impact pressures that exceed 10 tons/m^2, these avalanches can snap or uproot mature trees and destroy buildings.

For victims caught in avalanches, it is hard to fight the forces of even small ones. Tumbling downhill, fast and out of control, is never healthy. And if buried, victims can seldom dig themselves out of snow that often sets up like concrete. Avalanches are best viewed from a distance, of course, so as to appreciate their power and beauty without being so close as to be touched by their malevolence. *—Knox Williams*

Possible Triggers





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