Typical avalanche problems

The European Avalanche Warning Services (EAWS) describes five typical avalanche problems or situations as they occur in avalanche terrain. The Utah Avalanche Center (UAC) has adopted this set of problems and made minor edits to the original document to suit regional variations. Two additional problems have been added for use in specific situations in Utah. These are Cornice and Normal Caution. Because these two may be used by UAC, they have been added to this document.

Many avalanche centers in North America use the term avalanche problem to refer a set of four factors that includes the type of avalanche expected, location, likelihood, and size. Avalanche problem is used in a more basic sense in this document. The nine avalanche types used by many North American avalanche centers are included as expected avalanche types under each problem.

New snow

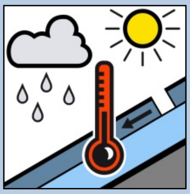
What?	Characteristics	The avalanche problem is related to current or most recent snowfall. The amount of additional loading by new snow onto the existing snowpack is the crucial factor of the new snow problem. How critical the loading is depends on various factors such as air temperature or characteristics of the old snow surface.	
	Expected avalanche types	• Storm slab avalanches • Loose dry avalanches • Natural and human triggered avalanches	
Where?	Spatial distribution	Often widely present and on all aspects.	
	Position of weak layer in the snowpack	Usually at or close to the interface with the old snow surface, sometimes in the new snow layers and sometimes slightly below in the upper layers of the old snowpack.	
Why?	Release characteristics	Dry snow slab avalanches: Additional load due to snowfall on existing weak layers (old snow surface or below) or newly created weak layers (within the new snow)	Dry loose snow avalanches: Lack of cohesion between the new snow particles
When?	Duration	Typically during snowfall and up to a few days after.	
How to manage?	Identification of the situation in the field	The new snow problem is fairly easy to recognize since it affects most of the terrain. Consider critical amounts of new snow and recent avalanche activity.	
	Travel advice	Dry snow slab avalanches: Wait until the snowpack has stabilized and the weak layer has adapted to the new load and gained strength.	Dry loose snow avalanches: Danger of falling is more important than danger of burial. Consider consequences in steep terrain.

Wind-drifted snow

What?	Characteristics	The avalanche situation is related to wind-drifted snow. Snow can be transported by wind with or without a concurrent snowfall.
	Expected avalanche types	• Wind slab avalanches • Natural and human triggered avalanches
Where?	Spatial distribution	Highly variable but typically on leeward slopes in gullies, bowls, near distinct changes in slope angle, behind ridgelines or other wind-sheltered locations. More common above treeline.
	Position of weak layer in the snowpack	Usually at or close to the interface to the old snow surface or within the slab layer due to variations in wind speed during storm cycle, but occasionally also slightly below in the old snowpack.
Why?	Release characteristics	Wind-drifted snow is an additional load on a weak layer and builds a slab that is particularly prone to support crack propagation.
When?	Duration	The wind-drifted snow situation can evolve very quickly and typically lasts during the snowdrift event, up to a few days at most, depending on snowpack evolution.
How to manage?	Identification of the problem in the field	If not hidden by new snow the wind-drifted snow problem can be recognized with training and good visibility. Look for signs of wind-drifted snow. Typical clues: snowdrifts, smooth and rounded deposits, recent avalanche activity, and often shooting cracks or whumphs. However, it is often hard to determine the age of wind deposits and wind deposits do not necessarily imply an avalanche problems (e.g., in absence of a weak layer).
	Travel advice	Avoid wind-drifted snow in steep terrain.

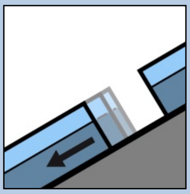
Persistent weak layers

What?	Characteristics	The avalanche problem is related to the presence of one or more persistent weak layers in the old snowpack. These weak layers typically include faceted crystals, depth hoar or surface hoar
	Expected avalanche types	• Soft or hard dry-snow slab avalanches • Persistent Slab or Deep slab avalanches • Natural and human triggered avalanches • Large, destructive and dangerous avalanches when the weak layer is deeply buried.
Where?	Spatial distribution	The avalanche problem can be widespread or quite isolated. It can exist in all aspects, but is most frequently found on shady slopes.
	Position of weak layer in the snowpack	Anywhere in the old snowpack, including at the ground. When deeply buried triggering becomes less likely, but avalanches larger.
Why?	Release characteristics	Release of avalanche occurs when loading exceeds the strength of the weak layer. They are most sensitive right after loading, but also triggered with light loads and weeks after the last storm. Deeply buried persistent weak layers are often triggered from where the snow is shallow and weak.
When?	Duration	Weak layers can persist for weeks to months; possibly most of the winter season.
How to manage?	Identification of the situation in the field	Persistent weak layers are very challenging to recognize. Signs of instability such as collapsing and whumps are typical but not necessarily present. Stability tests can be helpful to detect the persistent weak layers. Snowpack history is critical and reference to the published avalanche report is important.
	Travel advice	Travel conservatively and avoid travel on and below suspect slopes. Remote triggering is possible. Crack propagation over long distances and in surprising and unpredictable ways is common. Consider the history of weather and snow cover processes in the area. Be extra cautious in areas with a thin snowpack and at the transition from a deep to a thin snowpack. Persistent weak layers are a major cause of avalanche fatalities.



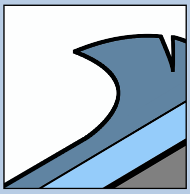
Wet snow

What?	Characteristics	The avalanche problem is related to weakening of the snowpack due to the presence of liquid water. Water infiltrates the snowpack due to snow melt or rain.	
	Expected avalanche types	• Wet slab avalanches • Loose wet snow avalanches	
Where?	Spatial distribution	When melting due to solar radiation is the main cause, distribution of the situation is mostly depending on aspect. The elevation is mainly depending on air temperature and humidity. All aspects are affected in the event of rain on snow.	
	Position of weak layer in the snowpack	Anywhere in the snowpack	
Why?	Release characteristics	Wet-snow slab avalanches: • Weakening and failure of pre-existing weak layers in the snowpack or release at layer interfaces where the water is pooling • Rain also represents an additional load on weak layers	Wet loose snow avalanches: Loss of cohesion between snow crystals
When?	Duration	• Hours to days • Rapid loss of stability possible • Especially critical as water percolates for the first time deeper down, once the snowpack has warmed up to 0 °C. • Natural avalanches might be more likely in the course of the day, depending on aspect (unless rain is the dominating factor).	
How to manage?	Identification of the situation in the field	The wet snow situation is usually easy to recognize. Onset of rain, snowballing, pin wheeling and small wet slabs or loose wet avalanches are often precursors of natural wet-snow slab avalanche activity. Deep foot-penetration is another sign of increased avalanche potential.	
	Travel advice	If the wet snow surface freezes into a crust during a cold night with clear sky, conditions are usually favourable in the morning. After warm overcast nights the situation often exists already in the morning. Normally rain on fresh snow creates this situation almost immediately. Good timing and trip planning are important. Consider avalanche runout zones.	



Gliding snow

What?	Characteristics	The entire snowpack is gliding on the ground, typically on smooth ground such as grassy slopes or smooth rock zones. Glide avalanches are typically related to a thick snowpack with no or only few layers. The release of a glide avalanche is difficult to predict, although glide cracks commonly exist prior to release.
	Expected avalanche types	• Glide avalanches; cold dry or 0 °C-isothermal wet snowpack • Almost exclusively natural avalanches. Human and artificial triggering is unlikely.
Where?	Spatial distribution	Primarily on smooth ground and on slopes of any aspect. Specific slopes may produce glide avalanches each year.
	Position of weak layer in the snowpack	Interface between the ground and overlaying snowpack. Full depth, climax avalanches result.
Why?	Release mechanisms	Glide-snow avalanches are caused by a loss of adhesion at the snow-ground interface, sometimes with free water at this interface.
When?	Duration	Days to months; occasionally during entire winter-season although more common in late winter into spring. The release can occur at any time day or night, even days after a solid refreeze.
How to manage?	Identification of the situation in the field	Glide cracks are often pre-cursors to glide release; however, avalanching without pre-existing glide cracks is also common. Release of indicator slopes is significant.
	Travel advice	Avoid being on or beneath typically suspect areas or areas with glide cracks. Unpredictable and catastrophic, therefore warranting greater margins of safety.



Cornice

What?	Characteristics	A wave-like formation of soft or hard wind drifted snow, often overhanging. Cornices often break further back than expected, even onto flat ridgelines, and are the cause of many unexpected falls in the mountains.
	Expected avalanche types	• Cornice fall avalanches can trigger new snow avalanches, wind slabs, persistent slabs, or wet avalanches on steep slopes below.
Where?	Spatial distribution	Cornices occur on the lee sides of wind-exposed ridgelines or sharp terrain breaks.
	Position of weak layer in the snowpack	Drifting extends the cornice outward, so the fresher, sensitive, and more easily triggered part of the cornice is generally near its outer edge.
Why?	Release mechanisms	• Natural cornice-fall avalanches are common during windy midwinter storms, as cornices rapidly build outward and become unstable with drifting storm snow. • Rapid warming or prolonged melt can cause cornices to become unstable, to buckle and calve.
When?	Duration	Cornices can be an issue once built throughout the season, generally from midwinter through spring.
How to manage?	Identification of the situation in the field	People are often lured too far out onto deceptive cornices as they attempt to gain views of slopes below.
	Travel advice	Avoid travel on and below large ridge top cornices, especially during periods with drifting snow or warm temperatures

Normal Caution

This is not a specific avalanche problem. It is used by UAC forecasters most often when avalanche conditions are generally safe and there is no predominate avalanche problem. Any avalanche type is possible but the most common would be wind slab, loose wet, and loose dry avalanches and they would be expected to be small. Do not approach a Normal Caution avalanche problem as an "anything goes" situation. Continue to keep your guard up and look for any signs of snow instability. Evaluate snow and weather conditions as you travel.