

Avalanche Q&A for Mushers

TC Wait and Andy Gleason

Despite a “rocky” start to the racing season by having to cancel the December Camp Hale race, Colorado, Wyoming, and Utah are getting some good snow this year. You may not think much about avalanches while out with your dogs, but many of the places we race and train (including the Camp Hale area) are prone to avalanches. In Colorado, we have an average of 2,300 reported avalanches each year. An average of 61 people are caught and 6 die each year in accidents relating to avalanches. I have the opportunity to work closely with folks at the Colorado Avalanche Information Center (CAIC) with my job at the Colorado Geological Survey. I thought it might be a good idea to corner Mr. Andy Gleason with some questions that might keep mushers and their teams safer in the back country.



Photo courtesy of CGS – Battleship Avalanche Chute

Q) *Mushers don't generally travel across steep slopes, why should we worry about avalanches?*

A) About 90% of all avalanches start on slopes of 30-45 degrees. Avalanches release most often on slopes above timberline that face away from prevailing winds (leeward slopes collect snow blowing from the windward sides of ridges). Avalanches can run, however, on low-angle slopes well below timberline, such as gullies, road cuts, and small openings in the trees where your mushing trails often cross. Even if you are always on the flats below slopes, you still have to think about the avalanche hazard on the slopes above you.

On very unstable days when the avalanche hazard is high, you can trigger an avalanche from the flats below a steep slope. This is sometimes called a telegraphed avalanche. It happens when you cause a collapse failure in the flats. You may hear a “whumphing” sound or feel a slight collapse of the snow. This failure can race upward and cause a shear failure in the snow layers on the slope above you and trigger an avalanche. Think of a carpet laid over a table. If you pull the carpet from the bottom, it will affect the part above and pull it downward. Snow that acts like this is called a slab avalanche. I know of a group of people who were 150 feet from a slope on the flats in the middle of a valley. They heard a “whumph” and triggered an avalanche 1,400 vertical feet above them. They were buried up to their necks, but they survived. The telltale signs of this are shooting cracks and “whumphs” as you cross flat terrain.

Q) *What terrain characteristics should I look for to determine whether an avalanche might impact the trail I want to take?*

A) Most large avalanche paths are obvious (when they are not obscured by clouds!): an open slope, bowl, or gully above timberline that leads to a swath through the trees. But small avalanche paths in the trees, in gullies or creek beds can be just as dangerous. Slope angle is the most important factor, so you should learn to recognize terrain that is 30 degrees or steeper. A slope meter helps you to recognize these slopes. Bent or damaged trees are good clues that show where avalanches have run in the past. Trees that have been flagged (uphill branches broken off by previous avalanches) are a good indicator that avalanches have run through an area. Look to see how high the uphill branches are broken off to indicate how large of a slide has gone through the trees.

Be careful when you are on a trail that cuts across a steep slope, such as a road cut. A road cut can be a terrain trap for snow that will catch avalanche debris and pile it up higher than it would on the flats below an avalanche path. Other terrain traps include gullies, benches at the bottom of slopes, and stream beds.

Q) Do avalanches always travel in established chutes? Aren't I safe if I stay in the trees?

A) Very dense trees can anchor the snow to steep slopes and prevent avalanches from starting; however, avalanches can release and travel through a moderately dense forest. We saw examples of this following the March 2003 blizzard where avalanches occurred near Silver Plume in places where there were no established chutes. Again, look for flagged trees, even in thick forests. If the branches are broken off on the uphill sides of the trees, an avalanche has ripped through the trees.

Q) What signs and indicators should I be looking for that could indicate avalanche danger?

A) When the snow cover is very unstable, nature often broadcasts clear danger signals. Fresh avalanches are the best clue. Snow that cracks, collapses, or makes hollow "whumphing" sounds is also unstable. Weak layers that are found by digging snow pits are signs of unstable snow. Snow that has become wet from thaw or rain can be dangerous. Look for snow plumes off of high peaks and avoid slopes that are being loaded from the wind. Even if you find no signs of unstable snow, you should always travel using techniques to minimize your risk.

Q) What weather conditions make for higher avalanche danger?

A) Avalanche danger increases with major snowstorms, high winds and periods of thawing. More than 80% of reported avalanches occur during or just after large snowstorms. The key to increased avalanche hazard is snowfall intensity. The harder it snows, the faster the snowpack is loaded. This can occur with either a heavy snowstorm or a strong wind. Winds can load slopes faster than the heaviest snowfalls. Even on a sunny day, wind can load the lee sides of mountains and release avalanches. Look for plumes of snow blowing off of the high peaks on a windy day. When you see rocky areas where the snow has been blown off of the side of a mountain, remember that the snow had to go somewhere. Usually it is on the lee slope where the avalanche hazard has become greater. Avalanches can occur in any month of the year. Any month with an above average snowfall will be the most hazardous.

Q) What snow conditions make for higher avalanche danger?

A) New snow, high winds, and unstable layers. The most common weak layer in Colorado is called "depth hoar". This is the sugary snow usually found near the bottom of the snowpack. It contains larger crystals from melted snow and bonds very poorly with the snow around it.

Another common weak layer is "surface hoar". These are the large feathery shaped crystals that form on top of the snow surface on cold mornings, the winter equivalent of summer's dew. While not a hazard when they first form, if they are buried they become a very weak layer that will cause any snow that falls on top of the surface hoar to form a slab avalanche.

Q) Anything else we should keep in mind to predict avalanche hazards?

A) An avalanche occurs when the stress (from gravity) trying to pull the snow downhill exceeds the strength (from bonds between snow grains) of the snow cover. The stress overcomes the strength when the load on the snowpack is increased. You and your team are heavier than a lone person and therefore you put a heavier load on a slope than a single person does. You could therefore more easily trigger a lower angle slope avalanche, or trigger a slide on a day that had a lower avalanche hazard.

There are four things to keep in mind that comprise avalanche prone areas: a steep slope (usually anything greater than 30%), snow cover, a weak layer in the snow cover, and a trigger (could be you, could be the wind, could be a heavy snowfall, could be a mountain goat...).

Q) Are there maps available that show avalanche prone areas?

A) Only for a few areas in the state such as Loveland Pass and Vail Pass. These are available through the CAIC. Otherwise you are on your own.

Q) Where can I find avalanche forecast information?

A) The CAIC website can be found at <http://geosurvey.state.co.us/avalanche/>. This website is updated daily and gives forecasting information and warnings for the entire state. If you don't have access to the internet, you can call one of the seven hotlines in Colorado that carry recorded messages of current and forecasted weather, snow, and avalanche conditions. Once in the backcountry, you may find different conditions and may have to alter your routes or plans accordingly in the interest of avalanche safety.

Daily reports on mountain weather, snow and avalanche information are updated each morning via telephone at these hotline numbers:

Denver/Boulder -- statewide	303-275-5360
Fort Collins -- northern mountains	970-482-0457
Colorado Springs -- statewide	719-520-0020
Summit County -- and surrounding areas	970-668-0600
Durango -- southern mountains	970-247-8187
Aspen -- local	970-920-1664
Crested Butte-- local	970-349-4022

Q) *What safety equipment should I be carrying in my sled or on my body?*

A) You should always have an avalanche transceiver (or beacon), shovel, and a collapsible or ski-pole probe if you suspect you will be in avalanche terrain. You should practice frequently to be proficient in using your beacon. Remember: you should not take extra risks just because you have rescue equipment and try not to travel in these areas alone.

Q) *Is there anything I can do to protect myself and my team (or increase our chances of survival) if we are caught in an avalanche?*

A) You can reliably avoid avalanches by recognizing and avoiding avalanche terrain. Travel at the valley floor away from large avalanche runouts, along ridgetops above avalanche paths, in dense timber, or on slopes of 25 degrees or less that do not have steeper slopes above them.

If you are traveling in avalanche-prone terrain you can minimize risk by using good technique, such as crossing avalanche areas one person (or dog team) at a time and crossing a slope at the very top or bottom if possible. Travel with someone else. If you are climbing or descending a slope, stay by the edge of a slope rather than the center. Turn back or alter your route if you detect signs of unstable snow. It is best to carry and know how to use avalanche rescue gear if you are in suspect terrain.

Surviving avalanches can depend on luck; therefore, it is always better to avoid them in the first place. Remember that only 1 of 3 victims buried without a beacon survives. If you are caught, first try to escape to the side, or grab a tree or rock. If you are knocked down, get rid of anything attached to you that could get tangled. You may have to let go of your sled, but probably you will not a choice. Swim with the avalanche to try to stay on top and avoid trees. When the avalanche slows down, reach for the surface with one hand and make an air pocket around your mouth with your other so you can breathe. Avalanches are very powerful and may tumble you head over heels. Chances are that some part of your team will be above the avalanche debris when it stops, so you will have a better chance of digging out the rest of the team. The gangline may or may not hold together during an avalanche event. Heavy-duty climbing ropes have been snapped like twine during avalanches, so you may have to probe to find your team if they are buried. Some dogs have been killed in avalanches, but many have survived.

If you are on top of the debris and there are others buried, stay and look for the buried victims. DO NOT go for help. You are the victim's best chance for survival. Half of all avalanche victims die within 30 minutes after being buried, so you must start your search immediately. If you are

wearing a beacon, turn it to RECEIVE and begin a beacon search. If you do not have a beacon, probe the most likely areas with your probe or whatever you can find, a tree branch will work in a pinch. The most likely areas where survivors may be found are above large rocks and trees, in terrain traps, and anywhere downhill of the victim's last seen point. Look for clues on the surface such as article of clothing. We can't give you all you need to know in this article, so for more information and to practice these skills you should take an avalanche course.

Q) *Where can I take an avalanche safety course in my area? How often are these courses offered?*

A) There are a number of Avalanche Education providers throughout the state that you can contact for their classes. A current list can be found on the CAIC website. You can also call the CAIC headquarters in Boulder, CO at **303-499-9650** for more information.