A skier contemplates entering obvious avalanche terrain in the Caribou Range of British Columbia.

OBVIOUS CLUES METHOD: A User's Guide

Story and photos by Ian McCammon

Years ago, forecaster Dale Atkins and I were talking over beers in the wake of several horrific avalanche accidents. "It's weird," he said, "how the names change, but the accidents stay pretty much the same."

Dale and other avalanche professionals have long recognized that there is a recurrent pattern to avalanche accidents. The pattern goes something like this: A group of experienced skiers or riders, often with avalanche training, seemingly ignores obvious signs of avalanche danger and ventures onto a steep slope. There they trigger an avalanche that catches and kills some or all of them. Viewed from the outside, the group's decision to enter the slope seems starkly at odds with the obvious danger.

There is mounting evidence that this recurring pattern arises, at least in part, from *human factors*: mental habits and shortcuts that help us navigate the civilized world but can be deadly when we use them in avalanche terrain unconsciously.

A few years ago, I found that some of my research on decision-making had inadvertently resulted in a simple method to minimize the influence of human factors in avalanche terrain. The method is by no means perfect, but it seems to help students recognize when their decisions begin to fall into the classic avalanche accident pattern. Many students have been excited to learn a simple decision guide that doesn't rely on years of experience or detailed knowledge of snow science. In this article, I'll describe the method and how it can be taught, in hopes that others may find it a useful starting point in helping their own students avoid becoming avalanche victims.

Origins

Before an accident occurs, all outcomes seem more-or-less equally probable. But once the bar fight breaks out, your buddy's sled falls through the ice, or the porch catches fire, the signals of impending doom seem obvious, and the chain of events, viewed in retrospect, seems to have led inexorably to the outcome. This effect, known as the hindsight bias, is especially pronounced when we look at the actions of other people. So an obvious question is whether the classic avalanche accident pattern really exists, or is it just a result of hindsight bias?

To find out, I examined over 700 avalanche accidents in the U.S. for evidence of seven obvious clues *(see sidebar, next page)*. These clues have long been cited in avalanche training materials as unequivocal signs of avalanche danger. In accidents where all seven clues could be accounted for (about 250 cases), no single clue stood out as being a causative factor. But what was striking was the large number of obvious clues (median 5) that were apparent to victims in the majority of accidents. In other words, the pattern that Dale and others had observed through the years wasn't an illusion. The typical avalanche victim did seem to ignore many signs of avalanche hazard.

In a series of follow-up studies, I looked at how this pattern correlated with avalanche training (low correlation: McCammon, 2000) and human-factors cues (high correlation: McCammon, 2003). As an analytical tool the number of clues is admittedly pretty coarse metric, but it had the advantage that it didn't depend on knowing accident rates or the exposure frequency of any user group.

Along the way, the list of the seven obvious clues became useful for quickly explaining to beginners how to recognize dangerous avalanche conditions. It formed the basis of an informal three-minute avalanche class that I still find useful when folks ask me about avalanche conditions at the trailhead. More recently, it has found its way into the Avalautor™, a decision support tool for recreationists in Canada (Haegeli and others, 2006; McCammon and Haegeli, 2006).

Obvious Clues Method

Using the obvious clues method is pretty straightforward. A person simply runs down the checklist and counts up the number of clues that they have observed. Table 1 shows how the number of clues relates to conditions under which past accidents have occurred.

History tells us that the vast majority of avalanche accidents could have been prevented if victims had re-examined their plans when at least three obvious clues were evident. This trend is robust across different avalanche climates, avalanche types, elevation, mode of travel, and level of training. As an added bonus, a threshold of three observed clues would have prevented a significant proportion of accidents under low and moderate avalanche danger, ratings where decision systems like the NivoTest and the Reduction Method generally break down for North American users (McCammon and Haegeli, 2004).

From a practical perspective, I've found that things start to feel serious when I've observed three of the seven obvious clues on a tour. Turning around at this point may not be mandatory under all circumstances, but this is certainly a point where I take a deep breath, re-assess my goals, and weigh my next decisions very carefully. Students likewise have found three clues to be a reliable warning flag that their exposure to avalanche hazard is rising sharply.

Things start to get tricky at a threshold of four clues. Field experience shows that this is when the

Number of clues	% of accidents	% of accidents prevented
2 or less	2%	98%
3 or less	8%	92%
4 or less	23%	77%
5 or less	53%	47%
6 or less	90%	10%
7 or less	100%	0%

Number of obvious clues present in historical avalanche accidents in the U.S. Third column shows the number that would have been prevented had the victims avoided avalanche slopes with the given numbers of clues present (N=252).

situation starts to feel "out there," margins of safety grow thin, and finding a safer route starts to seem like a Really Good Idea. At four clues, the actual proportion of accidents prevented varies by avalanche climate and elevation.

When more than four clues were present, the percentage of historical accidents prevented drops dramatically. The actual decrease varies significantly with avalanche climate, elevation, and other variables. Field experience indicates that under these conditions, advanced terrain knowledge, well-developed route-finding skills, and a solid stability assessment are no guarantee of safety. Sadly, it seems that these are precisely the conditions where human factors kick in with a vengeance, as people convince themselves that things aren't really that bad or that they have the skills to mitigate the rising danger. In these moments, the more alert members of a group can use the obvious clues method as a tool for communicating their alarm and hopefully stopping an accident before it happens.

Prevention vs Prediction

One of the biggest obstacles to teaching the obvious clues method is dealing with people's expectation that it somehow predicts avalanches. If a simple checklist could reliably predict avalanches, then we wouldn't need snow-safety experts, forecasters, or seasoned guides. It turns out that the best we can do is identify conditions that were typical of past accidents (those patterns again). An accident may not happen if there are many clues present, but if one does, it will fit the classic pattern. Someday, when we have reliable data on the conditions under which people don't trigger avalanches, we'll be able to develop predictive tools. But until then, past accidents can only tell us how to prevent similar accidents in the future.

I've found it helps to explain the distinction between prevention and prediction using the metaphor of an aviation checklist. When preparing for takeoff, pilots use a simple checklist to make sure they've examined the key variables that would prevent most crashes. If they ignore a few items on the checklist, it doesn't predict that the plane will crash. But if a crash does occur, it may well be due to the items that the pilot ignored.

Teaching with the OCM

Like most people, I have trouble remembering the complete list of obvious clues. The following are two memory aids that I've found helpful.

ALP TRUTh: Avalanches, **L**oading, **P**ath, **T**rap, **R**ating of considerable or higher, **U**nstable snow, **T**haw instability

This was the original mnemonic for remembering the seven clues, but it presents them in a different order than you are likely to encounter on an actual tour. The result is that you have to skip around in the checklist in order to keep track of the total number of clues.

Another memory aid avoids this problem by creating a running checklist in about the right order:

Crazy Ava's Unstable Patter Traps Local Thugs: Considerable, **A**valanches, **U**nstable snow, **P**ath, **T**raps, **L**oading, **T**haw

Both memory aids appear to work well, despite the fact that poor Ava suffers all manner of unsavory attributions on high-hazard days.

One advantage of the obvious clues method is that it can be used for all stages of travel in avalanche terrain: reading an avalanche bulletin, planning a tour, route finding, and slope evaluation. Students seem to appreciate its flexibility and how it reinforces the importance of staying alert for key clues at different points in a tour. I've found that introducing the method early in a course saves time since it provides a framework around which later phases of the course (especially the field portions) can be constructed.

The Future

Like other decision tools for avalanche terrain, the obvious clues method is in a very early stage of its evolution. More work remains to be done on refining the clues and studying the ways that people use them to make decisions. Over time, it is possible that consistent use of the method among recreationists might actually change the pattern of avalanche accidents, with more accidents happening at lower clue thresholds as people avoid avalanche slopes under more serious conditions. Such shifts in the classic accident pattern may be one way of tracking the widespread use of this and other decision methods (McCammon and Haegeli, 2006).

Although it has gained some popularity, the obvious clues method is certainly not perfect. It is a starting point on which I hope that others will build. But in the meantime, it seems to be a practical tool to help novices recognize the conditions that have taken lives in the past and start them on the road to developing avalanche skills that go beyond simple checklists.

References

McCammon, I. 2000. *The role of training in recreational avalanche accidents in the United States*, Proc. Int'l Snow Science Workshop, Big Sky, MT

McCammon, I. 2003. Heuristic traps in avalanche accidents: Evidence and implications (Parts 1 & 2), *The Avalanche Review* 22 (vol 2 & 3)

McCammon, I. and Haegeli, P. 2004. *Comparing avalanche decision frameworks using accident data from the United States*, Proc. Int'l Snow Science Workshop, Jackson, WY

McCammon, I. and Haegeli, P. 2006. *Evaluation of a rule-based decision aid for recreational travelers in avalanche terrain*, Proc. Int'l Snow Science Workshop, Telluride, CO

Haegeli, P., McCammon, I., Jamieson, B., Israelson, C. and Statham, G. 2006. *The Avaluator – A Canadian rule-based avalanche decision support tool for amateur recreationists*, Proc. Int'l Snow Science Workshop, Telluride, CO

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OBVIOUS CLUES

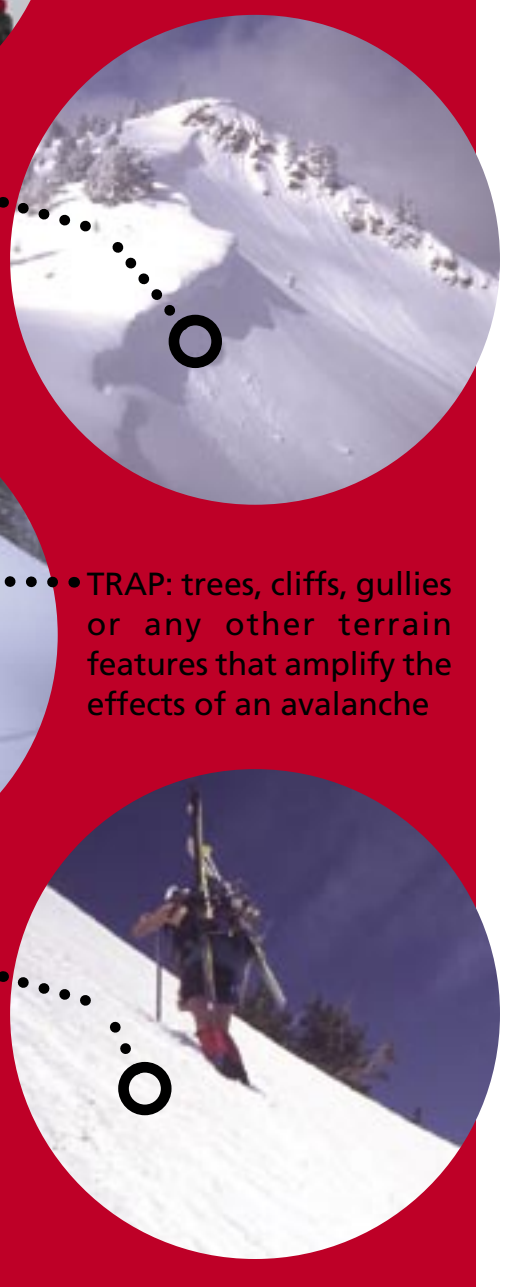
The Obvious Clues Method is a simple way to see how a route choice or a slope compares to past avalanche accidents. It doesn't predict if an avalanche will happen, but it helps novices recognize when they are entering a potentially dangerous situation. To use the method, simply add up the number of clues that are present. Here are the clues, in the approximate order that someone might encounter them on a typical tour.

RATING: of considerable or higher in the current avalanche bulletin

AVALANCHES: in the last 48 hours, reported in the local avalanche forecast or observed in the area

UNSTABLE SNOW: collapsing, cracking, deep trail-breaking or bogging down on a sled

PATH: entering an obvious path, recognizable by a novice. Trimlines, nervous trees or, above treeline, slopes steeper than ≈ 30°



LOADING: by new snow, wind or rain in the last 48 hours

TRAP: trees, cliffs, gullies or any other terrain features that amplify the effects of an avalanche

THAW: melting of the snow surface, accompanied by sinking in to your boot tops (skis) or bogging down (sled)

In general, having three or more clues present is a sign that your next decision should be made with care. At low and moderate hazard, be especially cautious if the bulletin mentions deep weak layers.