

ZEN IN THE ART OF AVALANCHE HAZARD FORECASTING

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ABSTRACT: Avalanche hazard forecasters seek to comprehend the true nature of the avalanche hazard by developing a feeling for the terrain, for the likelihood of avalanche activity, and for the likely consequences of that activity.

KEYWORDS: avalanche forecasting, avalanches, snow.

AVALANCHE HAZARD FORECASTING IS SIMPLE!

Every avalanche field worker is a forecaster. Whether deciding to ski a slope with a group of clients, open a highway or ski run with or without control work, or change a backcountry forecast from "considerable" to "moderate", a forecaster must seek answers to three simple questions:

Could the terrain produce avalanches?
Are avalanches likely?
What are the likely consequences of those avalanches?

BUT AVALANCHE HAZARD FORECASTING IS COMPLICATED!

Answering even three simple questions can be terribly complicated if the forecaster attempts to do so in a purely logical, linear manner. For example, even a reasonably simple decision-making algorithm might include hundreds of steps. The algorithm would get longer and more complicated as a forecaster's experience increased!

THE MERGING OF THEORY AND PRACTICE

For the Zen Forecaster, "theory" and "practice" don't have to be merged, because they are already intricately enmeshed in a whole called "forecasting".

The Zen Forecaster does not base decisions solely on the analysis of scientifically gathered data, but gathers as much data as possible. He reads and listens and learns as much as possible about the scientific study of avalanches, but does not discount folklore and anecdote as valuable forecasting resources. He makes observations and gathers as much information as possible from the forecasts and observations of others. The Zen Forecaster seeks enlightenment; that is, he seeks to comprehend the true nature of the avalanche hazard. His forecast is a feeling that comes to him based on all of the theory he has learned, information gathered in practice, and on his lifetime experience with avalanches.

Spend time with an old heli-guide, veteran ski patroller, long-time highway avalanche worker, or grizzled on-snow researcher, and the way you hear snow and avalanches discussed will be different than in a classroom. Ask one of these experts whether it's safe to cross a slope, and you'll usually get an answer like, "It feels okay to me", or, "We'd better not, something doesn't feel right". Does she go all the way through a complicated algorithm? Certainly not. The question is posed, she stops thinking of other things and the answer comes to her. It feels safe, or it doesn't. Where does the feeling come from? From the answers to the three simple questions.

THE THREE SIMPLE QUESTIONS

Could the terrain produce avalanches?
Are avalanches likely?
What are the likely consequences of those avalanches?

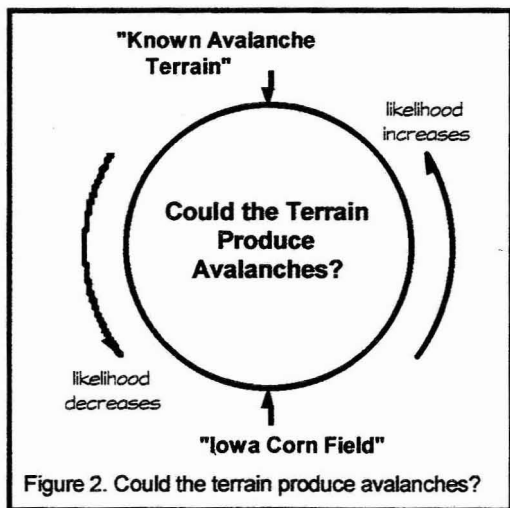
The three simple questions are not to be answered "yes or no", but are used to develop

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feelings and perceptions of hazard. The answers are represented here by three circular graphs.

Could the terrain produce avalanches?

The avalanche field worker will develop a feel for the answer to this by subconsciously asking himself three other questions: "Have I seen or learned of any avalanches on this terrain?", "Is this terrain similar to anyplace else where I've seen or heard of avalanches?", and "Do I see other clues that indicate this may be avalanche terrain?"

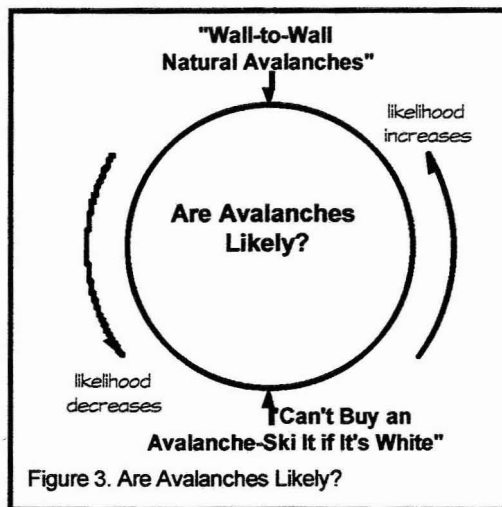


Are avalanches likely?

The answer to this lies in the forecaster's feeling for the instability in the snowpack, and in her feeling for the number of avalanche triggers available, both "natural" and "human-caused". Avalanches are more likely when the level of instability in the snowpack is greater, and when there are more triggers available.

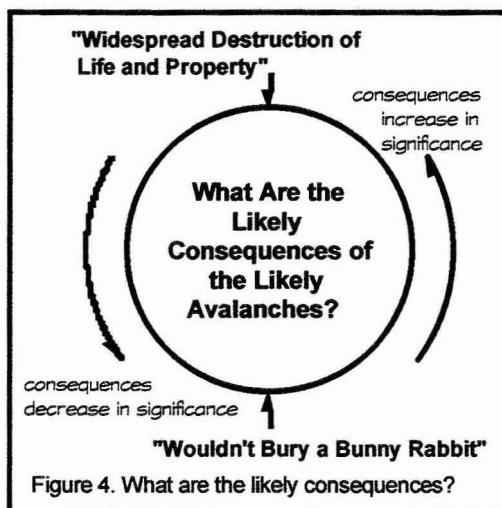
The feeling for instability comes from an infinite number of sources (to name a few: the forecaster's most recent observations of weather, snowpack, and avalanche activity; observations and reports from others; ski and explosive tests...). Some of these sources are difficult to explain scientifically. A veteran (or rookie) ski patroller may suddenly get an uncomfortable feeling while in avalanche terrain, decide to test a slope, and witness a large avalanche. Other times, when

"measurable" factors indicate instability, the snow "doesn't feel avalanchy".



What are the likely consequences of those avalanches?

Would the likely avalanches hurt anyone? Would they damage property? Will they reach the highway, railroad, village, or ski run? Are there people there? Are they wearing transceivers? Will they be deeply buried, or carried over cliffs or through the forest? Trying to answer these questions, and all of the others like them, could take hours when that time isn't available. Again, the forecaster gets a feeling about the likely consequences of any likely avalanches, and acts accordingly.



OBSTACLES TO ZEN FORECASTING

The Obstacle of Ego: letting one's perception of how he is viewed by others block his access to a forecast.

A guide may be concerned that her rich clients won't return if she appears to be too conservative. A state highway forecaster who is the "new guy in town" may feel that he needs to remind the locals that he's the one with the keys to the highway gate. The person behind the voice on the recorded avalanche hotline may feel compelled to use the first person so much that it says more about the forecaster than the forecast. Or a ski patroller may be more concerned with sounding cool on the radio than with what is actually happening under her feet.

These are all human feelings, valid to the forecasters who are feeling them. But they don't help a forecaster get a feeling for the answers to the Three Simple Questions.

The Obstacle of Focus: letting one's ability to feel the whole of the forecast be compromised by looking too closely at one factor.

A long-time mountaineer and ski patroller carefully measures and examines the wall of a snow pit, and declares to his rookie partners, "This pit tells me that this slope won't slide". Then he tests the slope with an air blast (two pounds of explosives suspended on a bamboo pole), and the entire snowpack on the slope ends up on the ski run below. Had he focused solely on the snow pit data, which he may have misinterpreted (did misinterpret?), the slide may have occurred while the run was open. Another forecaster says, "If it snows fifteen centimeters by midnight, the road will close". It snows 15cm by 10:00 PM. By midnight, the sky is clear and the temperature has dropped ten degrees Celsius. Does the road still close?

The forecaster who gazes at her computer screen without looking outside, and the ski patroller who uses explosive testing without paying attention to the previous night's weather data are blocked by the same obstacle. They are focusing on only a small part of a very big picture.

(This is not to say that grossly obvious factors should be weighted equally with more subtle ones. For example, if widespread natural avalanches are the only indicators of instability, that's really all that is needed to say that avalanches are likely and to give a good indication of the probable consequences. But continuing to look at other factors may give an indication of when the level of hazard may change, and to what level.)

The Obstacle of Inattention: letting one's attention be drawn away from the forecast by internal or external distractions and pressures.

An avalanche guru heads out the ridge to run a hand charge route. With his mind on a problem at home, he steps out onto a hard slab and is carried down through a steep, rocky chute, narrowly escaping serious injury. Another avalanche worker, intimidated by his much faster route partner, neglects a pocket of wind slab. Fortunately(?), it is another ski patroller who is caught in the slide, rather than a member of the public.

In these and many other instances, forecasters have their abilities to feel the forecast blocked by distractions, particularly by powerful emotions. A forecaster who recognizes when she is distracted is more able to put the distractions aside, or to ask for help from others when she is not able to do so (see The Obstacle of Ego, above).

THE TRAINING OF THE ZEN FORECASTER

Apprentices Learn From Masters.
Masters Learn From Apprentices.

It is very difficult, and can be dangerous to one's self and others, to attempt to become an effective avalanche forecaster without ever spending time with a master. Perhaps less evident is the idea that one can never truly become a master without teaching others. By guiding others in their quest for the true nature of the forecast, the master herself moves closer to enlightenment.

Mastering Zen Forecasting is Complicated.
But Mastering Zen Forecasting is Simple.

The master helps his apprentices to access all of the knowledge and theory of avalanches that they can digest. He shares his library, his

anecdotes, his data bases. He guides his apprentices whenever possible to the next bit of pertinent information. He helps his apprentices to quickly and thoroughly become expert at technical skills (skiing, searching with transceivers, reading of weather instruments, etc.). He seeks awareness of where he and his apprentices are in the five stages of learning: unconscious incompetence, conscious incompetence, conscious competence, unconscious competence, and conscious/unconscious competence).

The master offers encouragement generously, reprimands gently, and shares the spotlight so that her apprentices can avoid the obstacle of ego. She bypasses the obstacle of focus by pointing it out, and by sharing her view of the big picture. And she helps herself avoid distraction by reminding others of the obstacle of inattention.

Above all, the master and his apprentices seek the true nature of the forecast by continually asking the three simple questions:
Could the terrain produce avalanches?
Are avalanches likely?
What are the likely consequences of those avalanches?

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