



travel smart

prioritizing nature's clues: Potential Hazard

Red Lights: Stop! Danger!
Do not proceed.

Yellow Lights: Caution!
Conditions are uncertain or changing.
Be conservative.

Green Lights: Go ahead.
Everything is OK. Proceed.



Most avalanche "accidents" happen when:

TERRAIN is **SNOWPACK** is = **NO GO** or
WEATHER is

The choice of whether you live or die playing in the mountains is yours to make.

Only three variables—the terrain, snowpack, and weather determine whether or not an avalanche is possible. But there is no hazard until we add a fourth variable—us. More than 95% of the avalanches catching skiers, snowmachiners, snowboarders and other backcountry travelers are *human-triggered*, which means that we can learn to avoid making ourselves victims.

The clues we need are obvious if we know how to look for them, and are willing to listen to the message. To travel smart, assign a red, yellow, or green light to each piece of critical data.

The Message: It doesn't matter that it is a blue sky day with perfect new powder. If the snow is unstable, your weight on or near the slope can tip the balance. **Timing is everything!** You can only travel on terrain when you have a snowpack.

Keep your eyes, ears and mind open; don't get complacent. You may travel for hours and not find your problem spot until the end of the day.

terrain

terrain clues

Steep slopes As the slope angle increases, the stress on the snowpack increases. Anything steeper than 25° can avalanche, but prime time slopes are 30°-45°, the same angles most of us like to play on. Don't guess the angle, measure it with an inclinometer. You don't have to be on a steep slope to make it avalanche, you just have to be connected to it.

Terrain traps Think consequences. Avoid gullies, the bottom of steep-sided creeks, or bowls with big depressions at the base because of the high probability of a deep burial. Avoid slopes with cliffs below. Be suspicious of places where the slope angle suddenly increases like convex rollovers. Know that a slope doesn't have to be big to be dangerous.

Leeward slopes Wind-loading can decrease the stability of the snowpack in minutes by increasing the stress on leeward slopes. Wind-deposited snow makes good avalanche snow.

If the skier killed in this avalanche had recognized that the slope was steep (38°), smooth, and recently wind-loaded, he might still be alive.

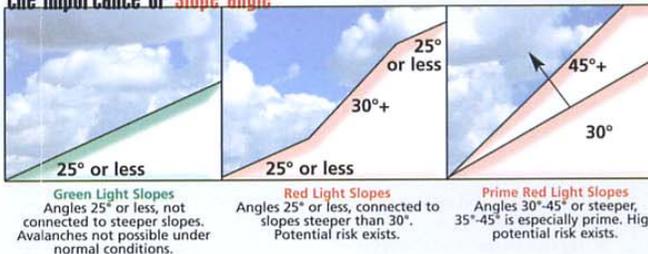
Terrain Trap

inclinometer



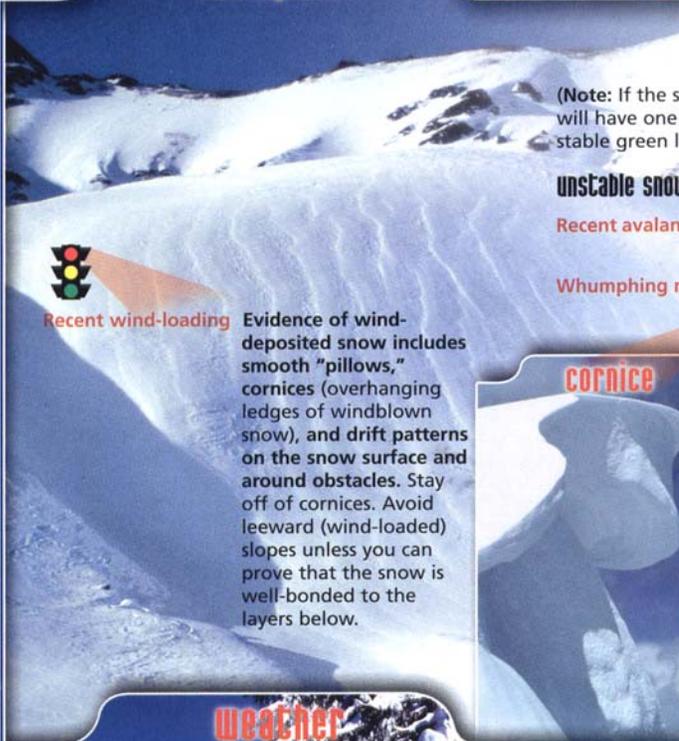
Two snowshoers died in this terrain trap.

the importance of slope angle





snowpack



Recent wind-loading Evidence of wind-deposited snow includes smooth "pillows," cornices (overhanging ledges of windblown snow), and drift patterns on the snow surface and around obstacles. Stay off of cornices. Avoid leeward (wind-loaded) slopes unless you can prove that the snow is well-bonded to the layers below.

unstable snow clues

Recent avalanches

The best clue of all. Avoid similar slopes (comparable angles, aspects, and elevations) that have not yet released.

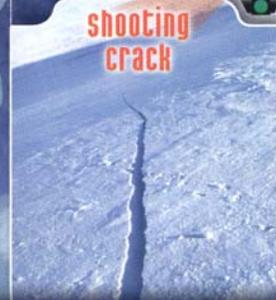
Whumphing noises

Whumphs indicate the collapse of a buried weak layer. Nature is screaming in your ear that the snow is capable of avalanching. Stay well away from steep terrain. Under these conditions, it is possible to trigger an avalanche from the flats if they are connected to steeper slopes.

cornice



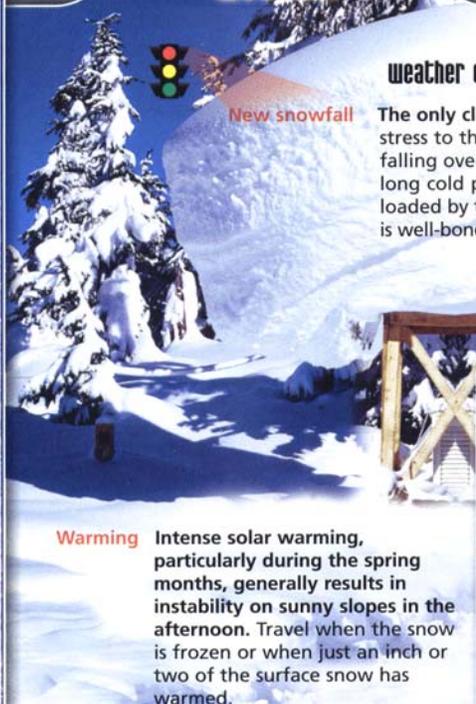
shooting crack



Hollow sounding snow Drum-like sounds indicate classic unstable layering, that is, a softer, weaker layer is overcapped by denser snow. Be suspicious!

Shooting cracks Cracks shooting out in the snow around you indicate the release of stored elastic energy and are an important clue that the snow is ripe for fracturing.

weather



New snowfall

weather clues

The only clues to instability may be heavy amounts of new snow or snow falling at a rapid rate. Both add stress to the snowpack. All things being equal, the snowpack is better able to adjust to three feet of snow falling over several weeks than to a big dump overnight. Be especially suspicious if the new snow follows a long cold period—cold weather favors the development of weak layers that can become a problem when loaded by the next storm. Initially, restrict your travel to lower angle slopes unless you can prove that the snow is well-bonded to the layers below.

Wind

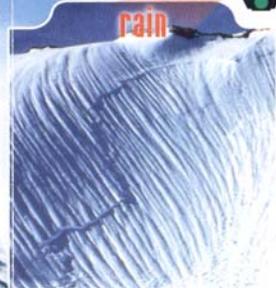
Wind-drifted snow can load at a rate ten times greater than snow falling from the sky. Wind-loading can make the snow unstable in minutes. Avoid steep, recently loaded slopes.



wind



rain



Rain Rain falling on cold dry snow can produce avalanches very quickly. Restrict your travel to green terrain. When the temperature drops and the wet snow refreezes, it will strengthen and stabilize.

Fluctuating storms Snow storms that start cold and end warm create upside-down layer cake conditions, with a layer of denser, warmer snow poorly bonded to colder, weaker snow underneath. Be suspicious of steep terrain.

Warming

Intense solar warming, particularly during the spring months, generally results in instability on sunny slopes in the afternoon. Travel when the snow is frozen or when just an inch or two of the surface snow has warmed.

red light R weather factors



human factor

human clues

- Attitude/Ego** Avalanches don't care about our beliefs, schedules, goals, or abilities. If you have a "travel to die" attitude, you probably will. People with high risk-taking attitudes tend to filter information about potential hazard and use it to push the fine line finer.
- Peer Pressure** Fear of being perceived as a "wimp" is one of the leading causes of avalanche accidents. Don't be afraid to say "No, I don't think we should travel here because..." Equally important, learn to accept a "no" from another group member. It might just save your life.
- Denial/Complacency** Just because you have traveled on a particular slope many times before, doesn't mean it can't avalanche. Base your hazard evaluation on key clues rather than assumptions, desires, feelings, or previous experience.
- Big Groups** There is decreased safety in numbers. In big groups, it is difficult to communicate, make good decisions, and follow safe travel procedures. Ideally, limit your groups to four people. Do not split your group.
- Sunny Day/Tracks** Most accidents happen on blue-sky days after recent storms because we feel invincible, and are lulled into a false sense of security. Tracks do not mean that a slope is safe. It is not unusual, for example, for snowmachiners to ride on a slope for more than an hour before it avalanches.

red light human factors

live or die by your habits

critically important travel procedures:

Don't EVER make exceptions to the following rules:

- Travel on or near steep slopes **ONE AT A TIME** while all others **WATCH** from a safe location.
- **NEVER** travel above your partner.
- **ALWAYS** have an escape route (quickest way off the slope) in mind. At least initially, travel the edges of a slope rather than center-punching it so that you have a bail-out option. Use releasable bindings.
- **AVOID** slopes with terrain traps (dips, gullies, or cliffs) below.
- **NEVER** stop in the middle of or underneath steep slopes.
- **EVERY** member of the group should **WEAR** an avalanche beacon, probe, and shovel.

KNOW HOW AND WHERE TO SEARCH BECAUSE YOU DON'T HAVE TIME TO GO FOR HELP..

avalanche!

you are the help!

Avalanche rescues do not work very well—the best defense is not to get caught. However, you can greatly increase you or your partner's chances of survival by being prepared and having a plan.

avalanche rescue:

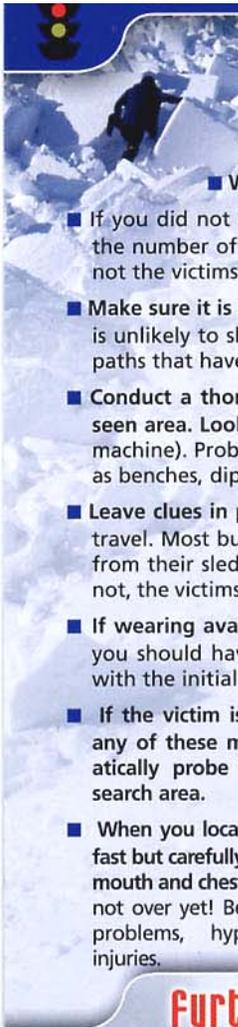
wear the gear,
know how to use it,
and have a plan.

If caught in an avalanche:

- Yell avalanche, then close your mouth so that you don't ingest snow.
- Immediately try to get off the slope or hold on to a tree or rock and let the snow go by.
- Discard gear such as skis or poles that can pull you down into the snow.
- **FIGHT HARD** to stay on top by "swimming."
- Attempt to roll onto your back; you have a better chance of survival if buried face up.
- As the avalanche slows, thrust some part of your body above the surface and wrap one arm in front of your face to create an airspace.
- Try not to panic so that you will use oxygen at a slower rate.

tools for survival





rescue

If you are a rescuer:

- **Watch the victim!** Establish the last seen area.
- If you did not observe the slide, **question any witnesses** about the number of victims, their last seen locations, and whether or not the victims were wearing beacons.
- **Make sure it is safe to search.** The slope that has just avalanched is unlikely to slide again unless it has reloaded or has adjoining paths that have not released that funnel into the same area.
- **Conduct a thorough initial search of the debris below the last seen area.** Look carefully for clues (e.g., ski, blood, glove, snow-machine). Probe around clues and in likely catchment areas such as benches, dips, rocks, tree-wells, and the toe of the debris.
- **Leave clues in place;** they may help establish the victim's line of travel. Most buried snowmachiners are found less than 200 feet from their sleds, in roughly the same fall line. More often than not, the victims are upslope and within 40 feet of their machines.
- **If wearing avalanche beacons, conduct a beacon search** (which you should have practiced many times before!) simultaneously with the initial search.
- **If the victim is not located by any of these methods, systematically probe the most likely search area.**
- **When you locate the victim, dig fast but carefully.** Free the victim's mouth and chest of snow first. It's not over yet! Be alert for airway problems, hypothermia, and injuries.

carefully look for clues



Further learning

Learn more. Read books, watch videos, go out with others who can teach you, take an avalanche workshop. The knowledge gained is an investment in your future; your friends and family will thank you for it.

Books/videos:

Snow Sense: A Guide to Evaluating Snow Avalanche Hazard, by Fredston & Fesler, 4th ed., 1999

Winning the Avalanche Game (video), Friends of the Utah Avalanche Forecast Center

**Internet Addresses/
Snow Hotline:**

www.avalanche.org

(Westwide Avalanche Network)

www.arh.noaa.gov

(National Weather Service-Alaska Region)

www.aprfc.arh.noaa.gov

(Alaska snow conditions)

907-754-2369

(Turnagain Pass conditions)

Workshop Information:

Alaska Avalanche School: 907-345-3566; alaskaavalanche.com

Southeast AK Avalanche Cntr: 907-586-5699; seavalanche@gci.net

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