

Caldera Chronicles

Year 27 Volume 1

Winter 2010

Avalanche

December 15, 2009

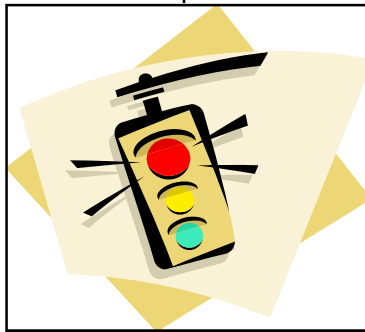
By: Greg Funderburk, Crater Lake National Park Fire Management Officer

Fourteen inches of overnight snowfall and I was excited to make some turns in the deep powder snow. As Cory Wall and I approached the ridge-line above the wildflower ridge we heard a whoomph and roar and observed fresh snow releasing off of the bare rocks near the ridge. A slide propagated about 200 feet wide and the loose snow ran about 300 feet before stopping in the trees. We continued on and heard several more whoomping noises as we skinned our way up Garfield Peak. The weight of the fresh snow was obviously creating a settling effect on top of the existing base.

We recognized the danger but, continued on, as we knew that the old snow was stable underneath. Several pits had been dug in the previous days and all of them indicated a stable base. We knew that the avalanche danger was extreme but, any activity would be confined to the fresh snow.

We stopped in the trees below the summit of Garfield Peak, took off our skins and had a quick snack. We utilized the trees as a wind-break to protect ourselves from the heavy snowfall and strong wind blowing from the southeast. The slope we were about to ski was clearly receiving additional snow loading from

the strong wind. We were acutely aware of the significant danger created by the overnight accumulation of snow but, after a discussion of the danger, we proceeded to ski Mt. Garfield using safe travel techniques, including a combination of ski cutting, leapfrogging, and anchoring in safe locations to negotiate the dangerous terrain.



I began by skiing one of the main chutes off of the summit of Mt. Garfield. I made heavy turns onto several pillows of wind deposited snow attempting to cause the snow to slide. I was unable to achieve any results and the bonding of the fresh snow on top of the base seemed reasonable for a safe descent. We did observe the fresh snow sloughing off of bare rock, creating a short slide in a gully to the north of our chosen route. We anchored at the bottom of the chute above the main snowfield of Mt. Garfield. The snow was

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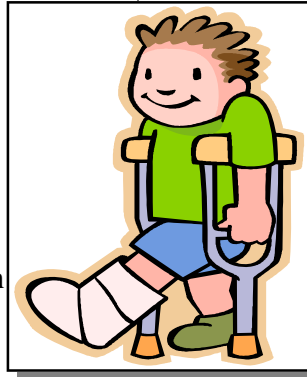
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shallow at the top of this snowfield and I had to carefully pick my way through rocks as I proceeded to an area of deeper snow. Before dropping into the left side of the main bowl, I decided to place one more ski cut at the top of the slope to test the stability of the bowl. I chose an anchor behind a tree on top of a small ridge as my escape zone in case a fracture occurred below my skis. Cory remained at our previous anchor to watch my progress.

As I began ski cutting across the apex of a small convexity, I noticed snow sloughing off of the cliff directly above my intended route. The slough appeared manageable and I continued forward keeping my eyes on my intended anchor point. As the snow hit my legs, my momentum slowed and I turned my skis slightly downhill in order to maintain speed and make it to the anchor. The force suddenly became greater and I was quickly swept off of my feet! At this point, I could hear Cory yelling as the combined weight of the slough and skier caused a fracture to propagate across the slope above my location. I began to tumble and my world turned white. I could feel myself moving down the mountain in a jumble of blocky snow. My goggles and hat were ripped from my head. My primary concern was to get my skis back downhill and hopefully make it to the surface of the snow in order to ski to the side of the avalanche. As I began moving faster and faster, I was able to get my skis downhill. I remained under the surface of the snow and

was surprised at the amount of air in the moving snow and the ease at which I was able to move my arms in a backstroke motion as I tried to bring myself to the surface. The swimming motion seemed futile and I could feel my skis dragging me deeper into the snow. I began to think of creating airspace if the snow ever stopped moving. I knew I was going to be buried and I was confident that Cory would be able to dig me out.



Suddenly, a loud crash as my skis and body slammed into what I believed to be a rock. The great force of the snow continued pushing at my back as

the avalanche continued down the mountain. When the slide finally came to rest, I pushed the snow away from my face and found that I was spread against a tree at the top of the hourglass. The snow in front of the tree had continued over the cliff leaving my body mostly unburied. My legs were stretched to their fullest extent with one 186cm ski tip at my waist and the other behind my hip as it had been pushed through my spread eagle legs. I was able to release the front and rear of my 3

pin cable bindings but, the tension of my position kept the boot tightly captured. I was experiencing excruciating pain as the muscles in my legs were being stretched. I began to yell to let Cory know that I had survived and I needed his help to extricate myself from the tree. In less than 2 minutes, I heard the beeping of his transceiver and he arrived at my location. He assisted with the removal of my skis and helped me out of the hole.

I was able to bear weight on my legs but, twisting or lifting my legs was extremely painful. I dug myself about 30 feet up the hill to a place where I could negotiate myself around the hourglass cliff. Cory helped me put my boots back in my bindings and all of my energy was focused on getting off of the mountain. We were very concerned about being in this location as most of Mt. Garfield funnels to the hourglass and more snow remained at the top of the mountain. I knew that I could sideslip and traverse across the avalanche debris. Cory side-slipped in front of me to smooth the surface and I made good progress until I reached an area of small trees. I was unable to kick turn to change direc-

tions and Cory was forced to remove my skis so that I could turn around. He returned the skis to my feet and we continued moving towards the road. At one point, I became bogged down in deep snow and was having difficulty moving forward. I was forced to grab my pants on top of my thigh and lift each leg individually to proceed. Cory did not believe that I could make it any further under my own power and began to create a shelter. He mentioned that he would go for help and be back in an hour. There was no way that I was going to wait for an hour or more when I was so close to the road. I mustered up all of my remaining energy and began side-slipping once again. Finally, I reached a location where I felt comfortable turning my skis and straight-lining to the road. I made it to within 10 feet of the road where I removed my skis and pulled myself over the snowbank with my forearms. Ranger Neeck quickly arrived and assisted me into his warm vehicle. I was soon backboarded and rushed to the Sky Lakes Medical Center.

In hindsight, we should have paid more attention to the warnings Mother Nature provided. We were overconfident in be-

lieving that we could manage the terrain in the face of the obvious avalanche danger. The west face of Mt. Garfield contains very complex terrain with multiple starting zones and trigger points. We were successful at managing the terrain and snow under our skis but, failed to recognize the dangerous conditions above our chosen path. Being hit from above was a gut wrenching feeling of helplessness. The turns that we were seeking on December 15, could never replace the days of missed skiing and pain that I have suffered since the incident.

*Be aware,
ski with care!*



A Message from the Crater Lake National Park Trust

Hello Ski Patrol Family! Since I recently became full time as the Volunteer Coordinator for the Park I have done my best to help the Ski Patrol with logistics and paperwork, as well as by organizing new fundraising opportunities.

This March we hope to host our first Rim Ski Donor Trip. This trip will be led by Brian Smith, an experienced skier who has successfully climbed Mt. Everest and has lived and worked at Crater Lake for many years. (Brian is the son of Larry Smith, who some of you may know.) The trip will also include me and two Ski Patrol representatives. Net proceeds from this event will be split with Mr. Smith's non-profit organization HAND (Helping Assist Nepali's Disabled) and the Ski Patrol. The trip requires a donation of \$1,000 (or just \$750 for the first five to register!) If you know anyone who would be interested in this event, please contact me.

On April 18th we will host our second annual Family Snow Day up at the Rim. Last year, the Ski Patrol igloos were a big hit! We expect to have even more kids and families joining us this year to experience Crater Lake in winter. We are looking for volunteers to help serve hot chocolate, put on snow shoes for snow shoe races, lead visitors to the Ski Patrol shelter area, walk groups from the bus area to the rim, and help with overflow parking. Let me know if you are interested in volunteering, but in any case please bring your family and friends up for a free event celebrating the place we all

love.

This spring we are also helping park fisheries biologist Dave Hering with some winter fish surveys along Sun Creek. We need volunteers to help by physically transporting necessary gear 5 miles through Crater Lake backcountry to Sun Creek. The dates of this work are subject to snow melt, so be sure to contact me for more information. In return for this volunteer help, Mr. Hering has also proposed to contribute toward our uniform fund.

As you know, Niel and Chris Fischer have been in the process of putting together a list of all of our needs for uniforms. They are not only getting details on jackets; but hats, ski pants, vests and thermals. There is even talk of putting together a Crater Lake Ski Patrol t-shirt to promote our work in the summer months. The Ski Patrol is hoping to pool money from a bunch of different sources including Park Service Funds, a donation from the Friends of Crater Lake, Volunteer Program stipends and individual donations.

After the mid February rescue by park staff and ski patrol volunteers, we received an individual donation from the participants in the rescue party. This money is held by the Trust, but earmarked specifically for the use of the Ski Patrol, and will mostly likely be added to the uniform stash for the 2010-2011 season. Keep in mind if you or someone you know is interested in making a tax-deductible donation to Ski Patrol, simply contact the Trust or donate online at our website, www.craterlaketrust.org

That's all from the Trust. As always I am so glad to continue to work with you. Your enthusiasm and overwhelming passion for your work constantly inspires me. I also want to send a special thanks to all of you who have taken the patience to get me familiar with the technique, equipment and environment of the Crater Lake Ski Patrol. Hope to see you out in the snow!

*Maria Clementi, Volunteer
and Outreach Coordinator
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Park Trust*

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SKI PATROL HOUSE SUPPLIES

Just a reminder that when you come up on patrol weekends please bring along a roll of paper goods, a bar of soap or garbage sacks. A little help goes a long ways.



Avalanche Danger Levels

LOW

Natural avalanches very unlikely. Human triggered avalanches unlikely. Travel is generally safe.

MODERATE

Natural avalanches unlikely. Human triggered avalanches Possible .

CONSIDERABLE

Natural avalanches possible. Human triggered avalanches probable .

HIGH

Natural and human triggered avalanches likely, travel is not recommended .

EXTREME

Widespread natural and human triggered avalanches certain.

Thanks

It seems the Crater Lake Ski Patrol is no stranger when it comes to transitions. Over the years, the patrol has seen many faces come and go. This year has been no exception to that rule. As we moved forward into this year, the patrol lost five of its members due to attrition, but yet gained nine new faces. I would like to welcome all our new patrollers to the ski patrol family.

As stated in the preseason trainings, one of our biggest goals of the season was to increase the number of certified ski patrollers, by offering a multitude of training opportunities throughout the year. Many of our patrollers have taken this opportunity to either improve their skill sets or get checked off on their skill competencies of becoming a certified patrol. This is very reflective by the numbers of patrollers that have turned out for our training events in record numbers.

I would first like to thank all the dedicated patrollers that have given up their weekends to come up and brush up on their skills. I want to thank all of our

wonderful instructors that have taken numerous hours in preparation for these events. Without the hard work of individuals like, Dan Miller, Chris Wayne, Robert Walters, Ken Coen, and Pete Reinhardt, and John Fertig our patrol would be at a loss.

This year so far, five patrollers have become certified, and those patrollers are: Phillip Lindesmith, Tom Piel, Dan Rubenson, Michael Smilenski, and John Fertig.

Great Job !

There are quite a few others that are on the cusp of becoming certified. I encourage those folks to take the time and get certified.

We still have several more training events scheduled for this year and I hope you will take the time out of your busy schedule to attend.



End of the Year Party & House Clean Up

On April 24 & 25, the patrol needs volunteers to help clean the ski patrol house. Saturday night we plan to have an end of the season dinner. All patrollers are welcomed to attend

If the patrol house is full, the community house maybe available for the overflow.

Please come, and let's celebrate this year's great ski season together in style. Bring your favorite dish for the potluck and do not forget to bring your skis because the spring corn is on!

Crater Lake Ski Patrol Web Pages

Please send you pictures you took this year to add to the Photo Album page on the Crater Lake Ski Patrol Web Site.

DUG OUT FROM THE SNOW – NOW WHAT?

By Brett Fisher
February 7, 2010

(NOTE: At the December training, I was both brand new to ski patrol and recently certified as a wilderness first responder. Some of the approaches to and comments about patient care during the avalanche scenarios confused me. So, I did a bit of research on the topic and wrote this article to share what I learned. Please keep in mind that this is written from the perspective of standard of care for a wilderness first responder. Those with additional qualification have more tools in their medical kit for handling avalanche and other emergencies than presented below.)

As ski patrollers, we have trained on avalanche response and are ready. And then one day we hear the alarm, "Avalanche!" Whether the response is for a companion in our patrol or for park visitors on the trail, our team is rapidly on scene, locating, and extricating the victim.

AVALANCHE RESCUE TARGETS. As we take our collective deep breath and survey the scene, we keep in mind what we know about avalanche incidents and rescue targets.

Target #1: 15 MINUTES. Fully buried avalanche victims have a 92% chance of survival if extricated within 15 minutes. This is why successful avalanche rescues depend on the quick actions of trained companions equipped with beacons, probes, and shovels.

Target #2: 15-35 MINUTES. Between 15-35 minutes after snow burial, the chance of survival decreases from 92% to 30%.

Target #3: 90 MINUTES. The target for organized rescue efforts is 90 minutes. Between 35 and 90 minutes, survival probability drops only from 30% to 27%. Between 90 and 130 minutes, the chance of survival drops precipitously to 3%. (Falk, 1994).

AVLANCHE LIFE THREATS. As we locate and dig out the avalanche victim, we keep in mind what we know about avalanche life threats.

Trauma. Most avalanche fatalities in burial victims extricated within the first 15 minutes are due to trauma (Falk, 1994). Overall, about 25% of avalanche deaths are due to trauma (Grissom, 2007). Avalanche victims carried through trees or over rock bands have a higher chance of traumatic injuries (Grissom, 2007). The most common trauma are chest injuries and head injuries (Brugger, 2009).

Asphyxiation. Asphyxiation is the the major threat to life during avalanche

burial. About 75% of avalanche deaths are due to asphyxiation (Grissom, 2007). Asphyxia is a condition caused by an insufficient intake of oxygen which results in hypoxia (low oxygen level) and hypercapnia (increased levels of carbon dioxide) and can lead to loss of consciousness and death (Tilton, 2004). The rate of asphyxiation is what sets the rescue targets described above. Within the first 15 minutes of burial, avalanche deaths due to acute asphyxiation may occur if inhaled snow blocks the upper airway. Within 35 minutes of burial, re-breathing expired air results in progressive hypoxia and hypercapnia that will eventually result in death if there is a too small air pocket and/or the formation of an ice mask within a small air pocket. Within 90 minutes of burial, prolonged survival is possible if the victim has both an open airway and an adequate air pocket for breathing (or is able to make use of an artificial breathing device like the Avalung) (Grissom, 2007). After 90 minutes, avalanche burial is nearly always fatal due to slow asphyxia and severe hypothermia

unless the victim has an air pocket open to the outside (Falk, 1994).

Hypothermia. Surprisingly, snow cover prevents rapid cooling of the body at its core (Falk, 1994) and hypothermia is not normally considered a primary cause of death in avalanche victims (McIntosh, 2007). However, avalanche burial victims will be hypothermic (Grissom, 2005). In addition, accelerated cooling of the body often occurs during and after extrication, which puts burial victims at greater risk of worsening levels of hypothermia (Grissom, 2005). Victims who have survived beyond 30 minutes of burial with a large enough air pocket or an artificial breathing device may survive for hours and develop severe hypothermia (Grissom, 2007).

AVALANCHE PATIENT ASSESSMENT and CARE. As the avalanche victim is extricated, they become our patient and patrollers qualified in emergency medical response assess the patient and provide care (Grissom 2007, Brugger 2001, Tilton 2004, Forgey 2006, and Wilderness Medicine Institute 2008).

Immediate Life Threats - ABCDE's – STOP & FIX

Responsiveness. An initial impression of the level of responsiveness is made as the head is exposed and cleared of snow. Since trauma to the head and spine are highly likely in an avalanche, the head and neck should be immobilized.

Airway. The airway should be cleared of snow as soon as possible and at the same time that the head and neck are being immobilized. This should not wait until the entire body is extricated.

Breathing. If breathing is absent or ineffective, assisted breathing should be provided. This should also not wait until the entire body is extricated.

Circulation. Assessment and immediate treatment of life threats from circulation problems depends on how long the patient has been buried in the snow and if there are signs/symptoms that they may be severely hypothermic.

If the patient is not responsive but has a pulse, they may have moderate or severe hypothermia and should be handled

gently to avoid causing cold peripheral blood to flow to the heart and triggering further complications like ventricular fibrillation.

If the patient is not responsive, a pulse is not present and the patient has been buried for less than 35 minutes, asphyxia is the likely problem and cardiopulmonary resuscitation (CPR) is begun.

If the patient is not responsive, a pulse is not present, and the patient has been buried for more than 35 minutes, severe hypothermia is a possibility. Severe hypothermia can mask the presence of a slow weak heartbeat and breathing. Initiating chest compressions on a severely hypothermic patient who has a pulse will likely cause ventricular fibrillation and the heart to stop. Careful evaluation for the presence of breathing and a pulse should occur for 60 seconds. Rescue breathing should be provided for 10-15 minutes. A second check for the presence of breathing and a pulse should occur for an additional 60 seconds. If the patient is still pulseless and breathless, chest compressions could be initiated. The decision to begin CPR will be dependent on the training and qualification of the rescuers, the availability of equipment such as for electric monitoring of the heart, and the length of time of evacuation to a medical facility (Wilderness Medical Society standard: 1) Less than three hours evacuation to a facility, do not begin chest compressions; 2) More than three hours evacuation to a facility, initiate chest compressions and perform for up to thirty minutes, but discontinue after this if CPR is not successful in restoring spontaneous circulation).

Disability/Decision. A decision is made whether to continue to immobilize the spine and protect against further damage to the central nervous system based on the method of injury.

Environment/Expose. Possible serious injuries are exposed and assessed and the patient is protected from environmental factors such as cold, wind, rain and snow.

Completing the Assessment and Care

Once the patient's immediate life threats have been cared for, a focused exam is conducted including a head to toe examination, the taking of vital signs, and determining relevant medical history. A problem list is developed and a plan made for treatment of each problem identified. Treatment is then provided which may include a focused spinal exam, treatment of hypothermia, providing oxygen, continued spinal immobilization with a backboard, treatment of trauma, and packaging for evacuation. The patient is then monitored and continuing care provided during evacuation.

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As a new potential addition to the CLSP, and

after having completed my first weekend on the trails at the end of January, I thought it might be interesting to share some thoughts about the process so far. My first introduction to the Patrol as a group was at the December orientation. I remember some serious cold, not much snow, and a long ride from Corvallis. There were a bunch of friendly patrollers that seemed to really like each other's company, and lots of experience in that room. A little bit of "nuts and bolts" stuff, like PSAR, and a whole lot of the "touchy-feely" stuff, culminating in Sunday morning's drum circle. Drum circle? For a guy fairly recently transplanted from the (b)east coast, this was an eye opener to say the least. I had heard about them, but honestly thought they were restricted to either Hollywood movies or to the Country Faire in Eugene. Clearly enough folks thought the idea of an 8am drum circle was appealing enough to create noise that could be heard from the parking lot. I will say that Dan's collection of percussion instruments from around

the world was quite interesting and impressive, especially to a long-time drummer such as myself. After coming home from that weekend, I really had to evaluate if I would be able to make the long trips from Corvallis to CL 3-4 times over the next few months. I decided that I would at least give it a full season to evaluate and see if it was a good fit.

My first real weekend was January 30-31. I arrived on Friday evening around 6pm after a leisurely drive that gave me time to 'smell the roses' along the way. The condo was already full with all the other patrollers for the weekend (Andy, Barb, Kristi, Marybeth) save for Niel, who arrived late that night. We spent Friday evening having whatever we had each brought for dinner, and getting to know a bit about each other. It was definitely a diverse group, but all seemed to share a love of skiing and a love of the Lake. What more do you need?

Saturday morning had us all meet in Canfield to decide on the day's plan. This involved the three candidates (Marybeth, Kristi and myself) spending the first 90 minutes or so getting an overall orientation to the area from Niel – where the SAR cache was; who, or what,

was Bill; where the Submarine was; etc. While the women had been through this before, they were kind enough to go through it all again. We then went out to Hemlock to reset poles, where we met up with Andy and Barb who were doing the same thing from the other end of the trail. We then went as a group to do some snow analysis, where despite our lack of a snow saw, we managed to determine that our risk of avalanche was either minimal, or astronomically high, depending on whose block was analyzed and who did the shovel compression test. By now it was going on 2:00, so we went in to have lunch and prepare for an afternoon skiing along the West Rim.

Once we headed out, we quickly came across a husband-wife team who were heading back to their vehicle to lose the two sleds they were hauling and to head back out to meet up with their two friends who were on snowshoes, allegedly heading back along the West Rim. Seems the four of them started on a circumnavigation on Thursday, but the married couple were having some problems. They left the group on Friday

at 10am, with the intent to spend Friday night near Watchman. The other two members of the party were apparently writers for Backpacking Light magazine, and were going to do the whole rim with a minimal pack of around 20 pounds. After a few minutes talking with the husband-wife, they seemed fairly competent and well prepared, so we skied on toward the Lightning Springs trailhead.

Snow was intermittent through the afternoon, but the temps were mild, so it was a nice ski. Didn't see much of the lake, but we did have a few more visitor contacts, helping one woman with a ski wax issue, and another person with a more suitable trail selection. PSAR in action – Charles would be so proud!

We got back to the condo around 5:45 and started working on dinner and the all-important alcohol consumption. As the evening progressed, Charles came by to give us a heads-up that the two writers from Backpacking Light were supposed to have finished tonight to meet the married couple for dinner, but they did not arrive as planned. While they would not be officially overdue until Sunday at 3pm, their friends were concerned that something was wrong, and Charles wanted us to prepare for a possible search on Sunday. This then sparked a few hours of intense speculation, assumption, guesswork, conjecture and planning (thank you, Mr. Roget!), all of which was ultimately for naught as the pair in question emerged sometime late on Saturday night and left the park. While it did not result in a search, it was a helpful exercise in that we got to formulate a plan that, at least under the influence of a few hoppy beverages, seemed to be a reasonable approach to looking for these two wayward snowshoers. Plus we had fun

planning the disparaging editorial we would write for Backpacking Light magazine!

Sunday turned out to be a beautiful day, and with no imminent search needed, we split into two groups. Barb and Andy were going to remain near the rim / visitor area, while Niel would take the three candidates to Sun Notch. It was a beautiful ski out the East Rim trail, with a nice moderate climb to get the heart pumping, and some great views along the way. About a mile from the notch, we got a radio call stating that two other skiers were going to be overdue today if they didn't finish their circumnavigation. By the time we got to Sun Notch, we were treated to some postcard views of the Lake – ah, it really does exist! – and mountains, and while having lunch we noticed two guys ski past. We questioned them and quickly learned they were the skiers in question, and were in good health and were going to make it out with no problems. We had a nice lunch sitting on the snow, in the sun, and sharing some excellent pineapple brought by Marybeth. A rather quick ski back, and soon we were back at Canfield turning in radios, beacons and probes.

All in all this was a great weekend for me, and I look forward to my next weekend. It should be a little easier since Niel gave me a different route back to Corvallis that shaved a few miles and about an hour of time off the commute. Hopefully I can get all my skills up to par with the rest of the Patrol, and get to know some of you along the way.

Mike McCusker

Avalanche Safety

By Phillip Lindesmith

What would you if you were the first to arrive at an avalanche scene? What if the “avy expert “of your party were buried and the rescue was dependant on your knowledge? Could you contribute to a discussion of route finding or avalanche hazards with your patrol? No matter how you answer, there is always room to learn more and hone your skills, especially at the start of a new ski season. The information I have provided for you here is just the tip of the iceberg, anything more in depth is beyond the scope of this introduction so it is up to you to study, ask questions and learn all that you can. My hope is that this general guide will provide you with some reminders and clues to keep you out of trouble or assist you in the aid of a victim.

Please recognize that I am NOT an avalanche science expert. I've completed a couple of weekend avy classes, attended other seminars, participated in several mock rescues and stud-

ied. I have learned that the more you know about the elements of this triangle, the safer you will be. **YOU, TERRAIN, SNOW PACK and WEATHER** are the key factors in avalanche safety. There is a dynamic relationship between these components and conditions are always changing so, re-evaluate the triangle often.

You and your party:

- Situational awareness, common sense, what's happening around you. Pay attention to factors changing in the triangle. **WEATHER, SNOW PACK, TERRAIN and PEOPLE**
- Weather report, avalanche report. Know what they mean.
- Fitness and ability of those in your party. Skilled skiers have less impact on the snow pack than klutzes.
- Number of skiers in your party. Smaller groups travel faster but have fewer resources.
- Spread out! The party that tours close together gets buried close together.
- Cross suspect slopes one at a time. The remaining party members to watch until clear of the

danger area. In large parties or large areas this may be impractical so use your situational awareness to stagger the group crossing or the distance. Don't forget the last guy!

- Number of skiers with avalanche training.
- Avy and survival gear, (see tool list). You carry this stuff as much for your fellow trekkers as for yourself.
- Check transceivers EVERY TIME before heading out. Know how to use them too.
- Undo leashes and pole straps at suspect slopes.
- Travel in same tracks on suspect slopes, (mine field strategy).
- Flexibility to turn around or alternate route. Be wary of other parties, especially snowmobiles and people on the slope above you.

Snowpack:

Heavy, dense, wet snow and rain create unstable slopes. Look for pin wheels.

New snow fall of any density more than 12 inches or snowfall greater than 1 inch per hour.

Air temperature, wind, sun or clouds all effect stability of the pack, (see weather).

Ice layers cause instability in the slab especially

consecutive layers, (think ball bearings under a slab of snow). They also create temperature gradients further destabilizing the slab.

Small temp gradients make the snow stronger; large gradients make it weaker.

Skiers may affect the snow pack to around 5 feet deep, not including fresh powder.

Wind loading of snow on leeward aspects of the slope increases the threat of avalanche.

Learn to dig and interpret Rutschblock and hasty pits. Ask yourself, "*Does this mean I can ski this particular slope at this time in this weather with these people?*" Remember the tangle!

Terrain:

The angle of repose is the angle at which a pile of granular stuff comes to rest. Snow piles up at roughly 35-45 degrees. At steeper angles, it sloughs off more readily but can still be dangerous. At 35-45 degrees the snow piles up, putting more stress on weaker layers before releasing on its own. That's why these aspects

are to be given extra consideration; they are just waiting to break loose. Higher elevation = more snow and wind.

Trees with branches offer great natural slab anchors. Rocks help anchor deeper slabs but not those near the surface.

Look for avalanche chutes, places where the topography allows the build up and funneling of snow. Places where young trees are bent and denuded on the uphill side.

Some avalanche hazard areas are obvious with scoured paths, bent trees and boulders present; others

are less conspicuous or even shrouded in bad weather. Know your topography so you can plan an escape route. Convex slopes are more unstable than concave slopes.



Weather:

Weather is a tricky and more complex part of the big picture. It affects the snowpack and changes how you deal with the terrain.

- Check weather and avalanche reports for your area and know what they mean for you. Know also what the weather *has* been doing over the past few days.
- Wind loading greater than 15mph increases risk. Wind drives snow to the leeward side of a slope and deposits it there. This overloads the slab and also creates cornices. Use caution when approaching ridges.
- Temperature extremes create instability in the snow pack. Rapid temp rise with snow, rain or near freezing on one hand and severe cold snap with lots of snow on the other.
- Temperature inversions are what happen when cold air is trapped under a layer of warm air. Normally you

would expect that the higher the elevation the colder the air, (3-5 deg.F for every 1,000ft elev.) Because cold air is denser it sinks and pools in valleys. If a warm front moves in, it overrides the dense cold air creating an inversion. So, why is this such a big deal? Temperature inversions.....

o Tend to form surface hoar, a weak layer in the snow

o Cause freezing rain which may cause a slide and create an ice layer when it freezes solid Cause the snow surface to warm rapidly, destabilizing the pack

Red flags and hair raisers:

- Whoomphing- literally the sound of weak layers shifting and collapsing beneath your skis....pucker up!
- Shooting cracks- Mother Natures way of saying, "Hasta la vista baby".
- Evidence of recent avy debris or worse, none where there should be especially after a storm.
- Avalanche chutes- scoured paths through the trees, bent and denuded trees, boulders on the snow. Cross suspect slopes one at a time, observing until skier has reached a safe stance.

- When your Rutschblock and hasty pit indicate unstable snow.
 - Rapid accumulation of snow.
 - Surface and depth hoar.
 - Pinwheels and snow rollers.
 - Temperature extremes, rain, wet snow accumulation.
- Ice layers.

Avalanche Triggers:

Natural build up releases more frequently on steeper slopes, (doesn't mean its safe).

Skiers, boarders, climbers

Snowmobiles are fast and heavy, major avy triggers.

Sound rarely has enough energy to trigger a release.

Tools:

- Compass/ inclinometer, (measures the angle of a slope).
- Avy transceiver- battery check, transmit check, wear as close to base layer as practical.
- Avy probe- substitute tent pole or ski pole without basket in a

pinch.

- Shovel- metal blade able to penetrate ice layers, plastic ones waste money.

- Map

- Survival gear- 1st aid kit, signal whistle, bivy sack, fire.

Calm and purposeful disposition

Stuff Ed told me: Ed Delmolino ex-Crater Lake park ranger and back-country expert.

- Team leader or incident commander to coordinate search with dispatch and rescuers, keeps overview of scene.

- Start at last known position and work down, looking for clothing, gear and extremities. Flag gear found and known site of victim, (plastic surveyors tape, ski poles, skis), follow least resistance path of snow flow.

- Searchers switch to receive, bystanders move to safe area and turn beacons off.

- Divide the team, one or two working beacons the rest probing and visual search.

- Once victim found dig from side of slope, not strait down, use probe as guide.

Turn off victims beacon.

Factoids:

- Avalanche slabs can travel at 150 mph.
- 1st 15 minutes after burial gives a 90% chance of survival, (excluding death from traumatic injuries).
- 30% chance of survival at 30 minutes.
- 25% of all victims die from trauma, (trees, rocks, ice).
- Avy debris sets up like concrete



the instant it stops.

- 90% of avy accidents are triggered by the victim or victim's party.
- To move one cubic meter of snow with a shovel = 5 min, with hands or skis = 45 min. Choice is an option you have BEFORE you are caught in an avalanche but not afterwards.

References and publications:

Staying Alive in Avalanche Terrain, 2001, Tremper
Avalanche Safety for Skiers, Climbers and Snowboarders, 2nd ed., 1999, Daffern

Backcountry Avalanche Awareness, 7th ed., 2001, Jamieson

Web sites:

Weather: Google National Weather Service, Northwest Doppler, NOAA-NWS Western Headquarters, Crater Lake National Park

Avalanche: Google Westside Avalanche Network, Northwest Weather and Avalanche Center, Cyberspace Snow and Avalanche Center

Why do you Patrol?

Within our scope of logic, lies the answer of why we are Crater Lake Ski Patrollers? For each one of us there are different rationales. Is it in some form of an altruistic gesture, why we are Crater Lake Ski Patrollers? Is it that the Patrol House is a great place to stay?. Or maybe is it that Crater Lake is the greatest place on earth to cross country ski ? Are the view to die for? For others, it maybe the friendships we build and the breaking of bread during our many potluck dinners thought the season? .Yet for others they may come for the first class training clinics that the patrol offers.

But yet there maybe a higher objective of why you are a Crater Lake Ski Patroller? Perhaps you patrol in order to propagate the sport of cross-country skiing at Crater Lake? Is it that we patrol to protect the natural resources at the park.? Or the need to keep our fellow winter visitors safe during there excursion to the park. Regardless of our scope of logic, to some degree

every citizen serves it community in some form. Philanthropy is not just about giving money. It is about creating a culture to pass onto future generations. According to *Barry Mackintosh, (1998)* "philanthropy has played a major role in advancing the national parks and the National Park Service".

What is it then, why do patrollers just keep coming back, year after year? The answers may vary, but there is one major theme. The love of the sport and the love of Crater Lake.

Avalanche Awareness System

There is a new avalanche awareness system in place at Crater Lake. Do you know what the new system consist of? Do you have the skills to elevate current avalanche conditions. If not, "*Please*" take a look at the [Avalanche](#) page off the main page of your Crater Lake Ski Patrol website for details. You will find a few different avalanche awareness cards in your radio harness. Please use them each and every time you enter Avalanche county. These two-sided cards are no substitute for training. They are only attended as a reminder of the things you need to think about when entering avalanche terrain.

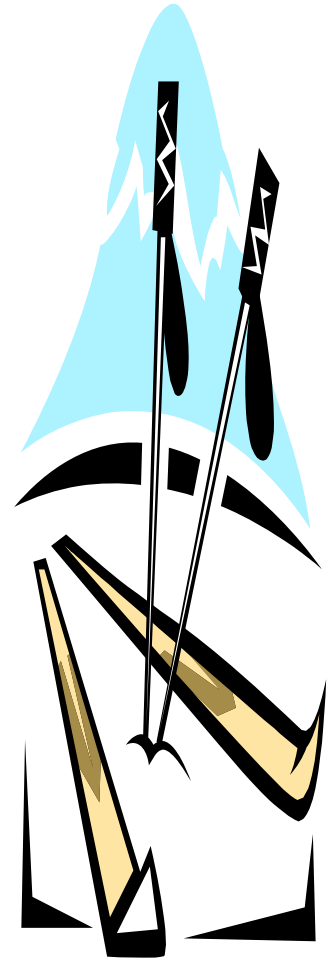


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Happy Ski Trails

