

LECTURE #3

Lecture 3 Topics
Avalanche Awareness
Snow Travel
Ice Axe Use
This reading and quiz are DUE at Lecture 3
<u>Mountaineering: The Freedom of the Hills (9th Edition)</u>
<u>Subject</u>
Avalanche Safety and Rescue Ch 17
The Formation of Snow Avalanches Ch 27, pp 555-557
Snow Travel and Climbing Ch 16, pp 330-353
Leadership Ch 22, All
Lecture #3 Material on the Course website under blue tab for Course Materials Steep Snow Tutorial by the Mountaineers, ignore roping up
On-Line Resources (click for hyperlink)
<ul style="list-style-type: none">• Walking in steep snow video• Ice axe arrest video• Northwest Avalanche Center (click on a region and review the forecast data)• NWAC education resources• Canadian Avalanche Association:• The Deadly Hole on Aasgard Pass – Importance of Run Out
<i>Additional Resources</i> Snow Sense , Fresler and Fesler, Alaska Mountain Safety Center Inc. The ABC of Avalanche Safety , Ferguson and LaChapelle, The Mountaineers Books The Avalanche Handbook , McClung and Schaerer, The Mountaineers Books

AVALANCHE HAZARD AWARENESS AND AVOIDANCE

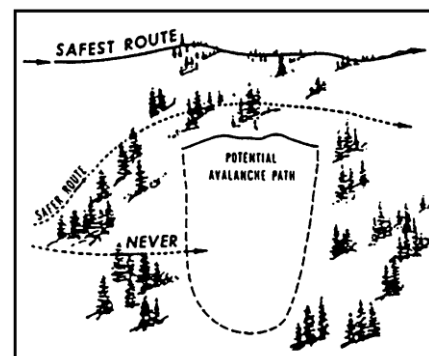
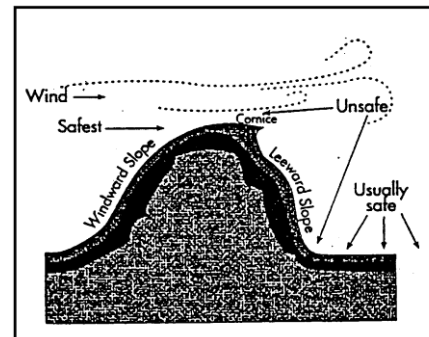
Snow avalanches are complex, natural phenomena. Experts do not fully understand all of their causes. No one can predict avalanche occurrences with certainty, but we know that avalanches can have a tremendous force and are life threatening to snow travelers year-round.

- Take the time to learn and understand avalanche safety by enrolling in an AIARE course.
- Knowledge of avalanche terrain and good route selection can help you avoid being caught in an avalanche.
- Check the avalanche hazard forecast (www.nwac.us) for the area in which you plan to travel.
- Think about the changing weather, terrain and snow pack conditions around you
- **AND constantly update your assessment of the avalanche hazard!**

Route Selection and Precautions

Avalanches don't typically happen by accident and most human involvement is a matter of choice, not chance. Hence, always practice safe route finding skills, be aware of changing conditions, and carry avalanche rescue gear. Learn and apply avalanche terrain analysis and snow stability evaluation techniques to help minimize your risk. Remember that avalanche danger rating levels are only general guidelines.

- The safest routes are on ridge tops and slightly on the windward side away from cornices. Windward slopes are usually safer than leeward slopes. If you cannot travel on ridges, the next safest route is out in a valley far from avalanche paths and other slopes.
- Avoid cornices. Move toward ridge tops by detouring out of the path of cornice snow pack.
- If you must cross a potentially dangerous slope, stay high and near the top. If you see cracks, or avalanche fracture lines in the snow, avoid them and similar slopes.
- Only one person at a time should cross a potentially dangerous slope. All other people in the party should watch. Before crossing the slope, remove ski pole straps, ski safety straps, and loosen all equipment, (except small backpack, which can act as a floatation device) so they may be discarded should a slide be triggered. Fasten all clothing, put on your hat and gloves, and raise your parka hood.
- Each person in the party should carry and know how to use an avalanche transceiver, sectional probe poles, and a shovel.
- If you must ascend or descend a dangerous slope, go straight up or down; do not traverse back and forth across the slope. Take advantage of dense timber, ridges, or rocky outcrops as islands of safety. Use them for lunch and rest stops. Spend as little time as possible on open slopes. As the hazard increases, route selection becomes more important.



Avalanche Survival

If You are Caught in an Avalanche:

- Discard all equipment except a small pack.
- Make swimming motions. Try to stay on top; work your way to the side of the avalanche.
- Before coming to a stop, get your hands in front of your face and make an air space in the snow. If you know you are close to the surface, try to stick a hand or foot out of the snow so you can be easily found.
- Try to remain calm, and breathe slowly.

If You See Someone Caught in an Avalanche:

- Mark the location where you last saw the victim.
- Search directly down slope, below where the victim was last seen. If the victim is not on the surface, scuff or probe the snow with a ski pole or probe pole or use avalanche transceivers if the victim is wearing one.

You are the Victim's Best Hope for Survival:






- Do not desert the victim by going for help, unless help is only a few minutes away. Remember, you must consider not only the time required for you to get help, but also the time required for help to return.

First Aid:

- Treat for suffocation, shock, impact injuries, and hypothermia.

Time is the Key to Survival:

- After 1/2 hour, the buried victim has only a 50 percent chance of surviving.

North American Public Avalanche Danger Scale				
Avalanche danger is determined by the likelihood, size and distribution of avalanches.				
Danger Level		Travel Advice	Likelihood of Avalanches	Avalanche Size and Distribution
5 Extreme		Avoid all avalanche terrain.	Natural and human-triggered avalanches certain.	Large to very large avalanches in many areas.
4 High		Very dangerous avalanche conditions. Travel in avalanche terrain <u>not</u> recommended.	Natural avalanches likely; human-triggered avalanches very likely.	Large avalanches in many areas; or very large avalanches in specific areas.
3 Considerable		Dangerous avalanche conditions. Careful snowpack evaluation, cautious route-finding and conservative decision-making essential.	Natural avalanches possible; human-triggered avalanches likely.	Small avalanches in many areas; or large avalanches in specific areas; or very large avalanches in isolated areas.
2 Moderate		Heightened avalanche conditions on specific terrain features. Evaluate snow and terrain carefully; identify features of concern.	Natural avalanches unlikely; human-triggered avalanches possible.	Small avalanches in specific areas; or large avalanches in isolated areas.
1 Low		Generally safe avalanche conditions. Watch for unstable snow on isolated terrain features.	Natural and human-triggered avalanches unlikely.	Small avalanches in isolated areas or extreme terrain.

Safe backcountry travel requires training and experience. You control your own risk by choosing where, when and how you travel.

(5 Black; 4 Red; 3 Orange; 2 Yellow; 1 Green)

SNOW TRAVEL AND ICE AXE TECHNIQUES

Snow can be a blessing in wilderness travel. Talus, brush, and logging slash are covered by consolidated snow making travel much easier. Snow bridges can also provide an easy way over streams and bogs.

Selecting the route on snow depends on the season, weather, and whether the slope is facing the sun, the wind, or both. Thus, there are several factors to consider in finding safe routes. Natural hazards such as moats around stumps, logs, trees, or rocks; snow slump; unsafe snow bridges; crevasses and bergshrunds; avalanches; and cornices must all be observed and avoided as you travel. Changing temperature and wind can rapidly affect the snow conditions. Be alert and observant to the environment around you as you travel.

The techniques of snow travel are the same whether the snow lies high in the mountains or deep in the woods. On steep slopes you may need safeguards such as an ice axe, a hand line, or crampons. With training and experience you will recognize both the dangers and the advantages of the snow and learn to use the medium to make wilderness travel easier and more enjoyable.

USING AN ICE AXE

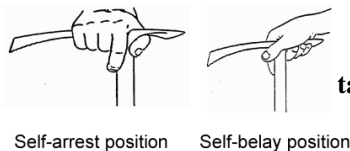


The ice axe is an essential item of equipment in snow travel. The axe pick must be sharp in order to cut into hard snow and to grab the ice.

Tape the adze or dull its corners to reduce getting wounded by it. Wrist loops are used to prevent the loss of your axe from accidental dropping. The axe can behave like a club or a tomahawk, however, if you have lost your grip on it. Especially if the loop leash is too long.



When traveling on the trail or other terrain where self-arrest will not be needed for a fall, carry the $\uparrow\uparrow\uparrow$ ice axe as shown. Do not hold the axe horizontally with the spike at your rear (not even if you want to harpoon the person behind you!). Also, should you fall forward; you won't impale yourself on the pick or adze.



Self-arrest position

Self-belay position

There are two ways to grasp on an ice axe: self-arrest grip and self-belay grip. The self-arrest grip should be used in situations where a fall is likely to take place. When traveling on moderate slopes the ice axe should be carried in the uphill hand with the pick facing backwards (self-arrest grip); in the event of a slide, the axe will be facing the proper way for self-arrest. Only the

$\uparrow\uparrow\uparrow$ self-arrest grip position on the ice axe head is allowed on Tacoma Mountaineers branch field trips. (left one in the picture.)

SELF-BELAY: The self-belay technique is designed to stop a fall or slip before a self-arrest is required. This involves gripping the head of the ice axe (with the self-arrest grip, not the self-belay shown) and thrusting it deep into the snow on the climber's uphill side. If a slip occurs, sink the axe deeper into the snow and grab the shaft at the snow level to hold the fall. For travel on steep slopes, have both hands on your ice axe; be ready for self-belay, and self-arrest if self-belay fails. $\rightarrow\rightarrow$



SNOW TRAVEL TECHNIQUES

Best way to prevent an incident is to be alert for changing terrain and conditions and rely on sound snow travel techniques such as using appropriate equipment (ice axe, crampons, and helmet) before or as soon as you are on a terrain with the potential hazard, even for a short distance. If you slip or fall, try to prevent sliding down with self-belay; and if it fails and you begin to slide down, self-arrest immediately before you pick up a speed making it more difficult to control and stop the slide.

STEP-KICKING: When traveling upward on snow, step-kicking can save the total energy the party expends in creating a path. The lead in the party kicks in fresh steps just deep enough to the front half of the boots if ascending straight up or a half side of the boots if traversing up diagonally. The party travels the path single file, each improving the steps further as he or she follows. It is important for the lead to space the steps so

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everyone is comfortable. Taking uncomfortably large steps for an extended period of time can be tiring and exhausting. When the lead is a little tired, he or she can step aside and let the next person take turn kicking in fresh steps.

To prevent blowing out the steps when stepping up to the next step, shift your weight to the uphill foot before lifting off the downhill foot, and avoid pushing up with the downhill foot or leaning toward the slope. Kicking slightly angled into the bottom slope creates more secure steps. It is not necessary to kick step multiple times since it will be reinforced by each person following.

WALKING IN BALANCE: While you are ascending a snow slope, keeping an extra point of contact (ice axe) until you are in a stable stance (in balance) helps you avoid falling. The stance with the ice axe on the uphill side, and the uphill foot in front of the downhill foot is **IN BALANCE**. This is most stable with your body weight being evenly distributed on both feet. The stance with uphill foot is trailing is **OUT OF BALANCE** and less stable. Move you ice axe only when your feet are stationary and in balance assuring you always have at least two points of contact.

CONCERNS WHILE DESCENDING

Changed conditions or just plain steep slopes require skill, not speed. You may face in until the angle permits heel holds while down stepping. Use your ice axe to stabilize your body by holding it on the uphill side. Whether you are facing in or facing out, attempt to stand vertically to help compact the snow under foot. Leaning toward the slope changes the center of gravity which tends to break out the steps allowing you to slip and fall more easily.

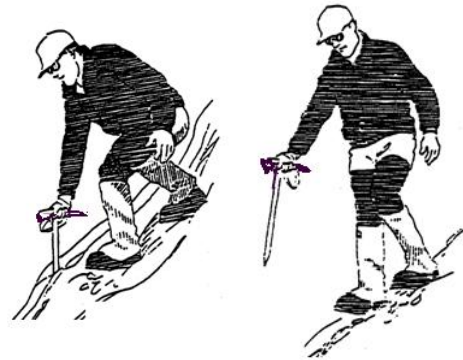
Plunge stepping is normally fast and even exhilarating. However, since your weight is multiplied on each down step, you could break through a rock moat, or worse yet, to a stream tunnel. Plunge stepping in crusty snow is therefore not advised. Even delicate walking to avoid breakthrough (post-holing) is tiring, but will save you from scraping your shins.

As you descend, watch for locally changing snow conditions and signs of potential hazards while you choose your route and techniques.

PLUNGE-STEP (FACING OUT) →→→

Use in soft snow only!

Lean slightly forward (*never* backwards). Descend with stiffened knees, putting your weight on (over) your descending heel to break the snow surface and to form a firm step.



FACING IN (BACKING DOWN or SELF BELAY)

- Plant ice ax firmly - Drive in the spike for an effective self-belay. Sometimes this takes a couple of tries. If you slip, grab the shaft at the snow line with one hand while holding onto the head with the other. Most of the weight is applied at the snow line; the hand on the head prevents the ice ax from levering out by putting weight on the head and pushing down.
- Use existing holes to save energy
- Each person can improve the holes by driving them deeper.
- Use stake position if possible - it allows you to hold onto the ax with both hands. Alternatively, you can descend with one hand on the ax while the other hand grabs steps for handholds.
- Use pick if spike won't drive into the snow - This is useful on short, sections of hard snow, especially with crampons.
- Use existing steps for greater security - each person should improve the steps as the party descends.
- More experienced climbers should descend first to build a good set of steps. If roped up, the last person will be highest on the slope and safeguards the rope team in the event of slips.

GLISSADE

Standing or sitting glissades are rewarding and fun but can be hazardous. Before you decide to glissade consider snow condition, steepness of the slope, and run out. Walk down instead if

- the surface is rough or icy
- the slope is too steep

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- there is no view of the run out or your snow patch ends at a rock pile and there is no safe run out
- you don't feel safe and comfortable glissading or
- any one or combination of the previous.

Wear gloves and long sleeves. Never glissade wearing crampons or snowshoes. Grab your ice axe in self-arrest position then turn your palm up, grab the shaft near the spike with other hand, and hold your ice axe outboard of your body with the pick pointing away from your leg and the adze away from your face. Stay in control at all times by steering and controlling the speed with your heels and the spike of your ice axe. Arrest if you begin to go too fast to be in control. Don't glissade in close intervals, so collisions can be avoided.

Sitting Glissade →→→

Lean back slightly while lifting the soles of your feet, except to brake. Use the spike and your heels to steer and control speed. Keep your legs bent for better control and to avoid knee injuries. The pick is pointed away from your body, not at your thigh or your groin. Stay in control at all times and glissade at a safe speed.



Standing Glissade →→→

Dig in your heels and use the spike of your axe to slow your descent. The use of your body and feet as if you were parallel skiing will provide you with directional control. The pick is pointing away from the groin area.



CRAMPONS

Crampons give additional traction and are useful when traveling on snow or ice. It is imperative your crampons are appropriate for and fit your boots. Before you leave home, practice putting crampons on your boots and walk around your lawn to make sure they fit your boots snugly and do not slip off. When traveling with crampons on, keep your feet flat on the snow surface so that all points of the crampons have maximum penetration. Space your feet sufficiently apart and take deliberate steps to avoid snagging a point on your gaiter or pants, gashing your leg, or tripping. If you must self-arrest a fall while you are wearing your crampons, the preferred method is to lift your feet and use your knees to stop. If snow builds up on crampons in a sticky snow condition, use your ice axe to tap the crampons to clear the snow ball frequently, so build up does not make walking difficult and dangerous. If snow is soft you can travel safely without crampons. Study Mountaineering: The Freedom of the Hills (9th Edition) carefully.

SELF-ARREST

The main purpose of self-arrest is to stop your slide in snow. You want to do it as quickly as possible before you build up momentum that will make stopping difficult or even impossible.

Maintain alertness for fall consequences and mentally rehearse your responses. Control both ends of your ice axe, or you could get the adze in your face or the spike in your thigh. **PERSIST**, WITH OR WITHOUT YOUR ICE AXE! Dig in with elbow, knees or toes, don't give up.

The Basic Self-Arrest Position

- Face down.
 - Feet down hill and spread for stability.
 - Head of axe held firmly, close to shoulder with pick in snow.
 - Spike of axe held near hips.
 - Back arched, putting weight on shoulder and feet while lifting spike of axe clear of snow.
- If the spike jams into the snow, you can cartwheel or lose your grip on the axe.

REMEMBER: Pulling up with your hand on the ice axe shaft helps to raise your torso.

Refer to the self-arrest section of Mountaineering: The Freedom of the Hills (9th Edition).

ONLINE QUIZ – required and self correcting

<https://goo.gl/forms/0kCjcI5a8iTiHK5g2>