Basic Snowshoe Course

Everett Mountaineers

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Introduction

The Basic Snowshoe Course offers an introduction to safe and enjoyable winter travel for the beginner. It is designed for people who want to get a taste of snowshoeing and pick up a few good skills without the commitment of a full course. Topics of instruction will include selection and use of proper equipment and clothing, nutrition and hydration, avalanche awareness, where to go, winter travel, safety, and choosing an outing. Students will be eligible to participate in easy snowshoe tours with the confidence of having a foundation in winter travel.

Course completion requires attendance to both lectures and the field trip. Only those who attend both lectures are eligible for the field trip.

Preparing to Snowshoe

Types of Snowshoes

Snowshoes increase the size of your footprint providing buoyancy in the snow. Generally, the larger the footprint, the less the foot will sink into the snow.

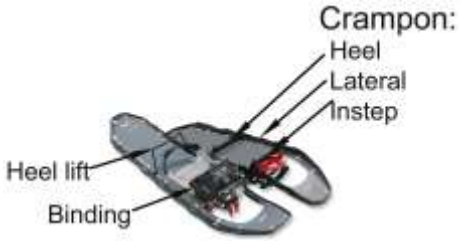
Snowshoes have a metal frame, a deck that holds the foot and bindings to attach the snowshoe to the foot. Most frames are either steel or aluminum. Decks can be made of plastic, woven polyesters or treated nylon.

Most snowshoes have an instep crampon. If it doesn't, you don't want to use the snowshoe even on flat terrain if it is icy. There are also lateral crampons along the sides of the shoe and heel crampons.

Some snowshoers prefer not to have the hard plastic snowshoe decks because of the noise they can make particularly on icy snow. The considerations that should drive your choice of snowshoes are the bindings and the terrain you expect to travel. For steeper terrain the heel and lateral crampons become very important and the heel lifts become desirable.

Snowshoes that are tailored for mountain terrain will have features not usually found on snowshoes tailored for rolling terrain.

Features to consider when evaluating snowshoes you would like to use:



- Terrain: rolling or mountain
- Frame material: aluminum or steel
- Deck material: urethane-impregnated nylon, plastic PVC-coated woven polyester, Nitex nylon
- Instep, heel or lateral crampons
- Gender
- Weight can be a consideration
- Bindings: Some are easier to put on/take off with gloves. Some hold your foot more securely.

These three examples are just to show different styles of snowshoes. There are others.

MSR snowshoes have an injected molded deck, steel crampon, braking bars and binding straps for the toe and heel.

Tubbs snowshoes are for flat or rolling terrain. They have an aluminum frame, a flexible decking and toe and heel crampon.

Atlas snowshoes have spring-loaded suspension, aluminum frame with flexible decking and a toe crampon.

(Snowshoe pictures from REI.com)

How to Choose Snowshoes

One of the great things about snowshoeing is that just about anyone can do it. Shopping for snowshoes is easy, too, once you know what to look for. Unlike skis or snowboards, they come in only a few sizes. Some models are activity specific, but for the most part snowshoes are versatile performers. With some knowledge of how snowshoes work and where you'd like to use them, buying the right pair is a walk in the park!

It is important to note that COST DOES NOT MEAN BETTER in snowshoes! Many experts say the ones they have liked the best and have used for years have been the LEAST expensive.

Anatomy of a Snowshoe

All styles of snowshoes allow you to travel across snow-covered ground without sinking or struggling. They provide flotation by spreading your weight evenly over a large, flat surface area. This flotation allows you to hike, climb or even run! Generally, the heavier the person or the lighter and drier the snow, the larger the surface area of the snowshoe needs to be.

Frames and Decking

Typically, today's snowshoes are constructed with aluminum frames and synthetic decking. The decking is usually made of a cold-resistant rubber or plastic type material. Some compact snowshoes are made without a frame; that is, with a hard decking material that supports weight on its own. Hypalon rubber decking is more flexible and lightweight, while composite plastic decking is stable and very durable. Both styles work well.

Bindings

Snowshoes secure to your boots with bindings, which usually consist of a platform and nylon straps that go over the foot and around the heel. Most snowshoe bindings are built to accept a variety of footwear styles, from hiking and snowboard boots to plastic mountaineering boots, so you don't need to buy special footwear. Some are made specifically for running and lace up snugly, while others are made for plastic boots and secure with ratcheting straps.

Rotating bindings pivot at the point where they attach to the decking under the balls of the feet. This movement allows you to walk naturally and to climb hills. The amount that bindings pivot varies among models. Some bindings are attached with metal rods and pivot 90 degrees or more. This causes the ends of the snowshoes, called tails, to fall away as you step, shedding snow and reducing leg fatigue. Rotation also allows "tracking" or steering in deep snow and positions your boots for kicking steps into steep slopes.

Fixed bindings are connected with heavy duty rubber or neoprene bands and don't pivot as much. This type of binding brings the snowshoe tails up with each step, allowing a comfortable stride. This also makes stepping over obstacles and backing up easier. There are pros and cons to both binding types. Fixed bindings can kick up snow on the backs of the legs, and rotating bindings can be awkward when climbing over logs or backing up.

Traction Devices

Although your weight provides some traction by pushing snowshoes into the snow, most modern aluminum styles feature crampons or cleats. These allow you to maintain a good grip on packed, icy or steep snow.

Toe or instep crampons are located on the undersides of the bindings, so they pivot with your feet and dig in as you climb. Heel crampons are placed on the decking undersides. They are frequently in a V formation, which fills with snow and slows you down as you descend. Not all snowshoes have heel traction, so it may be necessary to dig in the toe crampons on the descent. Some models have additional traction bars on the decking undersides that provide lateral stability and reduce side slipping as you cross slopes. Recreational style snowshoes will typically have moderate traction, sometimes only at the forefoot. Climbing snowshoes will generally have aggressive, toothed crampons at both the forefoot and the heel.

What Size Is Best?

Modern aluminum-frame snowshoes typically come in 3 sizes: 8" x 25", 9" x 30" and 10" x 36". Some snowshoes are made specifically for women. Some of these have smaller 8" x 22" contoured frames, plus bindings sized for women's footwear. Specific models for children come in 6" x 15" and 7" x 18" sizes.

How do you know which size is right for your needs?

1) Determine Your Weight With Gear

Your weight, including equipment, is referred to as the recommended load or carrying capacity. This is a major factor in determining the right size. In most circumstances, a heavier person or one with a heavily loaded pack will require larger snowshoes than a smaller person or one carrying gear just for the day.

2) Consider Snow Conditions and Terrain

Recommended loads are usually based on light, dry snow conditions but consider that a 150 pound person on powder snow requires bigger snowshoes to stay afloat than he or she does in compact, wet snow. In other words, you need larger snowshoes to stay afloat in Utah powder than you would in the wet snow of the Pacific Northwest.

Terrain should also be considered. Packed trails, brush and forest call for more compact shoes, which are easier to maneuver in tight spaces. Steep or icy terrain is also best explored with smaller snowshoes. Open areas with deep drifts require larger snowshoes. Your best bet is to get the smallest size that will support your weight for the snow conditions and terrain in your area.

As long as you have adequate flotation, smaller snowshoes will be much easier to handle.

How to Choose Proper Clothing

Material: Proper clothing for winter travel must be synthetic or wool only. No cotton should be worn.
Items: Proper clothing should start from the feet up. If your feet are cold, the rest of your body will feel cold and you will not enjoy your trip.

Boots should be lug-soled and as waterproof as possible. Insulated winter hiking boots are available. Plastic boots are warm but are expensive and heavy. Liner socks should be worn under heavier outer socks which can be ankle or knee length depending on conditions and comfort.
Long underwear should be worn or carried on all trips. Upper long underwear, turtlenecks and sweaters are all proper items. Multiple insulating layers (fleece, down, etc.) should be worn and/or in your pack for both upper body and legs.
Water and wind resistant pants or shorts are recommended, especially in wet snow conditions. A water and wind resistant coat, anorak or pullover is a must.
Gloves or mittens must be worn on all trips. The choice between gloves and mittens depends on the person, and liner gloves are recommended. A second pair of gloves or mittens for backup is a good idea.
Warm hats are essential. More heat is lost through your head than any other part of the body. Balaclavas and mufflers are optional.
Remember, layering is the key! Do you have enough clothes to get you through the toughest conditions?

Clothing

(adapted from "The Mountaineers Seattle Hiking Committee Hiking Handbook" by Ken Hahn)

What you put next to your skin in the backcountry is of vital importance, maybe even a life or death matter. The reason we wear clothing is for protection, mainly warmth, but the clothing doesn't provide the warmth; it's our bodies that do that. We produce warm air molecules all around us, and it's the job of our clothes to trap those molecules in their fibers to help maintain our body's temperatures.

Many factors affect the way we stay warm or cool off. The wind literally blows the warm air produced by our bodies away, causing a cooling effect. This may be desirable on a warm or hot day, helping to cool us off, especially if we're exercising; but on a cold day the wind can be deadly.

Another cooling contributor is water. We all know that a dip in the pool or lake on a hot day can be just what the doctor ordered, but that same cooling can be a big problem if it's rainwater and it's 40 degrees outside.

Sweating also can dampen our clothes; and while it may be keeping us cooler while we are hiking strenuously, that same effect will chill us once we come to rest. Water conducts heat many times faster than dry air and therefore chills us extremely fast, especially if you add wind into the picture. If we get too cold, we can become hypothermic, the cooling of the body's core temperature. (More on this later.)

Given the fact that we now know the main enemies of the body's' "warm zone," we can take a look at how clothing works to fight those bad guys off. Just what is okay and when can be very confusing. Let's break it all down into categories.

Fabrics

Natural Fabrics, as the name implies, come from natural resources. These are the fabrics that have been around for years and make up the majority of our wardrobes for city life. They have their pros and cons, and below is the breakdown:

Cotton: This is the most popular fabric of choice. It's soft, durable, cheap, flexible, easy to maintain. But, ah, it has drawbacks in the backcountry. Cotton fibers lose their resiliency when wet and literally collapse on themselves. This leaves no space between the fibers, and we have no way to trap warm air molecules. As a result, we are cold. Cotton is also slow to dry in the backcountry and is very heavy when wet. These factors make cotton a bad choice for reliability in hiking clothes, especially in wet weather. **Remember: Cotton kills.**

Wool: For a long time wool was the mainstay. Wool has some similar problems as cotton, such as it is very absorbent, slow to dry and very heavy when wet. It also can be very itchy, and some folks don't like the natural smell of wool or are outright allergic to it. The one good side of wool is that, unlike cotton, the fibers don't collapse when wet, meaning it retains heat even when wet. For this reason wool was the mainstay in outdoor clothing for many years, specifically hiking and mountaineering.

Silk: Another fabric that has been around for a long time, silk is known for its soft feel. While silk is very pleasant to the skin, the elements aren't very nice to silk. It doesn't hold up well to abrasion and can be slow to dry. There are also complaints that silk retains odors even after washing.

Synthetic Fabrics are fibers created from manmade processes, usually including a chemical process. Synthetics have become the norm for most outdoor applications for reasons noted below. In most cases synthetics perform far better than natural fibers. While it would seem that these fibers are a dream come true, it should be noted that they are created from some of the very sources of industrial pollution most outdoors folk would like to see shut down (i.e., the petroleum industry). It seems there is never good without evil.

Polypropylene: The first synthetic fabric to hit the outdoor industry, polypropylene (polypro from here on), brought a new aspect to clothing, a property known as *wicking*. Wicking is the title given to a fabric's ability to move moisture (perspiration) from the inside to the outside, where it can evaporate, without the fabric retaining much of the moisture. Polypro is also warm when wet and dries in a reasonable amount of time. Because of all these things, polypro makes a pretty good fabric for next to your skin. There are downfalls to polypro. If not laundered properly, it can feel like steel wool; and odors don't readily wash out as well. The general guideline is to wash it in cold water (not helping the smell factor) and use a dryer on a low setting only (or not at all).

Polyester: Ah, yes, polyester. Who could have had a "boogie night" without it? But alas, it has a purpose beyond mirror ballroom dancing (thankfully). Polyester is *the* magic fabric of the

present day. You won't find another fabric as prevalent in the outdoor clothing industry. Polyester is warm when wet, dries incredibly fast, is extremely lightweight, very durable, wicks very well and is easy to launder and care for to boot. Many companies have their own special concoction of polyester, boasting things like anti-microbial (nonstink) and durable water resistant (water repellant) coatings that don't wear or wash out. All of these things are helping to make us all very comfy in the backcountry, and who could ask for more. Polyester has been woven into many formats, including a small thin one for underwear usage, a tight thin one for use as a water/wind repellant fabric and, probably the most well known one, fleece. When it first hit the market, polyester fleece was very spendy and usually only for use in an outdoor situation. Nowadays it's on every department store rack across the country. Fleece comes in various weights and styles. Make your choice based on your needs. Most polyester clothes can be washed and dried normally, but check the tag to make sure.

Nylon: Basically a plastic that can be made into a fiber, nylon is another innovation to clothing. Its benefits are that it is very durable, lightweight and holds almost no water (making it warm when wet and quick to dry). Nylon is mainly used in a very tight weave format for wind and water repellency as an outer clothing layer. It is usually recommended to be washed on a gentle setting and dried on low or not at all.

Lycra (spandex): A popular synthetic that is known for its stretchiness and muscular support capabilities, Lycra is moderately warm when wet and dries on the slower side. Its main use is in specialized performance wear and in blending with other fabrics, usually for its stretchiness.

Fabric Blends are becoming more and more popular. Manufacturers are blending different fibers together more and more to take advantage of their helpful characteristics, often creating their own proprietary "dream" fabric. All work very well, but price usually goes through the roof. Socks are the one place that has probably benefited the most from the practice of fiber blending.

The Layering Principle

Outdoor clothing can be broken down into a system of layers, based on their main functions. This is a breakdown designed to demonstrate the functional abilities of these layers as a single unit. Obviously, in some situations (i.e., warmer weather), you would probably not want all these layers at once. Use your own judgment in regards to comfort level.

Base Layer: The layer next to your skin. You want this layer to trap the warmth your body is creating and keep it right there next to you. You also want it to transport (wick) your perspiration away from you to the outer layers. Polypro or polyester are the usual choices here.

Insulating Layer: This layer takes the place of your warm blanket at home. Once again, you want to keep warm air molecules trapped in the fibers. Some days a light fleece jacket may be enough. Other days you may need two thick ones to maintain your warmth. Keep in mind that two thinner layers are often warmer than one thick one. Polyester is the usual choice here.

Shell Layer: Think of the hard shell of an egg as it protects the insides. Your shell should protect you (and your inner clothes) from the elements. Your shell layer should keep rain off of you and keep wind from blowing away all those air molecules that are keeping you warm. Nylon is almost always the fabric used for this purpose.

Special Features

Waterproof: In order to make a shell material into rain gear, it needs to be waterproof. A simple

way of doing this is by taking the fabric and coating it with a waterproof substance. The most commonly used one for this task is polyurethane, basically a pliable plastic. The result is complete waterproofness. This is great for stopping moisture from getting in,; however, moisture can't get out either. Since hiking is a highly aerobic activity involving a lot of sweat, you can still get soaked from your own perspiration. Once you stop and cool down, it's the same as standing in the rain. For this reason *100%* waterproof garments aren't very desirable in a hiking application.

Waterproof Breathables: A special layer of synthetics is sometimes put in jackets and pants to make them waterproof but also breathable. The most popular (and widely known as the best) is Gore-Tex. The idea is to have a layer in a garment that restricts water droplets (rain/snow) from passing through one way but allows water vapor (perspiration) to pass through the other. The result is that you stay dry. There are two basic designs of waterproof/breathable garments. One is to have an outer layer of nylon or polyester, an inner unattached layer of the WB membrane and an inner layer of polyester mesh. The other type is similar with an outer and inner synthetic layer, except they are laminated to the membrane. The first is usually more natural feeling; the second lighter but crinkly. This type of garment is also very spendy, ranging from around $75 to over $400 per piece. All are generally waterproof; and what you are usually paying for is breathability, with the expensive stuff being the best. Care for this type of rain gear is very important, and the manufacturer's tags should be followed meticulously. They also require periodic treatments with chemical additives to maintain functionality, and most reputable outdoor stores will carry a line of them to do the job. Ask for the best, as to fully protect your investment.

Windproof: Some outerwear is designed specifically to block wind. When your skin is exposed to wind, warm air molecules that keep you warm can literally be blown away. The same breeze that cools you on a summer day can be deadly on a windy mountaintop if you aren't protected. The wind is even more effective at cooling you when you are damp as well. For this reason rain gear is always windproof as well as waterproof. In raingear the shell material (usually nylon) is woven very tightly, effectively blocking most wind. There is also fleece available with a windproof/breathable membrane behind it much like Gore-Tex. The membrane is very breathable but also very windproof. The result is a very comfy windproof layer, warmer and lighter than much more bulky straight fleece. Expect to pay significantly more for this feature than you would in a regular jacket.

Antimicrobial: Fabric (usually base layer material) that has a permanent treatment that is supposed to ward off odor by killing or not accepting the bacteria in our sweat that causes this problem. Most seem to work fairly well. Also an expensive feature.

A Functional Wardrobe

The way you dress for hiking is a very personal choice. Obviously in hot weather you won't want to wear full long underwear, so options are available.

Basics: T-shirts: Synthetic, specifically polyester, T-shirts are available.

Shorts/Pants: Nylon is the fabric of choice here, for durability and comfort. Models with zip-on legs are very convenient. Full nylon pants are nice too.

Briefs and Boxers*:* This type of underwear is available in polyester as well and is highly recommended.

A lot of folks like to wear their shorts over their long johns in cooler temperatures for comfort and ventilation. Synthetic tights are also an option for colder weather, providing warmth and support. Much clothing for other activities, such as biking and cross-country skiing, crosses over nicely for hiking. Experiment as you wish but have a back-up outfit in case your ideas don't work out. Nothing may be worse than a 7 mile walk out in pants or a shirt that is chaffing you or causing other discomfort.

Insulating: A fleece jacket or wool sweater are good to wear while you are active. If it is expected to be very cold, also take a down coat or vest to put on as soon as you stop for a rest or to eat. Fleece pants with full length leg zippers should be available to put on when it is really cold, when you stop or if you are required to be out longer than you planned because of an emergency.

Shell*:* A windproof, waterproof jacket with a hood will protect you from the wind and keep you dry. The hood over your hat will also keep your neck warm. Rain pants with full length leg zippers should be used when it is windy, when there is rain or snow or when it is really cold.

Accessories: A hat may be the single most important item you bring that's often overlooked. A hat should be in your pack year round. You lose a huge percentage (up to 75%) of your body's heat through your head. There is an old saying, "If your feet are cold, put on a hat." Nothing could be truer. As blood passes through your head, it cools with the outside air temperature. Now that your blood is a little cooler, outer extremities are the first thing to be affected, such as hands and feet. By simply putting on a hat, you significantly improve your body's warming potential. This could be extremely critical should you be cold already or wet and in the wind. A hat can be the number one lifesaving device you bring along. In hiking, don't leave home without it. Fleece and wool are good, with wind-blocking models available as well.

Like a hat, carry gloves every day of the year as well. If not for warmth, for general protection. Mittens are warmer, due to the fact that your fingers are kept together. Wind-blocking fleece gloves are also available, and wool works well also. For the summer, nothing beyond a light polyester glove liner may be needed. For the winter, keep in mind that it can be below freezing, even if there is no snow, and frostbite attacks the extremities first. It is a good idea to have more than one pair of gloves. If you are really active in the snow, gloves will get wet.

Sun Protection*:* The sun can be very harsh all year. In warm weather it's a good idea to wear a wide-brimmed floppy hat to protect your face and neck. Baseball caps with a veil attached to the back are also popular. One can be rigged by tucking a bandana under the back of your favorite baseball cap. A bandana alone can be used (i.e., skullcap style) for sun protection as well. Be creative, but stay protected. On sunny days in the snow it is important to protect the areas that might get reflected sun from the snow such as under your chin and nose.

Other*:* Your local outfitter probably has many other options to choose from: headbands, rain

hats, fingerless gloves, balaclavas (full face head insulation), etc. Try to find what works well for you.

A Final Note About Clothing

On a day hike your clothes may be your only protection from the elements. In the event of an unplanned evening out, your body will cool down significantly, especially during sleep. If this happens, it will be critical for you to have enough insulation and protection from wind and rain, specifically during cooler months. Even in the summer the temperatures in the mountains can drop below freezing, including at relatively low elevations. It's almost safer to backpack than to day hike. On planned overnight trips, you usually have a tent, sleeping bag and sleeping pad for protection from the weather. You can almost afford to forget your extra fleece on these types of outings. If you're cold, you just get into your sleeping bag. Not the case on a day hike turned overnight due to an injury, you're lost or whatever.

As for cotton, even with all these synthetic warm-when-wet clothing choices, some folks insist on hiking in a cotton T-shirt and shorts. My feelings are "fine, but have synthetic clothes in your pack for when the weather turns for the worst or you soak your cotton with sweat." With today's technology, there is really no reason, aside from stubbornness, to insist on hiking in cotton. Cotton denim (blue jeans) is the worst in general, if not outright unacceptable. Being a very dense fabric, it soaks up a huge amount of water and dries at the pace of evolution. When it becomes wet, it's very heavy and restrictive to hike in, not to mention dangerous if the weather is cold and windy. When it is cold, wearing cotton can be hazardous to your safety and endanger the safety of the group. A cotton bandana can be used as a headband to control sweat but should be taken off when it becomes cold.

PLEASE BE RESPONSIBLE! PLEASE BE PREPARED!!!!

How to Fill the Void (Your Backpack!)

Some tips on how to stuff your pack and ease the burden on your back.

There are two kinds of "packers" in the world: those who are organized and those who are not. A properly loaded pack will spare you the piercing stares of your anxious cohorts, not to mention a driving snow, wind or rain pummeling your already cold body; and it's easier on your back to wear one that's weighted correctly. Here are some tips to keep you organized and well-balanced.

1. The following items should always be at your fingertips in side pockets or a small accessory pouch that attaches to your hip belt or shoulder strap: sunscreen, sunglasses, munchies, map and compass, and water.
2. Your first-aid kit should also be relatively easy to get to in an emergency.
3. Use a separate bag for your Ten Essentials system and any other odd or loose items. Keep this in the top pocket of your pack where it is easy to reach.
4. Dense, heavy gear, such as extra water bottles, thermos, extra clothes, go against your back as high as possible. Women, who naturally have a lower center of gravity, may want to experiment packing heavy items more toward the mid back.
    - TIP: Weight distribution is a personal thing. Some folks like to carry all the weight on their hips, while others like to balance it more between shoulders and hips. Our best advice is to experiment with your pack's adjustment straps until the weight distribution feels juuuust right.
    - TIP: Organize all gear into color-coded stuff sacks or see-through mesh bags. Keep loose items to an absolute minimum, especially in the main body of the pack.
5. Clothing: Roll clothes into tight tubes and put in plastic bags to keep dry.
6. Food: Pack a couple of extra ziplock bags for garbage and leftovers.
7. Toilet paper: Store it in a ziplock bag along with a plastic trowel (for digging catholes) in an outside pocket so you can grab them when the urge hits.
8. Sit pad usually gets strapped onto the outside, unless it packs down really small.
9. Warm, dry insulating layer and rain gear: Tuck under the top lid for easy access.

Gear and Clothing Checklist for Snowshoe Day Trips

Required Equipment:

Backpack
Proper clothing
Boots (warm)
Gaiters (long)
Water bottle (wide mouth)
Snow shovel (at least two per group)

Toilet kit (blue bags)
Ten Essential Systems
Insulated sit pad (foam)

Recommended Equipment:

Trekking poles (collapsible)
Emergency whistle or mirror
Chemical hand and toe warmers
Thermos for hot food or drinks
Altimeter
Prescription glasses (if you wear contacts)
Dry change of clothes in car

Optional Equipment:

Ski goggles
Binoculars
Camera
Stove and cook pot (for boiling water)
Snow saw
Avalanche beacon

Strategies for Enjoyment in a Harsh Environment

Snowshoeing exposes you to two hazards not generally present on a summer hike: hypothermia and the possibility of avalanches. This section provides information so that you can be prepared to avoid these hazards. You need to maintain your stamina to avoid hypothermia and to remain alert. The food and water you choose to take with you and how you manage these will determine how strong you feel and how alert you are. First aid for hypothermia and what to do if you encounter an avalanche are also included.

In the summer you may have sixteen hours to finish your hike, scramble or climb, so if you encounter extra brush, follow the wrong trail or ridge or anything else that takes longer than you planned, you still have extra daylight so that you can end the day safely. Even if you end your activity in the dark, you will generally not be exposed to a hypothermia risk unless you are wet. When you snowshoe you may only have six to eight hours to complete your trip; and when the sun goes down, it can become much colder, exposing you to a higher risk of hypothermia, and your path may become icy and more dangerous. Careful planning is very important.

Winter Storms

Don't try to go anywhere in a full scale storm above tree line. Don't risk becoming exhausted or lost in a storm if you can't see. Don't count on following your footprints in snow. The wind can blow them to oblivion in a minute or two.

Food

Take lots of items that you know that you like to eat (mostly carbohydrates but also some sugar). Eat frequently and in small amounts: nibble (sandwiches, nuts, pastry, fresh/dried fruit, cheese, crackers, etc.) If you put your food in a small plastic container, you will protect it from being squashed in the backpack. Eat frequently even if you don't feel hungry because your body reacts to stress and cold by erasing the desire for food and water exactly at those times when it is needed most. Eating and drinking will provide more available energy to maintain body warmth. Eat a snack within the first hour after starting the trip. This will provide energy to your muscles early in the workout, and you will be less sore afterwards.

Water

Water is a nutrient that we all take for granted, yet it is the most important one of our daily lives. Drink, drink, drink - even if you don't want water! Your body reacts to stress and cold by reducing the desire for water (and food) exactly at those times when it is needed most. Thirst is a poor indicator of the need for water. You won't become thirsty until you're already 5% dehydrated, and your thirst will disappear when only two-thirds of the lost fluid has been replaced.

When water levels begin to drop, muscles and nerves tire and run out of energy. You will start to ache, cramp and hurt; and your physical performance will drop. At a 2% loss of your body's water, body temperature regulation is impaired. At 3% loss muscular endurance declines. At 4% muscles start cramping. At 6% and above you can suffer heat exhaustion, coma, and death.

Water is even more important during cold weather. Cold, dry air is deceptive because you don't see or feel yourself sweating like you do when it is hot. Furthermore, because cold air doesn't hold as much moisture as warm air, your body must rob itself of water to warm the cold air that you breathe before it gets to your lungs.

Because your body cannot absorb water as fast as you drink it, drink as much water as you can the night before and in the morning. And drink, drink, drink after you return from a trip in order to replace fluids lost while you were out. You will be less sore afterwards, feel better and recover faster. Avoid alcohol and caffeine drinks. Alcohol and caffeine are diuretics and increase water loss from the body. Water is as vital to life as oxygen. About 70% of your body is water.

Water has hundreds of important functions:

• Energy: Water carries nutrients and oxygen to your muscles, reduces muscles cramps and prevents impaired performance (both mental and physical). The early onset of tiredness, muscle cramps and headaches, especially on sunny days, is almost exclusively due to dehydration.

• Eliminates waste: Water provides liquid for urination that carries away wastes and reduces muscle cramps and soreness. Urine will be light colored if you are drinking enough water. If it is not clear or light colored, drink, drink, drink!

- Controls your body temperature: Dehydration is the most serious contributor to heat illness.
    - When you are dehydrated, blood vessels near the skin surface constrict because there isn't enough blood to keep them expanded. This greatly reduces the amount of heat you can get rid of. Dehydration also inhibits sweating and, consequently, evaporative cooling.

- Water warms you in cold weather by providing increased blood circulation to your extremities.

- Lubricates your joints and maintains proper muscle tone.

- Weight loss: Water helps metabolize fats and combats water retention. When you don't drink enough, your body automatically retains the water that it has.

- High altitudes (usually above 10,000') Dehydration significantly increases your chance of altitude illness.

Since drinking directly out of mountain streams is no longer advisable, you should carry enough water in your pack for the entire day. It is a good idea to carry a bottle carrier on your pack waist belt or have a hydration system so that you can drink water without having to take off your pack.

In the winter warm water is much easier to drink than ice cold water so carry an insulated water bottle carrier and put hot water in your bottles before you leave. (If you have the colored polycarbonate bottles, you can add boiling water to them as long as the bottle is not very cold.)

Also during cold weather carry a thermos. Having a hot drink available to warm you is well worth the additional weight of the thermos. In freezing weather carry or store your water bottle upside down. If the water freezes, the ice will form at the top where the air is and won't freeze the threads. Powdered drinks in your water also help keep it from freezing.

If you use a hydration system when it is cold, fill it with hot water, keep the hose close to your body and avoid exposing it to the air. Sipping often will keep the hose from freezing even when the temperature is 20° F or a little lower. An insulated hose is also useful. Clean your water bottles and hose, if you use a hose, regularly, particularly if you use sugar drinks. Mold and bacteria can easily build up on the bottle threads which can make you sick with dysentery.

Hypothermia

Hypothermia is a condition in which the temperature of the body's internal core has been lowered sufficiently to cause illness. Hypothermia is dangerous; it occurs without warning and quickly affects judgment and reasoning. Unless the signs and symptoms are recognized and treatment is begun, hypothermia leads to apathy, collapse and death. Hypothermia is not a condition of cold weather alone. Many hypothermia cases are reported in wet, windy weather with temperatures well above freezing. Florida has had more hypothermia cases than the northern states. Falling into a cold stream can also quickly bring about severe hypothermia.

Body Gains Heat:

Through the *digestion* of food.
By *external heat source:* sun, fire and warmth from another body
From *muscular activity:* exercise or shivering
Reduction of blood flow. (Constriction of surface blood vessels keeps blood nearer to the central core of the body-brain, heart and lungs)

Body Loses Heat:

Evaporation causes loss of a large amount of thermal energy. (Perspiration from the skin and fluid from the lungs during breathing.)
Conduction: the transfer of heat by direct contact. (Sitting on snow; being rained on.)
Radiation: the emission of thermal energy causing heat loss from uncovered surfaces of the body. Head and neck, areas where large blood vessels come close to the surface of the body.
Convection is facilitation of heat loss by the movement of air or fluid. (If an insulating layer of air is removed, cooling take place.)

Signs and Symptoms of Mild Hypothermia:

Complaining of being cold
Shivering leading to uncontrollable shivering
Decreased fine motor coordination (Difficult to strike a match, tie a knot or handle a small object.)
The earliest sign may be a change in personality, becoming disagreeable or apathetic.

First Aid:
End exposure! Get out of the cold and wet.
Remove wet clothing and replace with dry or add insulation to clothing.
Zip up jacket; add a hat.
Additional warmth: hot water bottles; small chemical heat packs to chest, armpits, neck and groin.
Fluids (warm or cold) and food if conscious and able to swallow easily. Avoid caffeine. It may add to heat loss.

Signs and Symptoms of Moderate Hypothermia:

Increase in lethargy and mental confusion
Refusal to recognize the illness
Uncontrollable shivering may be present or may have ceased
Slurred speech
Stiffness of large muscles of extremities
Difficulty walking or stumbling
As hypothermia deepens, may become unresponsive or unconscious

First Aid:
End exposure to the cold.
Best to be re-warmed in the hospital under controlled conditions if evacuation is prompt.
Do not allow to walk or otherwise exercise.
Replace wet clothing.
Call for help.

Prevention of hypothermia involves stopping of heat loss, termination of exposure and early detection of signs and symptoms.

- Prevent heat loss by regulating clothing to prevent excessive sweating.
- Cover areas that are sensitive to radiative heat loss: head, neck and hands. "If your feet are cold, put on a hat."
- Prevent convective heat loss by wearing layers of clothing, which will help to maintain the layer of warm air next to the body. Heat is lost rapidly with the lightest breeze unless this layer is maintained. Beware of the wind. It is a major source of cooling. Protect yourself from it.
- Prevent conductive heat loss by placing insulation between the body and cold objects: a sit pad.
- No cotton clothing. Wear clothes that wick wetness away from the body.
- Prevent heat loss during breathing by covering the mouth and nose with insulative material. Maintain warmth by putting on more clothes before you become cold. When you stop for breaks, put on additional clothing before eating or sitting in order to retain warmth.
- Put on clothing before you feel cold.
- Avoid working up a sweat. Take frequent clothing breaks as needed to add or remove clothes. Protect yourself from rain.
- If you fall into water, quickly roll in powder snow. This will absorb the water. Quickly brush off the snow and roll in it again.
- Your head and neck are major sources of heat loss, so cover these parts of your body first.

Most hypothermia cases develop in air temperatures between 30 and 50 degrees. Avoid hypothermia by keeping dry, staying warm, eating regularly, resting and drinking plenty of water. Eat foods high in carbohydrates that can be quickly converted to heat by the body.

Give your body a continuous energy source to generate heat. Drink plenty of fluids. Avoid alcohol, which dilates blood vessels.

Sleeping in cold weather: If your clothes are dry and you have conserved your energy, you may sleep safely for short periods. The cold will awaken you before you freeze. On awakening, move vigorously to warm yourself. When circulation is restored, you may sleep again. People who die from exposure or freezing generally have exhausted their body heat and energy before sleeping.

Hydration While Snowshoeing

Key concept:
- DRINK, DRINK, DRINK!

Dehydration can cause:
- Muscle fatigue
- Cramps
- Headache
- Malaise
- Disorientation
- Irritability

Dehydration results are:
- Decreased blood volume
- "Thickens" blood so oxygen and nutrients don't get to all the tissues
- Impairs muscle function and heat production
  - Hypothermia
  - Frostbite

Fluid replacements:
- Water

Electrolyte supplements:
- Emergen-C ™
- Pedialyte ™
- Oral rehydration salts
- Some sports drinks

<u>Not</u> so good non-alcoholic beverages:
- Sodas
- Sugary sport drinks
- Juice
  - high in sugar
  - may have potassium
- Caffeine
  - Okay in moderation. Drink usual amounts, supplemented with more water.

Water:

How much water?

- Enough to urinate every 4 hours
- Varies with
  - the individual
  - conditions
- Urine should be light yellow
- Carry
  - At least 2 liters of fluids
  - 1 liter should be water

- Pre-hydrate 24 hours before the snowshoe with an extra 1 - 2 liters

- Re-hydrate after the trip
  - Extra water in the car
  - Hot water in winter
  - Pitchers of water at dinner

Food + water = energy + warmth

Nutrition While Snowshoeing

Caloric Needs

- Active men: 3,800 calories/day
- Active women: 2,700 calories/day
- Maybe more when mountaineering!
- Protein is required to rebuild muscle stressed with heavy exercise.
  - Digested more slowly if animal protein because of higher fat
  - Eat larger portions of protein
    - after the trip
    - at dinner on an overnight

http://nutritiondata.self.com/tools/calories-burned

Inadequate calories results in:

- Decreased concentration and coordination
- Fatigue

- Impaired judgment
- Hypothermia:
  - 30% calories used for work
  - 70% used for heat
  - Food + water = warmth

Everyone needs <u>some</u> fat.
Small amounts help with:

- slower digestion
- a more sustained caloric release

What to take?

- Always take foods *<u>you</u>* like.
- Strenuous exercise decreases desire for food.
  - Worse at higher altitudes
  - Worse when cold

Food + water = energy + warmth

<u>Activity</u>	<u>Calories/Hour</u>
Sleeping	70
Watching TV	80
Strolling	140
Hiking, 4 mph	400
Backpacking	430
Weightlifting	500
Mountain climbing	600
Kickboxing	750
Rock climbing	800
Calories per pound	3600
Daily intake moderate activity	2200

http://www.class5fitness.com/calcalc.htm

Calories Used While Backpacking

Total Weight (body + pack)	Calories used in 10 hours
150	4,770
175	5,565
200	6,360
225	7,155
250	7,950
275	8,745
300	9,540

While you are on the trip, drink frequently. When it is very cold, drink often enough to prevent your water from freezing. Actually, you should always drink often. The same is true with food. Have some food in your pocket or somewhere handy so that you can take a bite or two when you stop to rest. Don't let your body get low on energy. Since it takes time for digestion to happen, start early so the nutrition is ready to support your efforts. Take food you like and nibble.

Hydration and Nutrition Summary

BREAK – SNACK – LUNCH

- Tastes good
- Moist
- Handy
- "Comfort Food"
- Electrolyte replacement drinks

WATER

- 1 Liter = 1.06 Quarts
- Carry 2 liters
- Wide mouth bottles
- Hydration bag
- Stomach size

Water Treatment

- Boiling
- Filtration
- Chemical
- No treatment, if acquired from a safe source – home

Possible water diseases with delayed onset:

- *giardia*
- *cryptosporidium*

Times to emphasize your nutrition and hydration needs: before you go, when you are ready to start, while going and after you return.

Snack and Drink

- At the TH (Trail Head)
- On the trail
- Back at the TH
- Recovery

No alcohol or drugs!

Food	Cal/oz.
Brazil nuts	185
Mixed nuts	170
Cashews (shelled)	170
Cocktail peanuts	170
Sunflower seeds (shelled)	170
Pringles	170
Peanut Butter	166
Almond Roca	163
Dry roasted peanuts	160
Reese's PB Cup	157
Hershey's Milk Chocolate	152
Hershey Kisses	151
Peanut M&M's	147
Pork bacon	140
Cheese & peanut butter crackers	140
Nacho Flavored Doritos	140

Food	Cal/oz.
Pepperoni	130
Hot Cocoa mix	115
Balance Bars	112
Monterrey Jack cheese	110
Sharp cheddar cheese	110
Hard Candy	110
Quaker Chewy Granola Bars	110
Nutri-Grain Bars	106
Wheat Thins	140
Plain M&M's	140
Snickers candy bar	136
Oreo cookies	136
Triscuits	135
Milky Way candy bar	135
Fresh apples	15
Raw carrots	13
Fresh peaches	12

Food	Cal/oz.
Pitted Dates	84
Beef Jerky (store bought)	80
Honey	80
Jams and jellies	80
Sun Maid Dried Fruit Mix	77
Bagels	74
Corn tortillas	67
English muffins	61
Fresh avocado	60
Cooked ham	50
Hummus (prepared)	47
Canned Chicken in water	40
Tuna (in spring water)	30
Canadian bacon	30
Bananas	26
Tofu	18

Pop Quiz

- How often should one eat?
- What foods should one eat?
- Should one drink more or less water while snowshoeing?

Snowshoe Code

The Snowshoeing Code is not a step-by-step formula for reaching the destination but rather guidelines to keep you safe. The Code provides safeguards and helps to prevent misjudgment. Many serious accidents can be avoided or their effects minimized if these simple principles are followed:

- Have a party of sufficient size to handle an accident. Minimum is 3.
- Keep the party together and obey the leader or majority rule.
- Never travel beyond your ability and knowledge.
- Never let judgment be overruled by desire when choosing a route or deciding whether to turn back. It is better to get back safely than not at all.
- Carry proper clothing, food and equipment at all times.
- Leave a trip schedule with a responsible person.
- Follow sound mountaineering practices as set forth in textbooks of recognized merit.
- Behave at all times in a manner that reflects favorably upon mountaineering

Snowshoe Techniques

The actual snowshoe travel techniques are very similar to hiking when the terrain is mostly flat. As the terrain becomes steeper, it becomes important to plant the toe crampon firmly when going uphill on hard snow. It is difficult to transverse a slope of hard snow without braking bars. When the snow is fluffy, it is easy to go where you want to go even though it may be tiring. If the tails of your snowshoes droop when you lift them up, care needs to be taken when stepping over obstacles. When the snowshoe is lowered beyond the obstacle, the tail may drop straight down into the snow.

Steep slopes: If you are nervous on steep snow slopes, remember to take aggressive steps. Really kick your toe into the snow when ascending and firmly plant your heel when descending. When descending, it is easier to make your own steps (in untracked snow) than to use someone' else's steps. Use your ice axe on the uphill side for self-belay, and always have two points planted at all times (two feet, or one foot and an ice axe).

Rest Step: The rest step is an essential uphill technique used on long strenuous trips to delay the onset of fatigue. Stamp the forward foot into the snow, straighten the rear leg and lock the knee and relaxing the thigh. Briefly pause, breathe and then repeat with the other leg. The rest step can be used on any steep terrain, with or without snow, and on or off trail.

Breaking trail through snow: The first person in the party has the task of finding the route and breaking steps into the snow, usually a tiring activity if the snow is heavy or deep. To make this task easier for everyone in the party, use the following technique:

Each *person* in the party should take a turn as leader for a set amount of time or number of steps. After the set amount of time or steps, the leader steps aside to allow the party to pass and takes up a position at the end of the line - allowing the next person in line to lead.

This conserves the strength of the party and allows everyone the fun opportunity to route find. In deep snow, with a large party, sharing the leadership can make the difference between getting to *your* goal or having to turn back.

Avalanche Awareness

The GOAL when you go into potential avalanche county is to Stay Alive and to Return Safely. The GOAL is NOT to get to some physical point.

An avalanche is a mass of snow and perhaps ice rapidly sliding down a hillside. In order for an avalanche to occur, the slope of the hill needs to be steep enough for the snow to slide and not so steep that snow never accumulates. A terrain that is between 30° and 45° is considered an avalanche slope. The most dangerous angle is 38°. As the snow begins to fall, it attaches to the rocks and brush and does not slide; but as the snow accumulates, layers are formed when there are really cold nights that form hoarfrost. The crystals can get an inch or more long. When snow falls on these crystals, a weak layer is formed.
Actually there are also other reasons weak layers are formed. The structure of the snow pack is important. For example, heavy snow on top of weak layers on an "avalanche steep" slope can slide. Another factor is the weather. Some hazardous conditions are heavy snow falling quickly can put pressure on the weak layers, as can windblown snow; and sunny days can melt the top snow, also increasing the likelihood of an avalanche. Stable weather can cause the weak layers in the snowpack to consolidate, especially if the daytime temperatures are near freezing, quickly reducing the avalanche hazard.
This section focuses on the slope of the terrain you travel on or under and the weather and snowpack. Information about the weather and snow pack is acquired from www.nwac.us.You should look at this information when you are planning a trip, monitor the hazard trends and carefully study the information just before you take your snowshoeing trip. And while on your trip, think about the terrain you are walking on, notice the effects changes in the weather is having on the snow, stay out of terrain traps.

Most of the time people trigger avalanches: 90% of the time it is either the victim or someone in the victim's party.

What gets us in trouble?

- Unaware of the danger
- Aware but willing to take the risk
- Poor terrain selection
- Missed obvious clues
- Bad communications
- Poor travel techniques

Three things that must be present for an avalanche to occur:

- Avalanche terrain
- Unstable snow
- Trigger

Group communication is very important: Everyone must be involved and everyone has a veto. When choosing a destination and choosing a route, the question must be "why shouldn't we go" to this destination and "why shouldn't we go" on this route. Look for the hazards, not the rewards.

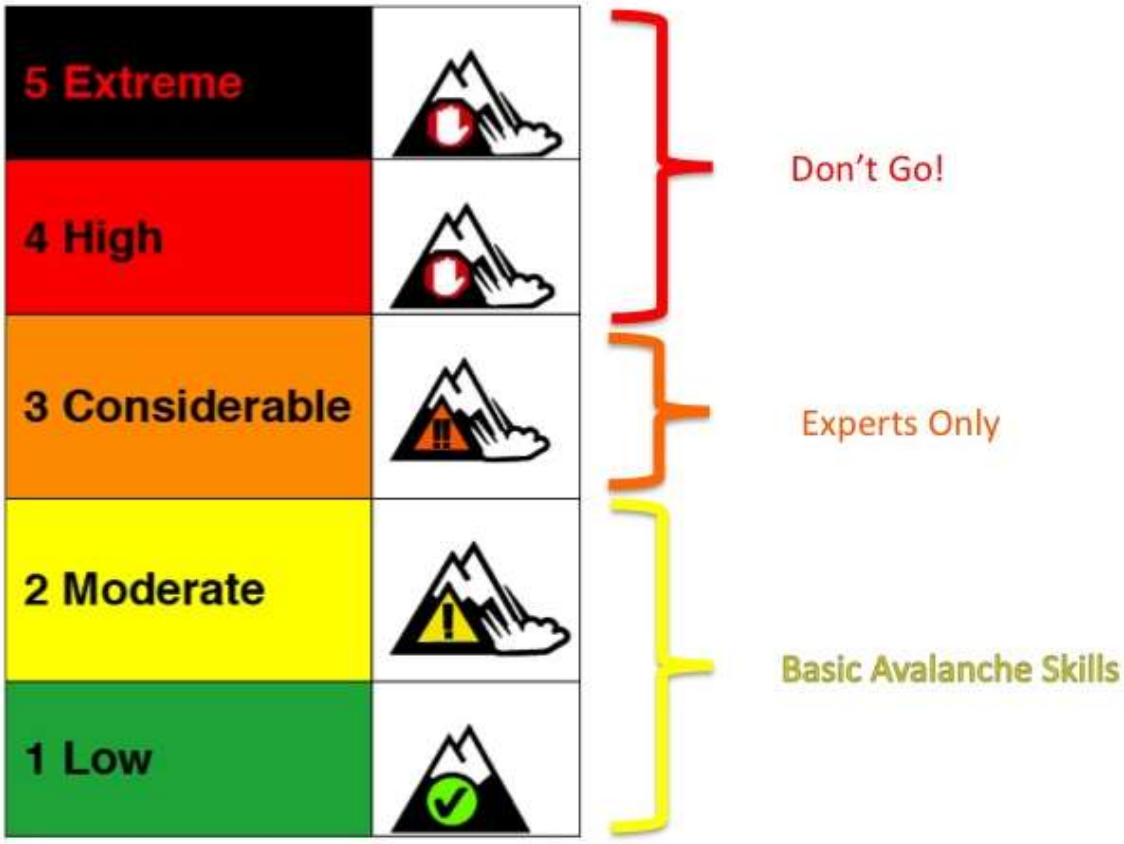
North American Public Avalanche Danger Scale

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 not 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.

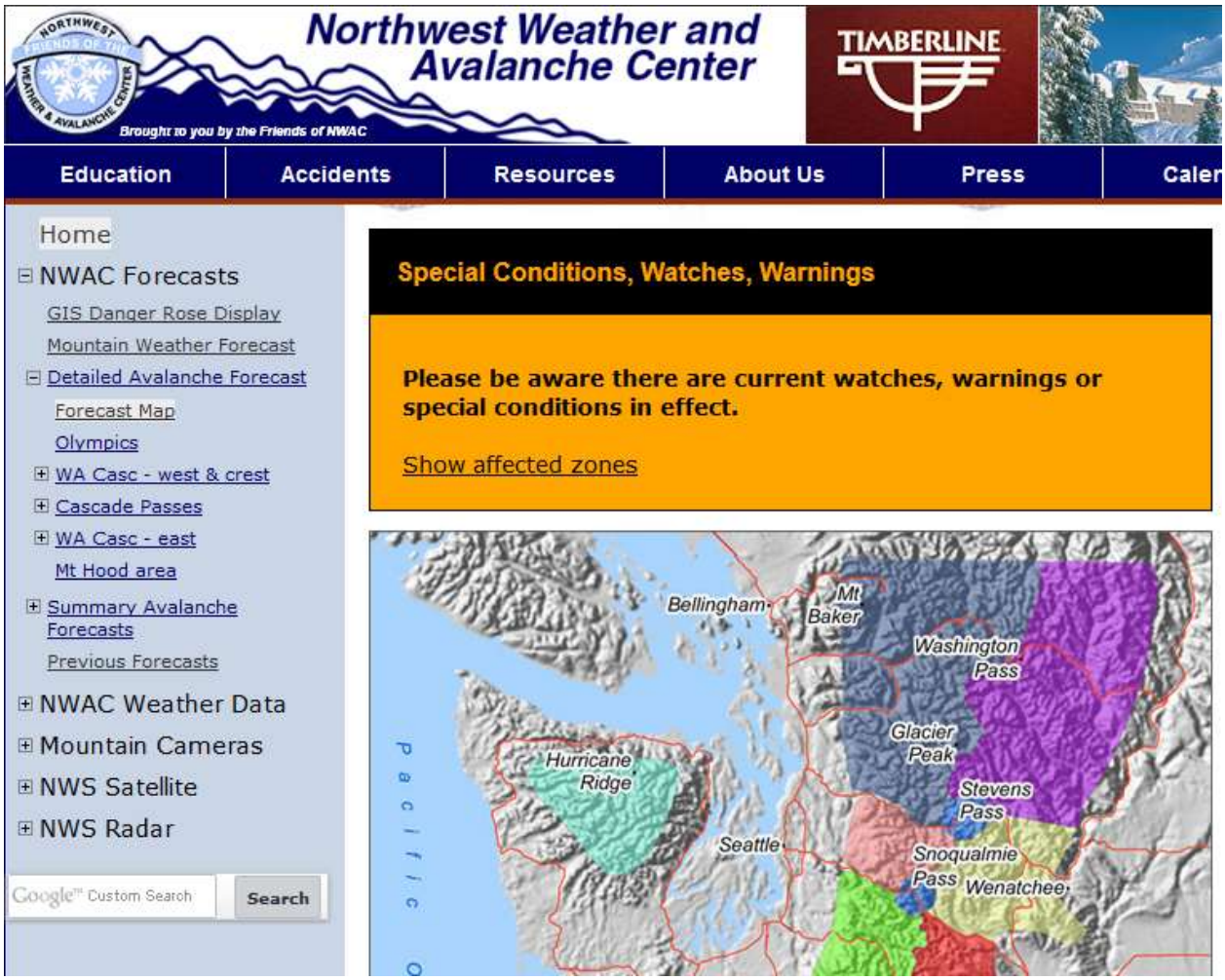
What Amount of Avalanche Training and Skills are Appropriate for each Danger Rating?



Avalanche Hazard Forecasts

The Northwest Avalanche Center, www.nwac.us, issues avalanche hazard forecasts daily from mid-November to mid-April – when there is snow. These forecasts provide backcountry travelers with current evaluations of snowpack stability and avalanche hazard below 7,000 feet in the Cascade and Olympic mountain ranges of Washington and northern Oregon. These forecasts use the terms listed below to summarize avalanche hazard. These terms, which are also used by other avalanche forecast centers throughout North America, have very precise definitions, as given below.

The first page of the 2013 Northwest Avalanche Center web site www.nwac.us looked like: The Avalanche forecast can be displayed by selecting the area you care about.



There *are* avalanche safe areas in the mountains *during all levels* of avalanche danger. You just need to understand the basics of avalanches and practice awareness and avoidance. When the Avalanche Danger is "Considerable" or above, stay off of slopes that are greater than 30 degrees. You don't want to travel below such slopes either. However, also consider the travel danger involved in driving to the safe places.

Avalanche Information

Avalanches don't just *happen by chance* — and most human involvement is *a matter of choice.* Slab avalanches that are triggered by the victim or a member of the victim's party cause most avalanche accidents. *Any* avalanche may cause injury or death, and even small slides may be dangerous. Hence, always practice safe route-finding skills and be aware of changing conditions.

Considering the large numbers of people exposed to avalanche hazard, as compared to the average number of annual deaths (avalanche fatalities in the United States now average 27 deaths per year), there is a low probability that someone will be caught in an avalanche at any given time and location. However, once a victim is buried, chances for survival are low — about one in three. Thus, prevention is the key to saving lives. For Basic Snowshoers this means carefully monitoring the Avalanche Hazard Forecast at www. nwac.us, monitoring changes in the weather – getting warmer or if it is snowing one inch per hour or more and staying off or below terrain that is steeper than 30 degrees when the Avalanche is considerable or greater.

As you spend time snowshoeing in the backcountry, learn more about avalanches by reading articles, books and watching videos and consider taking a class on Avalanche Awareness and/or the Level 1 Avalanche Class. Perhaps more importantly, practice good group communication and planning to avoid avalanche danger.

The equipment that Basic Snowshoers should carry is primarily to help avoid areas that have avalanche potential.

- Shovel: Each group should have a couple of shovels.
- Inclinometer to measure steepness of slope angles. (Some compasses have a built-in inclinometer.)
- (Optional) Thermometer to measure temperature changes — a sudden 5°-10° change or a 15° change in an hour weakens the snowpack due to the stress of expansion and contraction.
- (Optional) Stove, bivy and sleeping bag.

Avalanche Types:

- *Slab* avalanches (a large area breaks loose at once). Slab avalanches triggered by the victim cause 95% of all avalanche accidents. Most avalanches in the Cascades are slab avalanches. Wind causes most slabs to form — it packs the snow into cohesive layers, especially on lee slopes. The typical slab structure consists of a cohesive layer of snow (the slab) over a weaker layer, which is over a more cohesive layer (the sliding surface). These layers have poor adhesion to each other. Think: "peanut butter over jam over peanut butter." Weak and strong bonds within layers are not as important as the bond *between* layers.
- *Loose snow* avalanches start from a point and spread out in a fan shape.
- Other less common types include ice and climax (down to older snow or the ground).

Where and When Avalanches Occur

1. Know slope angles: Once slopes reach 30°, you are in avalanche terrain, regardless of all other factors. Most avalanches occur on slopes of 30° to 45°, with 38° being the most common slope angle for avalanches. Remember this 8° critical difference between slopes of less than 30^0 that rarely avalanche and slopes of 38° that avalanche more often than any other slope angle. Develop an "eyeball" for this critical difference — it's why you need to pay strict attention to subtle variations in steepness since most avalanches occur on slopes that are between 30 and 45 degrees. Before you leave home you should determine the slope of mountains you plan to travel on or under so that you avoid avalanche slopes, especially if Moderate or above. But if you are contemplating crossing or climbing a slope and you would like to know if it may be an avalanche slope, here is a simple way to use your trekking poles. Find the middle of one pole, stand it in the snow and extend the other pole horizontally toward the slope. If it doesn't touch the slope, it is not steep enough to activate an avalanche. Otherwise be very careful. Look at the slope to see if it gets steeper above you. Your compass may also have a clinometer on it that can be used to measure the steepness of the hill; however, it may be difficult to sight along the edge of the compass to arrive at a very accurate measure of the steepness.
2. Recent avalanche activity: There's no greater *clue* to avalanche hazard! Natural avalanches happen at the top of the instability scale, and you don't want to be there then!
3. Where they have occurred before: Old avalanche paths — easily identified below treeline by the lack of trees.
4. Gullies and couloirs (natural avalanche paths).
5. During a storm or afterwards until the snow stabilizes.
6. Under ridges, cornices or under other steep terrain (cliffs and rock bands): Always be aware of what's above. Remember that fog may prevent you from seeing what's up there. Study your map before you go.
7. On lee slopes: Because winds blow snow from windward slopes onto lee slopes. This wind-blown snow quickly *loads* lee slopes with more weight and stress than they can handle and forms avalanche-prone slabs.

8. In the Cascades winter avalanches are more likely to occur on north and east slopes. These slopes get less sunlight and may be slower to stabilize. Because our winds are predominantly from the southwest to the northeast, these slopes also get wind-transported snow.

9. More likely to occur on convex slopes (raised, curving outward), typically where the slope curves over the top of a ridge and tension forms because of the bend.
10. Where the snow is not anchored: open areas or sparsely timbered slopes.
11. On sun-warmed slopes: Warming weakens the snow, and meltwater lubricates slabs.
12. After a sudden warm storm.
13. Above timberline: Usually above 7,000 feet.

Weather - Warning Signs:

- Maritime Climates (Cascades west side) Weather is more important than snowpack analysis.
- Winds stronger than 15 mph rapidly load lee slopes with snow (even in clear weather). Snow plumes from ridges and peaks indicate that snow is being moved onto leeward slopes. Wind-blown snow can accumulate up to 10 times faster on the lee side of ridges than on the windward side. Wind-blown snow creates "avalanche" slabs.
- Wind direction can be determined by:
    a) Wind piles up snow *behind* obstructions (think snow fence).
    b) Snow erodes or is undercut *into* the direction that the wind is from.
- During storms if snow is falling at the rate of 1 inch or more per hour or if more than 8 inches accumulate. Needles and pellets are more dangerous than star-shaped flakes. Look on your parka to see type of crystals. If it starts to storm, get out (or wait until after the snow settles). *Most* avalanches occur during or after storms.
- Temperature is a major factor in avalanches. A rapid rise in temperature (10° or more) equals stress, and if warm enough, meltwater which adds weight and stress to the snowpack.
- Extreme cold, making the snowpack brittle.
- Rain (1" of rain equals 12" of snow) or wet snow, which significantly increases snowpack weight. Even a small amount of rain can greatly increase stress on the snowpack. Rain percolates through the snow and weakens it. If it percolates down to an ice layer, it acts as a lubricant for the snow above the ice layer to slide on. Rain also forms into ice layers which forms future sliding layers. *Wet snow and rain is a leading cause of avalanches in the Cascades.*
- Temperature inversions are common in the Cascades. (It may be cold in valley bottoms, but warm and raining above you — dangerously loading the slopes above you.)
- Intense, direct sunlight — although sunlight stabilizes slopes over time, slopes may also slide when the sun first hits them.

Warning Signs — You and Your Partner's Attitude:

- Beware of ignoring clear danger signs because of summit goals, peer pressure, haste, fatigue, or a willingness to take unwarranted risks.
- The "Herding Instinct" — people *think* there's safety in numbers, but the opposite is true

in avalanche terrain. (More people equals more weight which puts more stress on the snowpack.)

- Avalanches catch the really smart people and the really dumb people.
- Youth have the *perception* of invincibility.
- Be aware of people's reluctance to be the naysayer. Speak up about concerns.
- Always be willing to tell the trip leader that you won't continue due to snow stability concerns. If you are uncomfortable, say so!
- Respect each participant's risk-tolerance level.
- Accept that it's all right to turn back or alter your route for safety's sake.
- *Listen* to your intuition. If you have a bad feeling, pay attention to it.
- Always have a good reason why you're crossing, or are on, a steep slope.
- Don't be the one who thinks too late, "I give myself very good advice, but I seldom follow it".

Warning Signs — Terrain

Recent avalanche activity (either seeing an avalanche or seeing fresh piles of snow at the foot of a slope). If you see avalanches or if you see fresh avalanche debris, you shouldn't be there. Fresh avalanche debris has sharp corners; old debris has rounded corners.

- Uprooted trees lying downslope (carried there by previous avalanches) and scars on the uphill side of trees.
- Changes in slope angle (convex rollovers are the most dangerous). Lee slopes subject to wind loading.
- "Terrain traps": Open bowls, cirques, narrow gullies, *small safe-looking* slopes, slopes where you can't see the run-out, and slopes that have rocks, trees or cliffs.

Warning Signs — Snowpack

- Significant new snow that has not settled.
- Settling in the snow, particularly settling under your feet.
- Cracking — this indicates slab instability and may indicate an impending slab avalanche. Cracks shooting out from your steps indicate how much energy is stored in the snowpack — a 1-foot crack is okay; a 15-foot crack indicates serious hazard and that you're probably in serious trouble.
- "Sun-balling" (balls of snow rolling down the slope) — indicates that snow is settling or is potentially unstable. "Sunballs" occur when the sun first warms the snow, causing a temporary decrease in stability and weakening of the bonds between snow crystals. Think of sunballs as "little avalanches."
- Fresh snow on trees indicates snow not yet stabilized.
- Blocks of snow breaking up under you.
- Sounds from the snow ("whomph" or "boom" sounds) — although if you hear these sounds, you are probably already in serious trouble.
- Hollow sounds or feelings under your skis or snowshoes — signs of a snowpack dangerously close to avalanching.

- "Shear" layers (wind-packed, sun-glazed, thaw layers, ice layers).
- Heavy slab layers (wind-packed, thawed).
- *Surface hoar*. Feathery and sparkly ice crystals form when the snow is warmer than the air. If surface hoar gets covered with later snowfalls, it creates a very weak buried layer.
- *Depth hoar* layers within the snowpack (weak "ball-bearing" snow; large, coarse grains with distinct corners and faces). Depth hoar is a potentially serious weak layer and frequently occurs:
  - under an ice layer from moisture rising and being trapped below the ice layers
  - close to the ground in shallow snow
  - around rocks and shrubs
- Prolonged air temperatures below 20^0 allow weak layers to remain weak for long periods of time. Prolonged temperatures above 20° help stabilize weak layers.
- Conditions *within* layers of a snowpack have significantly more influence on its stability than does a solid-appearing surface.

Route Selection:

- Stay home when the avalanche hazard is high.
- Safer routes:
  a. Avoid avalanche terrain.
  b. Avoid traversing.
  c. Avoid abrupt terrain changes.
  d. Ridges and ribs (away from cornices).
  e. Windward side (into the wind) of ridges.
  f. Dense forest.
  g. Sun-shaded areas.
  h. South and west facing slopes in the winter (north and east in the summer).
  i. Wide valley bottoms.
  j. Slopes of less than 25° (almost always safe, unless there is a steeper area above).
  k. Slopes greater than 45° (usually safe, too steep for snow to accumulate).
  l. Rock outcrops and islands.
  m. Gentle terrain, and slopes with the most anchors

- Tracks do *not* mean the slope is stable — only that it may have been so earlier.
- Avoid slopes that end with *terrain traps* (imagine the consequences of yourself sliding down the slope into these traps):
  a. gullies, creek beds, and bowls (where a slide quickly piles snow deeply).
  b. cliffs (where you are likely to suffer trauma or where the snow can pile deeply).
  c. dense trees (where a slide can carry you against trees and injure you).
  d. harmless looking slopes that *appear* to have little threat of avalanching

- Ascend straight up or down (vertically) rather than across (horizontally) a slope.

- If ascending a suspect slope, keep close to the sides.
- *Never* travel above your partner, and stay out from beneath your partner!
- *Never* travel out of sight of each other.
- On especially wide slopes, stay several hundred feet apart as you are crossing.
- Choose slopes that have gradual, open runouts — not slopes with terrain traps.
- Statistically, the 2nd or 3rd person crossing a slope is more likely to get caught.

If You Are Caught — *Fight For Your Life!*

- *Shout* for help! Giving your companions a clue to your location will be very important if you are completely buried.
- Immediately after yelling, shut your mouth so it's not packed with snow and breathe through your nose. (This may be more difficult than it sounds.)
- If knocked off your feet, put *all* your effort into swimming motions to stay on top or to work your way to the side or to a tree. Keep your feet downhill so you don't hit things on the way down. *Fight for your life!*
- As the avalanche slows, work to reach the surface. If that isn't working, make an air space in front of your face and chest — as big a space as you can (ice will soon form around your air space) — and make it before the snow stops moving and sets up like concrete.
- Try to make your last effort one of reaching the surface, but this is less critical than making the biggest air space that you can. If any part of you shows above the snow, your chance of living goes up dramatically. Also take a large breath to expand your chest — the pressure of the snowpack against your body may prevent you from breathing. You could try to make a breathing space with one arm and thrust the other up towards the surface.
- If near the surface, you will likely know which way is up try to work your way up. Spitting, moving snow and watching its movement or seeing a hint of daylight will help you determine up from down.
- If you can't work your way out, remain calm to save oxygen, and quietly wait for rescue.
- If you hear rescuers, yell for help! Sometimes they can hear you.
- And hope that your friends have avalanche rescue beacons, are *experts* at using them and have *big* shovels!

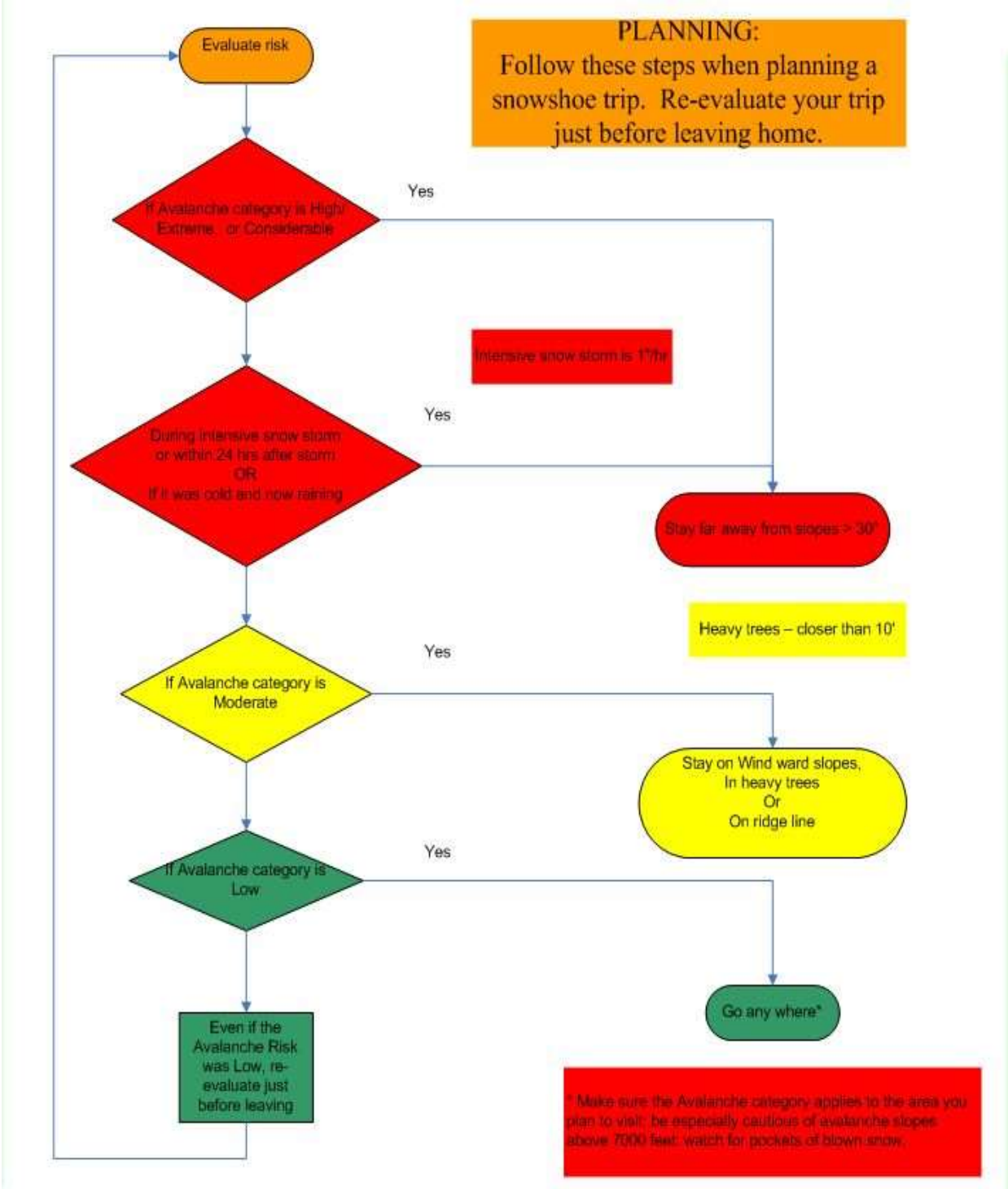
If You See a Victim of an Avalanche

- You are the victim's only hope of survival. If you go for help, no matter how close, the victim most likely will run out of oxygen and not survive. After thirty minutes the victim has only a 50% chance of survival. Speed of recovery is the critical factor in live rescues. However, no rescue effort should be abandoned prematurely on the assumption that the victim could not possibly be alive. For even after six hours, approximately 3% of the victims (1 in 35) can be expected to be found alive. No avalanche victim should ever be

denied this small chance at life.

- Mark where you last saw the victim and search down-slope from that point. Use avalanche rescue beacons if the victim is wearing one.
- If the victim is not on the surface, probe the snow with a ski pole or probe around obstacles or bends of a wandering gully.
- Be quiet as you search and listen for yells from the victim.
- If you rescue the victim, treat for suffocation, shock, *hypothermia* and impact injuries.

Planning Your Snowshoe Adventure



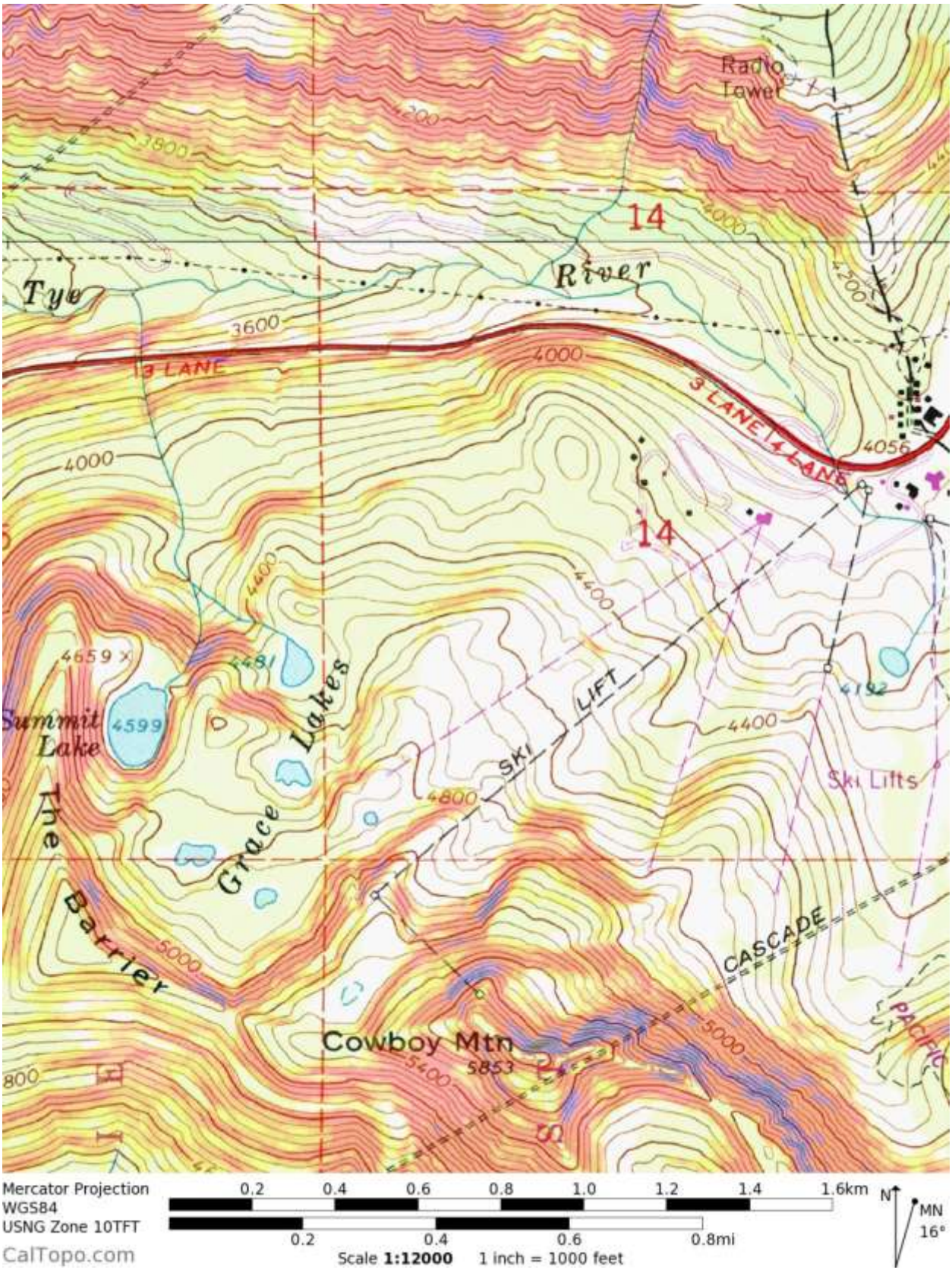
Planning Decision Tree for Basic Snowshoe Class

After you have selected a proposed trip, you will want to evaluate the avalanche danger. First determine the avalanche category and weather forecast. For the Northwest go to the Northwest Avalanche Center, www.nwac.us, to get the current information. Use the avalanche category and weather forecast and the decision tree to evaluate the avalanche risk for your proposed trip. If the highway may be or has been closed in order to do avalanche control, you should stay away from avalanche slopes! You may want to consider alternate routes. You may want to follow a windward ridge or a route through thick trees. If the avalanche risk is too high, even after considering alternate routes, choose a different proposed trip and re-evaluate the risk

caltopo.com

Caltopo is a free online topographical map. Access it from: caltopo.com
"Fixed Slope Shading" can be used to identify areas that are steep enough to be avalanche slopes. To display slope information, run the curser over the "map source" box, which is on the top right side of the map, and select "Shade Relief." Then select "Fixed Slope Shading." The resulting map will be shaded to show slopes in these ranges: 27°-29°30°-31°32°-34°35°-45°46°-

These maps can be tailored to your needs. You can scale a map to show fine detail of the route you plan to take, and you can scale a map to show the surrounding mountains. The "Shade Relief" feature can then be used to guide you to a route that isn't on or below an avalanche slope.


Radio Tower
14
River
Tye
3600
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3 LANE
3 LANE
4200
4056
4000
14
4400
4400
4659
4481
Summit Lake
4599
Grace Lakes
SKI LIFT
4192
4400
Ski Lifts
4800
The Barrier
5000
CASCADE
Cowboy Mtn
5853
5400
5000
PACIFIC
800
Mercator Projection
WGS84
USNG Zone 10TFT
CalTopo.com
0.2 0.4 0.6 0.8 1.0 1.2 1.4 1.6km
0.2 0.4 0.6 0.8mi
Scale 1:12000 1 inch = 1000 feet
N
MN
16°

Important Items to Know Before You Go:

Find current conditions for the area you plan to travel by looking online, perhaps at Washington Trail Association (wta.org), or contact local rangers and park officials to obtain the following information:

1. What is the major road access and is it open?
2. What parking is available and what permits are required?
3. What is the level of difficulty of the outing?
4. What topographic map covers the area?

Deciding Where to Go:

1. Look at the list of Mountaineers trips. Or read over available guidebooks. Look at the list of possible trips in this syllabus or look at online sites for trip ideas.
2. You'll have more fun and greater safety if you pick easier trips and avoid exceeding either your ability or conditioning level.

.

Things to Do Before You Go:

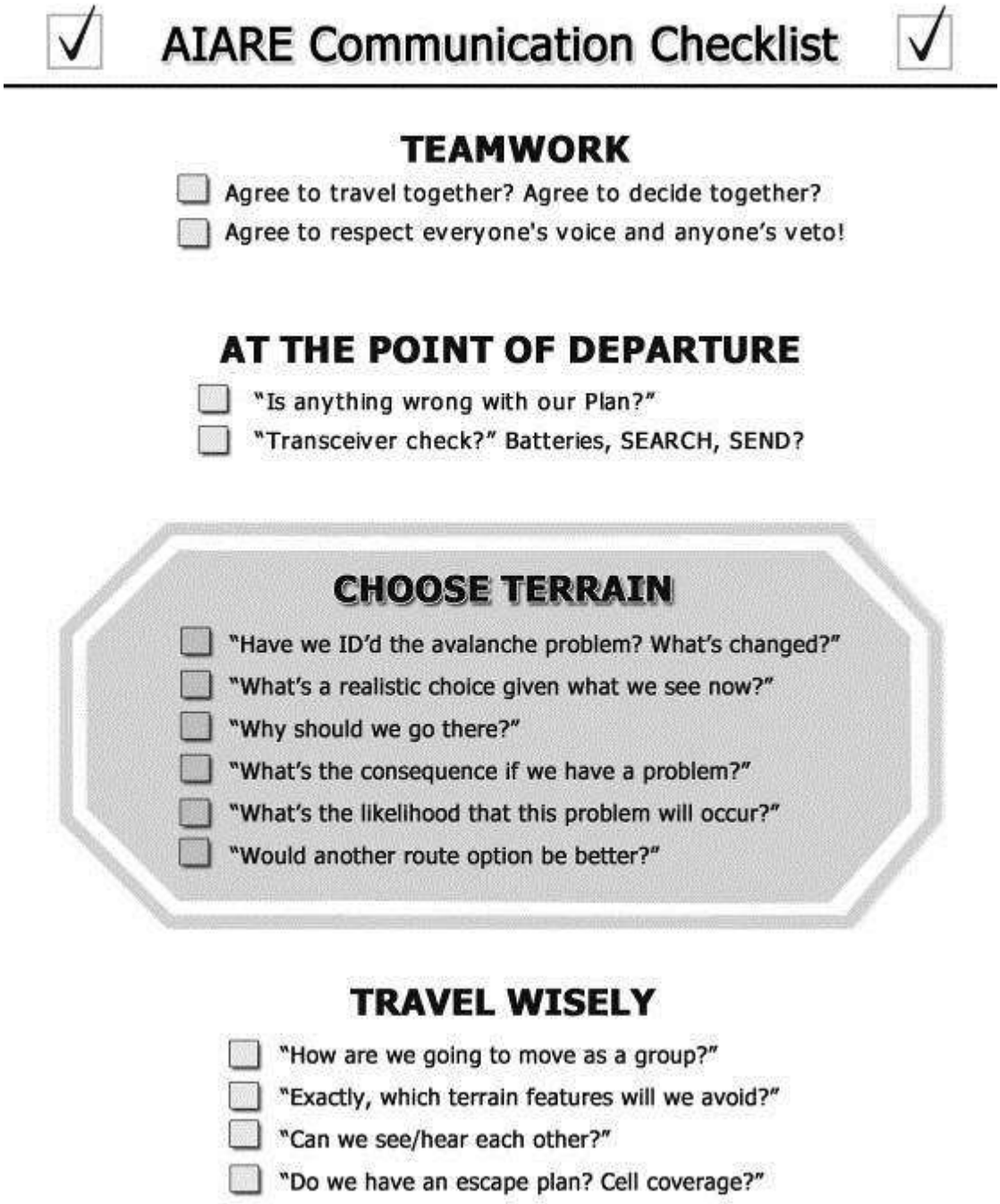
1. Gather and organize your gear several days in advance of your outing so you can concentrate on getting a good night's sleep the evening before your outing.
2. Make sure your equipment is adequate to ensure your comfort and safety in the worst possible weather conditions.
3. Information should be left in writing with a responsible friend indicating where, with whom, car description and vehicle license number, where parked and when and whom to contact for rescue in case of no return.

Things to Remember During Your Outing:

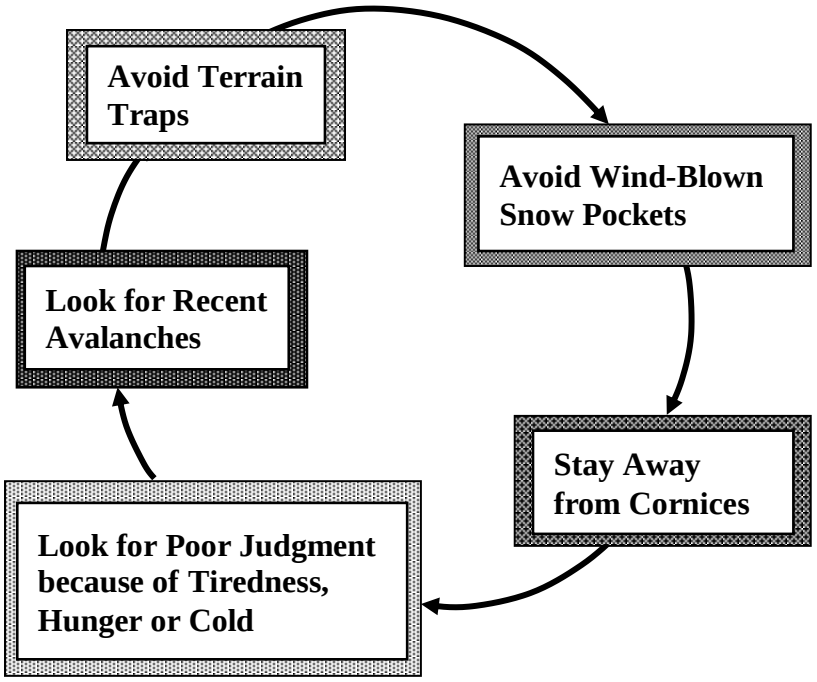
1. While still in the parking lot, compare the terrain you see with the map and route you plan to follow. Remind yourself of the bearing between your starting location and the route you plan.
2. Set your altimeter at the trailhead.
3. Remove a layer of clothing just before starting out to minimize sweating problems.
4. Staying together is the responsibility of all party members. Keep an eye on the person in front of you and the person behind you. Let those ahead know if it appears the group is getting split up.
5. Keep your map and compass out. It is very important to know at all times where you are on the map and what direction you should go to get out in case of a sudden storm or whiteout or in case wind-blown snow covers up your trail.
6. Travel slowly. Avoid sweating, as this will only lead to rapid chilling later on. Limiting breaks to no more than five minutes will also minimize chilling.
7. If your feet or hands are cold, put on a hat. Additional warmth can be obtained by doing local isometric exercises with the affected extremity or by using a disposable Handi Warmer.
8. Be aware of *changing weather* conditions and turn back if weather or route conditions appear to be hazardous.

Travel Wise Checklist

The American Institute for Avalanche Education (AIARE) has developed a Checklist and a graphic to prompt Wise Travel practices.



Continually Evaluate your Surroundings:



HAVE A SAFE AND ENJOYABLE WINTER — And remember after reading about all of the hazards out there that there *are* avalanche safe areas in the mountains *during all levels* of avalanche danger. You just need to understand the basics of avalanches, and practice awareness and avoidance.

DON'T FORGET TO HAVE FUN!

Winter Driving

You should have tire chains (and know how to install them), an insulating pad (to lay on while installing the chains), a shovel, sand or kitty litter (for traction), a full tank of gas, warm clothes, and other winter driving essentials. Winter driving seminars are offered by the Seattle Mountaineers branch during the winter. You should also check on driving conditions at the mountain passes. (See contact info later.)

Winter Driving Checklist

(Adapted from the Seattle Mountaineers Winter Driving Course)

VEHICLE PREPARATION

- Antifreeze mix rated to at least -35F. Flush and change the mixture every two years.
- Battery should have the highest cold start amp capacity that will fit in your battery box.
- Consider replacing the battery at the end of the warranty period.
- Engine oil: Lighter is better in the cold. Check your owner's manual.
- Oil weights for cold to colder temperatures: 1 OW40, 1 OW30, 5W30, 5W20.
- Keep your engine tuned according to manufacturer recommendations.
- Tires should have a minimum of 4/32" tread across the entire width of the tire.
- Minimal tire requirement is All-Season. Mud & Snow or All-Terrain tires may be safer depending on where you drive and how often.
- Front wheel and 4-wheel drive vehicles should mount the same type of tires on all four wheels.
- Windshield washer fluid should be rated to at least -10ºF.
- Check the wiper blades. Replace if brittle or cracked.
- Maintain tire pressure at recommended levels

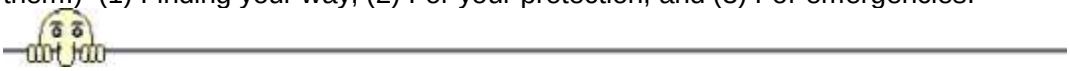
EQUIPMENT TO CARRY IN THE CAR

- Battery jumper cables
- Blanket
- Broom - cut off the handle so it fits in the trunk better. Put it under the car at the trailhead so you can brush off the snow from the car before getting in after your trip.
- Butane lighter to thaw locks

- Duct tape. Flares
- Lights: Flashlight (with extra batteries), 6 volt spotlight and/or 12 volt plug-in trouble light
- Screen or wire mesh to put under the drive wheels for traction when stuck
- Shovel
- Sno-Park permit
- Tool kit including extra belts
- Tow rope
- Windshield deicer spray
- Windshield scraper
- Chains (and know how to put them on --- this means practicing at home!) Steel cable or reinforced steel link type
- Gloves (waterproof with insulting liners)
- Hanger or hook to retrieve chains from under car
- Old jacket and/or pants for putting on chains
- Closed cell foam pad or old rug on which to lay
- Rubber tighteners

Ten Essentials

The Ten Essentials are required on all Mountaineer outings. All party members must have their own. The Ten Essentials can be divided into three group types. (Grouping helps you to remember them.) (1) Finding your way, (2) For your protection, and (3) For emergencies.

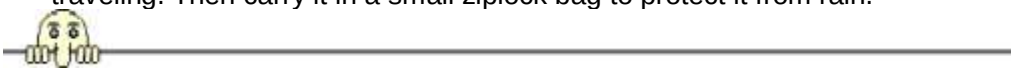


Finding Your Way:

•**Headlamp or flashlight with extra batteries and bulb** — Should be lightweight and reliable. Headlamps work much better for scrambling because your hands will be free to hold on to rock, brush, etc. You can also wear a headlamp around your neck if you don't like it on your head. Use only alkaline batteries or lithium. (Lithium batteries are the lightest, most durable and least sensitive to cold temperatures but are the most expensive). Test your light before each trip. If you use it much on a trip, replace the batteries.

•**Compass** — Never go anywhere without a compass. It is hard to imagine getting turned around 180°, but it happens. Once you lose that all-important sense of the direction, the alpine world suddenly appears featureless, inscrutable and hostile. Without a compass, you're lost — body and soul.

•**Map, topographic** — Some prefer *Green Trails* maps because they are more updated than *USGS* maps. Others prefer *USGS* because they show more detail for off-trail traveling. Some take both. It's a personal choice. Fold your map so that it shows the area in which you will be traveling. Then carry it in a small ziplock bag to protect it from rain.



For Your Protection:

•**Food, extra** — In addition to your regular lunch and snacks, take along extra food — enough so something is left at the end of the trip (in case your day is extended or you need to spend the night on the mountain). It should require no cooking, be lightweight, and high in carbohydrates (granola bars, cheese, nuts, etc.).

•**Clothing, extra** — Take more than you think you will need. See below.

•**Sun Protection** — At the high elevations of mountain summits, UV rays are very strong; and the presence of snow can effectively double the intensity by reflecting these rays back up at you. **Sunglasses** are a necessity to protect eyes from snow blindness, a painful and debilitating condition. Glasses should be **very dark** and block out harmful UV rays found at high altitude. On snow outings, glasses should have side shields (available at most outdoor stores). Nylon frames won't cause frostbite like metal frames. Glass fogs more easily in cold weather; polycarbonate scratches more easily. Waterproof **sunscreen** and sun-blocking **lip balm** are also essentials.

For Emergencies:

•**Knife** — For first aid and emergency use. Should be small, lightweight, folding and sharp.

•**First aid kit** — Carry one and know how to use it. Use information from the MOFA course or Wilderness First Aid course.

•**Matches, waterproof** — Carry windproof matches in a waterproof container with a compatible striker.

•**Fire starter —** Candles, butane lighters, chemical fuel (Firesticks, Fire Ribbon, etc.) — in case of an emergency. Carry something that will hold a flame long enough to start a fire with wet wood. For starting damp wood fires, the constant flame of a candle is excellent; and it's amazing the amount of light that a candle will provide. Candles can also be used to heat a cup of water. Don't make a butane lighter your *only* source of fire starter — they don't work when it's cold.

Ten Essentials Systems:

The debate over what and how much to carry in your backpack has continued over the years. With modern technology improving, the weight and makeup of equipment, this healthy argument will, no doubt, continue. Should a climber go “light and fast,” or should they play it safe? In truth, what you carry in your pack will be somewhat dictated by the type of activity you are pursuing. Are you out on a day scramble, or is this an overnight trip? Is the activity likely to involve snow and ice? If you find yourself underprepared, you will likely have to end your trip early. Mountaineers and outdoorsmen recently have developed the “Ten Essentials” for everything from kayaking to climbing, fishing to backpacking, hiking to hang gliding. In short, these lists and system are intended to start you thinking about what you will need. Plan ahead and you may better ensure a safe and exciting trip.

Ten Essentials: The Classic List	Ten Essentials System
1. Map 2. Compass	1. Navigation
3. Sunglasses and sunscreen	2. Sun protection
4. Extra clothing	3. Insulation (extra clothing)
5. Headlamp/flashlight	4. Illumination
6. First aid supplies	5. First aid supplies
7. Fire starter 8. Matches	6. Fire
9 Knife	7. Repair kit and tools
10. Extra food	8. Nutrition (extra food)
	9. Hydration (extra water)
	10. Emergency shelter

Appendix

Destinations

You are encouraged to join snowshoe trips listed on mountaineers.org. If you don't find a trip there then select one of the routes that are on the Mountaineers web site. The steps are:
Mountaineers.org
Select Explore
Find Routes & Places
Select Snowshoeing (on the Left)
Select Beginner or Easy (on the left under Snowshoeing Categories)

The Look at the possibilities

Another possibility is to go to wta.org
Select Find a Hike
Under Hike Name Enter: "*snowshoe*"
Select the Region

Then look at the possibilities: (Join WTA)

Some of these are also groomed ski trails, be careful not to step on the groomed tracks.

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Mountaineers.org
Select Explore
Find Routes & Places

Select Snowshoeing (on the Left)
Select Beginner or Easy (on the left under Snowshoeing Categories)
Then look at the possibilities!

More snowshoe routes are listed on wta.org.
Select Find a Hike
Under Hike Name Enter: "*snowshoe*"
Select the Region
More possibilities! (Join WTA)

Some of these are also groomed ski trails. Please be careful not to step on the groomed tracks!

Stevens Pass Area

Easy

Chiwawa Snow Park
Grace Lakes
Foss River Road
Icicle River Trail (Leavenworth)
Icicle Creek Golf Course (Leavenworth)
Lake Wenatchee State Park
Miller River (Check snow level)
Nordic Center

Easy/Moderate

Surprise Creek

Moderate/Strenuous

Lanham Lake
Skyline Lake
. Stevens Pass Nordic Center: groomed snowshoe trails.

Snoqualmie Pass Area

Easy

Cabin Creek
Gold Creek Basin
Lake Easton State Park

Salmon La Sac

Moderate

Commonwealth Basin

Strenuous

Amabalis Mountain: 2200 elevation gain

Paradise at Mount Rainier

When going through the gate, ask for a snowshoe map. It delineates the high avalanche areas to stay away from.

Paradise has several wonderful easy trails.

Park at Narada Falls and follow either the Paradise Valley trail or go up to Reflection Lake.

Mt. Baker

Easy

Heather Meadows

Olympic National Park - Hurricane Ridge

Pick up a map at the visitor center. It is an easy 2 mile walk from the visitor center towards Hurricane Hill/Obstruction Point Road, which is an easy to moderate route.

Mountain Loop Highway

Park at the road closure and snowshoe up the road to Big Four Ice Caves Picnic area and down the trail to the washed-out bridge just before the Big Four Ice Caves.

Easy

Deer Creek Road

Easy/Moderate

Pilchuck Road

Strenuous

Heather Lake

Lake 22: Snowshoe a short distance, but there are avalanche slopes farther. Be vigilant! Don't go unless the Avalanche danger is Low or Moderate.

For more information look for currently scheduled trips or possible trip reports at:

Everett Mountaineers: www.everettmountaineers.org

City of Everett Parks Department: www.everettwa.org/parks

Websites

- www.alpineandy.com - good source
- www.avalanche.ca/cac - pre-course exercise
- www.avalanche-center.org – avalanche training and information
- http://caltopo.com – mapping
- iheartpacificnorthwest.com/tag/snowshoeing– places to snowshoe
- http://www.isu.edu/outdoor/avahints.htm - good summary
- www.naturenw.org – Nature of the Northwest
- http://www.noaa.gov/wx.html - good weather information
- http://nsidc.org – National Snow & Ice Data Center
- http://nwhikers.net – lost/found/trade/buy/sell items
- www.onthesnow.com – snow reports, weather, webcams, etc.
- www.trails.com – guide to the outdoors
- www.nwac.us/ - Northwest Avalanche Center
- www.wsdot.wa.gov/Traffic/passes – WA mountain pass information
- www.wta.org - fresh trip reports

FIELD OBSERVATIONS

NAMES:				
Location •Time •Elevation •Aspect				
Sky •Cloud cover •Precipitation				
Temperature •Air •Surface & 20cm↓				
Wind •Speed / direction •Blowing snow				
Snow •Surf form / size •New snow •Snow height •Pen boot / ski				

TERRAIN USE • **SIGNS OF UNSTABLE SNOW** • **PATTERNS**
Red Flags • Avalanches • Snowpack Tests • Other Observations • Comments

REVIEW THE DAY: "Were our choices in line w/ our forecast / plan?" "When were we most at risk?"
"Where could we have triggered a slide?" "What would we do different next time?"

Class Evaluation Form

Please rate the following items on a scale of 1 to 5, with 5 being the highest score. Use the back of this sheet to list other topics of interest to you, and comment on the facilities, the administration of the class or any other aspect of the Everett Branch Snowshoe Program. We *`REALLY'* **want your input..**

Knowledge of materials presented?	1	2	3	4	5
Skill as an instructor?	1	2	3	4	5
The written materials? (syllabus)	1	2	3	4	5
The classroom facilities and location?	1	2	3	4	5
The course overall?	1	2	3	4	5
What do you consider to be the greatest strength of the program?					
The greatest weakness?					
What changes would you recommend to improve the course?					
Are you interested in becoming involved with the Everett snowshoe program? Name:_____					