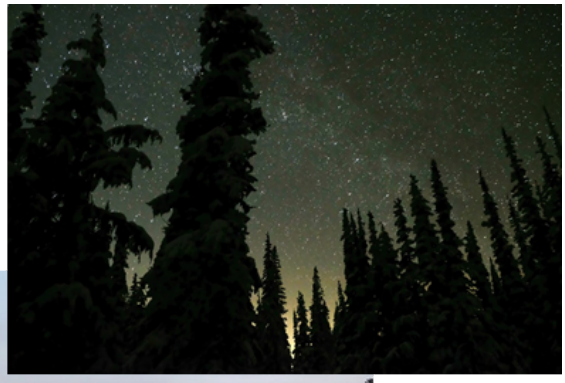
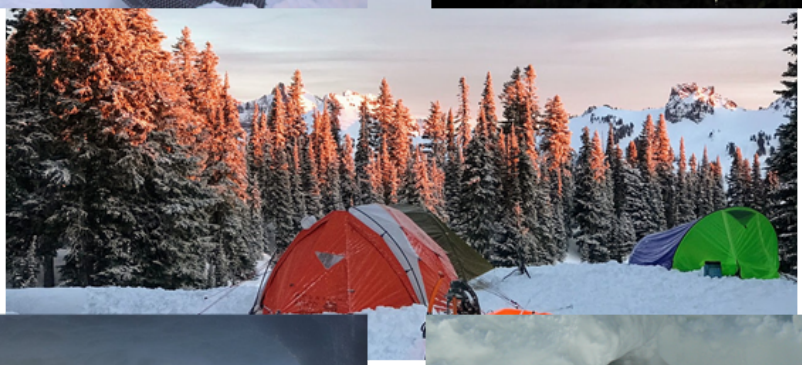
Tacoma Mountaineers
Winter Camping Course

Student Manual

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Welcome

Welcome to the Mountaineers and the Tacoma Branch Winter Camping Course. We're excited to have you join us this season for a combination of a lecture and field trip where you will gain the experience to enjoy the outdoors in a very special way during the winter months.

During this course, students will have the opportunity to learn basic snow camping techniques, methods to stay warm through proper layering, basic equipment needed for typical overnight activities and how to shelter and stay safe in cold weather.

Students will also be exposed to a basic overview of wilderness navigation and avalanche awareness. Please review this student manual prior to the lecture and prepare yourself to have fun in the snow with us.

Graduating The Course

Successful graduation earns the member the privilege to participate in most Mountaineers Winter Overnight activities.

- Attend classroom lecture
- Participate in the overnight field trip
- Attend an Avalanche Awareness seminar
- Volunteer for one Stewardship activity
- Send graduation request to Tacoma Snowshoe Committee

Students have two years to complete these requirements.

Snowshoes

While the Winter Camping Course is not a Snowshoe Course, the use of snowshoes is highly recommended for the approach to the campsite and while maneuvering around and preparing the campsite.

Consider renting different styles and brands of snowshoes before purchasing them. Get snowshoes for the Pacific Northwest. Our snow is famous for its water content so you won't need snowshoes to displace as much snow as you might if you were snowshoeing in drier conditions. The metal frame snowshoes are used widely here. Most snowshoers in the Northwest use the 8"X24" size; if you are very heavy (combined body weight and pack weight), you might get the next larger size. For most snowshoers, the energy required to lift a longer snowshoe is much greater than the minor improvement in flotation that the additional length provides. Whatever kind of snowshoes you select, be sure that the bindings on your snowshoes hinge up and down freely, yet allow little to no lateral movement of your boot. The binding should grip the boot firmly to keep it from shifting forward.

Be sure your snowshoes have traction devices (a traction device under the heel and a crampon or claw under the ball of the foot). Traction devices must be effective in all directions so they will hold when going straight up or down the slope, traversing or angling uphill. If snow freezes to the metal claw, you can attach a piece of tough plastic, vinyl fabric or the universal fixer, duct tape, to the claw to reduce the tendency for the snow to stick.

Inspect your rental snowshoes for wear before walking away from the store with them. Look for frayed laces or straps, for loose screws or bolts, and for pulled-out eyelets, hooks or rivets. Check the hinge mechanism to ensure that it pivots freely but does not wobble side-to-side.

Snowshoe Techniques

Basic snowshoe technique on flat terrain is not much more difficult than walking, once you get used to having feet that are 8 inches wide and 24 inches long. On steeper terrain, there are a few techniques that you should practice to travel successfully.

The first step is getting them on. Many snowshoes have no left or right shoe. Step into the snowshoe and align the ball of your foot with the axle of the traction device. Tighten up the heel band just above the lip where the sole of your boot meets the heel counter. Then tighten the bands across the top of the snowshoe snugly. Be sure to get the excess strapping out of your way so you won't trip on it. Follow the manufacturer's instructions in putting them on. Now you're ready to venture forth. You'll find that a rolling gait with the tips of the shoes lifted slightly upward with each step is the easiest way to walk. You may need a slightly wider stance to walk without stepping on the other snowshoe, but you'll probably find this comes without much effort.

Since Northwest snow conditions vary widely - sometimes from step to step - the snowshoer must work to maintain good balance with the weight centered over each foot. Sliding strides sometimes helps, but try to keep your weight centered. On hard or icy surfaces, you'll have to plant each foot firmly to help set the traction device of the snowshoe.

Gear Selection

Clothing

Camping in winter requires more gear, or in some cases, different gear than is needed when camping in the summer months. Camping in snow will often require a period of snowshoeing to your destination and digging snow when preparing your shelter area.

During this physical activity, your clothing can become saturated with moisture from profuse sweating, even in winter. If wet, you will chill down very quickly as soon as you stop for a break or move to the back of the group. To manage this, you need to learn how to stay dry and warm without overheating. Avoid excessive sweating by adjusting the amount of clothing you are wearing frequently and by adjusting the pace as necessary.

You can combat heat loss through radiation by remembering, if your feet are cold, put on a hat (this applies equally to the rest of your body). It's much easier to put on a hat than add another layer of clothing. Keeping your neck warm by putting on a fleece neck gaiter or putting on your jacket hood is also very helpful. Conduction occurs when you sit on cold surfaces during rest breaks. Use an insulating foam sit pad during breaks or sit on your pack to avoid direct contact with cold snow, rocks or tree stumps. Winter campers often find that it helps to put a foam pad under their feet, as well.

Layering

Layering fights convection and evaporation. In the Northwest you will need at least three layers for winter activities: a base layer to wick away moisture from your body, an insulating layer to retain body heat and a shell layer for wind and rain protection.

Base Layer

You will work up a sweat when you snowshoe. As evaporation removes the sweat, your body cools. For this reason, synthetic materials, such as polypropylene, polyester or acrylic, will wick away sweat from your body(so will silk and wool).

Do not wear any cotton during winter activities.

Once cotton is wet, it is worthless as an insulating layer and will actually cool your body too quickly. The base layer for snowshoeing is usually long underwear (tops and bottoms) made of synthetic material, wool or silk. Long underwear is available in a variety of weights, but lighter weights are usually preferable for aerobic activities like snowshoeing. Bring an extra underwear top to put on if one gets wet.

Insulating Layer

You can wear a single heavy layer or several light layers. Wool or synthetic materials (i.e., fleece or pile) work best for our damp climate. If they get wet you can just shake them out and they will still insulate you and dry very quickly. Down is generally a poor choice for snowshoeing in the Pacific Northwest environment because it is nearly impossible to keep a down garment dry while snowshoeing. When down gets wet, it is useless as an insulating layer. However, some people like to put on a down vest or jacket when they stop for breaks or make camp. If you can keep a down garment dry under your shell, it can't be beat for compressibility, lightness and warmth.

Shell Layer

Shell Layers have two purposes: defending you from wind, and protecting you from rain and snow. The stronger the wind, the more heat you will lose through convection. In keeping warm, wind protection is as important as adequate insulation. When it is windy, wear a wind-resistant jacket and pants. Cover your head with a hat or hood. Often, a thin wind-resistant layer will maintain warmth more effectively than a thicker layer that the wind penetrates. Wearing several layers of lightweight clothing will trap more warm air near your body than a single bulkier layer of clothing will. A lightweight vest will provide torso warmth without restricting arm movement.

Wet clothing is dangerous. It can extract heat from your body 24 times as fast as dry clothing. When it is raining or snowing, wear densely woven waterproof jackets and pants. Coated nylon works well but tends to trap your body's moisture causing underlying layers to become damp. Breathable waterproof fabrics, such as Gore-Tex®, are more effective, but they aren't perfect.

Wind Chill

Be sure to bring a hat, mittens, jacket and pants to protect you from windy conditions in the mountains. Although the temperature may feel tolerable while out of the wind, body temperature drops quickly. When adding wind to exposure the tolerability becomes much less and can be dangerous.

Adequate Layers

In a bivouac situation, you must remain warm enough to survive without danger of frostbite or hypothermia and, preferably, you should also be warm enough to sleep. Layering and insulating principles apply. You must bring enough clothing to remain warm during low levels of activity, and you must remain dry because wet garments conduct your body heat away from you into the cold air or cold ground next to you. Don't forget that you may get clothing wet from perspiration as well as from snow or rain. Wet boots and socks can cause your feet to become extremely cold. Dry socks and boots and/or standing on a piece of closed-cell foam pad will help keep you warm by limiting the conductive flow of heat away from your body. Extremities such as head, hands and feet pass off large amounts of body heat if not insulated. Put on a warm cap and mittens before you become chilled. The first principle of survival is to avoid situations in which the survival issue arises. Physical conditioning, trip planning, route finding,

competent leadership, and adequate equipment all can help you to avoid ending up in a survival situation.

Clothing Checklist

Below is a typical packing list for basic snowshoe activity. Extra items should be packed into waterproof bags to ensure they remain dry throughout the activity. Material should be breathable or manageable to reduce the accumulation of sweat.

Upper Body Clothing

- Base Layer Top, quantity 2 (wear one/pack one) (wool or synthetic)
- Lightweight Synthetic Top
- Mid layer Top, quantity 1 (fleece or wool)
- Shell Jacket with Hood (Gore-Tex® or equivalent)
- Insulating Jacket with Hood (Down or Synthetic)

Lower Body Clothing

- Synthetic Underwear
- Base Layer Bottom, quantity 2 (wear one/pack one) (wool or synthetic)
- Synthetic Climbing Pants
- Shell Pants with full side zips (Gore-Tex® or equivalent)

Head, Hands and Feet

- Warm hat
- Sun hat
- Liner gloves, quantity 3-4 pairs (wear one/pack the rest)
- Mid weight glove
- Insulated glove or mittens
- Waterproof glove
- Liner socks, quantity 2 pair (wear one/pack one)
- Outer socks, quantity 2 pair (wear one/pack one)
- Waterproof and Insulated Alpine Hiking Boot

- Gaiters

Boots

The type of boot that should be worn during a winter overnight will depend on the particular approach to the campsite. If there is a considerable hike to your location and snowshoes will be worn, an insulated and waterproof leather hiking boot with stiff uppers should be worn. The stiff upper will help reduce constriction of blood circulation caused by the snowshoe bindings.

If the approach is rather short, snowmobile or insulated rubber-type boots may work well for you. Select a boot with a moderately stiff sole that you can walk in when not wearing your snowshoes. In the winter a boot that is too tight will produce cold feet.

Whatever the approach or the type of trip, fashion boots (think Uggs) or lightweight trail boots will not be allowed on Mountaineers sponsored activities. These types of boots are either not waterproof or insulated enough for a winter overnight.

Backpack

Winter camping and backpacking requires extra gear and warmer, bulkier clothing, so you may need to use a larger pack than you typically do in the summertime. Pack as lightly as you can, but always make sure you're prepared for winter conditions. For most winter overnights, a minimum 65-liter pack.
If you plan on carrying skis or snowshoes, make sure your pack has lash points or is otherwise able to secure these large items.

Tent

For winter camping you want the warmth and weather protection of a four-season tent (which is really a one-season tent … winter). These tents can be completely sealed off from snow and wind, so you stay nice and dry inside.

A typical 3-season backpacking tent can work if you're making camp below tree line and you're not anticipating especially stormy weather, but for high winds and heavy snowfall, a 4-season tent is recommended. 4-season tents have sturdier poles and heavier fabrics than 3-season tents so they can withstand powerful gusts of wind and heavy snow loads. They also have less mesh and the rain flys extend close to the ground to keep swirling snow from getting inside.

For either type of tent, learn how to stake out your tent with all the guylines to keep it from becoming a kite in raging winds.

It's a good idea to get a tent that has room for one more person than will be sleeping in it (a 3-person tent for two people works well). This gives you room to stow gear inside away from the elements.

Double-wall tents tend to provide extra warmth, less condensation, and more comfort for extended stays, but single-wall tents are popular with weight-conscious backpackers. Regardless of which type you use, make sure the vents are open and you leave a small opening at the top of the entrance zipper, to allow moist air to escape. This may seem counterintuitive, but otherwise condensation will collect inside the tent and you'll wake up wet.

If you won't be on snow, set up your tent just like you always do. If you will be on snow, here are some items that will improve your experience:

Pack down the snow - Loose snow is more likely to be melted by your body and make it uncomfortable for sleeping. Before setting up your tent, walk around with your snowshoes (or skis) on your feet. You can try to stomp around in your boots but will most likely post hole and destroy your sleeping area.

Build a wall - If it's windy, build a snow wall around your tent if possible. If it's not feasible to do so, then dig out the snow a couple of feet down for your tent and vestibule. This helps to reduce wind impact. Don't completely seal up your tent though. It still needs to receive sufficient ventilation.

Dig out your vestibule - You can dig out a bench underneath your tent vestibule to create more space for stowing gear and to make it easier to get in and out of your tent.

Use snow stakes - Standard tent stakes won't do much good in snow. Instead, bury stuff sacks filled with snow or use stakes designed for use in snow in a deadman position. Make sure your tent is staked out securely so it won't blow away if the wind picks up.

Stay away from sharps - Keep any item that could tear your tent well away from your shelter and do not bring them inside. This includes items like ice axes, crampons and ski edges. Ripping your tent on a stormy winter day can be disastrous. When traveling as a group, it is common to designate a central "sharps area"

Sleep System

Winter camping usually means sleeping on snow, which means you're going to need a winter sleeping pad setup that blocks the cold beneath you from stealing away, or conducting, precious body heat. Conduction is heat loss that occurs when your body is warmer than the ground below you. Your body will continue to lose heat until the ground beneath you warms- a fight you aren't going to win. This is where your sleep system comes in.
A typical winter overnight sleep system is the combination of a winter sleeping bag, a closed-cell

foam pad next to the ground and a self-inflating pad on top to get the best insulation from the cold ground. The foam pad also serves as insurance in case the self-inflating pad gets punctured.
Pads are rated by R-value, the measurement of insulation, ranging from 1.0 and 8.0. The higher the R-value, the better it insulates. Pads designed for all-season or winter use usually have an R-value of about 4.0 or higher. Some campers will add a small tarp to their system to further reflect body heat back towards the sleeping bag.

Sleeping Bags

To ensure comfort on cold nights, it's a good idea to use a sleeping bag that's rated at least 10°F lower than the coldest temperature you expect to encounter. You can always vent the bag if you get too warm.

Cold-weather bags are supplied with generous amounts of goose down or synthetic insulation. Down is a popular choice due to its superior warmth-to-weight ratio. Just make sure to keep it dry (when wet, down loses much of its insulating ability). Winter bags are distinguished by their draft tubes behind the zippers, draft collars above the shoulders and hoods to help keep the heat in the bag. If you're not sure your sleeping bag is warm enough, you can add a sleeping bag liner. These add extra warmth while also minimizing wear and keeping your bag cleaner. The extra layer can add about 5 – 10°F of warmth.

If you bury your head inside your sleeping bag, moisture from your breath will get trapped in the bag. Instead, cinch the draft collar and close the hood down around your mouth and nose so you have a hole to breathe through. This is especially true if you use a down sleeping bag. Remember, condensation is the death of a down bag. A wet bag significantly loses its insulation and takes time to dry, which is sure to put a damper on your night. Achieve maximum loft or fluffiness by shaking your bag upside down. This technique redirects the down back to the upper half of the bag near your core where heat retention is most critical.

Stove

Most liquid-fuel stoves and some canister stoves are good options for winter camping.
As a general rule, liquid-fuel (white gas) stoves tend to work better than butane canister stoves in the winter because the latter lose performance in colder weather. White gas works as well in sub-zero temperatures as it does in the middle of the summer, so you can count on it in any conditions. This becomes an important consideration when you think about the fact that you'll be melting snow to get most of your drinking water and make your meals a couple times a day. No stove means no water or food, which means going home early. Plan for about eight ounces of fuel per person per day for trips where you'll have to melt snow for all your water.

Liquid-fuel stoves run on white gas, which burns hot and clean and performs well in below-freezing temperatures. But, they tend to be heavier and slower to boil than canister stoves, and you typically have to prime them before you can cook. Some multi-fuel stoves can also run on unleaded auto gasoline, kerosene, jet fuel and/or diesel, making them a great choice for international travel.

Canister stoves are lightweight, compact and quick to boil, but they don't all work well in cold weather. If you decide you want to use a canister stove for winter camping, make sure it has a built-in pressure regulator. In cold weather, canisters can depressurize and produce a weak flame. A pressure regulator helps combat this. Also, keeping your fuel canister warm by stowing it in your sleeping bag at night and in a jacket pocket when you're around camp and getting ready to cook can help stove performance.
You may want to bring a backup stove, just in case your primary stove malfunctions. Having a second stove can also speed up the group-cooking process. Work out the number of stoves as part of your group pre-trip planning.

Using Your Stove

Fuel - Keep in mind that it takes extra fuel to melt snow for drinking water. And, you'll use more fuel at higher elevations.

Never Heat a Dry Pot - This is important! Always keep a little water in the bottom of your pot to efficiently transfer energy to the snow. Put an inch or so of water in your pot, then pile in snow. As the snow melts and the water level rises, pour out the water, keeping that same inch at the bottom. Without this water, you can actually scorch the snow and damage your pot.

Don't Heat Drinking Water - When melting snow for drinking water, don't waste energy heating the water. Your goal is to melt, not boil. Once you've got liquid water, you've got what you need.

Use a Lid - Putting a lid on a pot greatly reduces the amount of energy needed to boil water. There may not be much of a difference in boiling speed, but there is typically a significant difference when it comes to melting snow. Putting a lid on your pot traps hot air and steam inside the pot, which speeds up the melting process, and greatly improves melting efficiency. This also allows you to regularly swirl your pot, mixing up snow and water, without risk of spilling anything. Again, boosting fuel efficiency.

Insulate - Using a piece of insulation that's sized to fit your stove as a stove base can improve performance. If you're using a liquid-fuel stove or a canister stove with a remote burner, the base will prevent your stove from sinking into the snow and becoming unstable as it heats up. If you're using a stove that sits on the fuel canister, wrap the base in tin foil to reflect some heat back up and help keep the canister warm.

Shovel

An essential part of building a snow structure is a snow shovel (also called avalanche shovel). These will help you build a wall around your tent to block the wind, bury tent stakes, excavate a group kitchen, and construct a snow cave or wormhole. Shovels are also used for performing common snow stability tests and in avalanche rescue situations.

Things to consider when choosing an snow shovel:

Material - Metal has the best strength-to-weight ratio for an avalanche safety shovel that you plan to use in the backcountry. Aluminum shovels made of 6000 and 7000 series aluminum allow less deflection and are stronger and more durable than plastic shovels. Plastic may be lightweight, but metal allows for more successful snow removal.

Blade Size and Shapes - Shovel blades vary in shape and size depending on their target user. Smaller blades are easier to handle but less efficient at chopping and moving large amounts of snow, while larger blades can move more snow but take more strength to operate and may tire you more quickly. Keep in mind that it may be easier to increase your rate of shoveling with a small shovel than to consistently under fill a large shovel when you're tired.

Your shovel blade should fit easily in your backpack. It should be strong and capable of chopping through hard and dense avalanche debris. Some shovel blades are flat, some are curved, and some models have serrated blades that help cut through snow and ice. When digging snow pits and making smooth walls, the shape and angle of the shovel blade is a factor to consider; a flat blade will help you create a smoother pit wall.

Handles and Grips - Look for a shovel that feels good in your hands while digging and fits inside your backpack. Anything on the outside of your pack is at risk of getting ripped off during a fall. Most shovels have telescoping shafts that give you several leverage options. Longer shafts give you more leverage for digging; short shafts are more maneuverable in tight spaces. Shafts that are oblong or triangular in cross section can offer increased rigidity and strength. There are several common grip types. T- and L-shaped grips are often lighter and more compact, while larger D-shaped grips are sometimes more comfortable to hold and can be used with mittens. Choose a shovel grip that works well for you and your hands. Some shovels offer the ability to configure the shovel as a hoe; there are times when the most efficient method of moving snow is to chop and drag it.

Weight - Sure, light is right when touring, but your shovel is not the place to cut back on weight. You want an absolutely dependable tool for effective digging and shoveling during a rescue situation – if in doubt, go a bit heavier.

Snow Saw

Snow saws are just that, saws for cutting snow. Snow saws are helpful when creating snow barriers when camping, building trenches or igloos, and testing snow stability to avoid avalanches. In an emergency, snow saws can be used to cut through wood.

Setting up Camp - Around camp, backpacking shovels can do wonders such as build wind barricades and trenches, but if the snow is hard packed or frozen over, shovels can have a hard time breaking in. Saws will make cutting through snow much easier.

Testing Avalanche Conditions - When traveling in potential avalanche areas, you'll want to stop and perform stability tests in the snow. Snow saws can make cutting into snow blocks and performing avalanche tests much easier.

Emergencies - If there's ever a need to cut wood for an emergency, a snow saw will get the job done. Ideally, if you're backpacking, you should carry a separate saw for cutting firewood.

How Long Does a Snow Saw Need to Be? - If you're testing snow columns for avalanche safety, you'll want to make sure you have a long enough blade. Extended column test requires a snow column 30 cm deep, so you'll probably want a blade that is at least 35cm long. A few saws on the market attach to adjustable ski poles to help extend the length of the saw. This is quite useful for cutting the back of the snow column where it's harder to reach.

Different Types of Snow Saws - Snow saws come in different variations depending on their use. Some snow saws have aggressive teeth and are designed for building shelters and cutting through ice and wood. Other saws are scientific snow saws with measurements for analyzing snow conditions and snow crystals. Some even attach to the end of ski poles, are foldable, and come in different lengths.

Trekking Poles

Trekking poles with baskets are optional for snowshoeing and can be used for shelter building. Most people find them indispensable, especially when descending steep slopes. Of course, you will want to learn to snowshoe in balance and not rely on poles all the time. Sectioned poles that you can collapse when not using them can be conveniently stored on your pack and give you a low profile for ducking through brush and trees. Be aware of the different section locking systems and be sure to choose one that allows for adjustment in the snow with cold gloved hands.

Ten Essentials

The Ten Essentials must be carried on all Mountaineer activities.

1. Navigation: Map & Compass (with declination set for the area)
2. Sun Protection: Wrap around sunglasses (preferably glacier rated glasses or goggles) and sunscreen, lip sunscreen
3. Insulation (extra clothing)
4. Illumination: Flashlight or headlamp, with extra batteries/bulb (unless LED)
5. First Aid Supplies: See note below
6. Fire: Candle or other fire starter and matches in waterproof container
7. Repair Kit and Tools
8. Nutrition (extra food)
9. Hydration (extra water)
10. Emergency Shelter

First Aid kits can be made from home supplies – it is not necessary to go out and buy an expensive commercially prepared kit. A typical kit may consist of: 1" tape – large roll, Pain med – anti-inflammatory preferred, Ace Wrap, Gloves (non-sterile), Gel type dressing for blisters, Pencil for making notes in event of accident (pens freeze), Gauze pads (clean bandana works great), Band Aids® (large type), Moleskin, Instant Hand Sanitizer, Full-size SAM splint (for immobilizing sprains, broken bones, stabilizing neck injuries).

Staying Comfortable

Throughout a winter overnight trip, you will most likely experience long durations of physical exertion and extended periods of inactivity. How you stay comfortable, warm and dry will vary depending on time of day and work being performed.

Eat food for warmth - Your body generates heat as it digests food, so if you're feeling cold try eating some food. Before you go to bed, have a little snack to keep your metabolism going and keep a candy bar nearby if you get cold in the middle of the night.

Spoon your meal - If you are preparing packaged freeze dried food for your meal (such as Mountain House or Backpacker's Pantry), add the hot water, seal the pouch and place it inside your jacket. Enjoy the heat while your meal stands for 10 minutes.

Add even more ground insulation - Put your waterproof layers between your two sleeping pads to add a little extra insulation from the cold ground.

Use your foam pad for more than sleeping - Use your foam sleeping pad to sit or stand on while you're cooking. It helps you stay a little warmer and drier. Wrapping over your legs while sitting will help keep you warmer and shield falling snow from your body.

Fill floor space in your tent - A bunch of empty floor space inside your tent will make it hard to warm up the interior space. Bring your backpack and other gear inside (avoid sharp items that could rip your tent, like crampons and axes) and place it around you on the floor of your tent to act as insulation against the cold ground.

Fill a bottle with hot water - Create a little heater that will last long into the night by boiling a liter of water and pouring it into your hard-plastic water bottle. Screw the lid on tight, make sure it doesn't leak, wrap it in a sock and toss it in your sleeping bag. Holding the bottle close to your tummy or between your legs against your femoral artery will really heat you up. In the morning, you'll have non-frozen water to drink.

Keep your boots inside - Bringing your boots inside your tent will keep them a few degrees warmer than if you leave them outside. This will make them a bit more pleasant to put on in the morning. If your boots have removable liners, keep them warm at night by putting them in your sleeping bag. The same is true for socks and boot insoles.

Sleep in clean clothes - Over time, body oils, sweat and dirt can rob your sleeping bag of its insulating power. Change into clean long underwear and socks for sleep.

Use your body as a dryer - If your gloves or socks get wet, put them on top of your base layer on your shoulders, in your armpits or tucked into your pants' waistband where your body heat will dry them.

Stow your bottles upside down - Water freezes from the top down, so by stowing bottles upside down, the bottle lids are less likely to freeze shut. Just make sure your bottle lids are screwed on correctly and won't leak.

Start out with your batteries fully charged - Winter nights are long, so make sure your headlamp, GPS and cell phone batteries are new or fully charged before an excursion and always take extras. Lithium batteries perform well in cold weather, but they can overpower some devices like headlamps (check your product's manual for compatibility). Alkaline batteries should work in any device, but they drain at a faster rate.

Keep electronics warm - Cold temps can zap battery power. When not in use, stow things like your headlamp, cell phone, GPS and extra batteries in your sleeping bag or a jacket pocket close to your body. A foot warmers stuck to the back of your cell phone and or GPS will help make the battery last longer.

Two pairs of gloves should be considered minimum - Gloves take a long time to dry, and cold hands make you miserable in a hurry. You should also learn how to do everything shy of tying your boot laces while still wearing your gloves so you don't unnecessarily expose your bare fingers to frigid winter temps.

Down Booties - Because you'll love them!

Eye Protection - Snow blindness is a type of temporary eye damage caused by snow reflecting UV light. Because snow is reflective, looking out into white snowy expanse can cause sunburn to the eyes. So don't forget your sunglasses, even if you know it's not going to be sunny.

When Nature Calls

Go pee when you need to… and when you don't - Your body has to burn calories to keep urine warm, so it's better in the long run to just deal when your bladder calls (or force yourself to pee before going to bed). By emptying your bladder, your body needs to use a little less energy to stay warm. If the idea of getting out of your toasty warm sleeping bag in the middle of the night seems unbearable, use a pee bottle. Women can use a pee funnel to go into the bottle. A well prepared vestibule can help alleviate any embarrassment when sharing a tent by providing a private area within your tent.

Harsh times call for harsh measures, and your warm pee jar (and lost body) heat can be used for passive warming—just make sure to tighten the lid and check for leaks. Jars can also be emptied and repurposed to pack out waste or feminine hygiene products. **BE SURE TO LABEL YOUR BOTTLE**

For ladies it's your choice if you prefer to drip dry, use a pee rag or pack out your toilet paper. Pee rags can dry when hanging on the outside of the pack or inside your tent at night. Pee funnels are a great way to maintain privacy, and keep your bum warm throughout the day's potty breaks.

If you are menstruating, another way to keep what you need to pack out to a minimum and make your travels easier is a menstrual cup. The menstrual cup is also useful on outings because you can leave it in place longer than tampons. Usually 12 hours for a menstrual cup, instead of 8 for a tampon. Menstrual cups need to be cleaned when emptied, but since they do not need to be changed as often as tampons, this can usually be done in camp instead of on the trail.

When on the snow we can't dig a cat hole and bury our business. This too needs to be packed out. Here is where you can use a trusty blue bag. Do your business on the snow, collect the waste using the blue bag like a glove. Turn the bag inside out and secure. Then place it in another bag. Deposit the bag in blue barrels at the trailhead (Camp Muir/Sherman). You can also use a WAG bag or other poo kit, which comes with two tear resistant bags, pooh powder, toilet paper and hand sanitizer. The non-toxic Pooh Powder waste treatment treats up to 32 ounces of liquid and solid waste allowing for multiple use and turns liquid waste to a solid for hygienic and spill proof transport. The Pooh Powder waste treatment controls odors and contains a decay catalyst that breaks down solid waste.

Avalanche Awareness

Although beginning snowshoers generally stick to flat or fairly flat terrain, it is not unusual for you to find yourself having to pass below a snow slope that might be prone to avalanche. Here are some things to think about when planning "where and if" you are going to go:

- Avalanches can be deadly
- Avalanches are caused by unstable snow, snow that has not bonded to underlying layers or to a hillside
- Most avalanches that impact the backcountry traveler are triggered by your own party
- Watch the weather! Rapid changes in wind, temperature and snow/rainfall may affect snowpack stability. Cold temperatures are more of a problem than warm temperatures, as they maintain an unstable snowpack
- A high percentage of avalanches occur shortly before, during, or after a storm
- Rapid snow accumulation increases danger; also, a foot or more of new snow is a concern
- Rainfall weakens or overloads layers and encourages them to slide

Check the avalanche forecast at Northwest Avalanche Center before you leave on your outing to obtain the current avalanche conditions. Other sources of current information are NOAA weather radio, the Forest Service, or a local ski area. Depending what the hazard is, find another destination (see Places to Snowshoe in this syllabus) or stay home!

If other than a Low Avalanche Hazard exists, it's best to pick a safer route - one on a ridge top and slightly on the windward side, away from cornices. Or, travel out in a valley far from the bottom of slopes. Avoid slopes with cracks (avalanche fracture lines) or areas where you hear a "whumpf" sound.

Avalanches most often occur on slopes of 30 to 45 degrees, but be suspicious of any slope between 25 and 65 degrees. Convex (curving outward) slopes are generally more dangerous, but they can occur on concave slopes also. Leeward slopes, north-facing slopes, and in the spring south-facing slopes can all be dangerous. Some avalanche slopes are obvious - they may have debris that is noticeable from previous events and may be devoid of trees. In general, slopes with large rocks, trees and heavy brush are less avalanche prone, as these things help anchor the snow.

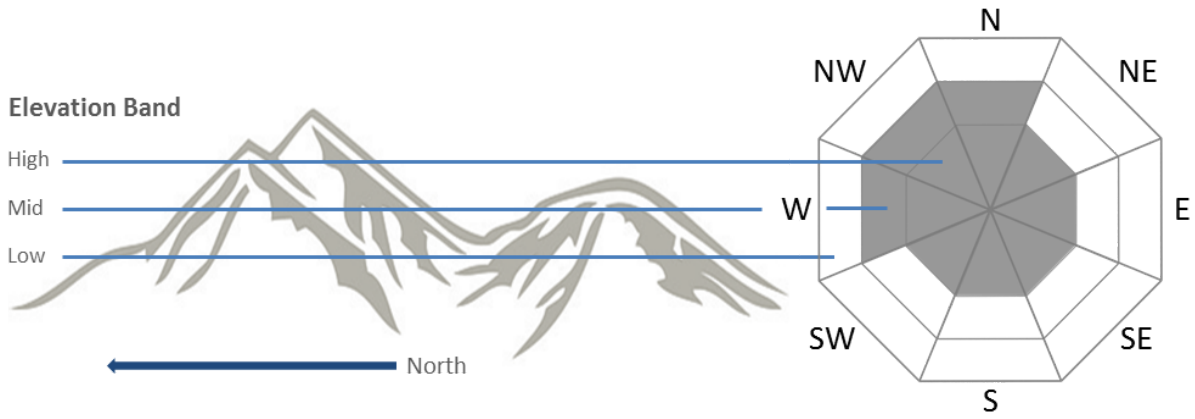
Should it be necessary for you to cross a potential avalanche slope, have the party cross one member at a time. Loosen your pack waist belt and sternum strap and remove ski pole straps so you can easily discard them if you get caught. Make swimming motions and try to stay on top of the moving snow as you work your way to the side of the slide. As the snow comes to a stop, try to make an air pocket in front of your face with your hands and inhale. Also, try to stick a hand or foot out of the snow; it might make you visible to rescuers.

The Avalanche Danger Rose

Location of the Avalanche Problem: Specialists develop a graphic representation of the potential distribution of a particular avalanche problem across the topography. In the following example, the diagram indicates that a particular avalanche problem is thought to exist on all high elevation aspects and on north to west-facing mid elevations (colored gray), and that it is less likely to be encountered on other aspects and elevations (colored white)

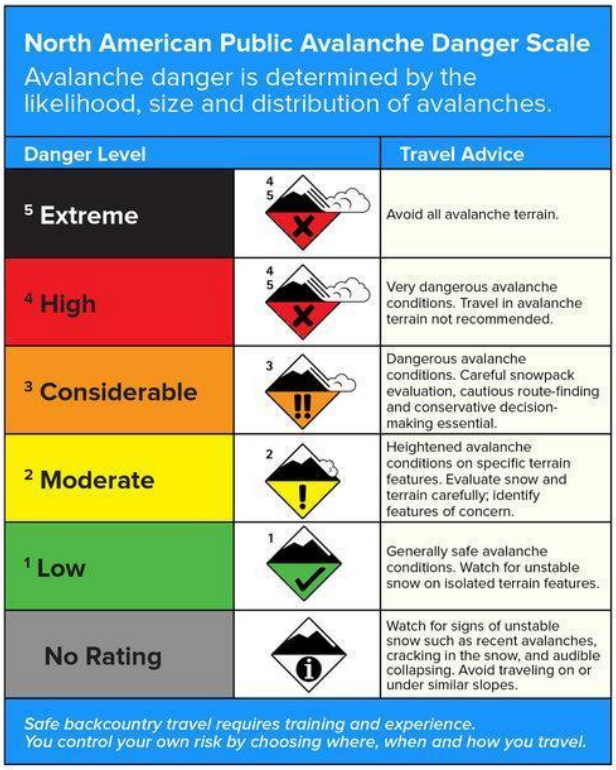
Source:

avalanche.org/avalanche-encyclopedia/avalanche-problem/



Danger Scale Legend

The United States and Canada use a five-category estimation of the avalanche danger: Low, Moderate, Considerable, High and Extreme.



North American Public Avalanche Danger Scale

Avalanche danger is determined by the likelihood, size and distribution of avalanches.

Danger Level		Travel Advice
5 Extreme		Avoid all avalanche terrain.
4 High		Very dangerous avalanche conditions. Travel in avalanche terrain not recommended.
3 Considerable		Dangerous avalanche conditions. Careful snowpack evaluation, cautious route-finding and conservative decision-making essential.
2 Moderate		Heightened avalanche conditions on specific terrain features. Evaluate snow and terrain carefully; identify features of concern.
1 Low		Generally safe avalanche conditions. Watch for unstable snow on isolated terrain features.
No Rating		Watch for signs of unstable snow such as recent avalanches, cracking in the snow, and audible collapsing. Avoid traveling on or under similar slopes.

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

The North American Avalanche Danger Scale is a tool used by avalanche forecasters to communicate the potential for avalanches to cause harm or injury to backcountry travelers.

Source:

avalanche.org/avalanche-encylopedia/#danger-scale

Winter Hazards

Weather

Before setting out on any trip, try to collect as much information about the weather as possible. Remember that weather predictions are never completely reliable. Be prepared for the worst weather. Watching the clouds and noting the direction of the wind can provide useful indications of what the weather is doing. In western Washington, winds from the south or southwest usually indicate deteriorating weather; winds from the north usually indicate fair weather. Remember that valley and mountain winds and clouds can be a local phenomena. It is the higher winds that count; note the direction of the highest clouds that you can see. Weather can change rapidly in Washington. Weather systems can move through the mountains within hours. At one place in the mountains it may be 15°F., clear and still at 8:00 AM, and 40°F. with heavy rain and high winds by 2:00PM.

The Internet, newspaper weather maps, radio and TV reports are all useful. You should check these resources for the latest information prior to departure.

Driving

Not all of the winter skills you'll use involve snowshoes. Just to get to the trailhead you may need to know how to drive on snow and ice on mountain roads. Sooner or later, whether it's on a Mountaineer's trip or a trip of your own, you're likely to encounter snowy roads. Since Puget Sound's rare snowfalls don't give a driver much of a chance to practice, it may help to read about some basic techniques for winter driving before you find yourself on that patch of ice on I-90. Although the Washington highways are repeatedly dozed/sanded/salted, a few situations warrant special attention. Changing lanes should be done carefully on snowy roads because you may have to cross snowy patches to get into the next lane. Always reduce speed when approaching a curve or turn in the road. Of course, be sure to use your signals.

Getting There and Home Safely

Oftentimes you'll encounter different road conditions on the way back home, when you're tired. Warming temperatures or even the heat generated by traffic tires can cause water to sit on top of compact snow. This can be very slippery. Melting can occur on the road during the day then refreeze the moment the sun goes down. Black ice can look just like a bare road surface but is extremely treacherous. It can occur at altitudes and temperatures where the snow has turned to freezing rain or drizzle - or any place where melted water has frozen on the road surface. Remember that ice at 32°F. is twice as slick as ice at 0°F. Be alert and be prepared for sudden changes in road conditions.

Vehicle Preparation and Helpful Hints

Make sure your car is in good working order. In particular, check all fluid levels, tire condition and tire pressure. All-season or Mud/Snow tires are generally preferable. Tread depth should be at least one-eighth inch for it to grip in the snow. You should also have chains along on your travels. Wiper blades should be in good condition. Spraying a shot of dry lubricant into door latches will help keep them from freezing up. You may wish not to set your parking brake when you leave your car or it may freeze solid

while you are gone. Keeping a lighter or match with you (not in the car) can be helpful when you get back to the car: If the lock does freeze, try heating the key before inserting it into the lock. The key should warm up the lock enough for it to work again.

What is the definition of a traction tire? - An approved traction tire, whether on a four-wheel/all-wheel drive vehicle or a standard vehicle, must have at least an eighth of an inch of tread and be labeled M&S, All Season, or have a Mountain/Snowflake symbol. These tires can be used year round. When you install approved chains, any tire becomes a traction tire.

Source:https://www.wsdot.wa.gov/winter/tiresidewall.htm

Chaining Up

Mount Rainier National Park Tire Chain Requirement: All vehicles are required to carry tire chains when traveling in the park during the winter season (November 1 - May 1). This requirement applies to all vehicles (four-wheel/all-wheel/two-wheel drive), regardless of tire type or weather conditions. Law enforcement officers check for chains at the park.

Source: https://www.nps.gov/mora/planyourvisit/tire-chain-faq.htm

Chains not only provide better traction when climbing hills, they also help provide the necessary drag for better control when descending hills. Don't just have chains … know how to properly install them. All chains come with instructions. Read them ahead of time, practice putting the chains on your tires and be sure to keep the instructions with the chains in the car. Be sure to put the chains on the tires for your drive axle. On a front-wheel drive car, that would be the front wheels and on a rear-wheel drive car that would be the rear wheels. On four wheel drive vehicles, it is usually the rear wheels that get the chains unless the manufacturer's instructions are different. Having a pair of pliers and a screwdriver is also handy to accompany your traction devices. A bag of sand or clay type (non scooping) kitty litter is often handy to gain traction out of an icy spot.

Driving

Drive slowly and take your time. Patience pays off in safety. Don't follow too closely and resist the urge to travel too fast while in snowy/icy conditions. It takes much longer to stop your vehicle while driving on snow and ice. Accelerate and brake gently. Avoid accelerating and braking while on ice – if at all possible utilize bare patches to assist you in keeping your vehicle under control. Bare patches in the road allow the tires a place to grip but remember they may be covered with a layer of ice. Roadside reflectors can assist you in identification of the edge of the road. Always travel with your headlights on and in low beam.

Getting Stuck

If your car does get stuck in the snow and help is not within certain reach, it is usually safer to stay in your car until help arrives or until the weather changes than to wander out in the environment. Use some of the emergency items listed in the following checklist to keep you comfortable. If you run your

engine for the heater, do so only for a few minutes at a time, saving on gas and being sure to ventilate the car.

Parking

Keep in mind that most winter parking areas require a SnoPark permit. Be sure that you have parked in a legal area as designated in the SnoPark brochure. Recreational parking is not allowed on highways, off-ramps, interchanges, or under overpasses. If possible, park your car facing downhill, and back into your parking place. If your battery should die, it will be much easier to jumpstart if the engine is accessible to the rescue vehicle. It is easier to get out of a parking place if you can put your car in Drive rather than in Reverse. Select a parking place where others are not likely to slide into it.

Equipment Checklist for Winter Driving

- Spare tire, in good condition and properly inflated
- Lug wrench & Jack
- Tire chains or cables (Practice beforehand, and make sure these fit.)
- Stout wire and pliers (for repairing chains)
- First Aid kit
- Shovel
- Flashlight with spare batteries and bulb
- Extra shoes or boots & Clothes
- Spare keys for car
- Coffee can filled with sand/clean cat litter; old rug; board or wire mesh screen (for traction)
- Windshield scraper
- Food and water
- Blankets or sleeping bag
- Jumper cables
- Extra money for pay telephone or emergency expenses

Snow Shelters

Using snow to build shelters in winter is an important survival skill and well worth practicing if you plan on camping in the backcountry during the winter months. Snow is a great insulator and works by preventing warmth trapped in its crystalline structure from escaping. But more importantly perhaps, is that snow and snow structures provide a very effective barrier against wind chill.

There are several different types of snow shelters that can be built to address emergencies and/or unplanned overnights. The shelter you chose will most likely be based on the following factors:

- Level of protection needed
- Amount of people seeking shelter
- Time required to build vs. time to safely evacuate
- Terrain and surrounding physical features available
- Length of time expected to remain sheltered
- Knowledge of building method
- Level of preparedness/gear availability

For example, if severe weather is approaching and you estimate that you only have about 20 minutes to be under cover, an igloo should not be your first choice. If you are a party of six, you will not be building a single snow trench.

The shelter types that will be discussed during this course include:

- Snow Cave
- Snow Trench
- Quinzee
- Igloo

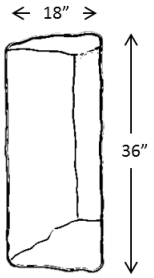
Several types of shelters can be built from snow, including igloos, quinzees, snow trenches and snow caves. Some can be built under a wide range of snow conditions. The major consideration is whether consistency of the snow is structurally appropriate for the type of shelter desired. In some cases a bit of time and physical effort can change the snow into a usable consistency. Carefully consider this investment in time and effort, especially when in the backcountry or in an emergency situation. For most types of snow shelters, a particular consistency of snow works best.

Snow Cave

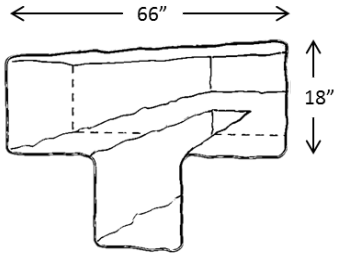
The Snow Cave will be the primary structure for this course. Students will have the opportunity to work in teams to construct a snow cave during the course field trip. Additional time will be spent during the lecture to discuss the preferred method to construct a snow cave. While there are several methods to completing a proper snow cave, we will cover one method, the Classic-T, that over the years has been found to be the most efficient. This method is aimed at reducing the build time and reducing the amount of physical exertion spent.

To begin construction of a snow cave, locate a sizable snowdrift, preferably on a moderate (30-40 degree) slope. A favorable snowdrift can be frequently found on the downwind, or leeward, face of hillsides or large natural features. The wind-blown, well sintered snow provides solid material for excavating this type of shelter. Structurally, the snow cave is very similar to the quinzee, except that it requires only half the work. The wind has already accumulated and packed the snow; all that is left to be done is to excavate the material. The size of the cave is dictated by the size of the snow drift you are working within. Probing the area where the shelter will be built will help confirm adequate snow depth and whether any obstacles (rocks, trees, etc.) will interfere with your plan.

Once you are confident with your buildsite, it's time to start excavating. A snow saw and small mountaineering shovel works well for this activity. Begin by digging out enough snow to expose a 4 foot high by 6 foot wide vertical face.

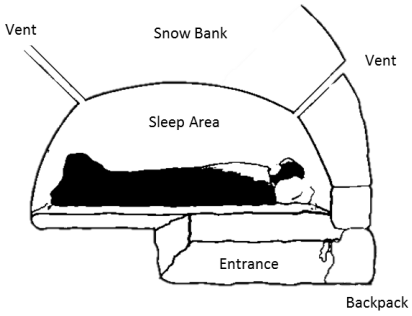


Digging further into your newly formed wall, excavate an area that is 3 feet high, from the bottom of the vertical face, and 18 inches wide. Be sure that the material being removed is moved downhill and away from your work space. Try to remove single, larger pieces of material to reduce fatigue. You may need to cut wedges at first to remove the first blocks. This section is the forming of the cold air trench that will reside between the sleeping areas.

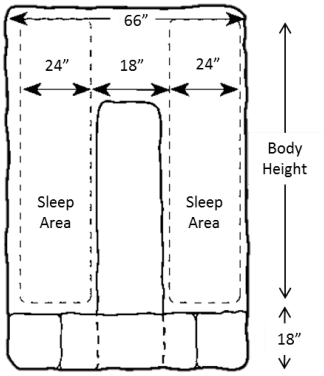


Once the initial column is removed, it is time to begin building the two sleep areas. This is started by forming a T-shape that is a minimum of 24 inches left and 24 inches right of the column and 18 inches high, taken from the top of the column. When complete, you should have a horizontal area, or the top of the T, that is a minimum of 66 inches wide.

Continue removing material while maintaining this T-shape. Using a snow saw, material should be removed in blocks and set aside for later use. Excavate into the cave a distance equal to the tallest occupants body height plus 18 inches. Be sure to keep the sleeping surfaces level.

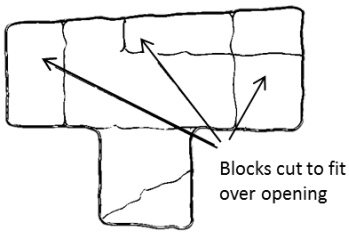


When the excavating is complete, begin to form the ceiling by shaping a dome shape that is steeper along the walls. A minimum of 2 feet of snow thickness must be maintained along the ceiling to ensure structural integrity. The internal ceiling of the snow cave should be a smooth, uniform and dome-like shape. Any sharp angles or corners tend to be stress points and can lead to structural weakness. Once the ceiling is finished, create two ventilation shafts using your trekking poles. One shaft should be near the entrance and the other near the rear of the cave. These shafts will need to be checked for blockage periodically. Maintaining clear ventilations tubes is very important and ensures the safety of the occupants.



Using the blocks that were previously removed, fill in the horizontal area of the T. Only the lower 18 inches of the initial column should be left remaining open.

The top of the entrance should be 6 inches below the top of the sleeping surfaces to help retain heat inside the cave. Fill in any gaps and cracks in the horizontal blocks with loose snow.



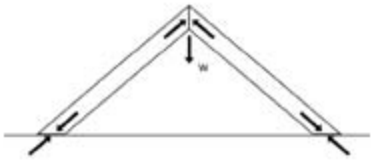
Around the sleeping surfaces, create a one groove approximately 1 inch in depth. This groove should start and end at both sides of the cold air trench. This groove will channel any moisture that has melted from the ceiling and walls and prevent puddles in the sleeping areas.

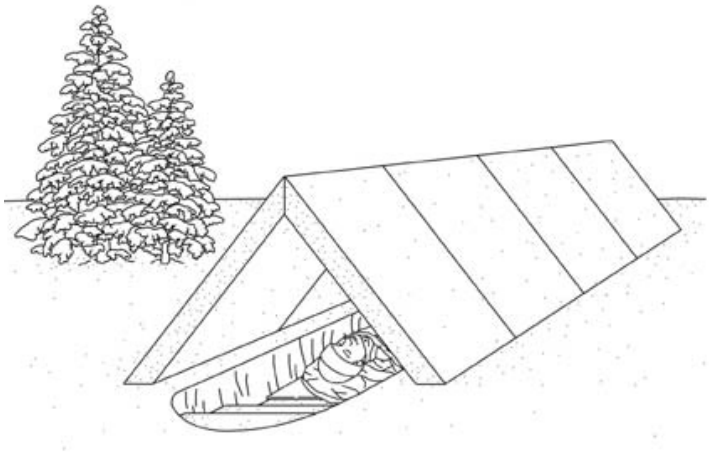
On the outside of your newly built snow cave, mark the shelter area using flags or some other visual cue so that people do not walk or ski on top of the cave.

When finished using the snow cave, be sure to completely cave in the structure and fill in any voids so that skiers, snowshoers and animals do not fall into the depressed area and injure themselves.

Snow Trench

When complete, a snow trench will look very much like a pup tent or A-frame tent. The bottom end of each leaning slab is firmly anchored to the snow surface. The top edges of the two slabs lean against each other at the top, or apex. This symmetrical structure allows vertical and horizontal forces to be balanced, creating a highly stable triangular cross-section.





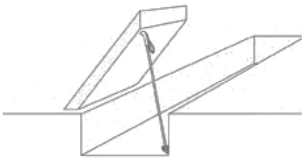
Snow shelters are best constructed from cold, dense, wind-packed snow, the same kind of snow used to build igloos.

The A-frame form of this shelter requires that large, relatively thin slabs of structurally strong snow be cut. A snow saw will make construction of this shelter type relatively easy.

For a typical one or two person shelter, six to eight snow blocks should be adequate, depending on their dimensions. At a minimum, slabs should be cut two at a time for structure assembly, although it may be more efficient to cut a number of slabs before starting assembly. All pairs of slabs should be approximately the same dimension. The dimension of the slabs will vary with snow conditions and depending on whether a shelter for one person or two people is needed. As a general guide, blocks should be approximately 3 feet long and 6 inches thick, and not so wide that they can't easily be lifted and carried.

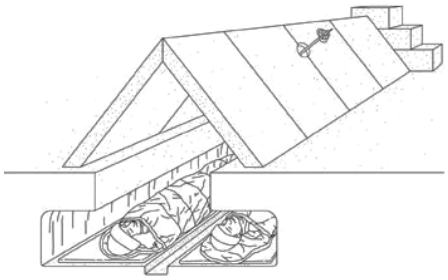
If the snow depth is shallow, the structure can be assembled on top of a flat snow surface. If the snow is at least a few feet deep, the structure can be assembled as a roof over a trench, which will give the occupants a bit more headroom.

A snow trench can be built by a single person using a temporary support to hold one of the two mating slabs in position while the second slab is being retrieved and placed. A trekking pole can be used to support the first slab.



Continue leaning slabs against one another to form an A-frame of the desired length. Once all the slabs are in place, a structurally sound shelter has been completed. There may be some small cracks and gaps between the slabs. While these gaps will not affect the integrity of the structure, they will allow drafts and snow drift to enter. Fill these gaps by hand with loose snow.

The ends of the shelter can be closed out using similar slabs as used on the roof, or with smaller blocks that stack and seal the end.

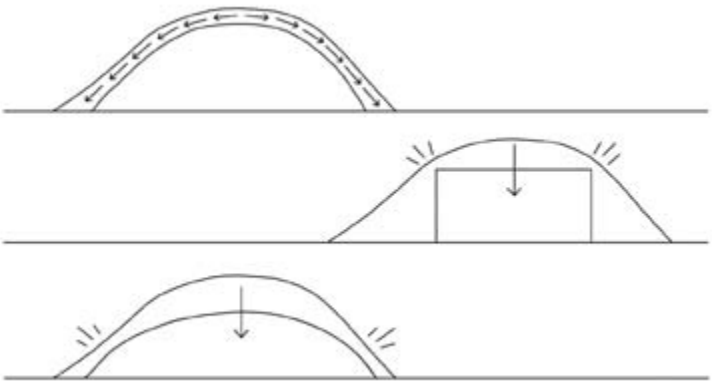


By excavating into the snow along the sides of the shelter, additional space can be made for two people to occupy the shelter.

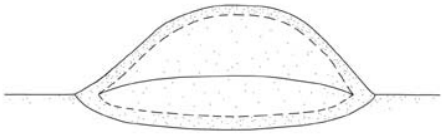
A fist-sized hole should be cut into one of the slabs towards the apex to allow for ventilation. It is important that this hole be kept clear at all times to ensure the safety of the occupants.

Quinzee

What's a Quinzee? A quinzee is a hollowed out, dome-shaped mound of well sintered snow. In a dome, much like an arch, the downward force of gravity is directed not only downward but also sideward along the walls. For a structure to be stable and not collapse, force applied from one direction must be balanced by an equal force applied from the opposite direction. The downward force of gravity must be balanced by an equal restorative force.



Along the entire arch or dome, the snow is in compression. It is pushed together by a balance between the force of gravity and the equal and opposite restorative force. The restorative force can be thought of as the ground pushing back against the force of gravity.



In a properly built, dome-shaped quinzee, all forces are in compression. Square corners and edges are areas of high stress and should be avoided. A thick roof placed a heavy load on this walls and is more likely to collapse

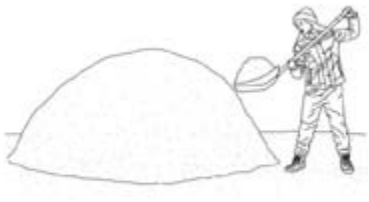
The ideal internal and external dome shape of the quinzee has equally thick walls and roof.

The quinzee is a fairly versatile shelter because it can be built with almost any kind of snow, as long as it can be shoveled into a mound and packed. A simple test to see if the snow will pack is to make a snowball in gloved hands. If a solid snowball that doesn't fall apart can be formed, chances are the snow will pack well enough for a quinzee build.

If the snow on the ground is already hard packed, the quinzee may not be the best shelter option. With hard packed snow, a lot of physical exertion will be needed to break out chunks of the snow with a shovel, break it down and repack it.

Even with good snow conditions, building a quinzee is labor intensive; it requires a lot of shoveling. Before completing construction of a quinzee, about twice the amount of snow that makes up the final structure will have to be shoveled.

For a two to three person shelter, prepare an area of approximately 7 to 8 feet in diameter by packing down the snow to form a solid foundation. Snowshoes work well for this task. Begin shoveling snow onto the prepared area. To save physical energy and time, shovel snow from as near your mound as possible. Occasionally pack the snow mound by patting it with

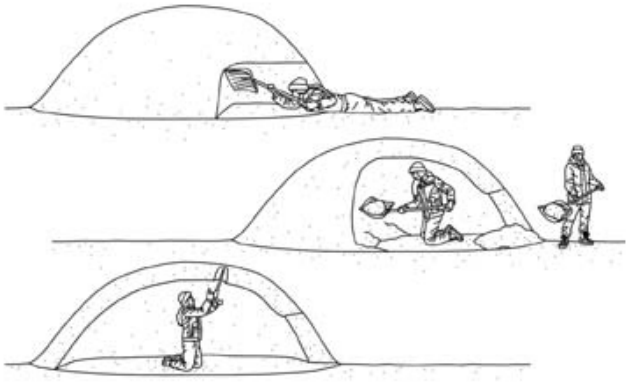


the backside of your shovel blade. Continue shoveling and mounding the snow until there is a well-packed, dome-shaped mound that is about 5 to 6 feet tall at the peak.

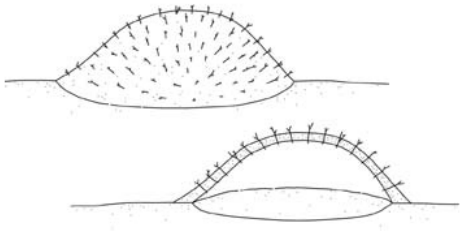
Now wait.

The snow will take time to coalesce into a solid mass. This process can take between 1 and 2 hours - sometimes more depending on snow and weather conditions. Once the snow has bonded, you can begin excavating the interior of your quinzee.

Choose a location for the entrance and begin to dig a small, arch-shaped hole at ground level into the side of the snow mound. If possible, the downwind side of the shelter is the best place to make this opening. The entrance should be just large enough for a person to crawl through without difficulty. For the best structural integrity, attempt to make the opening a smooth arch-shape and not squared off or with sharp corners.

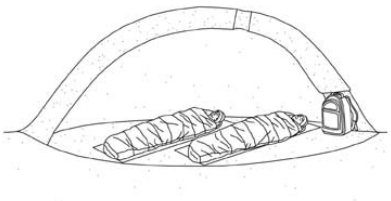


Continue by digging into the mound, further opening up the interior space. Try to maintain a consistent wall thickness of 2 feet. Snow carved from the interior can be passed out the entrance to a partner for removal and mounding nearby the entrance to form a windbreak.



One trick to keep from breaking through to the outside of the mound or creating a thin spot in the wall is to gather a few dozen 2 foot-long thin dead twigs. Completely push them into the snow mound at various places all over the dome. These twigs will act as depth gauges. During excavation of the interior, if the ends of the twigs become visible, you will know that enough snow has been removed from that section of the dome. Digging to the point where most of the ends of the twigs become visible inside ensures a uniform 2 foot wall thickness. Strive to keep the ceiling and interior walls of the dome a smooth, continuous rounded shape. Edges and corners tend to cause points of stress that weaken the structure.

When the excavation is complete carefully cut a fist sized ventilation hole in the downwind side of the dome near the top. Be sure to periodically check this ventilation hole for any obstruction. If the hold becomes plugged, it has the potential of creating an unsafe environment inside the shelter. A trekking pole can be used to clear the ventilation hole.

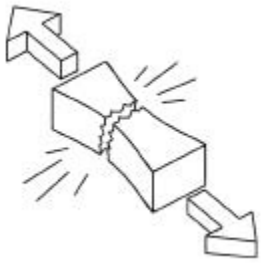


A backpack can be used to close the entrance.

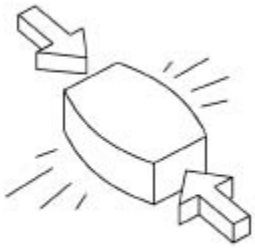
Igloo

The igloo is the highest art of snow shelter construction, requiring the precise shaping and placing of snow blocks to form a stable and strong dome-shaped structure.

Two structural forces are present in an igloo: compression and tension. Compression occurs when weight is applied that squeezes the snow crystals closer together. Tension occurs when the applied force pulls the snow crystals apart.

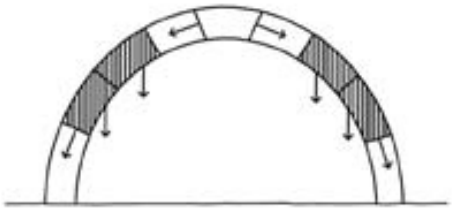


Tension

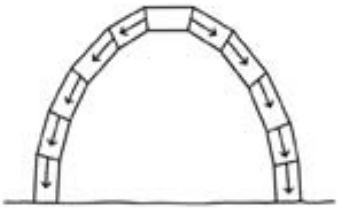


Compression

If the amount of tension exceeds the amount of compression applied to the snow crystals the structure would most likely fail under little force. For this reason, a cross-section of an igloo more closely resembles a parabolic arch than a hemisphere. Structurally, parts of a hemisphere are in compression while other areas are in tension. If the tension were great enough to break the snow crystal bonds, a hemisphere shaped igloo would collapse rather easily. On the other hand, the entire cross-section of a parabolic-shaped igloo is in constant compression and therefore a much stronger structure.

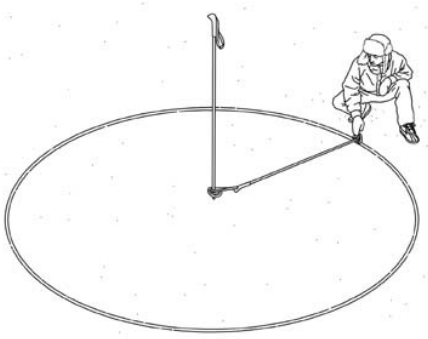


True Semi-Circle Arch
(some blocks under compression, some under tension)



Parabolic Arch
(all blocks under compression)

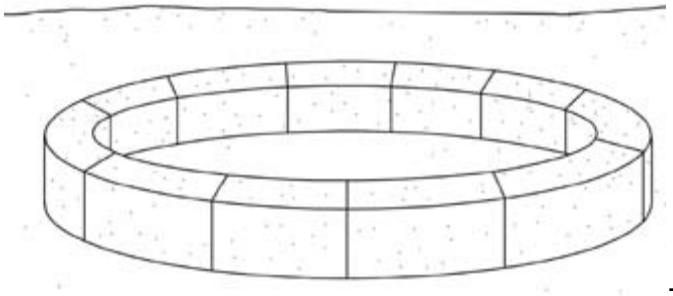
An igloo large enough to shelter two to three people should have an internal diameter of at least six feet. By outlining the size of the interior space of the igloo in the snow, it will be easier to accurately place the snow blocks in a circle to form the base of the igloo. Place a trekking pole in the ground vertically at the center of your igloo site. Place the strap of your second pole over the first and lay that pole horizontally on the ground. Rotate the horizontal pole in a circle, scribing the inner diameter with your snow basket.



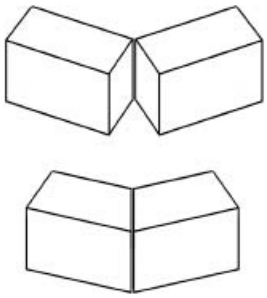
A solid foundation is necessary for structural stability of an igloo. If the loose snow surface was to give way under the added weight of the snow blocks, the igloo might shift, or most likely collapse during construction. The ideal condition is for the foundation to be strong enough to support the weight of a person without leaving deep footprints. Using your snowshoes, walk over the building site, compressing the snow surface into a solid platform just as you would when preparing a surface for your tent.

Snow blocks can easily be cut with a snow saw (or an ordinary carpenter's saw). Cut all the blocks the same size. A good size for blocks is about 18 to 24 inches long, by 9 to 12 inches thick, by 12 to 18 inches tall. Some snow saws will have measuring marks on them to aid in determining proper block sizing. Keep in mind that smaller blocks will require more blocks to be cut and create more joints which will reduce the structure strength.

Begin placing the blocks in a circle to form the first ring. To improve the strength of the igloo, each block should be mitered, or cut at matching angles, so that they fit together tightly.

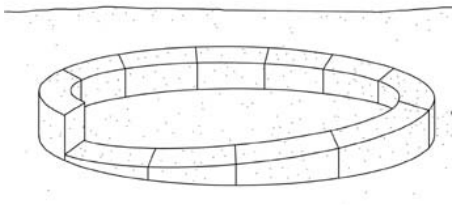


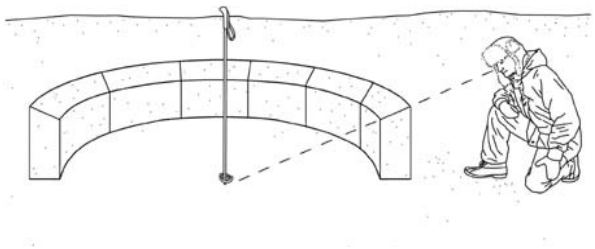
The First Circle Of Equal Height Snow Blocks



Miter Edges For Tighter Fits

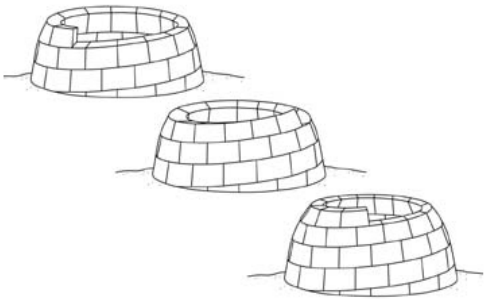
After the first ring of blocks is in place it is time to cut away a portion of several of these blocks to create a circular, vertical ramp. This ramp provides two points of contact: a shoulder and a base, which will support the inward-sloping blocks that will be added to create the dome shape of the structure. To form the ramp, start at a joint between two blocks and block by block cut away a portion of each block. The gradual slope of the ramp should continue between half and three-quarters of the way around the ring.

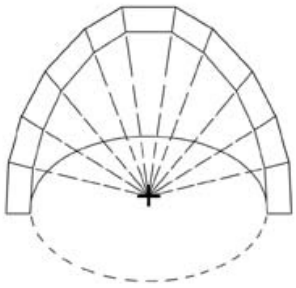




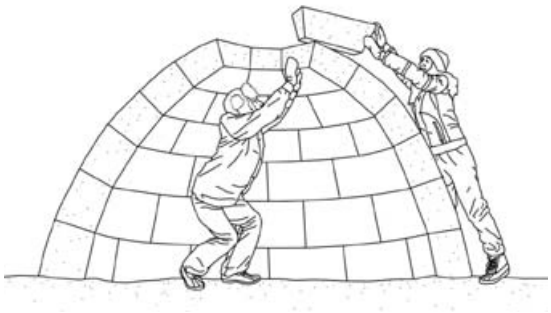
Shape the top of all blocks so that they angle slightly inward towards the center of the igloo. This slant causes the block that is placed on top to lean further inward. If the angle is not steep enough, the walls of the structure may not curve inward enough to complete the dome. Place a trekking pole vertically in the center of your igloo. You should be able to visualize a straight line when looking along the top of the block toward the base of your trekking pole.

Continue stacking more snow blocks on top of the ramp. Starting at the point on the ramp where a full-height block meets the shortest block, place a new block in tight contact with the shoulder and base. Cut the side edges of the new block so it fits tightly against the block next to it. Each block should bridge the vertical seam between the two blocks beneath it. Cut the top of each new block to angle inwards toward the center of the igloo.

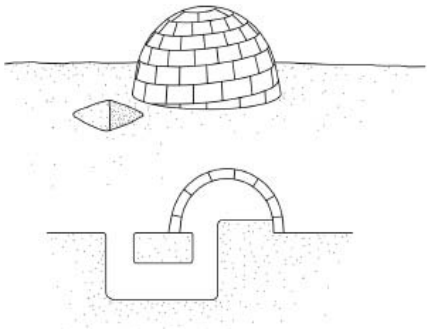




When you have reached the top of the igloo, you will need to cut and place the cap block. Like a cork, the cap block plugs the hole at the top of the dome and supports the inward leaning walls. This block will require some creative shaping. All sides of the cap block need to be mitered to tightly fit the adjacent block on all sides. It will be helpful

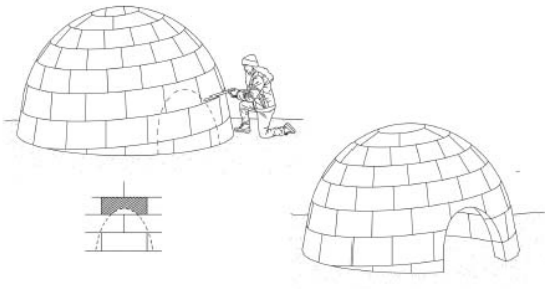


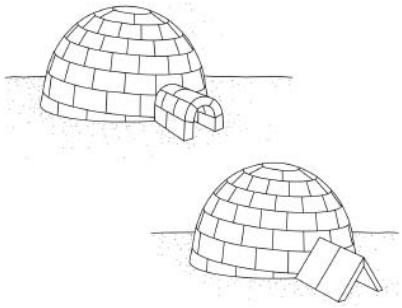
if you have a second person inside the structure during the placement of the cap block.



With the dome complete, you will need to form an entrance. Avoid making the entrance before the dome is complete as it will weaken the structure and increase the chances of a collapse. There are several choices for an entryway design. Depending on the depth of the snow, you can create a “gopher hole” or an arched-shaped entry. If the snow depth is more than three feet, you can dig a hole about three feet away from the outside wall of the igloo and about three feet in depth. The hole should be wide enough for a person to crouch at the bottom. At the bottom of the hole, tunnel horizontally toward and under the wall of the igloo. When the tunnel is beneath the interior of the igloo, tunnel upward into the igloo. This entrance style will prevent the warm air inside the igloo from escaping as the cold air will sink into the tunnel and warm air will rise into the igloo.

An arched-shaped surface entry can be cut in the side of the igloo when the snow is too shallow for a gopher hole. The arch shape minimizes stress on the walls of the igloo and should be no more than 2 feet by 2 feet, or just large enough for a person to crawl through. Choose the location of the entryway so that the arch of the opening will be centered beneath a solid snow block and not directly beneath a seam between two blocks. To protect from wind and blowing snow, a windbreak or surface tunnel entrance can be built against the opening in the igloo.





No matter how well the seams were mitered, your igloo will have some open cracks and gaps between the snow blocks. These openings will not affect the strength of the igloo but will allow any heat generated inside the igloo to escape and wind gusts to enter. Once the igloo is complete, seal all cracks and gaps by hand packing them with loose snow.

It is important to allow some ventilation for the safety of the occupants. Create at least one fist sized ventilation hole near the top of the dome. You will need to check this opening periodically to make sure that falling snow or snow drift hasn’t blocked it. You can use a trekking pole to clear the hole as needed.

Fitness

Conditioning

The most important piece of equipment you have is your own body. Muscles and bones are created for work and will increase in capacity to handle the load asked. This is the basis for body conditioning and must be done or the penalty can affect the individual and party to the point of being a considerable hazard. Physical fatigue not only spoils the fun of an activity but may also create danger by impairing perception and judgment. Good physical conditioning is the best safeguard against emergencies. It allows you to recognize your limits and you are less likely to make fatigue-induced errors.

Getting in shape for snowshoeing consists mainly of improving your aerobic fitness. In addition, some basic strength and balance exercises can be helpful. Problems that may be associated with inadequate conditioning are: feeling winded, muscle soreness, kneecap area pain, shoulder, back and neck discomfort and falling. If you are in good condition you can reduce the likelihood of developing these problems and increase your enjoyment of any outdoor activity.

Aerobic Fitness

The major cause of muscular fatigue is the inefficiency of the circulatory and respiratory systems. Contributing causes may include dehydration, change in body temperature and depletion of energy sources. The bulk of muscular fatigue is traced to a lack of cardiovascular fitness. Energy expenditures may be nearly identical for all members of a Mountaineer party on a particular trip; however there may be wide variations in their available aerobic power - their body's ability to absorb and use oxygen. The amount of oxygen a person can use to do muscular work depends on age, sex, and training. An individual's maximum oxygen consumption is the amount of oxygen used to work oneself to exhaustion (the point where muscle biochemistry will not allow any further work). Thus, the length of time the expenditure of energy is required is significant. The experienced hiker sets the pace using a proportion of his available power so that he is capable of continued exertion to achieve the destination, return safely, and drive home. If you have less aerobic power than the other members of the party, you will be using a much greater proportion of your total aerobic capacity. The greater proportion of your aerobic capacity you use, the more you have to push to keep up and the sooner you will become exhausted.

Specific training activities for snowshoeing include step aerobics classes, stair climbing, using treadmills, walking, jogging, bicycling and hiking. The goal of your aerobic program would be to achieve a distance and elevation gain within 60-75% of those expected to be experienced on an activity. It is important to remember that you need to work up to this level gradually. The activity should be prolonged enough to warm the muscles, produce a sweat, and induce mild breathlessness. To be of aerobic value, exercise should be 30 to 45 minutes in duration three to five times per week. Increase the length of your workout each week by 10 percent. Remember, the best way to keep yourself in condition for any activity is by doing that activity.

Strength Training

A strength-training program can help keep you well-toned and make your activities more enjoyable with less effort, less muscle soreness and lower risk of overuse injuries. Common muscle imbalances for snowshoeing are inadequate strength in the quadriceps and lower legs. The hamstrings may be weaker than the quads. The hip, especially those muscles on the front and inner groin, and buttock muscles are often not strong enough. Specific target areas should include the arms, shoulder girdle, posterior back, the quads, hamstrings and the abdominals. Because you are working on the endurance aspect of strength training your exercises should be done in 2-3 sets of 15-20 repetitions.

Stretching

Stretching is an important part of any physically demanding sport. Proper stretching not only reduces the chance of injury, but also improves performance by increasing flexibility. Flexibility training helps increase both circulation and range of motion in joints. A flexible joint can move farther with less energy, which is a definite benefit when hiking.

The first step is to make stretching a regular part of your conditioning program. Second and just as important is to include some stretching in your trips. Early morning stretching can be difficult because your muscles have not had a chance to warm up. Special care should be taken when stretching stiff or cold muscles. Some people prefer to do a little stretching after they have been hiking for 10 to 15 minutes or during their first break when their muscles have had a chance to loosen up. A little stretching before, during, and after a strenuous trip can greatly reduce muscle stiffness. During your trips try to hold each stretch for at least 10 seconds. In training sessions, increase it to 60 seconds for each stretch. The main thing to remember when stretching is that it should never be painful and one should never bounce.

Balance

Your fitness program should include exercises to improve balance and agility. These exercises should be started within 4-6 weeks of your outdoor activity. They can be done as part of your strength-training program, with or without a pack, at least two times a week lasting 5-10 min.

Exercising In The Cold

Proper Warm-up - In cold weather it is more difficult to warm up the muscles. Therefore, it is essential to begin each outing with simple calisthenics or walking and stretching. Once begun, continue the warm up activity until the outing begins.

Wear Appropriate Clothing - Select clothing that will maintain comfort during the activity. There is a tendency to over dress, which can lead to sweat accumulation in clothing and loss of body heat. Be sure to stop 10 - 15 minutes into the activity to adjust your clothing layers. Hint: Start Cold!

Avoid Rapid Cooling - Add clothing when taking rest breaks or completing the outing to avoid post-exercise hypothermia.

Lactic Acidosis - During any intense exercise, like sprinting or lifting heavy weights, your body requires more energy than normal to keep the muscles functioning. In this case, the body metabolizes glucose to deliver energy to the muscles.

The metabolized glucose, called pyruvate, is converted into lactate. When lactate accumulates at high levels in the blood and muscles, it creates acidity called lactic acidosis, which causes muscle fatigue and at high levels can interfere with muscle recovery. The accumulation of lactic acid can cause burning sensations that can disturb your athletic activities.

While the most common symptom of lactic acid buildup is fatigue and a feeling of tiredness, there are a few harmful symptoms that can occur as a result of lactic acidosis.

- General weakness
- Yellowing of the skin and/or eyes
- Experiencing shallow or rapid breathing
- Fast heartbeat
- Muscle cramps
- Abdominal pain and discomfort
- Headaches
- Appetite problems
- Diarrhea, nausea, and/or vomiting

There is a solution to almost everything and lactic acid buildup can be tackled easily. Here are some precautions you can take to reduce the buildup of lactic acid.

Drink water or an electrolyte-replacement drink, which can play a vital role in preventing buildup of water-soluble lactic acid. Don’t wait until you feel thirsty. By then, you’re likely already dehydrated.

The key to healthy and beneficial exercise is maintaining consistent activity. If you want to be physically fit, you need to exercise frequently. This will make your body adaptive to additional energy production and you will require less glucose to burn for energy, which eventually means less lactic acid buildup. While it is true that keeping yourself motivated to exercise on a daily basis is the key to a healthy lifestyle, forcing your muscles beyond their capacity can produce negative results. Excessive workouts every day without any routine or cycle can cause severe muscle soreness. Make sure to stay challenged, but don't increase intensity too fast or all at once. Add weight, repetitions, minutes or miles gradually over a set period of time to maintain healthy levels of lactic acid.

Although there is an emphasis on consistent workouts and keeping yourself motivated enough to bring out desired results, you must know when to back off. As you start to feel your muscles burn or you struggle to breathe, slow down until you catch your breath, so your body can deliver more oxygen to the muscles. Moreover, alternate periods of activity with periods of active and inactive rest as appropriate. Stretch immediately after your workout. Stretching after a workout helps release lactic acid and gives an immediate relief to your muscles preventing them from lactic acid buildup and muscle soreness. Lactic acid can take around 30 minutes to an hour to disperse post-workout, so make sure to cool down appropriately and stretch right after.

Apart from above-mentioned steps, including certain foods into your daily diet can help control lactic acid buildup to avoid lactic acidosis. Foods and vegetables with magnesium, fatty acids, and B vitamins are recommended. Foods rich in Vitamin B are leafy green vegetables, cereals, peas and beans, fish, beef, poultry, eggs and dairy products. Vegetables such as Spinach, collard greens, turnip greens, navy beans, kidney beans and seeds such as pumpkin, sesame and sunflower seeds are great sources of magnesium.

Nutrition

Maintaining your health and energy in the winter environment is not tremendously different from what you do everyday - you need to eat, drink, and stay warm. However, it does require a little more effort and planning ahead. It takes a lot of calories to keep your body warm. Winter trips make bad times to go on a diet. Fat, calories, carbs … eat all you want and you'll probably lose weight anyway. Skimp on any of it and you're likely to have a hard time staying warm no matter how many layers you wear.

On short trips, your biggest concern will be getting plenty of water and high-energy foods to boost you up to your goal. Obviously, the lighter the food the less weight you have to carry on your back. At the same time, it's not a good idea to shortcut on needed calories, electrolytes and especially not on water. Energy requirements (i.e. calories) will vary somewhat depending on an individual's conditioning and metabolism, as well as on the length and effort of the trip.

Carbohydrates, fats and protein all yield energy. Fatigue, poor recovery and aching muscles reflect a lack of critical nutrients. A balanced diet of 55% carbohydrates, 30% fat and 15% protein is recommended daily. Carbohydrates however, are the main emphasis for endurance exercise.

Complex carbohydrates such as dried fruits, whole grain breads and pasta, and brown rice digest fairly easily, which makes them good for quick energy and high altitudes. For cold environments, foods high in fats are needed, such as butter, nuts, cheese and chocolate. Unfortunately (especially if you love chocolate) these foods do not digest as easily as carbohydrates and thus are not as good in high altitude situations.

Food Planning

Try to take foods that are simple to prepare and require minimal clean up. Pre package/repackage your food to save on bulk and weight. Carbo-loading will give you a head start on your energy needs. Overall, you should expect to expend between 3000-5000 calories per day on an average outing in the Cascades. Plan your food accordingly!

Fluid Consumption

Even in cold weather, you need to avoid dehydration by maintaining your fluid level. The average adult loses 1.5 to 2 liters (1.5 to 2+qts.) of water from his or her body each day. "Sensible loss", which is water excreted by the kidneys, ranges from 1 - 2 liters a day. "Insensible loss", through perspiration (even in cold weather) and evaporation from the lungs (to moisten air that is inhaled) accounts for one-half to one liter daily. Failure to replace normal water loss (through the kidneys, skin, or lungs) or abnormal losses results in dehydration. The subsequent reduction in blood volume affects circulation, increasing your risk of developing hypothermia or frostbite.

With mild exertion, water intake should be at least 2 quarts per day. With heavier exertion or at high altitude, 3 - 5 quarts are needed. Thirst alone is not a reliable indicator of the need for water. In cold weather, we don't crave cold drinks. You need to make a conscious effort to consume fluids and maintain hydration. Hint: Drink before you are thirsty, and drink often.

Fluid Guidelines

Pre-hydrate before you begin your trip. Lattes do not count! Carry two 32 ounce water bottles. Drink at every opportunity during the outing. Water is the fluid of choice, as it is most easily absorbed by the body. If you are out more than two hours and really exerting yourself, you may consider adding an electrolyte powder to your drink.

When the trip is over, rehydrate with fluids containing sodium. You are less likely to blunt the "thirst drive" and adequately rehydrate your body.

Cold Weather Injuries

Most people snowshoe because they enjoy the beauty and serenity of the mountains in winter. But this environment can also be hazardous. To cope with the hazards, you must know what this winter environment is like and how your body responds to it. Typically, the environment is cold, wet and windy. Travel in deep snow is often slow and strenuous. Trails that can easily be followed in the summer are hidden by snow. Winter days are shorter than summer days. All of these factors can make it easy to become exhausted, lost or caught by darkness in the mountains.

Staying Warm and Dry

To fully enjoy the winter environment, and to be comfortable and safe, you need to stay warm and dry. Being cold and wet is not only miserable, it is dangerous. Hypothermia is a condition in which your body's internal core temperature is low enough to cause illness. Hypothermia can occur without warning and can affect judgment and reasoning rather quickly. Unless treated, hypothermia leads to apathy, collapse, and eventually death.

Your Body Gains or Converses Heat In Four Ways

Digestion of food produces heat to maintain normal body temperatures. External application of heat (sun, fire, and warmth from another body) warms your body.

Muscular activity by deliberate exercise or involuntary shivering warms your body. Reduction of blood flow near the surface of your body constricts surface blood vessels, reducing circulation in your skin and keeping blood nearer your body's central core for use by your brain, heart and lungs.

Your Body Loses Heat In Four Ways

Evaporation causes a large loss of thermal energy as water changes to vapor. Examples are perspiration from your skin and exhaling moisture from your lungs during breathing.

Conduction transfers heat by direct contact. Contact with anything cooler than skin temperature contributes to heat loss. Examples are sitting on the snow, touching cold equipment and being rained on. Radiation is the emission of thermal energy and causes the greatest heat loss from uncovered surfaces of your body. Your head and neck, areas where large blood vessels come close to the surface of your body, are particularly susceptible to radiation heat loss. Your unprotected head may lose up to 50% of your body's total heat production at 40°F.

Convection facilitates heat loss by movement of air or fluid. Your body continually warms a thin layer of air next to your skin. If this warm air stays close, it insulates you; but if air currents remove warm air, your body cools at a much more rapid pace. This is why the wind can chill you so quickly.

Eating and Drinking to Help Keep Warm

Since you will sweat while snowshoeing, you must drink fluids to avoid dehydration. Plan on at least two liters of water for an all-day outing. Don't drink a lot at any one time. Instead, drink a little, but drink often even if you don't feel thirsty. Cold decreases your thirst even as your need for water increases.

Your body burns fuel to stay warm and to work your muscles. You may use up to 6,000 calories on a one-day outing. You must replace these calories to stay warm and keep going. Snack often and primarily on easily digestible, high-calorie carbohydrates. Pack foods that you know you will eat.

All this exercise produces fatigue by-products that can be remedied through rest. Keep a slow, steady pace and rest about 5-10 minutes every hour.

Hypothermia

Although not a condition of cold weather alone, hypothermia is a continuous threat to snowshoers. You need to know how to recognize, prevent and treat this illness. If your body loses more heat than it gains, your body core temperature will decrease progressively until hypothermia results. Exposure to cold constricts the blood vessels in your skin and then the deeper lying tissues. The effect is to decrease the amount of heat transported by your blood to your skin so your skin temperature becomes lower.

Preventing Hypothermia

- Prevent Heat Loss
- Control evaporative heat loss by regulating clothing to prevent excessive sweating.
- Cover your head, neck and hands. Put on a hat.
- Wear layers of clothing that help maintain a layer of warm air next to your body.
- Use insulation between your body and cold objects. Wear pile or fleece. Wear a wind or rain jacket and pants in windy or wet weather. Exchange wet clothes for dry ones. Don’t wear cotton. Use a sit pad during rest breaks.
- Wear clothes that insulate when wet or that wick wetness away from the body.
- Cover your mouth and nose with wool or insulating material.
- Drink water and eat food high in carbohydrates, fats and sugars.
- Keep continuously active to ensure adequate heat production.
- Terminate Exposure
- Get out of the wind, rain and snow. Find shelter. Bivouac early before your energy is exhausted and your coordination and judgment are impaired.
- Put on your wind and rain clothing.
- Use your emergency blanket for shelter or an additional clothing layer.
- Detect Hypothermia Early

Anytime you are exposed to wind, cold or wetness, watch each individual for the signs and symptoms of hypothermia. Treatment of early hypothermia is relatively simple compared to the efforts needed to deal with a severely ill individual. The individual may deny having any problems. Believe the signs and symptoms, not the victim.

Signs of Hypothermia

Mild Hypothermia

- Complaints of Cold
- Shivering
- Difficulty using hands
- Core temperature above 90° F (32° C)
- Psychological changes, withdrawal and apathy

Moderate to Severe Hypothermia

- Lethargy, mental confusion
- Refusal to recognize the problem
- Uncontrollable shivering
- Slurred speech
- Stumbling
- Core temperature 90° F (32° C) or lower

First Aid

- Get the patient out of the cold and wet.
- Replace wet clothes with dry; add insulation to clothing
- Place the patient in a warm environment
- Offer warm liquids or food if the patient is conscious and able to swallow.
- Rehydration is dramatically effective in treating mild hypothermia. Dehydration is a strong contributing cause of hypothermia.

Frostbite

Frostbite is caused by constriction of surface blood vessels in conjunction with exposure to cold. Your hands and feet are affected most commonly, but your nose, ears and face are also particularly susceptible when it is cold. If the temperature continues to drop, circulation will almost completely cease in the affected area and frostbite will occur.

Preventing Frostbite

- Wear enough clothing.
- Wear a hat, balaclava or hood; mittens rather than gloves; extra socks if they won't make your boots too tight; wear a facemask in strong, cold winds. Exercise your fingers and toes to maintain adequate circulation.
- Don't wear constricting clothing or boots.
- Don't touch cold metals with bare skin.

Activities and Rating System

Activity listings are found online at www.mountaineers.org. Each activity will include the trip difficulty rating, location, applicable map details, trip leader information, registration dates, and any other trip specific instructions. Some trips may require a SnoPark Permit for trailhead parking. Confirm with your leader what permits or passes may be needed and location to obtain one.

Rating System

Trips will be rated in terms of both technical difficulty and strenuousness. Both ratings must be available to participants when they sign up.

Technical Rating System

The technical difficulty of a trip is specified as one of the following three values: Beginner, Basic, or Intermediate. Each value has a specific meaning defined as follows.

Rating	Description	Prerequisites
Beginner	Terrain is flat or gentle with minimal avalanche danger. Limited to Easy and Moderate routes.	Open to all properly equipped members and non-members of The Mountaineers.
Basic	No exposure to steep terrain which would require the use of an ice axe with minimal avalanche danger. Route can be of any strenuousness level.	Must be a student or graduate of Basic Snowshoeing, and students must have successfully completed the field trip prior to sign-up.
Intermediate	Exposure to terrain that may require the use of an ice axe and/or the use of avalanche tools: beacon, probe, and shovel. Route can be of any strenuousness level.	Must be a student or graduate of Intermediate Snowshoeing, Alpine Scrambling graduate, or Basic Climbing graduate. Intermediate Snowshoeing students must have successfully completed the field trip prior to sign-up.

Strenuousness Rating System

The strenuousness of a trip is classified as one of the following four values Easy, Moderate, Strenuous, or Very Strenuous. Each value has a specific meaning defined as follows.

- Easy: Up to 750 ft. elevation gain, and up to 6 miles round trip. Most likely on an established trail or road.
- Moderate: Up to 1,500 ft. elevation gain, and up to 8 miles round trip.
- Strenuous: Up to 2,500 ft. elevation gain, and up to 10 miles round trip.
- Very Strenuous: Over 2,500 ft. elevation gain, or over 10 miles round trip.

Gear Information

While rental and purchasing information changes from year to year and the research put forth into this Appendix usually occurs before the start of the winter season. Please be sure to call ahead to the company listed to confirm rental and/or winter gear is still offered.

Gear Rental Information

Snow Links		https://tinyurl.com/tacoma-snow-links	
Miyar Adventures	425.749.9549	miyaradventures.com/gear-rentals/	20% discount
REI (Seattle store only)	206.223.1944	rei.com/stores/rentals	
Wildernest Outdoors	206.780.8527	wildernestoutdoorstore.com/gear-rentals/	

Retail Stores Offering Mountaineers Member Discounts

Backcountry	Internet	backcountry.com	15% discount[1]
ExpertVoice	Internet	experticity.com	Up to 70% discount
Miyar Adventures	Redmond	miyaradventures.com	15-20% discount
Mountain Hardwear	Seattle	mountainhardwear.com	15% discount
Outdoor Research	Seattle	outdoorresearch.com	10% discount
Wildernest	Bainbridge Island	wildernestoutdoorstore.com	10% discount

Other Retail Stores

Alpine Ascents	Seattle	shop.alpineascents.com/shop/
Arc'Teryx Outlet	Marysville	arcteryx.com
Ascent Outdoors (new/used)	Seattle	ascentoutdoors.com/
Dick's Sporting Goods	Various	dickssportinggoods.com
Feathered Friends	Seattle	featheredfriends.com

[1] Add items to cart and then email groupsales@backcountry.com to apply a discount on full priced items. Be sure to identify yourself as a Mountaineers member in your email.

REI Co-Op	Various	rei.com

Online Retailers

Amazon	amazon.com	Various
Everest Gear	everestgear.com	New
Moosejaw	moosejaw.com	New
Mountain Steals	mountainsteals.com	Discounted New
Sierra Trading Post	sierratradingpost.com	Discounted New
Steep And Cheap	steepandcheap.com	Discounted New

Mountaineers Sources

Gear Grab	Multiple Times Per Year	Various Branch Locations
Mountaineers Gear Trade, Swap and Sell	Facebook Group	Member Sales
Mountaineers Marketplace	Facebook Group	Member Sales

Reading and References

The following books provide good sources of information relating to all aspects of snowshoeing and winter mountain activities. Most books are available at The Mountaineers Bookstore, REI and Amazon.

- Mountaineering The Freedom of the Hills, 9th Edition by the Mountaineers
- Wilderness Navigation by Bob & Mike Burns
- Mountaineering First Aid, 4th edition – published by The Mountaineers
- Snowshoe Routes – Washington by Dan Nelson
- Snowshoeing Routes – Oregon by Shea Andersen
- Snowshoeing: from Novice to Master, 5th edition by Gene Prater
- Snowshoeing: A trailside guide by Larry Olmsted
- 100 Best Cross Country Ski Trails in Washington by Vicky Spring & Tom Kirkendall
- Conditioning for Outdoor Fitness by Musnick and Pierce
- Snow Sense by Jill Fredston & Doug Fesler
- Staying Alive in Avalanche Terrain, 3rd Edition by Bruce Tremper
- The ABC's of Avalanche Safety – 3rd edition by Ferguson & LaChapelle
- The Avalanche Handbook, 2nd edition by McClung and Schaerer
- Avalanche Safety for Skiers, Climbers and Snowboarders, 2nd edition by Daffern

Information Sources

— The Mountaineers	mountaineers.org	206-521-6000
— National Weather Service	weather.gov/sew	206-526-6087
— Northwest Avalanche Center	nwac.us	
— Mount Rainier National Park	nps.gov/mora	360-569-2211
— Washington State DOT	wsdot.wa.gov/traffic	888-766-4636
— Backcountry Information / Permits		
Mount Rainier National Park		360-569-2211
Olympic National Parks		360-452-4501
Washington State Parks Info		800-233-0321
North Bend Ranger Station		425-888-1421
Mt Baker Ranger Station		360-856-5700
North Cascades National Parks		360-856-5700
Skykomish & Stevens Pass Ranger Station		360-677-2414
Hoodsport Ranger Station		360-877-5254
— Alpine Snow Phones		
The Pass		206-236-1600
Stevens Pass		206-634-1645
Mt Baker		360-671-0211
— Road Conditions		
National Weather Service		206-526-6087
WSDOT		511
— Weather Broadcast Stations (Continuous 24 hour)		
KHB-60		162.55 MHz
WXM-62 NOAA Weather Radio		162.475 MHz

Graduation Requests

The graduation process requires two items; stewardship verification and the graduation request form.

If your stewardship was completed with the Mountaineers, then that will show on your profile and nothing more in that regard is needed.

If you completed your stewardship with a different organization, then print the Stewardship Activity Verification.pdf and have the organization/leader sign it.

The graduation request form can be filled and submitted online. There is an option to upload your signed Stewardship Activity Verification if needed.

Stewardship Verification Form:
https://www.mountaineers.org/locations-lodges/tacoma-branch/committees/tacoma-snowshoeing-committee/graduation-requests/Stewardship%20Activity%20Verification.pdf/at_download/file

Graduation Request Form:
https://www.mountaineers.org/locations-lodges/tacoma-branch/committees/tacoma-snowshoeing-committee/graduation-requests/winter-camping-graduation-request

* If for some reason the internet is unavailable, you can print the forms below and mail them.

Stewardship Activity

Tacoma Mountaineers
Stewardship Volunteer Activity Verification

On _____, _____ participated as
DATE VOLUNTEER NAME

A volunteer at _____ and performed
ACTIVITY SITE

assignments that aided the environment and its positive effects on the local community.

_____
SIGNATURE OF VOLUNTEER COORDINATOR

Winter Camping Course Graduation Request

FROM _____ _____

Name E-mail Address

I certify that I have completed the requirements for graduation from the Winter Camping Course as indicated below:

1 - I have attended the lecture in:

Month _____ **Year** _____

2 - I have attended the field trip in:

Month _____ **Year** _____

3 - I have completed the Avalanche Awareness Seminar:

Location	Date	Instructor

4 - I have attached my completed Stewardship Activity Verification.

Mail: Tacoma Mountaineers Program Center
℅ Winter Camping Graduation Request
2302 N 30th St
Tacoma, WA 98403