General Backcountry Safety

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An introductory course in backcountry safety for those with little or no experience in mountainous and backcountry terrain.

About the Author

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The author of the Mountain Rescue Association's *Helicopters in Mountain Rescue Operations* manual and co-author of the *Avalanche Rescue Operations* manual, Charley has consulted rescuers, mountain guides and climbers throughout the world, from Kazakhstan to Sweden, from Kilimanjaro to Aconcogua. Charley is a frequent speaker at meetings of the Wilderness Medical Society, the Mountain Rescue Association, and the International American Technical Rescue Symposium. He is a recognized leader of mountain rescue training programs.

General Backcountry Safety

Objective

The Mountain Rescue Association, a national non-profit membership association dedicated to saving lives through rescue and mountain safety education, has developed this program to be used by any person who will spend time in the backcountry.

At the conclusion of the course, the student will have an understanding of:

- Backcountry preparedness
- Clothing for backcountry travel
- What to do when lost
- The hazards of nature and how to avoid them

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Introduction

While the topography of the world's backcountry has not changed much in the past several centuries, the way we explore them has changed dramatically. In the 1700's, covered wagons and horseback trails dotted the American landscape as pioneers scouted and settled in the pristine remote hills. In the 1800's, prospectors discovered the rich resources of the mountains while mining communities sprouted like sagebrush. During the 1900's mankind's ingenuity has resulted in rubber rafts, fiberglass kayaks, titanium mountain bikes and snowboards as we explore more and more new ways to recreate in the backcountry.

In the past few decades, the number of backcountry recreationalists has grown continually. With that increase, the number of mountain search and rescue missions has escalated as well. Mountain Rescue Association teams currently respond to well over a thousand search and rescue missions each year. An alarming percentage of those missions are searches for persons lost in the backcountry. What is most distressing is that many of those searches could have been avoided if the victims had taken some simple precautions. Unfortunately, too many of these missions result in victims with serious medical complications such as hypothermia, frostbite, dehydration, shock or severe trauma.

Despite these disturbing facts, basic backcountry use can be risk-free if the user is knowledgeable and prepared. Knowing what could go wrong and preparing for it in advance can often mean the difference between an enjoyable day in the backcountry and disaster.

In this program, we will discuss the most common hazards of backcountry use and offer some simple guidelines designed to help the user reduce the associated dangers.

Backcountry Equipment

The "Ten Essentials"

The first and most obvious rule of safe backcountry use is to always carry equipment that might become necessary in emergencies. Every backcountry user, even on seemingly insignificant day hikes, should carry the most basic equipment; commonly referred to as the “Ten Essentials,” The key word is "essentials." The survival equipment, clothing and other resources you carry will increase your chances of surviving an emergency.

Technically skilled and highly experienced rescue mountaineers never go into the field on search or rescue missions without these ten essentials. Carefully selected, these items can easily fit within a small backpack.

The "Ten Essentials:"

1. Topographic map and magnetic compass

Too often, backcountry users venture deep into the backcountry without a map and compass. The fact that they are able to safely venture back out is usually pure dumb luck. With a map and compass, it is much easier to identify your location and direction of travel. This is especially important in the event that you become lost.

To learn to use these items, see the chapter entitled "Map and Compass".

2. Flashlight (with extra batteries and bulb)

How far do you suppose you could safely travel at night in the backcountry without a flashlight? Could you signal others, if you saw a campsite far away? A flashlight makes travel at night possible and aids in signaling when lost.

3. Extra clothing (including mittens, hat, jacket and rain gear)

Hypothermia is the most common killer of backcountry users. Inability to maintain body heat can quickly rob an unsuspecting victim of all energy and common sense. Since severe weather may present itself very quickly in the backcountry, extra clothing should be carried to help maintain body heat.

4. Sunglasses

Especially in the winter, ultraviolet glare from the sun can cause blindness. Worst of all, the backcountry user may not realize this is happening until it is too late. A good pair of sunglasses, designed to limit ultraviolet light, will eliminate this risk.

5. Extra food and water

These items will maintain energy levels in the case of an emergency and help maintain body temperature in cold weather. While you can survive three days without water and three weeks without food, your energy levels will be seriously depleted without these.

6. Waterproof matches in waterproof container

Waterproof matches, available from most backcountry supply stores, are capable of igniting in high winds and/or blinding rain. Building a fire may be impossible without these. Fires are critical since they not only provide heat, but also make the job of search and rescue teams easier by providing a visible signal.

7. Candle/Fire starter

A candle burns much longer than does a match. This is helpful when trying to start a fire, especially if your firewood is wet.

8. Pocket knife

There are a multitude of applications for a pocketknife in emergencies. The common Swiss Army Knife is so-called because it is standard issue for the Swiss Army, which has devised 246 uses for their standard 7-instrument knife.

9. First aid kit

Proper first aid care is difficult, if not impossible, without a good first aid kit. Backcountry shops carry several brands of small, lightweight first aid kits including small first-aid manuals.

10. Space blanket or two large heavy-duty trash bags

These items can help provide shelter in an emergency situation and can be used as a raincoat or a windbreak. The additional warmth they provide far outweighs their minimal weight.

This list of "Ten Essentials" assumes your trip is a summer excursion. At any other time of the year, be sure to bring more of the right kind of clothes. When choosing your equipment, remember that the body's ability to maintain its core temperature is critical to your survival in the backcountry.

Unfortunately, a large percentage of search fatalities would have probably survived had they carried and used the ten essentials. When you venture into the backcountry, you are often many miles away from civilization. Emergencies often present themselves at times when qualified help is many hours away. This simple fact underscores the need to carry emergency equipment.

Clothing

The Backcountry Is No Place for Calvin Klein

Since hypothermia is the most common cause of accidental death in the backcountry, proper clothing is essential to every backcountry user from novice to professional. Hypothermia results when the body loses more heat than it can generate. Effective dressing is the simplest way to avoid hypothermia in the diverse weather of the backcountry.

Effective dressing means more than simply owning the most expensive parka and the fanciest rain gear. World-class mountaineers have long known the value of specialized techniques in mountaineering dress.

Layering

At any time of the year, the most effective way to dress is by "layering". This method has been proven, not only on Mount Everest but in the cold northern regions of Minnesota as well.

Layering simply means wearing one thin layer of clothing over another over another. Many experienced winter mountaineers do not carry a heavy down parka into the backcountry and for good reason. If they become warm underneath a down parka, removing the parka leaves them extremely exposed. Rather, they will carry numerous lightweight layers.

The advantage of layering is that one can add and remove protection from the elements in small increments, thus balancing heat generation with heat loss. In addition, layering traps dead air for additional weight-free insulation.

Composition of Layers

The body is a source of heat, which you want to retain within your clothing. It is also a source of moisture, in the form of perspiration that, in many situations, must be kept away from the skin due to the cooling effect of evaporation. For this reason, the layers of clothing near your body should be thin and porous to hold in heat and wick away perspiration. Middle layers should be thicker in insulating quality to hold in more heat, yet be able to dissipate the moisture further away from the body. Finally, the outer layers should be thick enough to prevent heat loss and still protect the inner layers from the external elements. The most effective outer layer is completely waterproof, yet allows water vapor (perspiration) to escape. Most conventional rain-gear does not allow water vapor to breathe, thus the body's perspiration is held within the layers of clothing, increasing evaporative heat loss and saturating clothes.

The key to mastering the layering system is to add or remove layers of clothing at just the right times. Remove a layer before you begin sweating; add a layer before you get cold. By doing so, you can balance the amount of your body's heat generation with heat loss. Conserve your sweat, not your water!

Extra Clothing

In discussing the "ten essentials," we have suggested carrying additional clothes. This simple suggestion should not be overlooked, since a warm, balmy morning at the trailhead often ends in a cool, windy chill on the summit.

Five Methods of Heat Loss

Just as the body constantly produces heat, it constantly loses it.

There is a simple reason why we wear clothes, besides to preserve our own simple modesty. Since human beings are warm blooded, we must rely on our own bodies for internal heat. Most warm-blooded creatures are protected from the elements by a coat of fur. This fur helps preserve warmth by trapping air and providing a layer of insulation. Humans, on the other hand, have no such coat of fur. This means, quite simply, that we must maintain a suitable artificial environment close to our skin that allows for the retention of the body heat that we create internally.

Five Ways We Lose Body Heat

There are five mechanisms through which body heat may be lost: Conduction, convection, evaporation, radiation and respiration.

Conduction is the transfer of heat through direct contact. If you were to sit on a slab of ice, your body heat would move through your clothes to the ice below. Wet clothing robs your body of heat through conduction as well. In fact, wet clothing will do so 240 times faster than dry clothing. This is why we should remove a layer of clothing before we begin sweating.

Convection is the transfer of heat through the movement of air. The body tries to create its own insulating layer. This means that the body warms the air close to the skin. If this thin layer of warm air were to remain intact, our bodies would maintain their own insulating layer and clothes would be unnecessary. Unfortunately, wind brushes this warm air aside with little effort. The body must then generate another warm layer of air. In even moderate winds, the body doesn't have a chance to keep up with this loss of heat.

Evaporation occurs when we sweat and the tiny droplets of liquid are converted into vapor. This conversion from liquid to vapor results in a net heat loss. That is, the surface on which evaporation occurs will lose heat (which explains why you feel a bit cold when you step out of the shower, before drying off). The body sweats because its internal temperature is too high and it wants to cool down. Sweating will occur even in winter, if the backcountry user does a poor job maintaining ventilation through clothing. When the clothes become wet with sweat, further heat is lost through conduction.

Radiation is the movement of rays of heat from a warm object to a colder one. At temperatures as warm as 40 degrees Fahrenheit, fully one half of the body's heat can be lost by radiation from an uncovered head, since blood vessels in the head lie close to the skin. Hats and balaclavas (facemasks) are essential to prevent this loss of body heat.

We lose our body heat naturally, simply through respiration. Furthermore, we may burn over 50% more energy in winter than we would in summer. This is partially explained by the fact that we are breathing extremely cold air, warming it and saturating it with water vapor. As much as one-third

of our body-heat loss can occur through breathing. Breathing through a scarf or balaclava helps by "pre-heating" the inspired air.

Map and Compass

"Did I Bring The WHAT???"

All experienced backcountry users know how to use a map and compass, right? Wrong! Some do. Most don't. In fact, the number of search subjects found without either is startling. The invention of the Global Positioning System (GPS) has actually made matters worse in that some backcountry users think a GPS unit replaces the need for a map and/or compass.

Map and compass work is important for reasons beyond safety. Experienced topographic map-readers can determine the most picturesque backcountry campsite while sitting at their kitchen table, simply by studying the topography around their proposed sites. Furthermore, accurate map and compass work can reduce the amount of time spent looking for campsites or parking lots.

Students of this program should follow up with a local "Map and Compass" course. These are generally available through local backcountry retailers or from your local Mountain Rescue Association search and rescue team.

Backcountry Preparedness/Accident Avoidance

Planning Your Trip

Often, recreationalists venture into the backcountry with little or no pre-planning. This occasionally results in catastrophe as they do little to prepare for the severe conditions that they may encounter.

With even a seemingly insignificant day-hike, the time to plan a trip is before leaving home. There are numerous things that should be done before starting out on the road.

Let Others Know

One important rule too often forgotten is to let others know exactly where you are going, with whom and when you can be expected back. I hate to sound maternal, but search and rescue teams often spend hours driving around on back roads looking for a subject's vehicle before they know where to enter the field to begin a search.

By letting someone know EXACTLY where you intend to go, when you expect to return and where your vehicle will be parked, you can eliminate the possibility of searchers having no idea of where to look. Should your plans change in route to your destination, stop and notify that person of your new itinerary. In addition, if you leave pertinent information on the dash of your car (e.g. name

and phone number of your contact in town, location of travel/campsite and so on) search teams will have a very timely idea of your plans. Otherwise, search teams can be of little assistance when all that is known is that you "went camping somewhere in the Gore Range."

Whenever possible, utilize trailhead and summit check-in logs. These generally exist at most popular National Forest trailheads and atop many popular mountain summits.

Plan Your Route

Before Sir Edmund Hillary became the first man to stand atop Mt. Everest in 1953 (at 29,035 ft., the highest mountain in the world), many climbers had tried using various routes. A few of these mountaineers died trying. To this day, the South Col route on Mt. Everest remains the prominent Everest route.

Careful planning based on earlier attempts combined with detailed study of the risks of various routes led the 1953 British Everest Expedition to choose the now famous South Col route. It is not by accident that this route is so popular. Repeatedly, it has been proven to be the safest and easiest route.

Likewise, popular routes to the summits of mountains in the United States are based on similar exhausting study by early mountaineers. Detailed in mountaineering books, as well as on many topographical and trail maps, these trails should be closely followed. Any deviation by inexperienced mountaineers can lead to disaster. In addition, backcountry users should stay on maintained trails as part of the Leave No Trace ethic of mountaineering.

Backcountry preparedness begins with prior knowledge of the anticipated route...types of terrain, technical skills needed, length of the route and amount of available shelter along the trail.

Know Your Physical Limitations

Disorientation results when the body is cold, oxygen deprived and/or fatigued. Know the physical limitations of each member of your team, especially if any member has a predisposing medical condition that could possibly require immediate care while on the trip (e.g. diabetics and persons with heart conditions).

Among your considerations should be the following:

Altitude acclimatization of each party member

A mountain resident at 12,000 feet is accustomed to 68% of the oxygen to which someone living at sea level is accustomed. Since air density decreases as altitude increases, more work is required to breathe at higher elevations. The intercostal muscles surrounding the lungs must work harder when the air density is lower. High-elevation residents have already strengthened these muscles and changed their blood chemistry to accommodate inspiring less oxygen. Mountaineers who live at sea level would therefore experience greater difficulty catching their breath when climbing to 14,000 feet than would the resident of the mountains, even if the flatlander is in better physical condition. Additional problems can develop as well, including Acute Mountain Sickness, Pulmonary Edema and Cerebral Edema. These complications are serious and can result in coma and death, and at elevations far lower than 14,000 feet.

Based on these facts, plan the difficulty of your route based on the knowledge that each team member may be accustomed to a different concentration of oxygen.

Know your team members' comfort level near steep ridges

Although most backcountry trails are not technically difficult, some may involve hiking moderately close to a steep ridge with an imposing severe drop. This could create anxiety on the part of recreationalists who are not accustomed to such relatively unprotected slopes, even if the trail is five feet wide and perfectly flat.

In addition, the lack of a flat horizon on high peaks may make balance more difficult for those who are not accustomed to such terrain. This can lead to increased anxiety, panic and perhaps nausea on the part of inexperienced backcountry users. Imagine yourself standing on a five-foot wide ledge at the top of a 30-story building. Scary, isn't it, even if the ledge **is** five feet wide?

The team's most experienced backcountry user should stop and ask each of the team members whether or not they feel comfortable with the exposure when encountering severe pitches. If some team members do not feel comfortable they must be given the option of turning back, or risk cleaning out the gene pool.

If team members do turn back, they should always travel in groups of two or more and the team leader must be certain that they are equipped with a map, compass and survival equipment. This reduces the risk of a lone hiker becoming disoriented and lost.

Maintain a chemical-free body

Not surprisingly, many rescues are performed each year on victims who have altered their body chemistry with alcohol and/or other drugs. If these substances are an active part of your life, remain in the safety of less severe terrain.

If you think going UP was hard...

Many inexperienced backcountry users become intrigued by small, seemingly simple pitches of technical rock and decide to challenge themselves by attempting to climb them without technical equipment. After all, if the first ten feet was THAT easy...

The startling surprise comes when they reach a point at which they cannot continue up and realize that descending the same pitch will be much more difficult than the ascent they just completed. The reason is simple. In ascending a pitch, the foot placements are easily visible somewhere between the feet and waist level and one never HAS to look down. In descending, the foot placements are now below the feet, perhaps 6-8 feet below the eyes and are not easily discernable. What makes this realization more alarming is that in order to find those footholds, the climber must look down more often. At this point the inexperienced technical climber, without any fall protection (such as ropes, anchors, and a belayer) is faced with the grim reality that a fall would be very dangerous. Adrenaline now overtakes the body and the leg and arm muscles that are holding the person in place quickly become fatigued as a result.

The moral, based on many seemingly unnecessary rescue missions, is this: Unless you're carrying technical rock hardware and are experienced at technical pitches, stay off them and enjoy a safe hike. After all, a helicopter ride back to the nearest hospital is not worth the long and painful several hour wait (with broken bones or ruptured internal organs) for the rescue team and

helicopter to arrive. Believe me, trauma center helicopters are a lousy way to see the backcountry.

Not so surprisingly, a large percentage of rock climbing accidents occur with novice climbers.

Think "Before"

"Prepare" is defined in Webster's Dictionary as "to make ready beforehand for some purpose, use or activity." The inclusion of the word "before" in this definition is not by accident.

One way of assuring the success of your trip is to remember the "Rule of Befores". Listen to a weather forecast **before** planning a trip. Tell people where you are going and when you'll be back **before** you leave. While on the trail, drink **before** you get thirsty, eat **before** you get hungry. Add a layer of clothes **before** you get cold; remove a layer of clothes **before** you get hot. Make camp **before** you need camp. Find protection from foul weather **before** it arrives. By doing these things, you will find yourself always thinking ahead. Think ahead at all times and you will rarely find yourself unprepared.

Test your equipment under controlled conditions prior to actual use

Do not put yourself in a position in which you discover that your equipment is inadequate while in the backcountry. If, for example, you plan to use a three-season sleeping bag in conditions of extreme cold, test the sleeping bag in a safe place, such as your own back yard, in similar weather conditions. This way, if the sleeping bag does not perform as expected, a warm bed offers a safe alternative. Consider this example with all backcountry equipment to be used.

Protect against Giardia

Giardia is a microscopic parasite that exists in water sources nearly everywhere on the planet. It cannot be seen with the naked eye and once ingested, its symptoms read like a “Who's Who” of digestive system ailments: abdominal cramps, diarrhea, loss of appetite, nausea, flatulence, vomiting, weakness and fever. One's digestive system is never quite the same after a battle with giardia.

The disease begins with fecally contaminated surface water and the parasite thrives in cool, clear water. Elk, deer, beaver, muskrat, dogs and humans are all known carriers, which helps explain why it has overtaken literally every water supply on Earth. Once ingested, the microscopic cysts multiply in the intestines at a phenomenal rate. A victim of giardiasis may excrete billions of the tiny parasites in a single day.

Carriers of the disease may be "asymptomatic;” that is, they show no signs of the disease themselves, but can spread it to less tolerant individuals. Since humans are known carriers, human waste should ALWAYS be disposed away from water sources to reduce possible future contamination of those water supplies.

To reduce the risk of infection, all water to be consumed should be boiled for several minutes (increasing boiling time at altitudes above 10,000 feet). If boiling is impractical, chemical treatments or portable filter systems (available at backcountry outfitters) should be used. The giardia parasite is so small, it is possible to contract the disease from a toothbrush dipped in a

stream or from bottle cap threads. For that reason, you must be meticulous with your water treatment.

Though giardiasis may not present itself for five to seven weeks after ingestion of the parasite, it has been known to occur much more quickly. The only treatment in the field for a victim showing signs and symptoms of giardiasis is to quickly transport the individual to a medical facility. Because of diarrhea and vomiting, hypovolemia (reduced level of body fluids) can be a serious complication, so periodic intake of treated fluids should be encouraged. Sometimes victims of giardiasis may be so incapacitated that they are unable to walk. In this case, a rescue team should be sought to assist in evacuation.

Keep the Team Together at All Times

Throughout this program, we refer to every group of backcountry travelers as a "team". The word "team" implies a group of people working together for the benefit of the whole. If you consider yourself part of a team and constantly stay aware of the other team members throughout your trip, especially in cases of extreme weather, accidents can be easily avoided.

As with any team, a "team leader" should be chosen for all backcountry trips. Your team leader must be perceptive of the individual abilities and experience of each team member. This person must know that the only real goal for a backcountry adventure is the safe return of each party member. The team leader need not be the most skilled mountaineer, but rather the most trusted and most respected backcountry user.

Of the hundreds of searches performed in the United States by Mountain Search and Rescue teams each year, most are conducted for subjects who have been separated from a group of people and usually from shelter and survival equipment. The rule is simple: do not wander away from the team! In Kansas, for example, roads are easily found just about everywhere. Fly over western Colorado just once and you'll realize this is not true of mountainous states. In the words of a now infamous young girl trying to find her way home, "Toto, I don't think we're in Kansas anymore."

If team members must separate from the rest of the team, they should always do so in groups of two or more. In addition, they should carry and be skilled in the use of a map and compass. This will reduce the risk of any individual becoming lost. Also, make certain to mark on the map the precise location of the team.

"If You Don't Like the Weather, Wait Ten Minutes."

"Today's forecast calls for clear skies in the morning. Highs will be in the mid- to upper-seventies. Increasing clouds with localized thunderstorms by late afternoon in the mountains." God only knows how many hundreds of times we hear this mountain weather forecast in the summer. Day after day it's the same story. And day after day some percentage of the mountain peaks and valleys experience severe thunderstorms in the late afternoon.

Backcountry weather in specific valleys or ranges is relatively difficult to predict from distant Weather Service offices using even the most modern instruments. It is generally easier for the backcountry traveler to predict the weather from the particular valley.

When hiking in the mountains, constantly watch the sky and take note of the size, height, form and movement of clouds. Changes in these characteristics are meaningful. With relative ease one can predict local storms in the mountains through basic observations. This is important so that your team can be quickly guided off the mountain to a place of safety.

In the winter, cyclonic storms usually arrive with substantial warning. They are not as local and can be more easily predicted by the Weather Services. Still, and particularly because of the time of year, one should always be prepared for the worst possible weather. In winter storms, the imminent dangers of lightning are replaced by frostbite, hypothermia, lack of visibility and the inability to travel as quickly, due to the snow cover.

"Oh *!#+*!, What Should I Do Now?"

What To Do If You Get Lost

Imagine... it's a beautiful day. You've taken your camera and headed out for a short hike away from your campsite. The wild flowers are compelling and you wander about aimlessly for a few hours. Two rolls of film later, you begin to head back for camp. Suddenly, nothing looks familiar. You look around for a while, trying to find something, anything, that looks familiar. As dusk approaches, your heart beats faster and you become very anxious. You have nothing but your camera and two spent rolls of film and without a flashlight, it will be impossible to find your way back. Your head sweats and your heart pounds feverishly as you begin to feel the panic associated with being lost.

Discovering you are lost in the backcountry can be a frightening experience. This feeling can be compounded by the five basic fears: that of being alone, darkness, animals, suffering and of course death.

STOP!

At the moment you realize you are lost, the most important thing you can do is S.T.O.P. (Sit, Think, Observe and Plan). Do not run off frantically looking for a way out. Rather, stop and assess your situation! Use your head, not your feet. At this point your brain is your most important piece of survival gear. The first ten minutes of being lost are when most search fatalities make their deadly mistake.

Whatever you do, don't panic. In most situations you can survive 3 days without water and 3 weeks without food. Force yourself to breathe deeply and slowly. Rest assured that by remaining calm and relaxed, your chances of survival, which are quite good already, have increased by 50 percent. Your primary goal now should be to stay alive, not to find your way out. Help will be on the way soon after you are reported missing. Sheltering the body and conserving energy is your greatest concern right now.

YELL!!!

When you first discover that you are lost, stay where you are. Yell or blow a whistle 3 times to signal your party or any others within earshot (a whistle will carry farther than your voice and requires less energy). Wait several seconds, then turn 90 degrees and try again. Do so several times in every direction. If you have no whistle, yell "HELP" rather than a friend's name. Doing so will help assure that your distress call is not ignored.

If someone yells back, let **him or her** come to **you**. Rock walls and valleys play strange tricks with echoes and you may lose your potential rescuers by attempting to locate them. In addition, your rescuers are most likely a group of people, so they will have a better chance of finding you than vice-versa.

If you do hear someone yell back, no matter how faint his or her yell may be, stay put and keep yelling. They may sound far away only because they are facing away from you and have not yet ascertained from where you are yelling.

If you are near a loud stream, move away before yelling or whistling for help. Be certain to mark your way back to the stream, however, as you may want to follow that stream later if your calls go unanswered. The same is true for windy areas where a howling gust can be quite loud. Remember, someone may hear your call at times when you cannot hear his or her reply, especially in windy areas. Do not give up yelling or whistling simply because a reply is not heard.

Stay Put

When setting up a search, mountain rescue teams follow certain priorities and make certain assumptions about their subjects. These assumptions are based on behavior patterns of lost subjects. An understanding of these assumptions may help guide you to a place that is searched early.

The first members of a search party are quickly dispatched to the point at which the subject was last seen (strangely enough, referred to as the "last seen point"). They follow trails and streams near this last seen point, yelling the subject's name and blowing whistles. This simple fact is reason enough to just sit still and wait for rescuers to find you. Unfortunately, nobody does. Less than 30% of lost persons are found within one mile of the last seen point.

Additional rescuers search areas of high probability near the last seen point. Statistics on behavioral patterns of lost hikers have shown that 88% walk downhill when lost, 73% find and follow a trail or path and 82% are found in open areas. Based on these facts, field teams often search downhill from the last seen point before spreading the search out in other directions.

Air searchers are generally used soon after you are reported missing and weather permits flying. Plan to stay near open areas and be ready with signals.

What if You REALLY Blew It?

In the unfortunate circumstance in which you were hiking alone and forgot to tell anyone where you were going, you would be well advised to try to find your own way out. After all, search teams

can't look for you if nobody knows you are lost or, for that matter, where you went. In this case, consider the following:

Assuming you are still at the point where you first discovered you were lost and you've tried whistling or yelling numerous times in all directions, look around for any memorable landmarks which may help you discern the direction in which you were traveling. Your goal is to SLOWLY retrace your steps. Listed below are some clues to help in this effort:

Determine Magnetic Orientation

Do you have a map and compass? If so, try to identify your exact location and the best direction of travel to return to a nearby road or trail. You may recall that the first items on the list of ten essentials are a map and compass. Right now that $10-$15 expense looks like a bargain, doesn't it?

If you don't have a compass, there are still several methods you can use to help determine magnetic orientation. The most accurate method can only be done during a sunny day: Place a 3-foot long object (stick, ski pole, etc.) in the ground, upright, in a cleared area. Place a marker in the ground at the end of the stick's shadow line. Wait 15 minutes and place another marker at the end of the shadow line. Repeat this process until you have 5 markers in the ground. Now lay another stick alongside the markers. This stick points west in the direction of the first marker, east in the direction of the last marker. Granted, this takes over an hour, but it may be time well spent. And besides, by the time you've finished, someone may have found you. If so, simply tell them you're studying the effects of solar radiation on vertical sticks!

If you don't have a compass and the sun is NOT visible, you may still be able to determine magnetic orientation. Tree bark may be moist on the north side, dry on the south side (determine this by looking at many trees, not just one!). The limbs of trees may be heavier on the south side as well.

Is the direction of shadows any help in determining your magnetic orientation? During the mid-winter in most United States backcountry, the sun comes up from the east/southeast horizon and takes a more southerly path across the sky before setting in the west/southwest. This means your shadow points to the west-northwest in the early morning, towards the north at noon and towards the east-northeast in the late afternoon and evening. At the vernal and autumnal equinox (March 21 and September 21) the sun rises due east and sets due west.

Is the presence of hills, slopes, peaks or valleys any help in determining your earlier direction of travel? Can you remember what you saw the last time you had a panoramic view before becoming lost?

Utilize Other Clues

Can you find your own footprints and back-track? (Make a footprint and study it.)

Do you remember any clouds you faced as you hiked before you became lost? Can you find them again? They may help you determine the direction in which you were traveling (Do not use this method if you have been lost for over an hour.).

One of the most successful methods of self-rescue is called the "wagon-wheel" approach. Starting at your present location, follow a given compass bearing for about two hundred steps. If along the way you find no clues to help you identify your location, turn 180 degrees and walk the two hundred steps back to your initial location. Then, take a compass bearing 45 degrees from the first bearing and repeat this process over and over. Your goal is to always stay as close to your original position as possible. Walking aimlessly may take you further and further from any recognizable landmarks.

Once you've determined that you are completely lost and have no idea of your earlier direction of travel, do whatever possible to find a trail or stream. Keep in mind that if followed downhill, trails and streams generally lead to civilization at some point. If a road is encountered, regardless of its condition, follow it downhill. Even if the road appears to be an abandoned wagon trail, it will likely lead somewhere. If, for any reason, you do leave a road you encountered, mark the point from which you left the road with sticks, stones, strips of clothing or perhaps a note indicating the date and time and your direction of travel. At some point, a searcher will probably cover that road.

Throughout your ordeal, periodically whistle 3 times or yell for help, especially in places where rock walls or hills may help carry the sound.

Shelter

When lost in the backcountry, you must prepare for darkness well in advance of nightfall. If you must spend the night, utilize whatever is available for shelter. When doing so, keep in mind that what is underneath your body is often more important than what is above it. At night, the ground is usually colder than the surrounding air. Shelter yourself from the ground with additional clothes, tree branches, brush, wood or anything that helps trap air.

Leave Clues! Clues! More Clues!

Throughout your ordeal of being lost, pause every few minutes and contemplate how to make yourself "bigger" by signaling methods and by leaving clues. You can signal your distress in a variety of ways. Stamp SOS in large open areas such as snowfields or grassy meadows (Be sure not to spell it backwards or upside-down, as this easily confuses rescuers). Pile downed tree branches in rows or place boughs in tramped snow. Create "arrows" from downed wood to indicate your direction of travel. Anything unnatural (such as piles of wood or rocks) will act as a clue to searchers. If a helicopter or airplane passes overhead, signal it using the bottom of a can or a mirror.

The truth is that searchers are looking more for clues than for victims. There are always more clues than victims and once clues are found, the size of the search area is reduced. To make the job of searchers easier, leave clues such as clear footprints, arrows drawn with sticks, notes attached to trees or anything you can think of to signal rescuers. If you spent all your time leaving clues and less time trying to hike out (when you probably don't know which way to hike anyway), you would probably decrease your time lost significantly.

Fire Building - Can You Build a Blazing Fire With Damp Wood and One Match?

The ability to build a fire when lost is extremely helpful for reasons beyond the obvious warmth it provides. The light from the fire helps search teams at night when their task is much more difficult. During the day, a smoky fire will attract searchers as well.

The key to fire-building is to assume that no matter how many matches you actually have, you will need some later to start another fire. With practice, you can learn the skill of building a roaring fire with ONE match, ONLY one and ALWAYS one. To do so, follow these simple guidelines:

Always carry wind resistant and waterproof matches (you may recall that item 6 of the "Ten Essentials" is waterproof matches...another cheap investment at this point, isn't it?).

First of all, collect your firewood and start to build your fire BEFORE darkness and BEFORE you get cold.

Choosing a Site

Choose a site well protected from the wind. Clear the ground down to the soil and dig a small pit. This pit helps protect your fire from wind, aids in positioning the twigs and collects red coals as the fire continues.

Now gather rocks and surround the pit with them. The rocks offer additional wind protection, but more important, they absorb heat from the fire and increase the radiative heat.

Collecting Wood

As you collect wood, keep in mind that no twig is too small when attempting to start a fire. Break the wood down to manageable pieces, some as small as toothpicks. You MUST have very small twigs to start a fire efficiently with only one match. And remember, YOU MUST TRY TO DO THIS WITH ONLY ONE MATCH! (If small twigs are unavailable, pieces of torn clothing or lint from pockets may be substituted.) Gather enough wood for a long-lasting fire.

If the ground is wet, dried pine needles underneath the top layer of needles might be available. If it is raining, look UP for dried firewood. Most trees have dead lower branches that remain dry during the early stages of a rainfall. Never try to start a fire with fresh, green pine needles, however. You will simply waste your matches. And remember; use your matches as if your life depends on them. IT MAY! (A candle, item 7 of the "Ten Essentials", is extremely useful in starting a fire and conserving matches.)

Until you have a large bed of red-hot coals, do not rest secure in the belief that you have built a successful fire. Monitor the fire, blowing on it whenever necessary, adding more twigs and logs and protecting your wood pile (and marshmallows!) from future rain by covering them with branches.

Build a Visible Fire

Since searchers often utilize airplanes and helicopters, you should try to create a visible fire. At night, add as much wood as is reasonably safe to create a big fire. During the day, add items that

create smoke. Rubber items work well for this, as do fresh branches of green pine needles. A smoky fire can be visible for many miles.

Practice this skill on your next camping trip, or for that matter in your fireplace at home. This valuable skill may help you avoid a cold, wet evening spent staring at a book of used matches and a lifeless pile of firewood.

Several years ago, two snowmobilers who survived four days in a blizzard with no matches, yet they were found next to a roaring fire. How did they do it? Simply by ingenuity. After gathering firewood, they tore up long strips from the snowmobile manual, dipped them in the gas tank and held them next to the spark plugs as they started the snowmobiles...instant fire!!!

What to do When a Team Member is Lost

If the team has lost a member of the party, the team must evaluate the need for additional support based on the weather conditions as well as the health and preparedness (e.g. ten essentials) of the lost party. Keep in mind it may be a matter of hours before a search and rescue team can be assembled and dispatched into the field.

Mountain search and rescue teams in the United States are generally volunteer organizations and do not charge for the services they provide. Cost should not be considered when assessing the need for a search party.

If additional support is necessary, be certain to clearly indicate on a topographic map the exact location of the "last seen point" before leaving this location. This is essential. In addition, mark the actual location with a piece of clothing and, if possible, encircle a sample of the victim's footprint with rocks, twigs, rope, etc. Unless the team is quite large, dispatch the ENTIRE remainder of the team to the nearest public road, leaving markers along the way, such as strips of brightly colored clothes or unnaturally placed logs or rocks. These markers will help search teams find the last seen point and may help the lost party find their own way out. Once at the road, send one or two people to find a phone and call the sheriff's office immediately. The rest of the team should remain on the road, near the trailhead(s), in the event that the lost member hikes out. They should stay there until search teams arrive so the search teams can interview them to learn as much as possible about the subject of their search.

Avoiding the Hazards of Nature

Introduction

Year after year, many unsuspecting backcountry users are injured or killed in accidents that are the direct result of nature-related problems. Lightning and avalanches as well as heat and cold-related problems result in many deaths each year. Unfortunately, many of these accidents could have been avoided if the backcountry users had been knowledgeable and prepared.

When Lightning Strikes

Although we hear more on the news about such weather disasters as hurricanes, tornadoes and flash floods, no element of the weather takes more lives each year than lightning. Over one hundred Americans are killed each year by lightning. Of all the weather hazards in the backcountry, this phenomenon is the most significant.

The National Weather Service has estimated that roughly 2,000 thunderstorms are occurring on earth at any given moment, producing 100 lightning strikes per second.

Lightning is a very dangerous yet somewhat avoidable hazard of backcountry use. With a small degree of understanding of the electrical energy of a lightning strike, the backcountry user can better reduce the risk of death or injury.

Lightning almost always occurs in conjunction with a thunderstorm. In fact, the frequency of the lightning can usually be determined by the intensity of the thunderstorm. In a well-developed thunderstorm, strong updrafts and downdrafts create an intense electrical field. The upper section of the storm builds up a strong positive charge, while the lower section develops a negative charge. Whereas the ground is normally negatively charged, the strong negative charge of the storm induces a positive charge on the ground as the storm passes overhead. Electrical current begins to flow up buildings, trees and other tall objects as the opposite charges attract each other. When the difference between the charges is great enough, the insulating atmosphere between the cloud and ground is insufficient and an electrical connection is made. The result...a lightning strike.

The current in a bolt of lightning averages 30,000 amperes. Normal household current is 20 amperes. An impressive difference, wouldn't you say?

Due to this imposing power, the basic dangers of lightning are not only that of being the subject of a direct strike, but of being in the path of ground currents as the electrons flow to the location of a nearby strike.

Lightning and the Human Body

Second only to metal objects, the human body is an excellent conductor of electricity - better than natural substances such as rocks, trees and soil (nearly ALL objects are conductors, however, given the extreme amperage found in lightning).

With few exceptions, a direct lightning strike is fatal. Ground currents, or "indirect strikes", can also be fatal (though not always) and require more knowledge to understand avoidance.

The Lightning Process

Lightning is usually a ground to cloud process. The cloud induces a charge in the ground that "pulls" the electrons toward the base of the cloud. The base of the cloud is positively charged, which induces a negative charge to be attracted below it. Electrons flow along the ground and discharge upward when the strike occurs.

Lightning is generally pulled from the most conductive object closest to the source cloud. In the plains states, strikes are generally vertical. In mountainous terrain, however, a diagonal or horizontal strike may reach to a nearby peak.

The danger of a lightning strike is as follows: When lightning occurs, the intense electrical charge (100 billion electrons) is drawn quickly from many directions. As it travels across the ground, the charge passes through any conductive object in its path, including a human body. If this happens, both an entry and exit point result somewhere in the body. The unusually high current will flow through the body in the same way an electrical charge passes through a wire - in through an entry point and out through an exit point. When these points of entry and exit are at opposite extremes (e.g. entry at a hand and exit at a foot) the vital organs of the midsection are subject to extreme electrical shock. If, however, the current passes from one foot to another, the organs are usually not as prone to damage. In either case, severe third degree burns at the entry and exit points or fourth degree burns of the intermediate muscles and bones can result, depending on the victim's proximity to the strike.

Positioning Yourself

The key to safety during a potential thunderstorm is to know the most likely point where lightning might strike and to anticipate the path of travel of the charge that is drawn from it. Anticipate the hill on which you are standing will sustain a strike and work to avoid key places on that hill.

What places are safer than others? The general rules are as follows:

Stay away from the isolated or largest trees, nearer the dense, shorter ones. Also, stay farther from isolated trees than the height of the tree. When on an exposed talus or scree field (rock fields with no tree protection) stay nearer the smaller rocks. In open areas, seek a low place such as a ravine or valley, but be alert for flash floods.

In all cases, stay away from sources of water (e.g. streams, lakes, puddles or even small pools of water collected on rocks). Water is an excellent conductor of electricity.

The optimal location would be sheltered by small trees in a ravine, away from water and rock overhangs. As an electrical charge traveling along the ground reaches an overhang, it will very likely arc across to your body and travel through it rather than along the rock.

If your team is a large group of people, spread out as much as possible to reduce the risk of multiple casualties. If you take shelter in a cave, stay away from the entrance. As the lightning passes through the ground, it will travel near the opening of the cave and will use a body as a bridge to pass from one side of the entrance to the other. When camping, don't take shelter in your tent if it is out in the open or under one of the larger trees in the area. Tents provide no additional insulation.

Body Position

Body position is simple. Avoid positions that would allow the charge to pass through the body. Whenever possible, drop to your knees and bend forward putting your hands on your knees. Try not to place your hands on the ground, as this would increase the chance of entry and exit points resulting at opposite extremes. NEVER lie flat on the ground. At all times, wear shoes and stay on something insulated such as dry clothing, packs, ropes or tree branches. Occupy the smallest area possible.

When there is a hazard of lightening, remove all exposed metal objects from your clothes. These objects become hazardous not only because they present a possible target for a direct strike but

also because they will heat up significantly and fuse clothing or flesh as the current passes through the body on an indirect strike.

When you see a bolt of lightning, count how long it takes for you to hear the thunder and divide by 5. The result is your distance, in miles, from the lightning. If a thunderclap is heard fifteen seconds after the lightning, you are three miles away from the storm. If both the thunderclap and lightning are simultaneous (and generally extremely loud), you are directly below the storm. If at any time you feel your hair stand on end, lightning is imminent.

Hypothermia...The Most Common Killer of Backcountry Users

On February 1, 1989, the temperature in Butte, Montana dropped from 42 degrees to -4 in one hour. Regardless of the season, a temperature drop of 30-40 degrees Fahrenheit in one hour is not uncommon in the mountains. Add cold rain and wind and nature has mixed the perfect recipe for hypothermia.

What is Hypothermia?

Hypothermia is the rapid, progressive mental and physical collapse accompanying the chilling of the inner core of the body. It is caused by exposure to cold, aggravated by wet, wind and exhaustion. Hypothermia has killed more unprepared backcountry users than any other malady. In fact, the state with the most reported cases of Hypothermia is, believe it or not, Florida! The reason is simple. Floridians are generally unprepared for cold weather.

There are a number of ways to avoid hypothermia. The trick to staying warm is to gain more calories than you lose. The body can burn as little as 50 calories per hour while sleeping or more than 1,000 an hour during heavy work. Just as the body constantly produces heat, it constantly loses it.

Your body may burn over 50% more fuel in winter than it would in summer. This is because you are inhaling cold air, warming it and saturating it with water vapor. In fact, as much as one-third of your body-heat loss can occur through breathing. Breathing through a scarf or balaclava may help by "pre-heating" the inspired air.

The body also loses heat by perspiration and its subsequent evaporation from the skin. In addition, 75% of the body heat can be radiated from an unprotected head, since the blood vessels in the scalp lie close to the skin.

Creating Body Heat

Clothing and shelter can only conserve body-heat, they can't create it. Liquids and food are the only "internal" source of heat creation for the body. This is because heat is produced in the body by chemical reactions through the metabolism of food, mainly oxidation of carbohydrates. Muscular activity is a second source of heat, but uses food energy to generate the heat.

The Body's Reaction to Cold

The body's first reaction to cold is to shiver. Shivering is the first sign of hypothermia and is the body's way of forcing an isometric contraction and triggering a stored glycogen "dump" from the liver. It is the body's attempt to generate heat by rapidly and rhythmically contracting muscles. Despite the fact that shivering is fatiguing, it generally helps keep us warm. It diminishes with

oxygen deficiency, breathing of carbon monoxide or the taking of aspirin or alcohol. The body's ability to maintain warmth is depressed by the lack of water, lack of food, fatigue and shock. After shivering stops, hypothermic victims are confused into thinking they are feeling warmer. THEY ARE NOT. They are dying.

Problems Which Increase Hypothermia Dangers

Constipation retards efficient metabolism of food and reduces energy levels. This is a dangerous situation in the winter, as the body can no longer take advantage of the energy provided by the "fuel" ingested.

Despite what grandmother told you on those cold Wisconsin evenings, alcohol reduces the body's ability to fight cold. It dilates peripheral blood vessels, blocking vasoconstriction and allowing warm blood to exit the body's core. In addition, the alcohol may actually make the victim feel warm and more competent. The low temperatures will increase the intoxication because brain cell membranes are more fluid as a result of the increased metabolism.

Smoking or chewing tobacco constricts peripheral vessels, reducing circulation necessary to keep the skin warm. Aspirin also dilates the vessels. Such conditions are conducive to frostbite and hypothermia.

In addition, sedatives, antidepressants and neurological problems common in the elderly will all increase the risk of hypothermia.

Hypothermia is a killer in summer as well as winter. It is more often triggered by a combination of wind, wet and cold than by cold alone. In fact, just plain dry cold, even at extremes of -30 degrees, is far more manageable and far more pleasant than 20-degree weather with wet snow and rain falling and a harsh wind blowing. I'll take the 30 below any day.

The Hypothermia Lab in Duluth Minnesota has studied this phenomenon for over a decade. The lab discovered that the human body can adjust its metabolism to adapt to the cold. Studies showed that Eskimos respond to cooling with an almost instant metabolic leap and with skin temperatures that remain remarkably high. The "Ama", Korean pearl divers who once dived naked into icy waters in search of treasure, had high basal metabolic rates, more efficient tissue insulation and a higher threshold of tolerance before the onset of shivering. One generation after they had started using wet-suits, they had completely lost their specialized responses to the cold.

Hypothermia and the Mind

The Hypothermia Lab also found that circulation can be increased by mind-power. Subjects of experiments who thought about how much they wanted to get out of the cold suffered rapidly falling body temperatures. On the other hand, shivering subjects, directed to perform a mental arithmetic task, stopped shivering for short periods. In addition, when people get anxious, they have more problems with temperature regulation.

One of hypothermia's strangest manifestations is "paradoxical undressing." People suffering severe hypothermia are often observed throwing off their clothes, as if they felt they were burning up. This is believed to be because the hypothermic victim's body, which has been vasoconstricted to maintain core heat, may abruptly vasodilate, allowing warm blood to pump briefly through the body's peripheral areas. To the hypothermic victim, who is already mentally foggy, the vasodilation may produce a sense of extreme warmth.

In addition, chemical changes occur in the body that can make the situation more dangerous. First, epinephrine (adrenaline) is released into the bloodstream, which increases the heart rate. This is healthy, since it increases the metabolism. Other chemical changes, however, can cause hypothermic victims to experience vivid hallucinations very similar to those reported by schizophrenics. This is believed to be caused by increased dopamine in the blood. In addition, researchers have found that spinal and cerebral neurons become hypersensitive when they are cooled just three or four degrees below normal. This can lead to neural misfiring and to seeing things that just aren't there.

Believe the signs, not the victim. Team members should monitor each other carefully, even in temperatures of 50 degrees. Any early sign of hypothermia is a serious warning. Take immediate action to correct the situation before it is too late. Most cases of hypothermia develop in temperatures between 30 and 50 degrees Fahrenheit. Many novice backcountry users simply don't believe such temperatures are dangerous. They fatally underestimate the dangers of being wet and/or poorly clothed at such temperatures.

Environmental Conditions Contributing to Hypothermia

When the body is wet, the evaporation of moisture from the skin has a very rapid cooling effect that can be extremely dangerous. Water conducts heat 240 times faster than air. Therefore, heat is lost 240 times faster if evaporation is occurring. A wet backcountry user must always change quickly into extra dry clothing as soon as possible. Staying wet is an open invitation to the dangers of hypothermia.

It is equally important to protect yourself from your own sweat. Working up a sweat on the trail will result in wet clothes by the time a final destination or resting place is reached. Wet clothes will chill the body significantly, especially in conditions of high wind where evaporation takes place much more quickly.

The Body's Reaction to Hypothermia

Mother often said and (for once) she was right: "If you want to keep your feet warm, wear a hat." In temperatures of 5 degrees, up to 75% of your body heat can radiate from an uncovered head, since the blood vessels are close to the surface. If the head, or any other body part, is exposed to cold, the body chills and "shunting" can result. When this happens, circulation to the extremities is sacrificed to assure that the remaining body heat is reserved for vital internal organs. The result is that the hands and feet receive less warm blood than does the midsection.

Shunting occurs as a result of vasoconstriction. Vasoconstriction cranks up your blood pressure as you chill. As a result, cold can be dangerous for people with heart disease.

The key to avoiding this dangerous situation is to be brave (and smart) enough to give up reaching the peak when the first signs of hypothermia present themselves.

Frostnip and Frostbite

The less severe form of frostbite, called "frost-nip", is the classic white spot on the cheek or the nose. It occurs when the outer skin freezes and can generally be taken care of with application of a warm hand. Frostnip stings, but generally causes no more problem than a sunburn.

Frostbite, however, is the freezing of deep tissues. Vasoconstriction and cold air are not the only factors leading to the problem. Altitude also plays a part. The higher the altitude, the thinner the atmospheric oxygen becomes and the less there is for the body to use. Since the body's response is to send the lion's share of available oxygen to the brain and central core (shunting), the peripherals are put on starvation rations. At high altitudes cellular metabolism decreases in the extremities due to lower levels of oxygen.

When skin temperatures drop below 50 degrees Fahrenheit, the sense of touch and pain are lost. Frostbite occurs when temperatures drop further and circulation to those areas ceases. The water between the cells in the skin and capillaries freezes resulting in tissue damage.

Prevention is the key word when discussing frostbite. Keep the extremities warm and avoid restricting circulation with tight-fitting clothes or boots. For additional warmth, draw your jacket arms inside with the sleeves turned inside out and crossed inside of the back of the jacket.

Dehydration

Dehydration occurs when the body has insufficient water to maintain suitable energy levels. Water is as important to the body as is oxygen.

The average person needs to replace two quarts of water a day minimum. Heavy perspiration, exposure to extremely warm temperatures, constipation and/or excessive vomiting can easily double this amount. To avoid dehydration, you should drink water regularly, in small amounts, to replenish this supply.

Eating snow for a short period is harmless, but if done to excess it can cause the mucous lining of the mouth to become inflamed and painful. If you have no stove, find a running water source.

Dehydration hastens the onset of general fatigue and enhances the possibility of constipation, which is a dangerous situation.

Salt helps the retention of body fluids and reduces muscle cramps, so salty foods or salt supplements should be used.

Snow Blindness/Sun Blindness

The eyes are especially sensitive to the brilliance of sunshine, especially that which is reflected from snow fields. If unprotected, the eyes can be burned and/or permanently damaged. The burns are so excruciatingly painful that, once a backcountry user has suffered and recovered from this malady, he may never again remove his sunglasses even while sleeping.

The only way to prevent snow/sun-blindness is to wear polarized sun-glasses, whether you feel you need them or not (radiative light penetrates even clouds and/or fog). Snow blindness can occur in as little as one half hour. There may be no sensation other than brightness to warn the victim. The pain does not occur until well after the damage has been done.

Altitude-Related Illnesses

Since the average body is accustomed to life at lower elevations, several problems can occur at altitude that are cause for concern. These problems are listed below, ranging from the not-so-dangerous to the life-threatening.

Altitude Sickness (a.k.a. Acute Mountain Sickness)

Altitude sickness is the most common of altitude-related illnesses. It can effect individuals at altitudes as low as 5,000 feet.

Altitude sickness is caused by the lack of oxygen (which can be enhanced in the winter) and can be aggravated by cold, fatigue, drinking alcohol, smoking or chewing tobacco. It is also believed that there is a connection between a disruption of the acid/base balance in the body and alcohol sickness.

Altitude sickness is dangerous only in that it signifies a body's reaction to increased altitude. It can lead to significant complications such as high altitude pulmonary and/or cerebral edema, both of which can be fatal.

In its mild states, altitude sickness consists of headaches and difficulty sleeping. Other common complaints include nausea, drowsiness and shortness of breath. These symptoms could increase in severity leading to violent headaches, vomiting, vertigo and unconsciousness.

Some of the more common symptoms of altitude sickness include shortness of breath, legs feeling heavy, dizziness, insomnia, blurred vision, lack of appetite, nausea, vomiting, diarrhea and headaches. For these reasons, altitude sickness is often confused with the flu.

Sleep may be difficult during the first few nights of your ascent. Regular periods of heavy breathing, separated by periods of no breathing at all may wake the sleeper with a sense of suffocation. Hyperventilation may occur, causing the light-headedness, dizziness and tingling in the hands, feet and mouth. Again, avoid foods high in protein for the first few days and reintroduce them cautiously.

Fatigue and cold aggravate altitude sickness. Symptoms usually disappear as the body adjusts to the lower oxygen pressure.

To avoid altitude sickness, drink extra amounts of water, not just during ascents, but several days beforehand. About one week before your trip, eat more starches, more long chain carbohydrates and less proteins. Reduce the intake of foods that cause an acidic reaction in the body. Some believe that the use of an antacid tablet would be beneficial as well, though this is open to debate, since antacid tablets are designed to alter the acid/base balance in the stomach, not necessarily in the bloodstream.

In addition, climb to higher altitudes at a gradual rate. Your body will acclimatize to altitude changes, but only at a rate of about 500 feet per day.

Strangely enough, it has been shown that residents of high altitudes can suffer from reverse altitude sickness when they spend time at sea level. High iron content and high blood viscosity cause this phenomenon.

High Altitude Pulmonary Edema

High Altitude Pulmonary Edema (HAPE) is a severe illness whose symptoms are similar to pneumonia with congestion and difficulty in breathing. The symptoms are often confused with altitude sickness, except that pulmonary problems exist. The symptoms will increase in severity in a matter of days. HAPE is simply an accumulation of fluid in the lungs. Symptoms develop in 6 to 36 hours after arrival at high altitudes and consist of shortness of breath, weakness, coughing and a feeling of tightness in the chest. The cough is constant and can be irritating. The pulse becomes rapid while respiration becomes rapid and constant. Anxiety on the part of the victim only increases these symptoms.

Heat-Related Illnesses (Heat cramps, heat exhaustion and heat stroke)

Muscle cramps (a.k.a. "heat cramps") occur when the body's salt content is low. This salt content drops below normal when excessive sweating occurs. Though very painful, cramps are not a dangerous situation. They are, however, an indication that the backcountry user is doing a poor job of monitoring fluid levels. Salt tablets, available at any pharmacy, should be taken on any trip that will involve excessive exercise.

Heat exhaustion occurs when the body is unable to cool itself sufficiently. This generally occurs in warm climates, but can also occur in the mountains.

A victim of heat exhaustion is a victim in trouble. Heat exhaustion is generally caused by too much exertion during hot weather. Symptoms of heat exhaustion include moist, clammy skin, weakness, nausea and possible delirium.

Heat stoke occurs when heat exhaustion is not treated. A victim of heat stroke is a victim in a life-threatening situation. This is truly a medical emergency. The body has become so over-heated that it is generally no longer able to sweat. Without the ability to sweat, the body cannot cool itself. If this victim were an automobile's radiator, steam would be shooting out of the mouth, nose, ears and eyes.

Symptoms of a victim of heat stroke include dry skin, flushed face, nausea, weakness, delirium and eventually unconsciousness. This person's internal temperature is dangerously high and the possibility of brain damage is introduced.

Conclusion

In this program we have discussed many of the hazards of backcountry travel. The key to safe backcountry travel lies in recognizing these hazards and knowing, in advance, how to avoid them. Avoidance is the only way to assure that your day in the backcountry is a safe and memorable experience.

Happy trails to you. May the magnificence of the backcountry stay with you forever.