

MOUNTAINEERING

Denali National Park and Preserve

Introduction

This material is provided as a reference aid to help you plan technical or expeditionary climbs in Denali National Park.

"The fact that the West Buttress route is not technically difficult should not obscure the need to plan for extreme survival situations. Of course, some climbers manage to get up and down in perfectly nice, but rare period of weather; when back home, they encourage others to climb this "easy walkup" of a mountain. Little do they realize that it was only by sheer luck they weren't trying to keep their tent up in the middle of the night in a 60-mph wind at 40 degrees below zero, with boots on and ice axe ready in case the tent suddenly imploded. Because of the nontechnical reputation of the popular West Buttress route, it is a terribly underestimated climb."

<ALIGN=RIGHTPeter H. Hackett, M.D.

<ALIGN=RIGHTfrom [Surviving Denali](#)

<ALIGN=RIGHTby Jonathan Waterman

"We had climbed rope but simultaneously, front-pointing forever into a revived storm and relentless wind. Everything was cold, even our souls. Frostbite was waiting to jump at the slightest sign of weakness, but both of us played our own winning game with it. McKinley's climate is tough. We were drawing heavily on all our Himalayan experience just to survive and it was a respectful pair that finally stood on the summit ridge. It took a few hours to dig a miserable little hole, but free from wind and spindrift, and there we spent an equally miserable night. We had climbed the mountain too quickly to acclimatize and now we were suffering!"

<ALIGN=RIGHTDougal Haston

<ALIGN=RIGHT1977 [American Alpine Journal](#)

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Search and Rescue Requirements

Denali National Park and Preserve recognizes that a certain number of park visitors each year will become ill, injured, or incapacitated in some way. It is the policy of Denali National Park and Preserve to assist those in need, when, in the opinion of the park personnel appraised of the situation, it is necessary, appropriate, within the reasonable skill and technical ability of park personnel and provides searchers and rescuers with a reasonable margin of safety.

[Search and Rescue](#) operations are conducted on a discretionary basis. The level and exigency of the response is determined by field personnel based on their evaluation of the situation. Rescue is not automatic. Denali National Park and Preserve expects park users to exhibit a degree of self-reliance and responsibility for their own safety commensurate with the degree of difficulty of the activities they undertake.

Denali National Park and Preserve encourages self-reliance, preventative education and user preparation. We believe the prudent use of these elements to be the best possible means to safely enjoy the park.

The Mountain's Name

Denali (The High One) is the Native American word for North America's highest peak, Mount McKinley, rising 20,320 feet (6,194m) in the mountain chain called the Alaska Range. Denali was renamed Mount McKinley for William McKinley, a nominee for president, by the Princeton graduate and gold prospector, William Dickey. Dickey was one of the hundreds of prospectors seeking gold in the

1896 Cook Inlet stampede. He had written an article for the New York Sun where he described the mountain as the highest in North America at over 20,000 feet.

"When later asked why he named the mountain after McKinley, Dickey replied that the verbal bludgeoning he had received from free silver partisans had inspired him to retaliate with the name of the gold-standard champion. "

Mt. McKinley: The Pioneer Climbs

by Terris Moore

Since the turn of the 19th century, the official name of this great mountain has not rested in peace. In 1914, following his historic first ascent of the mountain in 1913, Hudson Stuck wrote in the preface of his book, *The Ascent of Denali*: *"Forefront in this book, because forefront in the author's heart and desire, must stand a plea for the restoration to the greatest mountain in North America of its immemorial native name."*

In 1980, the name Mount McKinley National Park was officially changed to Denali National Park and Preserve. The State of Alaska Board of Geographic Names has also officially changed the mountain's name back to Denali. Negotiations continue today to officially return the original native name to this magnificent mountain. This booklet uses the names Mt. McKinley and Denali interchangeably throughout.

Mandatory Requirements

The following regulations must be complied with by anyone planning climbs or backcountry trips within the park:

- **Registration:** The following is mandatory for Mt. McKinley and Mt. Foraker: Each expedition member must [register](#) with the Talkeetna Ranger Station **at least 60 days** in advance. The group's forms should all be sent together. Since the rangers deal with over 300 expeditions each year, each party must have a distinct name which should be used on all correspondence. Registration forms are available from the [Talkeetna Ranger Station](#).
- **Check In:** All Denali and Mt. Foraker climbers must stop by the Talkeetna Ranger Station for an orientation and briefing prior to their departure for their expedition. This briefing will include information about sanitary practices and current weather, avalanche and glacier conditions. All other backcountry users should register and attend the orientation. Backcountry permits are required for any overnight use on the northside and can be obtained at the Backcountry Desk located in the Denali Visitor Center.
- **Check Out:** Upon your return from the mountains you must immediately check out with the Talkeetna Ranger Station.
- **Garbage:** EVERYTHING taken into the park must be brought out of the backcountry when you leave. Do not leave any permanent caches on the mountain. Abandoning surplus food, fuel, wands, and other equipment in caches or disposing it in crevasses is prohibited. By regulation, all garbage must be carried off and taken out of the park. **KEEP THE MOUNTAIN CLEAN.**
- **Human Waste:** Follow the instructions provided by rangers on [proper human waste disposal](#). Use pit toilets where provided. Elsewhere, biodegradable bags are used for latrines. Plan on bringing additional bags for this use. Citations are given for improper disposal of garbage and human waste.
- **Guiding:** If you plan to climb with a guide, make sure the guide is authorized to operate within Denali National Park and Preserve. There are seven [guide service companies](#) authorized to provide this service. If you have questions about your guide, please call the Talkeetna Ranger Station. **Unauthorized guiding is illegal and your climb could be cancelled at any time. Fines can be imposed and criminal charges will be brought against the unauthorized guides.**

Arctic High Altitude Mountaineering

"[Denali] remains unique among the mountains of the world. Situated at latitude 63 N, it is the highest point near the Arctic Circle. Piercing the central plain of Alaska, Denali is buffeted by storms from the Gulf of Alaska and from the Bering Sea. In few mountain locales of the world does the weather change so precipitously and dramatically. A balmy day of glacier travel can rapidly deteriorate into a day of survival-snow-cave digging. The intense cold is, of course, another unique feature of Denali, comparable only to the Antarctic ranges. The Himalaya is tropical by comparison. On the South Col of Mount Everest (26,200 feet) in late October, the lowest temperature we recorded in 1981 was 17 degrees below zero. On Denali, this would be a rather warm night at only 14,300 feet in May and June. Temperatures between the high camp and the summit even in the middle of the summer, are routinely 20 to 40 degrees below and even lower at night. This combination of extreme weather and temperature pummels the unprepared.

Denali also renders the climber more hypoxic; the barometric pressure is lower for a given altitude than on mountains closer to the equator. This difference becomes noticeable above 10,000 feet or so, and makes the summit of Denali equivalent to anywhere from 21,000 to 23,000 feet in the Himalaya (Mt. Everest is at latitude 27 N), depending on weather conditions. The barometric pressure is also much lower in the winter than in the summer. Lower barometric pressure means less oxygen in the air; therefore Denali is more of a hypoxic stress and physiological challenge than one might expect for its altitude."

<ALIGN=RIGHT>Peter H. Hackett, M.D.

<ALIGN=RIGHT>from the preface of *Surviving Denali*

<ALIGN=RIGHT>by Jonathan Waterman (2nd Edition)

In the interest of personal safety all expedition members should be familiar with the potentially very serious medical problems and extreme mental and physical stresses associated with high altitude arctic mountaineering. You will be carrying heavy loads (often 60-90 lbs., 27-40kg.) at altitudes between 7,000 and 20,000 feet (3000-6000 meters). Temperatures may range from 90 degrees F (32 C) to -50F (-40C).

Conditions may vary from intense snow glare to severe snow storms with whiteout and winds in excess of 100 mph (160 km/h). Expeditions usually last from two to five weeks. Prolonged confinement within cramped tents or snow caves due to bad weather often occurs.

Rescue of injured or ill climbers, if possible at all, may be exceedingly slow and uncertain if weather conditions are not ideal. **You should be prepared and equipped to perform self-rescue.** Each party must rely on its own resources and cannot count on the aid of other climbers or rescue personnel (See [Rescue](#)).

Climbing Clean

Leave nothing in the mountains. Expeditions have climbed Denali and have carried out everything brought in including their human waste. **The most important part of clean climbing is planning ahead.**

- **Litter Removal:** Everything MUST be carried off the mountain. Each person must make a strong personal commitment to remove all of their garbage, excess food, fixed lines, and all other equipment. Sleds or haul bags make excellent descent towing bags, allowing an additional 50 to 75 pounds (20-30kg) to be taken out. Keep Litter dry by consolidating it in plastic bags or waterproof stuff sacks.
- **Caches:** Temporary caches should be buried under large snow blocks or loose snow at a minimum of three feet deep. When relaying loads, be careful to bury your food caches to protect them from ravens. More than one expedition has come to grief from the depredations of these birds. Mark the cache with long wands, 1.5-2 meters above the surface. Clearly mark the cache with the name of your expedition and expected date of return. This will prevent other climbers and the Mountaineering Rangers from thinking the cache was abandoned. At lower altitudes, wolverines, grizzly and black bears have been known to destroy caches near the edge of glaciers. Secure these caches in three layers of garbage bags so no scent is emitted. At higher altitudes, high winds often scour the snow, exposing caches. It is not permitted to leave permanent caches in the Park. Food caches left for another party must be clearly marked and buried at least a meter deep. This other party will be responsible for retrieving the entire cache. If only a portion of the cache is utilized, then the remainder becomes garbage. These caches often melt out, making the cache vulnerable to ravens which peck it apart. Once they are broken open, the wind will scatter the loose material. Locating a reported cache can be very difficult. Caches left for others rarely serve their intended function, and almost always contribute to litter problems. An expedition will be cited and fined for littering if a cache is abandoned.
- **Human Waste and Sanitation:** Intestinal disorders, vomiting and diarrhea may result from contamination of your food or drinking water caused by human waste. The resulting dehydration can become a serious problem at altitude. All drinking water is obtained from melted snow. Precaution must be taken when gathering snow from well used camps. Travelling out a rope length away from older tent platforms will generally suffice. Conditions become worse as the season progresses and improperly deposited waste melts out. For the health and safety of all, it is imperative for everyone to follow these simple steps:
 1. Use pit latrines where they are provided. At other locations:
 2. Dig a shallow hole in the snow or use a plastic bucket.
 3. Line the hole or bucket with a biodegradable sack.
 4. Stake the corners of the bag open with wands and use a snow block to cover the top when not in use. A little attention to prevent overfilling will make the process of disposal much easier.
 5. Use this bag as the latrine for all members of the expedition while at camp.
 6. Develop a separate urinal spot and mark with a wand.
 7. When you move camp or the bag fills, simply tie it off and toss it into a deep crevasse. If no crevasses are available, the bag should be carried until a suitable crevasse is found. The wastes are usually frozen and will ride well on a sled. On steep technical routes, the bag can be tossed away from the climbing route or feces can be deposited on snow blocks and shoveled off the route.
 8. Crevasse ONLY human waste. All other trash must be carried off.
- **Fixed Lines:** The use of fixed lines as climbing aids has become a serious problem on popular technical routes in the Alaska Range. As alpine ascents have become more popular, very few parties leave fixed lines in place. Several lines are managed seasonally on the West Buttress headwall between 15,500 and 16,200 feet. Other than these, all other fixed ropes must be removed on descent. Old fixed lines are often in very bad condition and should not be used. One climber was killed when he relied on an old fixed line. Expeditions should make an effort to remove old lines and must remove their own fixed lines.

General Information

The Expedition

The expedition should consist of at least two to four members. A larger expedition of four or more provides greater inherent strength and self-rescue capability. Expeditions should not exceed 12 members. A group composed primarily of individuals who have not climbed together tends to be a weak climbing group. Such expeditions are not recommended. Each member should have solid mountaineering skills, glacier travel knowledge, and must have stamina, conditioning, excellent equipment and the mental fortitude to survive in severe arctic conditions. Experience has shown that even these qualifications do not guarantee safety or success. The more difficult routes are technically very demanding and all members attempting these routes should be highly skilled. All members must know the physical condition, limitations, and the experience of each team member.

Solo Climbing

The major hazard facing a soloist on Denali is that even the most cautious and experienced climber is unable to determine the location of and/or strength of the many snow bridges that must be crossed. Each year, a number of people take serious crevasse falls on the large Alaskan glaciers. Nearly all of these falls prove to be little more than an adrenaline rush for the entire climbing team... unless of course, the person who fell is either improperly roped or not roped at all. Unfortunately, experience plays little part in determining who falls through these snow bridges. Some crevasses may be faintly visible while others are totally undetectable. Some soloists have devised crevasse spanning poles attached to their climbing harness that provide a degree of protection in case of a crevasse fall. Many are experienced enough to identify and avoid mostly mountain hazards, but hidden crevasses add a new dimension of objective risk to soloing. Virtually all experienced Alaska Range mountaineers are not willing to accept this level of risk.

A solo climber has virtually no self-rescue ability in the event of a serious accident or illness, and creates undue risks to the search and rescue party. **We strongly recommend against solo travel.**

Climbing Seasons

Snow and weather conditions for climbing major Alaska Range peaks are usually best from May through July. Colder minimum temperatures and strong northwest winds commonly occur in May. Late June and July are warmer but more unsettled. By late July, travel on the lower glaciers is made difficult by melting snow bridges over crevasses and by more inclement weather with heavier snowfall and increased avalanche danger. The highest success rates occur in June. April is an excellent month for many of the lower peaks with conditions often cold and clear while the winter extremes still linger on Denali and Mt. Foraker. The coldest weather on Denali is found from November through April with average temperatures ranging from -30F to -70F recorded at the 19,000 foot level. It is not uncommon to find it -50F at the 17,200 foot camp in early May.

Winter climbing in Denali borders on the ridiculous more because of its unfathomable risks than because of its mountaineering challenge. Some of the world's best climbers have either disappeared or perished from literally being flash frozen! In winter months, the jet stream, +100mph (160 km/h), will often descend over the mountain's upper flanks. Combine this wind with the naturally caused venturi effect that doubles wind velocity in such areas as Denali Pass and you will find one of the most hostile environments on this planet. The combined effect of ferocious wind and extreme cold easily and routinely send the wind chill off the charts.

Routes

With over 30 routes on Denali, the West Buttress, West Rib, Cassin Ridge and Muldrow are the most frequently climbed. The West Buttress and the Muldrow are the easiest ascent routes; the primary climbing difficulties being crevasses, steep ice and exposed ice covered ridges. Denali is attempted by approximately 1000 climbers each season with over 75% attempting the West Buttress. With this many climbers in such a short season, climbers can expect to encounter several hundred others.

The Talkeetna Ranger Station has reference materials for routes on Denali and other peaks in the park. This includes climbing areas such as the Ruth, Little Switzerland and the Kichatna Spires. A good route guide for Denali, Mt. Foraker and Mt. Hunter is [High Alaska](#) by Jon Waterman (see [Reference Materials](#)). Other specific route descriptions maybe found in the [American Alpine Journal](#). Valuable information often may be obtained from members of previous expeditions. If you are unable to find information elsewhere you can direct specific questions to the [Talkeetna Ranger Station](#).

High quality photographs of peaks and routes taken by Bradford Washburn can be acquired through the [University of Alaska, Fairbanks](#). For specific photo numbers you may need to contact [Bradford Washburn](#) directly.

Approaches

From the south, the usual approach is by ski plane from Talkeetna to the Southeast Fork of the Kahiltna Glacier or to the Ruth Glacier in the Don Sheldon Amphitheater. Some groups have skied in from the Peters Hills or the Anchorage-Fairbanks Highway. The conditions are usually good for skiing on these lowland approaches until breakup in early May. The party should plan to have their expedition gear flown in and allow at least a week for the ski approach. Specific route information can be obtained from the Talkeetna Ranger Station.

From the north, the approach for Denali and other peaks is by foot, ski, or dogsled (see [Aircraft](#)). The park road is generally open by the second week in June where the approach can be made from Wonder Lake. Before the road is open you will have to fly to Kantishna (several more miles) or ski the road from the Park Headquarters. The approach from Wonder Lake to McGonagall Pass is 18 miles (29 km). The majority of expeditions planning climbs from McGonagall Pass arrange to have their supplies taken in by dog team in the spring. Parties that have prepared for this have the highest chance of success. A major challenge and potential danger is crossing the McKinley River. This broad, braided river typically runs higher from June through July due to glacier melt. Each member should be versed in river crossings and teamwork used for deeper sections.

All plastic buckets used for long term storage that were taken in by dog team must be packed out upon your return or arranged to be picked up the following spring.

Guide Services

Seven American guide services are authorized for Denali, Mt. Foraker and other peaks/mountainous areas within the Wilderness boundary. These and other guide services have permits to operate within the new park additions outside the Wilderness. Each of the seven Denali services meets stringent standards established by the National Park Service to insure a quality operation. All operators are reviewed periodically to maintain a high standard.

The guide services usually require a deposit several months in advance and a resume of you climbing skills. All chief guides leading on Denali have previous Denali experience. A list of the [seven authorized guide services](#) is available from the Talkeetna Ranger Station.

Aircraft

Aircraft operated by commercial use permit holders are allowed to land in the new park additions. The original park is designated

Wilderness and, as such, motorized vehicles are prohibited. Helicopters are not allowed to land in the park unless there is an emergency. Talkeetna is the base of operations for the air services.

Medical Problems

"As we made our way slowly, we were surprised to see figures ahead. We could make out two climbers sitting in the snow, with equipment strewn all around them...they were two lads of about twenty. One was wearing a black silk glove that had ripped apart to reveal yellowing fingers, frozen solid; the other was just sitting stupefied in the snow, his head bowed over his own useless, frozen hands. Yellow Fingers was quite chirpy; joking at the coincidence of our meeting at the summit like this. Dougal asked why his hands were exposed, and received a confident, flip reply. We told him that he had frostbite, and that he would probably lose his fingers, and maybe his entire hand. 'What do you mean, frostbite?' asked Yellow Fingers. We patiently explained, got his gloves and other clothes out of his sac, and did what we could to make them warmer...we heard later that the two lads had to face extensive amputation of fingers, toes, hands and feet, despite the finest treatment available at Anchorage Hospital."

Doug Scott

Mountain 52

Cold Injuries

Major hazards of a Denali climb are frostbite and hypothermia. Denali presents a combination of long exposure, severe weather, high altitude, low temperature and low humidity which make it one of the most severe climates on Earth. Cold resistance is impaired by high altitude hypoxia and dehydration. Mountaineering literature contains numerous vivid accounts of frostbite on Denali, such as found in Accidents in North America Mountaineering. Forty cases of frostbite (3-4%), is common for climbers on Denali each season. Several of these require extensive hospitalization, often with debilitating results. The basic essentials of adequate clothing, food and water are critical at all times. The following is excerpted, with permission, from Medicine for Mountaineering, Third Edition, by James A. Wilkerson, M.D.

"Frostbite is a cold injury produced by freezing of the tissues. The hands and feet, which are farthest from the heart and have a more tenuous blood supply, and the face and ears, which are usually exposed, are most commonly affected...As the circulation becomes severely impaired, the skin and superficial tissues exposed to severe cold begin to freeze. Ice crystals form within and between the cells and grow by extracting water from the cells. The cells are injured physically by the ice crystals, as well as by dehydration and the resulting disruption of osmotic and chemical balance..."

Diagnosis and Prognosis. *The typical early signs of frostbite are sensations of cold or pain [loss of sensation and numbness] and pallor of the affected skin. However, some victims may suffer little pain, and pain typically disappears as the tissues begin to freeze. As freezing progresses, the tissues usually become even whiter in appearance [pale, waxy] and all sensation is lost. With deep frostbite the tissues become quite hard...*

The extent and severity of frostbite are notoriously difficult to judge accurately during the early stages, particularly while the tissues are frozen. After thawing some prognostic signs appear. With minor frostbite [frostnip], which only involves the tips of the fingers or toes, or a small area of the ears, nose or face, the tissues may only be red for a few days after thawing. With more severe injuries [frostbite], blisters commonly develop after rewarming and may cover entire fingers or toes. If the blisters contain clear fluid, the underlying tissues are usually still alive and can be expected to recover almost completely. When the blisters are filled with bloody fluid, portions of the underlying tissues are usually dead and cannot recover. The most severe frostbite injuries are not followed by blisters, probably because the circulation to the tissues is too poor. Such tissues commonly retain a deep purple color [after thawing].

Treatment. *The preferred treatment for frostbite is rapid rewarming in a... water bath. Treatment in a wilderness environment should be attempted only when the following conditions can be met:*

The victim can be kept warm during rewarming and afterwards... [so there is no danger of refreezing]. The greatest tissue damage occurs when frostbitten tissues are thawed and then refrozen. Far less damage is produced by walking on a frostbitten... [or thawed foot]. [Frostbite will spontaneously thaw by walking out or a night in the sleeping bag]. During rewarming, the water temperature should be maintained between 100 and... [105] degrees F (38 to... [40] degrees C). Higher temperatures further damage the tissues; the water must not be hot enough to feel uncomfortable to an uninjured person's hand. A large waterbath permits more accurate control of temperature and also warms the frozen extremity more rapidly, often resulting in less tissue loss, particularly when freezing has been deep and extensive.

During rewarming, hot water must be added to the bath periodically to keep the temperature at the desired level. (A frozen hand or foot is essentially a block of ice and does tend to cool the water.)... Warming usually requires thirty to sixty minutes, and should be continued until the tissues are soft and pliable. During rewarming, the frostbitten tissues usually become quite painful. Aspirin and codeine... may be given during rewarming or afterward for pain.

Following the rewarming, the patient must be kept warm and the injured tissues must be elevated and protected... Every effort should be made to avoid rupturing blisters, which invite infection... [At this point a determination must be made whether the patient can continue down]. Healing requires weeks to months, depending upon the extent of the injury. Subsequent care in the field should be directed primarily toward preventing infection. Cleanliness of the frostbitten area is extremely important. Soaking the extremity each day in disinfected, lukewarm water to which germicidal soap has been added may be helpful. A small amount of dry, sterile cotton may be placed between fingers or toes to avoid maceration. Antibiotics should not be given routinely, but if infection appears to be present, ampicillin or cloxacillin should be administered every six hours until a physician's care is obtained."

Medicine for Mountaineering, Third Edition, by James A. Wilkerson, M.D.

Body tissue which is frozen, thawed and refrozen will be damaged much more than tissue which is frozen only once. All precaution must be taken to insure that the thawed extremity is not refrozen. In many cases each season, individuals with minor frostbite are able

to descend to base camp without further tissue damage. However, avoidance of refreezing is paramount and care must be given to prevent both infection and the breaking of blebs which occur with rewarming. Reaching the base camp airstrip will expedite your departure for medical treatment.

Acclimatization

It requires one to two weeks to become well acclimatized to a given altitude on Denali (depending on the individual). Individuals also lose this acclimatization in the course of a few weeks. Talkeetna is close to sea level which is a major disadvantage for someone who has established some acclimatization and is waiting to fly in. The longer they wait, the more acclimatization is lost. Several days spent high on peaks before your arrival will not be enough to transfer that acclimatization to your climb here. You will lose that acclimatization in transit.

Limit your ascent to 300 meters (1,000 feet) per day at elevations above 3000 meters (10,000 feet). The following schedule is the fastest recommended rate of ascent of the West Buttress given ideal weather. Expeditions should plan on 21 days.

- **Day 1:** Base camp 7200 feet (2200 meters)
- **Day 2:** Base of 'Ski Hill' 7900 feet (2400 meters)
- **Day 3:** Upper Kahiltna 9600 feet (2900 meters)
- **Day 4:** Camp 11,000 feet (3350 meters)
- **Day 5:** Rest
- **Day 6:** Bergschrund 13,000 feet (3960 meters)
- or past Windy Corner 13,500 feet (4115 meters)
- **Day 7:** Basin 14,200 feet (4330 meters)
- **Day 8 through Day 11:** Rest in Basin, acclimatize and carry high sleep low.
- **Day 12:** Move to 16,200 feet (4940 meters) Ridge Camp
- or 17,200 feet (5240 meters) High Camp
- **Day 13:** Rest
- **Day 14:** Summit

Many other factors figure into this, including the weight carried, weather, and each member's health. The extra rest days at 14,200 feet (4330 meters) have proven to be critical before ascending higher. Allow 3 to 5 days food and fuel at high camp.

Physiological and Physical Impairment

Mountaineers preparing to climb Denali must be aware that everyone will be physically weaker at high altitude. Expeditions can expect to move more slowly and will not be able to carry very heavy loads. There are also other problems at high altitude less commonly known but potentially as dangerous, such as mental impairment, dehydration, fatigue, loss of cold resistance, and lack of recuperative powers. The major environmental variable responsible for these effects is lack of oxygen (hypoxia) associated with high altitude.

Mental Function

Bradford Washburn has estimated that above 18,000 feet (5500 meters) on Denali a person is reduced to roughly 50% of their mental capacity. During the winter climb of 1967, the three members stranded at 18,200 foot Denali Pass for six days required approximately twice as much time to answer a series of subtraction problems as they did at 7000 feet on the Kahiltna Glacier.

In retrospect, most high altitude climbers can recall situations in which their thinking was impaired and their judgement poor. These effects are insidious, since climbers are not aware of the impairment at the time. A controlled exposure in a low pressure chamber is often necessary to convince a climber (or pilot) of the effects of hypoxia. Many high altitude climbing accidents may be attributed to such lack of judgement. Thus, it is important that climbers realize in advance that their mental functions will be impaired. Advance planning should be thorough and complete to avoid a critical situation which poor judgement and slow thinking will magnify. For example, sudden impulsive decisions to go on or return must be considered carefully.

Lassitude.

At high altitude motivation can diminish greatly. Thus, Joseph Wilcox, leader of a 1967 Denali party wrote in his diary:

"With five people crammed in the tent, morale decreased rapidly. There was no interest in cooking meals and by the next day no one was even interested in melting drinking water. We found ourselves very apathetic...not caring whether or not we got enough to drink or eat or if our gear was wet...we just lay there and waited with little or no sleep...by morning the cold had taken its toll...Jerry Lewis and I had numb feet and I had numb fingers."

Here the motivation to do even the simplest camp chores almost disappeared, yet these tasks of melting snow, cooking, or drying clothes in the wind will help determine the success and safety of the party. The will to survive and succeed must be maintained. Inactivity during tent bound stormy days can itself be devastating to morale, and as tiring and debilitating as climbing. Keep the body limber and mind alert on storm days with camp projects in and out of the tent.

Illness or Injury

It is difficult for the body to recover from illness and injury above 14,000 feet (4300 meters). Descending to a lower elevation is often the only solution for a complete recovery.

Diarrhea may be serious when climbing above 14,000 feet (4300 meters) because dehydration is further aggravated, and with impaired absorption the body receives little nourishment and is further weakened. A person suffering from severe diarrhea should descend or be assisted below 14,000 feet (4300 meters). This person should not go back up until gastrointestinal function returns to normal.

Dehydration

Dehydration is a major hazard of high altitude mountaineering. Dehydration may compound the problems of any illness or injury, making recovery more difficult. It contributes to frostbite directly, by causing constriction of blood vessels in hands and feet.

Climbers have difficulty drinking adequate amounts of water above 14,000 feet (4300 meters). Fuel for melting snow is not difficult to carry, yet the tendency is to take only a minimum rather than an adequate amount. It is inviting tragedy not to have at least a week's supply of fuel if one plans to spend even one night above 17,000 feet (5000 meters). This fuel must be used to provide each climber with at least three liters of liquid per person each day. Water bottles should be filled as often as possible and kept in sleeping bags at night to prevent freezing.

Fatigue

To a considerable extent, Denali represents a problem in logistics and weather. Climbers feel that they must make the best use of good conditions, even though doing so may overextend the physical and emotional capabilities of some or all of the party. If violent weather overtakes them in this condition, tragedy can follow. Climbers must maintain a physiological margin of safety against fatigue and cold just as they do food and fuel. In this connection, it is worthwhile to put in the effort of preparing igloos or snow caves for shelter at high altitude rather than tents. They provide greater protection and rest.

Sleep

Standard sleeping medications should be avoided above 10,000 feet (3000 meters). Sleep medications cause a decrease in the respiratory response, lowering blood oxygen levels, which can cause Acute Mountain Sickness (AMS). Diphenhydramine or Acetazolamide are the drugs often prescribed for sleep at high altitude.

Carbon Monoxide Poisoning

Cooking in poorly ventilated areas such as tents with all doors and vents closed, or old ice glazed igloos and snow caves, produced two serious cases of Carbon Monoxide (CO) poisoning in 1985, and two deaths in 1986. We suspect that many others also suffered lesser forms of CO poisoning. Furthermore, CO poisoning may be a contributor to AMS. This may have been the case in the 1993 rescue of a Czechoslovakian climber who developed severe HAPE (High Altitude Pulmonary Edema) and HACE (High Altitude Cerebral Edema). It is difficult to distinguish between Mountain Sickness and the early symptoms of CO poisoning. An inexpensive CO detector which has been found very beneficial can be acquired at most hardware stores. **Avoid the temptation to heat shelters with cooking stoves. Allow for good ventilation.** Extra caution is necessary if two stoves are being used at the same time. Cook in the open as much as possible.

"Carbon monoxide poisoning among mountaineers is probably much more common than realized. The effects of CO and altitude hypoxia appear to be additive, and thus CO exposure at altitude is much more dangerous than at sea level. Recent measurements by William Turner and Bill Summer, on Denali, found toxic levels (greater than 750 parts per million) of CO near the stove in tents, snow caves and igloos. A major factor in producing CO is the damping effect on the flame of having the pot too close to the flame from condensation on the pot. Keeping the pot warm and adding snow slowly to warm water thus produces much less CO than filling a pot with snow. Climbers cooking in shelters should try to minimize condensation on the pot.

Adequate ventilation is the key to removing CO from a shelter. The Swiss climbers' tent was made of an apparently unbreathable material, and closing the vents sealed the tent as well as their fate. The same could happen when cooking in a tent completely buried by snow, or in an igloo with glazed ice walls on the inside. In a tent, ventilation is a function of the wind and the area of the vent opening. When cooking in a snow cave or igloo, the vent must be at least of ski pole basket- sized diameter, should be placed directly above the stove, and can be sealed when not cooking in order to maintain warmth. Climbers with symptoms of Acute Mountain Sickness must be especially careful. CO poisoning should be considered in anyone unwell at altitude if using a combustible appliance in a closed shelter. Treatment is to stop the CO production, and have the victim if conscious, hyperventilate in fresh air. Descent to a lower altitude, administration of oxygen, and forced hyperventilation by mouth to mouth breathing may be required for comatose victims."

1986 Analysis of the CO poisoning deaths of two Swiss climbers on Mount McKinley, by Peter Hackett, M.D.

Altitude Illness

The difference in the barometric pressure at northern latitudes affects acclimatization on Denali and other high arctic mountains. Denali's latitude is 63 degrees while the latitude of Mt. Everest is 27 degrees. On a typical summit day in May, the Denali climber will be at the equivalent of 22,000 feet (6900 meters) when compared to climbing in the Himalaya in May. This phenomenon of lower barometric pressure at higher elevations is caused by the troposphere being thinner at the poles.

Other phenomenon observed on Denali are the dramatic low pressure weather systems that are generated in the Gulf of Alaska. Each season the camp at 14,200 feet (4400 meters) experiences barometric changes that physiologically raise the camp by over 1000 feet (300 meters) in less than a 24 hour period with the occurrence of one of these systems.

"The altitude was only 20,320 feet or so, and yet it felt like 24,000 feet. Perhaps there is something in the theory that the low pressure in polar regions makes climbing relatively more difficult than elsewhere."

Doug Scott

Mountain 52

This was written six months after Doug Scott and Dougal Haston summited Mount Everest, and just after their new ascent on the South Face of Denali.

"Except for a few hours of calmer conditions, the storm lasted for several days and forced us to do nothing. Of course, we realized the benefits of such forced idleness, as it offered us an ideal opportunity for high altitude acclimatization. Without proper adaptation to the altitude, major problems can quickly result...High altitude pulmonary edema and cerebral edema occur often on Mount McKinley; their treachery forces even the best conditioned climbers to their knees. Again and again, Mount McKinley is underestimated by climbers whose arrogance borders on stupidity."

Peter Habeler

Alpinismus 10-1980

Acute mountain sickness, high altitude pulmonary edema, cerebral (brain) edema, and retinal (eye) hemorrhages often occur together. They are all manifestations of failure to adapt to the stress of high altitude and are not individual diseases. Hypoxia (lack of oxygen) is the underlying cause in all cases. The extreme cold of Denali also apparently contributes to altitude sickness, especially pulmonary edema.

Symptoms:

- Acute Mountain Sickness (AMS): Headache, loss of appetite, dizziness, fatigue, irritability, weakness, nausea and disturbed sleep.
- High Altitude Pulmonary Edema (HAPE): Shortness of breath, rapid heart and breathing rate, weakness, gurgling in chest, cough, changes in consciousness leading to death.
- Cerebral Edema (CE): Headache, vomiting, staggering, lethargy, progressive deterioration leading to coma and death.
- Retinal Hemorrhage (RH): Rarely symptomatic; small hemorrhages in the back of the eye.

Illnesses

Acute Mountain Sickness (AMS) is common and occurs usually above 8,000 to 9,000 feet (2400 meters). Symptoms appear a few hours after arrival at a new altitude and may worsen, then slowly improve. AMS should dictate slowing down or halting a climb, and the climber should be watched for more serious developments. Light activity, plenty of fluids, and no upward progress are the best treatment.

Aspirin or Tylenol can be taken for headaches and Acetazolamide (Diamox) can be started to speed acclimatization and prevent AMS. Many parties experiencing early signs of AMS have been able to continue to complete a successful expedition by descending 2,000 to 3,000 feet (600 to 1000 meters) to allow one or two days acclimatization, then reascending. Like all forms of altitude sickness, it is minimized or prevented by taking more time to gain altitude.

High Altitude Pulmonary Edema (HAPE) seldom occurs below 9,000 feet (2750 meters). Symptoms begin to appear hours after a too rapid ascent. It is suspected that hard work and cold increases susceptibility to HAPE. Symptoms are increasing fatigue, shortness of breath at rest, weakness, and a dry cough. Later, bloody or frothy white sputum and bubbling in the lungs becomes obvious. Usually there is a low grade fever, the pulse is often fast (90-130 beats per minute at rest), respirations rapid (20-40 per minute at rest) and lips and fingernails are blue.

Once HAPE is diagnosed or even strongly suspected, the party must start down. This is the only readily available treatment.

Oxygen is effective, but usually not available, especially in the quantities necessary (12 to 36 hours of oxygen breathing). However, no medication, no amount of rest, and not even oxygen is a substitute for getting down. The party is taking a greater risk by delaying evacuation than by starting down at night or in dubious weather. Getting down even one or two thousand feet usually has a dramatic beneficial effect, unless the illness has progressed too far, and then further descent to hospital care, oxygen and medical attention are necessary to save the life of the victim. Exertion by the victim must be minimal.

Cerebral (brain) Edema (CE) is less common. It is unusual below 12,000 to 13,000 feet (3600 meters). Symptoms include staggering as if intoxicated while walking, and sometimes a severe headache and vomiting. Hallucinations may occur. Behavior becomes irrational and simple tasks impossible. Lethargy leads to decreasing consciousness and the patient may drift into coma and die. Even more urgently than HAPE, **CE demands immediate descent under almost any conditions.**

The loss of coordination (ataxia) in CE can be detected by a number of simple coordination tests, for example, the heel to toe walking test. Draw a straight line in the snow and have the person walk on the line, placing the heel of each foot directly in front of (touching) the toe of the last. Anyone unable to walk normally along the line should be assumed to have CE, and possibly HAPE.

Dexamethasone (DECADRON), if available, can be administered early in CE (a dose of 4 mg orally or injected every 6 hours is often prescribed), and the victim should be taken down the mountain.

Summary

There is no way of predicting who will or will not develop altitude sickness. Physical fitness offers absolutely no protection from altitude illness. Two to four nights spent at 14,000 feet or so is necessary for acclimatization before moving up higher on the mountain. **The best treatment for any type of altitude illness is rapid descent to a lower altitude.** Normally, anyone with altitude illness who starts down early after onset will recover rapidly and completely. As is the case with all medical problems, prevention is the most important aspect in the management of altitude sickness. Listen to your body and climb according to how you feel.

Remember the adage "carry loads high and sleep low." Delay moving to a higher altitude with symptoms of AMS. Watch team members of your expedition carefully for signs and symptoms of high altitude sickness. Don't ignore other members' complaints.

Leadership and Interpersonal Relationships

Irritability can easily spring up between close friends during a stay at high altitude. A nagging fear, doubt, or feeling of guilt can easily grow dangerous. Leadership characteristics may undergo drastic change because of the stressful situation. Personality changes may bring out latent domineering tendencies in anyone and can be extremely upsetting to group relationships. Being on the mountain may precipitate a variety of phobias, including claustrophobia from living in close quarters, which can lead to panic with an overwhelming desire to run away. In extreme cases a single climber may even leave the group and attempt to descend alone, which can lead to fatal consequences.

Glacier Hazards

Crevasses

The glaciers in the park demand respect. Glaciation is vast throughout the Alaska Range. With tree line at 1,500 to 3,000 feet (500 to 1000 meters), the extent of ice covered lands is enormous. Year round snowfall constantly hides crevasses. Extensive networks of crevasses exist throughout the range, and one must consider being roped at all times. Snow covered crevasses are often hard to detect and many climbers have been surprised by serious falls. In late winter and spring, the glacier surface is often covered by a wind slab condition. This condition makes crevasse detection very difficult if not impossible. Be sure to thoroughly probe a campsite and wand its periphery before unroping. A ski pole without the basket will make a good crevasse probe. Ice axes shorter than 70cm are inadequate for crevasse probing. Avalanche probes are excellent for locating hidden crevasses.

Roped Travel

When traveling in teams of two on the lower glaciers, climbers should be roped at least 100 feet (30 meters) apart. A space of 50 feet (15 meters) apart is minimum for four on a rope. Many crevasse bridges easily exceed 60 feet (20 meters). Make sure your sled and pack are tied off to the rope as you travel and not only to you. **When in doubt about a crevasse crossing, use a belay.**

Icefalls

Icefall activity is unpredictable. Avoid runout zones if possible and don't stop when crossing these zones. Locate campsites considerable distance from icefall areas. When choosing a campsite, consider that is high above your location and the possibility of an earthquake disrupting inactive icefalls. Earthquakes are common in the Alaska Range. Icefall activity increases with temperatures above zero during the day and freezing at night, such as commonly occur in July. An experienced climbing team of four disappeared on the NE Fork of the Kahiltna Glacier; it is felt that they were killed by icefall. Most of the glaciers have icefall zones. The Talkeetna Ranger Station can provide detailed information about safe routes including travel on the dangerous NE Fork of the Kahiltna Glacier.

Avalanches

Heavy snowfall combined with widespread avalanche hazards are objective dangers that climbers face in the Alaska Range. Every year avalanches are triggered by climbers and in many circumstances someone is seriously hurt or Killed. Parties should be capable of doing their own avalanche hazard estimation and snow stability evaluation. When traveling anywhere in the range, good judgement and a careful approach to route-finding are the key elements in avoiding avalanches. Each team member should carry avalanche transceivers, shovels and probe poles and be thoroughly trained in their use. Mountaineering parties should be equipped to deal with the possibility of an avalanche accident and hence be a self contained rescue team.

The following is excerpted from [Snow Sense: A Guide to Evaluating Snow Avalanche Hazard](#), by Jill A Fredson and Doug Felser:

"As you travel through the mountains, choosing routes or campsites, you need to answer the following questions:

1. **Terrain Analysis**
Is the terrain capable of producing avalanches?
2. **Snow Stability Evaluation**
Could the snow slide?
3. **Avalanche Weather Forecasting**
Is the weather contributing to instability?
4. **Route Selection/Decision-Making**
Do safer alternatives exist?

If the answer to any of these questions is 'yes,' then you would be well advised to go where the answer is 'no.'

If you decide that you do want to travel on or near steep slopes, then you must seek the key information needed to answer the questions above. By doing so, you can begin to base your hazard evaluation upon solid facts rather than assumptions, feelings, or guesses.

The Talkeetna rangers may be able to advise your party of current weather, snowfall accumulations and reported avalanche activity.

Rescue

A climbing party high on Denali or other arctic mountains cannot depend on any assistance in case of an emergency. Due to acclimatization restrictions, it could be days before a ground party could arrive on the scene for a rescue. Clear air turbulence can often prevent air support, even on good days. For all practical purposes, a climbing party is alone and must depend upon its own resources if an emergency situation arises. **Injured or ill persons must often be moved to lower elevations by the remainder of the group if at all possible.** This is for the benefit of the injured person and to aid in rescue by a ground party or possible evacuation by aircraft.

"Hurricane-force winds, familiar to Mount McKinley's arctic latitude, slowed to a rough gale during the night, then quit toward morning. After five days of living in fear of flying off the Cassin Ridge in our two-man tent, Jeff Duenwald and I prepared to retreat 5,000 feet down the ridge to the Northeast Fork of the Kahiltna Glacier. Summit ambitions for 1981 had been blown away in the storm and now simply surviving was clearly the driving force.

We had underestimated the length and severity of Alaskan storms and now our rations were a box of macaroni and half a quart of fuel. Our alpine-style ascent with one 9mm rope and ten pitons had proceeded smoothly, but a safe descent from 17,500 feet with this same gear was cutting it thin.

These were minor problems, though, compared with the cerebral edema that had snuck up on me during the storm. I was completely blind every other minute. Not once in ten major Himalayan expeditions had I experienced altitude disease, but Mount McKinley is deceiving. With a short approach and low base altitude, Jeff and I had climbed too high too quickly to acclimatize properly. We didn't panic, nor did we consider being rescued by the National Park Service. As Himalayan veterans, Duenwald and I climbed with a singular attitude: that responsibility begins and ends with the climber. We began our descent. I rappelled and set anchors while able to see and waited patiently while blind. As we lost altitude, my periods of blindness shortened, enabling us to move even faster. By nightfall we were at 14,000 feet and by early the next day had dropped to the Kahilna Glacier. I was no longer experiencing periods of blindness, just hunger and embarrassment. My only regret was that we had not taken Mount McKinley as seriously as it's higher, but warmer cousins in Asia."

John Roskelley (1993)

Certain conditions (weather, avalanche hazard, terrain, etc.) may preclude any rescue attempt. The determination of when, or even if, a rescue attempt will be made is based on the collective judgement of those who are in charge of the rescue operation.

The use of aircraft in a high altitude rescue operation or on steep terrain is difficult and hazardous. **Do not delay evacuation if bad weather threatens or if an aircraft evacuation is doubtful.** To delay the evacuation of a climber suffering from altitude illness to a lower altitude may prove fatal. Don't risk the opportunity to descend in the hope of a quick helicopter response.

A rescue by helicopter requires a great deal of risk, effort and expense. The average rescue costs \$7,500; some run over three times this amount. When an injured or ill climber can be carried down to the lower glaciers and evacuated by fixed wing aircraft, the rescue costs are much less.

Over the years helicopter assistance has been requested by expeditions. Frequently, assistance was not possible because of severe weather, inadequate landing location, or the availability of a helicopter. These parties were forced to handle their emergencies on their own. They were able to safely evacuate a climber to a lower elevation.

All climbing groups confronted with an emergency situation should first consider what they can do to handle the situation on their own. Next, they should try to enlist the help of other climbers nearby. **Finally, and only when all other options have been tried should the group request additional assistance.**

If a rescue becomes necessary and the party has exhausted all means of evacuation, it may request assistance from the National Park Service via the party's radio or other means. In a rescue situation, parties must provide clear concise information and this may require transmitting in the blind.

Parties requesting assistance should provide:

1. Name of your party
2. Location and elevation
3. Extent of illness or injury
4. Current weather
5. Names/locations of other climbers who can assist
6. Your immediate plans

Rescue Transmission

Foreign climbers must speak slowly in English. If you can speak very little English, you should first initiate the call by saying, "Rescue, Rescue" and then say the name of your party. Next give your elevation, location, injury or illness and weather. At this point you may wish to briefly transmit the same information again, in your foreign language. Transmit your brief message three to four times every 30 minutes until you get a response. When possible, the Park Service will record your message and get it translated. Remember to warm the radio and batteries at least 30 minutes before each call. You may have to move to a different location to get out, since most radios are line of sight. Radios are not perfect and may not be functioning properly if you do not receive a response. Some parties adapt their radios to a portable battery pack which can be kept warm while transmitting. Always be prepared to evacuate the injured member or attempt other means of help. The rescue signal of "standing upright with two arms fully raised over your head" indicates you need rescue. If by the time an aircraft arrives on the scene you have lost communication due to weak batteries, you should display this signal to the aircraft.

Mountaineers will be Expected to Aid Other Climbers in Emergencies

Self sufficiency

Those who depend upon rescue efforts of the strength and expertise of others to extricate themselves from difficult positions are inviting disaster. Helicopters and/or acclimatized rescuers are often not available or the weather prohibits their response. In the Alaska Range, travelers should be prepared with knowledge, equipment, strength and common sense to support their own expeditions. The selfless assistance provided by climbers through the years have saved countless lives. This help has not been given without hardships and often causes aborted climbs for the rescue volunteers. All climbers must prepare to be self-sufficient.

Equipment and Supplies

Footwear The single most important piece of gear is footwear, which must be of the highest quality. Boots must be of the warmest rated doubled plastic models or the military vapor barrier type. Both have excellent track records for use on Denali. All double boots must be equipped with a completely insulated overboot, including closed cell foam on the sole. Supergators are inadequate substitutes for overboots. Boots should be fitted with several pair of socks and should not be worn too tight. Climber's feet tend to swell slightly at higher altitudes. Many climbers use vapor barrier liners (VBL) against the skin or over a thin pair of socks. Feet that have been wet all day from the VBL's need to be placed in a dry environment each night. Foot powder is very helpful in drying out the feet. Not

allowing the feet to dry can lead to a serious condition known as immersion foot (trench foot). Many climbers on Denali have suffered with this debilitating condition, which is very similar to frostbite. All footwear systems should be thoroughly tested before departing. Single leather boots are inadequate for the conditions and have contributed to numerous cases of frostbite in the past. Most of the severely frostbitten feet have occurred on summit day. All members should be ready to leave camp at the same time so no one is left standing around getting cold toes. Once you have left your high camp you will have little opportunity to attend to your feet. Cold toes are not uncommon, but adequate circulation must be maintained with some degree of sensation in the tips of the toes at all times. If your toes become cold at this point, you must either stop to rewarm your feet or make a hasty retreat. On most summit days the option to stop is not a possibility. Frostbite of the feet can sneak up slowly and its consequences are devastating.

Clothing

Outer layers of clothing must be adequate for the most severe arctic conditions. The best is necessary. These items should include:

- expedition weight down parka with a good hood and wind tunnel
- down pants or expedition weight pile pants
- parka shell, loosely fitted, with a hood, wind tunnel and plenty of pockets
- climbing bibs or wind pants that are fitted for layers
- mittens fitted large with long sleeves and removable liners
- light weight face mask or balaclava
- hat of double layer construction with good ear protection

The conditions experienced in lower glacier travel are often very hot when the sun is out, or wet when it is snowing. Several medium weight layers of synthetic clothes work best. A good sun hat and reflective white shirt are very helpful with the intense glare.

Lightweight, wind-resistant clothing in layers allows for adjustments to be made according to conditions. Several changes of socks should provide thick, loose insulation. Booties that are down or synthetic fiber filled with insulated soles are good for wear around camp and in the sleeping bag. Booties work exceptionally well inside the overboots for colder conditions or when there is deep snow in and around camp. Each climber should bring synthetic gloves and extra mittens. Thick pile tops and bottoms are needed for climbing before June.

Parties traveling through the lowlands during the summer months will need headnets, effective mosquito repellent, rain gear and mosquito netting for tents. The icy cold river crossings are made easier with neoprene booties worn in lightweight running shoes.

Sleeping Gear

An expedition quality sleeping bag is essential. Down or synthetic fiber filled bags rated to 20F (minus 29C) is the minimum acceptable. Many climbers use an overbag along with their sleeping bag. This is especially important for April and May climbs. Allow extra room in the sleeping bag for wearing layers of clothing, inner boots, and storing a water bottle. Almost as important as the sleeping bag is sufficient insulation underneath the bag. Two closed cell foam pads or a combination closed cell with inflatable foam pad are the standard. Adequate sleep is essential at high altitudes. Do not economize on weight by compromising sleeping gear.

Snowshoes or Skis

One pair of snowshoes or skis per person must be taken! Hidden crevasse bridges become unpredictable without the flotation of skis and or snowshoes and snow accumulations of greater than a meter can occur at any time. Only experienced skiers should attempt to ski. Skiers should practice with a heavy pack and sled to make sure they are prepared. Climbing skins are necessary. Snowshoes should be sturdy with traction devices for steeper sections and side hill traversing. Ski poles are also very useful with snowshoes. Anticipate that snowshoes tend to need more repairs than skis.

Sleds and Haul Sacks

Sleds or sacks have proven very useful for travel on the lower glaciers and for shuttling loads. A single climber can pull loads of 30 to 40 pounds (14 to 18 kg) with little difficulty. Most Denali climbers use lightweight plastic sleds available from department stores or through the Talkeetna based air services. Sleds can be rigged with rope breaks on the descent. Sleds and sacks can be used for carrying garbage on the descent. They may also be used for evacuating sick or injured climbers.

Stoves

Carry at least two stoves of proven efficiency that work at high altitudes and in extreme cold. Carry spare parts for cleaning and repairs. Almost all parties use white gas, which is readily available. Disposable gas cartridge models are discouraged and the cartridges are difficult to obtain in Alaska. Domestic cartridges may not be pressurized enough for the extreme cold. Plan on 4 to 8 ounces (.15 to .30 liters) of white gas per person per day. You will need more fuel earlier in the season due to colder temperatures and drier snow. **All full and empty fuel containers must be packed out.** The rangers may request to see your containers upon arriving at base camp.

Food

Plan three weeks of food for the West Buttress, consisting of 4000 to 5000 calories per person per day. This amount figures in about a week of storm bound days. Each climber should plan on consuming at least four liters of fluid per day. Good hydration hastens acclimatization and prevents dehydration. Be sure to repackage food before you depart for the mountain to minimize garbage. Foreign climbers need to be aware that [no freeze-dried meat](#) may be brought into the United States. Only commercially canned is allowed to enter the country, other meats must be purchased upon arrival in the United States. Anchorage has numerous retailers who sell freeze dried, dried, bulk and other food commodities at prices equivalent to other areas in the United States.

If you access the mountain by air, plan a base camp food cache in the event that bad weather delays your flight out at the end of your climb. Be sure to bury this cache at least a meter and mark it with your name and expected return date. The lower glaciers melt considerably during the climbing season, and exposed caches can be raided by ravens. **If the cache is not labeled with your expedition name and date, the mountaineering rangers will conclude that it was abandoned, and remove it.**

If you are planning to traverse through the lowlands, you should be prepared to prevent giardia by filtering or boiling your water, or using water purification tablets. Giardia cysts have been found in lakes and streams on both the north and south sides of the Alaska Range. You should plan to cook 50 to 100 meters away from your camp to prevent the intrusion of bears due to cooking smells. After cooking, all food, garbage, pots and other utensils should be triple packaged in large plastic bags and placed 100 meters from the camp in a different location than where you cooked, but in a spot that can be observed from your tent.

Snow Shovels

Carry several shovels per party. Larger, sturdier types are essential. Avoid small lightweight shovels since they are worthless for moving large volumes of snow. The aluminum grain scoop (14 x 18in or 35 x 45cm) has proven to be indispensable. These scoops can be purchased at many hardware stores. Shovels are used for digging in campsites, constructing snow caves, removing snow from around tents, and occasionally used for clearing the route after deep accumulations. A small strong shovel such as a steel spade is indispensable for digging snow caves or tent platforms in wind packed snow or at camps above 14,000 feet (4,300 meters).

Snow Saws

Your party should carry several saws, since they are essential for building walls around your tent or constructing igloos and snow caves. They should be sturdy, with large, sharp teeth, a stiff blade and should be fitted with a large handle.

Tents

Tents should be of expedition quality. The two to three person dome shaped tent has developed an excellent track record. Allow extra room per person since many days are often spent storm-bound. Small, one person tents designed for narrow platforms may be the only thing that will work for routes such as the Cassin Ridge. It is possible to dry damp clothing in a larger tent, but it is extremely difficult to do in a two-person tent. Extra poles and repair materials are important, in case of damage caused by storms. Plan to take extra pickets, wands or deadmen for anchors. **Never** leave a tent without anchoring it securely. Tents are lost each year due to sudden gusts of wind while the tent was left unattended or drying. The rain fly should be used for its added strength to the integrity of the tent. It also traps a layer of air for added warmth.

Operation of the stove should occur outside of the tent. Under extreme conditions, members of a party may be forced to cook inside the tent. If so, cooking must be done at the entrance, with plenty of ventilation. **Never** cook without adequate cross ventilation! (see "[Carbon Monoxide Poisoning](#)"). Avoid lighting the stove while inside the tent.

Snow walls should be constructed around tents for protection from winds. However, even the best walls and tents will not provide comfort and rest during severe wind storms. Snow walls collapse and tents fail each year. Furthermore, the noise of flapping tents can become nerve-racking, causing significant mental and physical fatigue. Winds in excess of 80 miles per hour (130 km/h) are common and may last many hours or days. Always be prepared for a tent failure with strategy to build a snow cave.

Snow Shelters

Acclimatization days are well spend constructing and igloo or snow cave. At times, the only shelters to survive a wind storm at the high camps are snow shelters. All party members should have experience in the construction of snow shelters. A small steel shovel will become invaluable for digging into the hard ice found high on Denali or Mt. Foraker. Habitation within the snow shelter can be quite pleasant compared to the agony of a tent during cold evenings or stormy conditions. During construction, make sure the entrance ceiling is built lower than the floor and the entrance opens at right angles to the wind. Candles and a small lantern for spring climbs provide added light and warmth. Always allow for good ventilation while cooking, and read the section on [Carbon Monoxide poisoning](#).

Rope

Take at least one 45 meter, 9mm Perlon water repellent rope per two people and a 45 meter spare for crevasse rescue. Use a 50 meter rope for three climbers. Fixed rope made of Polypropylene (solid core 9mm) should only be used on snow and ice. Static Perlon should be used over sharp ice and any rock for fixed line. All fixed rope must be removed upon your descent.

Ice Axes

One ice axe per person is necessary, plus an extra per party (since they are easily lost in crevasse falls). An ice axe 70cm or taller is more practical for non-technical climbs such as the West Buttress or Muldrow Glacier routes. Picks on ice climbing tools are frequently broken on technical climbs. The extreme cold throughout the year creates **very hard** ice. Tape the grip area on the head of the ice axe with closed cell foam and duct tape or hockey tape, This inhibits cold penetration to the hand.

Crampons

Bring one pair of crampons per person, that can be adjusted to be worn with or without overboots. An adjustable pair should be carried as an extra with each party. A small file is essential on technical routes. Clamp-on crampons will work with most current overboots. This is a significant advancement since lace-on crampons tend to place pressure across the top of the foot.

Crevasse Rescue

All party members must have worked together on similar techniques for crevasse rescue. Crevasse falls are imminent while traveling on glaciers in the Alaska Range. Each climber should be rigged for a crevasse fall with foot loops, mechanical ascenders or prusiks and a pulley ready to be used. Attach the pack and sled to the rope while traveling. Safety straps should be used on skis since they are easily lost in a crevasse fall. Each member should carry a picket or snow fluke in addition to their ice axe.

Snow and Ice Anchors

Snow pickets of 2 to 3 foot length and/or snow flukes are essential for anyone traveling on glaciated terrain. The snow bollard or deadman anchors work well but require additional time to place. They may be the only anchors that will work in a variety of unconsolidated or slush snow conditions. A rack of ice screws are essential on steeper routes but only a couple per party are needed for the West Buttress or Muldrow.

Eye Protection

Snow blindness is common due to the extreme glare, even on overcast days. Sun glasses should provide maximum protection from

ultraviolet and infrared rays, along with protection from side glare. Double lens ski goggles work well in bad weather and whiteout conditions. Extra glasses should be taken by each party.

Medical Kits

All members of the party should be familiar with the contents and use of the medical kit. Split kits should be carried when members in a party separate. It is of the greatest importance that members consult at length with a physician or take a course on the field treatment of common emergencies. The following is a list of medical kit contents for a high altitude expedition to Denali or Mt. Foraker suggested by Dr. Peter Hackett.

ITEM	USE
Diphenhydramine	Allergies, Sleep
Promethazine	Nausea, vomiting
Ibuprofen	Headache, muscle aches & pains, burns, frostbite, sunburn
Codeine	Painkiller, cough suppressant
Dexamethasone (Decadron)	Severe AMS or HACE
Acetazolamide (Diamox)	To speed acclimatization, treat mild AMS
Cephalosporin	Antibiotic
Labiosan (or similar)	Lip protection
Immodium (or similar)	Diarrhea
Antibiotic ointment	Skin infections and prevention
Acetaminophen (Tylenol)	Headache, pain killer, fever
Sun Block	Sunburn prevention
Throat Lozenges	Sore throat

OTHER ITEMS

Gauze, bandages, pads	Thermometer
2" adhesive tape	Small scissors, knife, nail clippers
Skin closure strips	Spare sunglasses
Space blanket	Safety pins
SAM splint	Betadine solution

Radio

Carrying a two-way radio is recommended for all parties and essential for climbs off the beaten path of the West Buttress. Each season, climbers are rescued without significant delay because they used a radio to call for assistance. Some of the most lengthy and drawn out rescues were lengthened by the lack of communication. In some accidents, climbers had to wait for weeks, or crawl for days to summon help. The Park Service will often drop a radio to a suspected injured party in order to provide clear communication. If you are climbing in the Ruth or on the Cassin, a radio can be a real life saver in an emergency.

The Citizen's Band (CB) radio is the radio preferred and carried by most climbers. Channel 19 (27.185 MHz) on the CB is monitored by air services and the Park Service in Talkeetna. Even though Denali is 60 miles from Talkeetna, its great height allows direct communication with the Talkeetna Ranger Station and even as far away as Anchorage or Fairbanks over 100 miles distant. While flying in the mountains, the Talkeetna pilots monitor Channel 19, as do rangers at the Kahiltna Base Camp and the 14,000' Ranger Station on the West Buttress. Daily mountain weather forecasts are broadcast from the Base Camp Operator. The standard 3-5 watt CB can easily be purchased from electronics retailers or rented from your air service in Talkeetna. Be sure to carry extra batteries and make sure the radio and batteries are warm before transmitting.

Communications from the north side of the Alaska Range are more difficult. If you are climbing the Muldrow or other routes in the vicinity, the CB is the best choice. Beginning in May, Channel 7 is monitored at Camp Denali near Wonder Lake, while Talkeetna's pilots frequenting the area will be monitoring Channel 19. If you are considering a remote area, your best choice is a radio that can transmit on aircraft frequencies. This will allow you to communicate with the airlines or use the emergency locator transmitter frequency.

Cellular phones are being used on a limited basis with connecting repeaters from Anchorage to Fairbanks. Both cellular phones and CB radios are line of sight and are usually functional only above 13,000 to 14,000 feet (4000 meters) on most routes. The CB has the advantage of allowing communications between expeditions on Denali and other peaks. Always be prepared for radio failure and have a contingency plan ready in the event that your radio does not work.

Signal Devices

Because radio communication may not always be possible, it is recommended that other types of signal devices be carried. Smoke and rocket-type flares have been used with limited success. Mirrors are much more limited, being dependent on adequate sunlight. The portable ELT (Emergency Locator Transmitter) has had good results. The ELT does lack the capacity for two-way communication.

Trail Markers (Wands)

Every expedition should carry a few (20) wands (dark green bamboo garden stakes) whether to mark a cache, or indicate the edges of a crevasse. Several wands should be carried on summit day to replace any that have been blown away in recent storms. Near zero visibility can envelop the upper mountain very quickly, making Denali's broad summit plateau very difficult to navigate. Once the trail

to the summit is lost, every effort should be made to retrace your steps back to the last wand. Wands should be 1 to 1.5 meters in length, spaced 100 to 150 feet (30 to 50 meters) apart. Each expedition may expect to use 200 to 300 wands for routes less frequently climbed. Several wands should be taped together forming a sturdy marker 2 meters above the snow when marking caches below 14,000 feet (500 meters). Wands can be purchased from garden and hardware stores, and are available locally.

Repair Kit

Plan your kit around the equipment you carry, such as the stove, skis and tent. In addition, carry parachute cord, wire, duct tape, a screw driver for skis, patching material for your inflatable mattress and tent, and a sewing kit.

Talkeetna Ranger Station

In 1977, the National Park Service established a ranger station specifically for mountaineers in the small community of Talkeetna. Since 1984, the station has been staffed year-round to provide information and assistance to mountaineers before, during and after their climbs. The mountaineering rangers have extensive experience in the Alaska Range and can provide invaluable information. A collection of over 150 high quality photographs of the Central Alaska Range by Bradford Washburn is available for viewing at the ranger station. The station maintains a reference library including a complete set of American Alpine Journals, a map collection, and specific route information for numerous other peaks, including the Ruth, Kitchatnas and Little Switzerland. Please feel free to use all of these resources while in Talkeetna to better prepare for your climb.

SEND ALL INQUIRIES, [REGISTRATIONS](#) AND CORRESPONDENCE TO:

Talkeetna Ranger Station
Denali National Park and Preserve
P.O. Box 588
Talkeetna, Alaska 99676
USA
Phone: (907)733-2231
Fax: (907)733-1465

Reference Materials

History and Information:

[American Alpine Journal](#). Excellent reference for Alaska Range route information. Various issues.

[Dangerous Steps](#) by Lewis Freedman, Stackpole Books.

[Denali National Park and Preserve Annual Mountaineering Summary](#). Published annually in the American Alpine Journal.

[Denali, Symbol of the Alaskan Wild. An Illustrated History of the Denali-McKinley Region, Alaska](#), by William E. Brown, Alaska Natural History Association.

[High Alaska: A Historical Guide to Denali, Mt. Foraker, and Mount Hunter](#), by Jonathan Waterman, American Alpine Club, New York, New York, 1988.

[In the Shadow of Denali](#), by Jonathan Waterman, Dell Books.

[Mount McKinley Climbers Handbook](#), by Glenn Randall, Chockstone Press.

[Minus - 148](#), by Art Davidson, Cloudcap.

[Mount McKinley, Conquest of Denali](#), by Bradford Washburn and David Roberts, Harry N. Abrams

[Mount McKinley, Icy Crown of North America](#), by Fred Becky, The Mountaineers.

[Mount McKinley, The Pioneer Climbs](#), by Terris Moore, The Mountaineers.

[Surviving Denali: A Study of Accidents on Mount McKinley, 1903-1990](#), by Jonathan Waterman, American Alpine Club, 1991.

[The Ascent of Denali](#), by Hudson Stuck, University of Nebraska Press.

[The Hall of The Mountain King](#), by Howard Snyder, Charles Scribner's Sons.

[To the Top of Denali](#), by Bill Sherwonit, Graphic Arts Center Press.

[White Winds](#), by Joe Wilcox, Hwong.

Photos:

[High Quality Photos of peaks and routes of Bradford Washburn](#): University of Alaska, Fairbanks
Alaska and Polar Region Department
Fairbanks AK 99755-1005

[Bradford Washburn](#)

The Museum of Science, Science Park
Boston MA 02114

Mountain Safety:

[Accidents In North American Mountaineering](#). Published annually by the American Alpine Club. Issues from 1977 to the present are especially valuable.

[Glacier Travel and Crevasse Rescue](#), by Andy Selters, The Mountaineers.

[Medicine for Mountaineering](#), Edited by James A. Wilkerson, M.D., The Mountaineers, 4th Edition.

Mountaineering: The Freedom of the Hills, Edited by Don Greydon, The Mountaineers, 5th Edition.

Mountain Sickness: Prevention, Recognition and Treatment, by Dr. Peter Hackett, American Alpine Club.