

"Thirty Below is a Piece of Cake"

OR

"What We Learned from the February, 1979 Deep Freeze at Camp Boyhaven"

**T.R. Brown
December 30, 1979**

Thirty Below is a Piece of Cake*

or - What we learned from the Feb. 1979 Deepfreeze at Boyhaven, a Planning Document to extend your camping practice from 0 to -30.

This was the weekend when 3 troops camped out on Friday night when the temperature went down at least to 10 below, and when 3 other troops camped out on Saturday night when the temp. went to about 30 below. Because the extreme low temperature on Sat. night had been forecast all day, the Klondike Derby competition was terminated at 4 pm. Sat., after the skill events were completed. Sat. night camping was at the discretion of each troop's leaders.

Because -30 is approximately 25 degrees colder than recent Klondike Derby experience, it will be worthwhile to summarize our present knowledge of how to camp in extreme low temperature, for we learned a lot. The following points cover the major areas we are concerned about, starting with various aspects of clothing. Note that I am trying to be practical about cost, suggesting many layers of what's available, instead of spending the money for expedition-quality gear.

1. Be sure that there is plenty of insulation under your feet. Socks get thin just like the bottom of a sleeping bag, requiring some kind of firm insulation beneath. Felt insoles are great. Carry extra felt insoles to provide a spare dry pair when the first pair gets sweaty.

Plenty of room in boots is essential because the looseness gives extra insulation thickness, and also permits the warm blood to flow freely and keep the feet warm. Most Scouts need to be checked to be sure that their boots are big enough and loose enough. The Maine, or Sorel-type hunting boot is probably best, with rubber bottoms, leather tops and replaceable felt liners.

2. One pair of longjohns will keep your legs warm down to about -5°. Add another pair of longjohns and go to -30. Scout pants are good. They don't pick up snow, dry quickly, are somewhat windproof, and reasonably loose. With windproof wool pants, you may need only one pair of longjohns. Be sure to avoid tight blue jeans, which are sure to get wet, and cannot be dried in the field. ADK feels that bluejeans should be outlawed for winter camping, as being unsafe.

3. Cover the ears and neck. A deep hood is useful to protect the face from wind, although Stefansson did not use the deep, tunnel hood. The ears MUST be covered for protection, for they stick out in the breeze, and will freeze as solid and brittle as potato chips. A pull-over wool hat with a neck section is a good idea.

4. Hand protection can be furnished by loose leather shells alone down to about +10°. Put heavy woolen mittens inside, and they're good to -30. You will find that the leather must be porous in order to be a good heat insulator. Greased leather is cold.

*for Troops which can handle 0°F.

The care of hands becomes a major, serious problem at -30. So long as the body is warm, and the hands are enclosed in heavy wool mittens, all is well. The problem arises when you need to work a camera, light a fire, whittle some kindling, or do some other minor chore. The hands can be brought out of the mittens, and will work fine for a short period of time, say 10 or 15 seconds. You then need to pop them back into the mittens for a couple of minutes. This will keep them from freezing.

Therefore the mittens need to be instantly available - somewhere on the person. You don't dare put them down. An easy way to make them available is to pin the mittens to a string or thong over the neck, as the Arctic explorers do. To lose a mitten in deep snow can mean the loss of the hand - it is extremely serious.

Again, the problem is that the hand doesn't feel cold after only 10 or 15 seconds in the open, so you tend to leave it out. A gradual numbness is not very noticeable, so you don't realize that your hands are very chilled until you try to tie a knot, and can't, or try to hold a match, and cannot do it. Then you need to warm the hands from an external source of heat - under armpits, between legs, on your tummy, - and it takes a long time to warm them sufficiently. If you must work with your fingers at these temperatures, try clarinet gloves (without fingertips), or use a second set of work gloves, loose ones.

A pair of hand-warmers can be slipped into your pockets, and they are a delightful asset on a supercold day. They burn gasoline, or solid-stick fuel, and are a great solace to hands and spirit. Very convenient when you absent-mindedly let your hands get numb.

5. To keep your body warm at -30 you just need to move a little faster, but not fast enough to perspire. A steady moseyin' around pace is probably sufficient. This means no standing around, hence no long lunch breaks. Lunches had best be eaten while continuing to move, eaten from the Gorp reservoir in your right hand pocket.

Obviously, you will be wearing another layer of insulation than you would at a warmer temperature, of say zero degrees. A bulky sweater, or a down vest, should be enough to handle the cold temperature, provided that you keep moving. While in camp it is a good idea to cut up a log for the fire every so often, to help you keep warm.

If you must work hard, as in climbing a mountain, or chopping wood, the additional exertion will cause you to perspire, filling your insulation with water, unless you first remove enough clothes to provide for the extra dissipation of heat. Since the extra heat can be 4 times that of standing around, you'll need to cut the insulation to one-quarter, leaving yourself standing there in one wool shirt and some fishnet underwear. Hopefully, if the loss of heat remains more than the production of heat, your body will not heat up as you work, and your sweating will be minimal - because the body calls for sweating to cool off a too-high temperature. But put your jackets back on quickly when you finish chopping, or sawing.

This point is emphasized because our experience is that taking off clothes in cold weather seems very hard to do; most people just cannot force themselves to do it. But wet insulation is virtually no insulation, and can result in Hypothermia.

6. An extra sleeping bag will be needed when the temperature gets much below zero. A bag with eight inches of loft (i.e. 8 inches high lying on the floor) is OK to zero, but you need about 12 inches of loft to cope with -30. So, find a big, wide-mouth bag, 34 inches or so wide, and put your mummy bag inside it. (Don't try to stuff one mummy into another mummy.) A rough general rule for me is 4 in. of loft for 32°, 8 in. for zero, and 12 in. for -30.

If the loft is somewhat less, or you are a person who doesn't generate much heat, then you will need to augment the bag by wearing a sweater, or a down vest, or both. And of course longjohns, and wool socks. Down booties are said to extend the comfort range of a sleeping bag by about 10°. You can increase your heat production by eating a snack before hitting the sack, and having a candy bar ready in case you need it at 3 am. If you need to answer the call of nature in the middle of the night, it is a good indication that you are not dehydrated, but it is pretty uncomfortable in 10 inches of snow. With forethought you will have handy a tin can, or a screw-top Skippy jar. This provides great peace of mind.

The insulation underneath your bag needs to be increased also, as the temperature gets colder; an air mattress plus a foam pad, two foam pads, an extra old sleeping bag, horsehair blanket, etc. etc. Also, remember that snow itself is porous, and a good insulator, so sleep on the snow. The frozen ground, or a slab of ice, can suck up a lot of heat.

Wind protection is necessary, so don't sleep in leantos below zero. The temperature in a tent will run considerably warmer than a leanto, especially if the tent is crowded. If you put three people in the normal two-man tent, they'll be warmer.

7. Frostbite of nose and cheeks becomes more likely as the temperature goes below -20, even in relatively calm air. Some authorities (Washburn pl3) distinguish between "Frost-nip", which is a whitening of nose or cheeks, noticed right away and warmed immediately using a bare hand, and "Frost-bite" in which the freezing was not noticed, and so the skin becomes more seriously frozen. We learn that the treatment of "Frost-nip" through normal vigilance and care involves no permanent damage at all, and is no cause for alarm. It is a normal part of living at -20 and below. We should expect it, be alert for it, and when it happens, warm the affected part promptly and gently. Be sure to check your buddy rather continually and let him know of any whitening, for he probably will not realize it.

If you are walking at 4 mph at -22°F or so with no wind, you can expect frostbite. This is the wind-chill temperature where the heat loss from the face is great enough to cause freezing. The basis for measuring "wind-chill" is the heat loss from the face of a person walking at 4 mph. (In K-Cal per sq. meter per hour, if you are curious.) For example, the heat loss from the face of a person standing in an 8 mph wind at zero F, is the same as if he were walking at 4 mph at a -16° temp. The -16° equivalent temp. is called the "wind-chill temp." for an 8 mph wind at 0°F .

The reduction in temperature caused by the wind can be approximated by the formula $\Delta T = 9\sqrt{V}-4$. (This approximation is best between 8 and 20 mph.) The important thing to remember is that when the temperature and wind velocity combine to give a wind-chill temp. of -22 or below, then one must be very careful to protect ears, cheeks, chin and nose. And when the thermometer says -25 or below, some sort of facial protection, or extra watchfulness is essential.

There was some concern at Boyhaven about frostbitten noses while sleeping. Most authorities don't mention the problem, so it must not be very prevalent. Danielsen says (p132) that if your nose gets cold, pull your hat or ear band over it. Covering your face with a scarf while you sleep can be done, but it seems to lead to the formation of snow on the inside, which is uncomfortable. A ski mask should be useful. Exhaling inside the sleeping bag makes the bag wet.

An important point made by Stefansson is the danger of a beard icing up as you walk around, and freezing the face. Then you have great trouble thawing the ice out of the beard in order to save the face. Local Schenectady bearded folk are probably in no danger if they don't go too far from a warm building.

8. Backpacking into the wilderness at temperatures below $+10^{\circ}$ or so is reserved for competent woodsmen, who almost never make a mistake, whose camping attitude is conservative and reliable. Even so, the consequences of even a slight injury, which merely immobilizes a person, are so serious that the use of a light-weight sledge or toboggan is advisable for trips into the woods. A sprained ankle, cut foot, or twisted knee would be only embarrassing in the summer, but could be fatal in the winter if a person were not able to exercise enough to stay warm.

Since -30 is 40 degrees colder than $+10$, you need about twice the insulation, which probably weighs 10 lbs. more per person. Much of this extra weight could go on the sledge, along with an assortment of other additional equipment (tents, woodstove, and stove-pipe).^(7.) And the sledge would then be available to carry out the injured.

The standard type of sledge presently used by the U.S. military forces for carrying heavy equipment during operations in deep snow is the "A-16 Aluminum Sled". It is about 4 ft. long and is pulled with a harness. For the use of our Scouts in deep snow a sledge should have a full bottom⁽¹²⁾ like a toboggan, be lightweight, and be fitted with handles at the rear to steer it.

- 7. "Paradise Below Zero" -Calvin Rutstrum
- 12. "The Friendly Arctic" -V. Stefansson

Backpackers should consider snowshoes as their prime means of winter travel, considering skis only after trying them out with a full pack. It is unbelievable to an experienced cross-country skier how poorly he skis with a 50 lb. pack. Snowshoes are better for carrying a load. Crampons may be needed to handle icy slopes above timberline.

9. As the temperature goes down much below zero you need to do two things in planning meals:

1. Avoid long lunch stops, and refuel the bodily fires frequently. This means that you need to provide for short snacks rather than one big lunch. The big meals tend to make one logy and chilled while the food is being digested. A frequent re-stoking of the metabolism keeps you warm and full of pep.

2. The cooked meals need to be planned to use a minimum of heat. The environment will be sucking the heat away from the food pot at a terrific rate, and the fire is probably somewhat more feeble than in hot weather as well. So - things don't cook. Don't plan on boiling a big pot of water for 10 minutes to cook spaghetti. Won't happen. Rather, warm up a couple of cans of Dinty Moore's stew, and pour it over some instant mashed potatoes. Pre-cooked foods which need only to be warmed up, or dried foods, which will instantly re-constitute with boiling water, are examples. In the winter there should be no problem in keeping pre-cooked, frozen foods frozen. And remember, too, that whatever you bring will freeze, such as eggs, soups, or drinks.

Remember that the human fires need a lot more fuel in cold weather. Danielsen (p97) points out that 4100 calories per day is average. Note that this is almost twice the normal adult diet, and approximately what a healthy teen-age Scout consumes in the summer. Therefore plenty of food is important to feed the metabolism to keep people going, and as Bradford Washburn says in "Frostbite", it had better be appetizing, or the guys won't eat it. Specifically, he says on page 5, "There is no better investment in the well-being, safety, and efficiency of a party than delicious food, plenty of it, well-prepared." Or, as Gen. Sherman said, "An army travels on its stomach".

All writers on winter camping point out how easy it is to forget to drink enough water. If you take the water away from the body's chemical plant, it cannot function, and the result is called Dehydration, which makes one feel bad, dopey, even get a headache. Since you don't get thirsty in the winter, you don't grab for the water automatically. Rather, you have to deliberately plan for an adequate liquid intake, and make sure that it happens.

Since you will no doubt depend on stoves for cooking, be sure that your particular kind will actually function at the expected temp. Butane won't work below +35°, and propane poops out at +30 or so. Non-pumped gasoline stoves are very tricky below +10°, and so for any temperatures below -5 we recommend a pumped gasoline stove. And be sure to try it out, in the cold, ahead of time.

10. Forestalling Hypothermia is a serious responsibility for the Group Leader. He needs to know the conditions under which people lose more heat than they generate, and see to it that a too-cold person is warmed. Cold, wet, tired, hungry people are predictably susceptible, and the Leader is responsible for re-planning the trip to avoid a real emergency. He must be prepared to initiate immediate action if he feels a person is in a Hypothermia situation.

11. "It's the brain that goes first" is the famous line from a movie on Hypothermia.

I have long suspected that my ability to think, and reason, deteriorates after about 4 hours exposure to cold. This may indicate a general problem which, if anticipated, can be guarded against. As one experienced camper told me, "After being exposed to extreme cold, my brain turns to mush." Washburn (p 3) speaks of "hypoxia", a condition of lack of oxygen at high altitude, which causes one to think poorly. "Hypoxia brings about an insidious reduction in our reasoning powers, with a tendency to make one lazy, sloppy, careless, indecisive, and lacking in the endurance, insight and judgment normally encountered at sea level." Note that hypoxia and hypothermia have many of the same symptoms and problems.

The Leaders' behavior which I sense at Klondike Derbies is a concentration on the immediate task, shutting out from consideration the situations which may develop into problems an hour from now. Therefore, Leaders should be wary of the following attitudes:

Loss of perception - you see things, but they don't have meaning,
 Loss of decisiveness - "let things ride; they'll probably work out."
 This is very much the same attitude as a sleepy automobile driver, who can keep his car in the right lane, but does not take decisive action when an emergency requires it. Therefore, push yourself to constantly extend your attention into the future. "What will be the result in an hour of what I see in front of me now?" "What action should we take right now to create a better situation two hours from now?"

To forestall and prevent the above deterioration of intellect,

- a. Drink plenty of water
- b. Get plenty of sleep
- c. Keep nice and warm
- d. Be well fed (Don't get too hungry. Keep nibbling.)
- e. Avoid exhaustion (Slow down. Delegate the chores to others.)

In other words, keep the organism running at peak efficiency, and it will function better.

The Leader of the group must try to avoid getting hung up on the problems of the moment. Delegate them. Let someone else worry about the Beaver Patrol not getting its fire started; let someone else wash the dishes. As Leader, your job is to think ahead, and plan. You must arrange to keep your own brain clear and calm to worry about the big picture, because planning in advance how to cope with problems will prevent them from becoming serious.

As Robert Peary said, "An Adventure is the result of poor planning."

T. R. Brown

12-30-79

Additional reading, and references:

1. "Frostbite" -Bradford Washburn a pamphlet
2. "Winter Hiking and Camping" An ADK manual by John Danielsen
3. "Arctic Manual" -Stefansson This was Stefansson's training manual for the Air Force in 1942. ~~Now out of print.~~ Use library copies. *Back in print. (1985)*
4. "Manual of Ski Mountaineering" A Sierra Club manual, edited by David Brower
5. "Physiology of Heat Regulation and the Science of Clothing" edited by Newburgh and published by Hafner. The library can get it for you.
6. "Survival in Antarctica" -National Science Foundation
7. "Paradise Below Zero" -Calvin Rutstrum
8. "The Adirondack Winter Mountaineering Manual" by ADK
Although long out of print, it is an excellent reference on planning trips, if you can find a copy to Xerox.
9. "The North Pole" -Robert Peary
10. "The Complete Snow Camper's Guide" -Raymond Bridge
11. "Hypothermia: Killer of the Unprepared" -Dr. T.G.Lathrop
This is the definitive pamphlet on the subject.
12. "The Friendly Arctic" -Stefansson
13. "Movin' On" -Harry Roberts