

Concepts for Staying Warm When It's Cold

The information that follows comes from a snow camping course. However, the principles explained here are applicable any time of the year. The Sierras are unpredictable enough that you need to always be prepared for cold weather hiking & camping. An important part of your preparation is clothing. Proper clothing is your first defense against the elements. It is critical that each Scout be properly clothed to prevent hypothermia, which is just as possible in June as it is in January. With the right knowledge, there is no reason not to get out in this cold.

Cold Weather camping is officially defined by the Boy Scouts of America as “a trip in which the high temperature of the day is 50 degrees Fahrenheit or lower”. Cold temperatures are only one challenge. Rain, snow and wind may also encumber the camper, at any time of the year. Conquering these elements can be satisfying.

A Little about the Weather

There are three different types of weather and cold. Each presents its own challenge. I will only describe the first in detail, since it is what we need to worry about.

- **Wet Cold** – This is the most dangerous type of cold in many ways. It is also the type that our Troop will be camping in. Even most snow camping on much of the west coast falls into this category. This type of cold is defined as being between **50 and 14 degrees Fahrenheit**.

Unfortunately people often are not aware of just how cold they are because the temperatures feel relatively warm. Rain is a possibility and hypothermia may easily set in. Rain can soak and penetrate clothing much more readily than snow does. Also, any snow that may be frozen on the ground during the night may melt and get into clothing during the day, especially footwear. Clothing can easily get wet during the day and then freeze solid at night. Additionally, it is easy to soak clothes working during the day, only to face freezing temperatures at night.

- **Dry Cold** – The temperature range is between 14 and -20 degrees Fahrenheit.
- **Arctic-like** – Temperatures in this category are below -20 degrees Fahrenheit.

Temperature is not the only weather condition that needs to be a concern to a cold weather camper. Wind and moisture can have a profound impact on the human body.

- **Wind** - A temperature of 40 degrees Fahrenheit coupled with a 10 mile per hour wind will equal a 30 degree Fahrenheit wind chill. A little wind can drastically alter the perceived temperature that a person is trying to stay warm in and can have a profound effect on the human body.

- Moisture - Rain and snow also will have an impact on the camper. Moisture chills at a rate of conductivity of 30 times that of air. It is extremely important to keep moisture out of clothing and away from the skin and body core. Staying dry is very important. Wet clothes are very dangerous. Water is the unbalancing factor, and our clothing choices will focus on keeping moisture away from our skin.

Your Body and The Cold

The human body provides the heat necessary to maintain its survival. Maintaining this body heat is vital to staying warm in cold weather. The organs in the abdomen, chest, pelvis and head are the vital parts and the body fights to maintain their heat. These areas are referred to as the **body core**, and your body functions best when these areas are at or near 98.6 degrees Fahrenheit. Blood flow will be reduced to the **extremities (or shell)** of the body (arms, legs, hands and feet) in order to maintain the body's core. Thus, the extremities get cold first. From this it is possible to understand the old saying that a person should **wear a hat to keep their feet warm**. Preventing **CORE** body heat loss is the secret to staying warm in the cold. In order to best do this, it is important to understand the ways that we lose heat.

Radiation – Large quantities of heat are lost through the head. Anywhere from **55 – 75%** of the body's heat can be lost this way. It is vital for the cold weather camper to wear a hat or some kind of insulated head covering.

Evaporation – Throughout the day, a person will sweat, sometimes perceptibly, sometimes imperceptibly. In the summer time, this is valuable for preventing heat related emergencies. However, in colder temperatures, sweating is dangerous, if not deadly. This sweat may leave and take body heat with it or freeze in a person's clothes and cause heat to be pulled away. Wearing the proper amount of clothing and monitoring activity levels is the best way to prevent this type of heat loss. Roughly **21%** body heat can be lost this way.

Respiration – The air that a person exhales contains heat. As a person inhales, the outside air is cooler than the body's core temperature. This continuous in and out exchange of air cools the body. Unfortunately, little can be done to control this. Body heat loss of **2 – 9%** occurs in this way.

Conduction – A person sitting on the snow or a metal surface is losing heat through the heat transfer that is occurring between his body and that cold surface. Proper insulation and avoiding contact with drastically colder objects is important in a cold weather camping event.

Convection – Each person has a warm layer of air next to their skin. Wearing proper clothing will keep this warm air layer around the body. This layer can be blown away by wind, and so it must be protected by wind proof layers. **Heat loss between conduction and convection is about 15%.**

Tips for Staying Warm

The cold weather camper is in a battle to stay warm. The body loses heat easily, and the weather has many weapons to take heat. The single most important way to stay warm in the cold is to dress properly. It is vital to dress in a way that keeps both the bodies' core and extremities warm

Clothing should fit loosely enough to allow adequate circulation of blood. The most important thing about the way a cold weather camper dresses is the practice of dressing in **layers** and monitoring body heat and activity level, thus avoiding **overheating**. Clothing traps warm air in the void spaces between layers. If a person wears more layers, they will create more void spaces. It is these void spaces that create "warmth". It is better to have multiple thin layers than to have one thick layer of insulation. This arrangement will better hold warm air. Monitoring activity level is very important. As a person gets warm they should remove a layer in order to prevent perspiring and getting moisture into their clothing, thus staying **dry**. Wearing many thin layers also allows us to do this. Additionally, it is important to keep outside moisture out, as much as possible. When clothes get soiled or wet they should be changed. Synthetic clothing loses some of its insulating value with excessive body oil saturation. So we must keep our clothing **clean**. We can say then that the key to staying warm is the acronym C.O.L.D.

keep Clean
avoid Overheating
wear Layers
stay Dry

Clothing Tips for Cold Weather

Cotton - Choosing the proper clothing is a vital consideration of staying warm in the cold. It is advisable to choose clothes that are **NOT made of COTTON**. Cotton absorbs water and does not dry quickly. Cotton is a wonderful fabric for summer time activities. But since it stores water in its fibers, and water lowers the temperature as it evaporates, it cools the wearer. In the cold weather, your prime objective is to conserve heat, not lose it. Cotton is so effective in cooling its wearer that it has caused severe hypothermia and even death when used in cold temperatures. Therefore, it is not going too far to say that in cold weather circumstances, **COTTON LITERALLY KILLS**.

Synthetic - The best clothing choice is synthetic, insulating materials. Polyester, acrylic, polypropylene, polar fleece, along with different blends of these work well. The important thing is to read clothing labels. You might be surprised what 100% synthetic clothing you already have. Additionally, you may find some great deals on clearance racks or at garage sales. Good layers DO NOT have to come from an outdoor store.

NOTE: It is possible to wear blends with a little cotton in them, as well. However, they will stay damp and will not wick as well as 100% synthetic garments will, so this is not recommended.

Down - Down is an alternative. However, once down is wet it mattes up and does not retain much heat. Down is as used as insulation in jackets and sleeping bags. It is best used by older Scouts or adults, who are used to monitoring their own clothing's moisture buildup and making changes.

Wool is a natural fiber that will retain a high percentage of its insulating qualities even when it is wet. The biggest drawbacks are the potential "itchiness" and that it is slightly heavier than some synthetics. However, many die hard outdoor enthusiasts use only wool. It is usually readily available at army surplus, at thrift stores and at garage sales, not to mention new stuff from outdoor stores.

Nylon - Outer shells should be made of nylon, or some other water proof/water resistant, wind proof fabric. Ponchos can be a cheap waterproof layer for rain without wind. Using ponchos in windy conditions should be undertaken with caution. This is because moisture can enter through the open bottom and get into the clothing system. Ponchos do provide superb ventilation for active pursuits, and are superior to a standard rain suit when hiking in rain.

Our clothing system should consist of three parts. These are listed below from the closest to the skin to the one that is farthest away.

Clothing Layering System

Wicking layer (Lightweight wicking fabrics) - This is the layer next to the skin to wick moisture away. It is the most important part of your layering system because it is closest to you. As a minimum it should include long johns, a long sleeve t-shirt, liner socks, and liner gloves. This can be a natural fiber like wool or silk, or a synthetic fiber like Polypropylene, Thermostat, Capilene, or Bipolar. The synthetics are preferred to natural fibers because they wick moisture better, dry faster, and last longer. Although silk is very comfortable, it does absorb water and dries slowly. Wool was the standard until synthetics were developed, although it still is an alternative for those that can't tolerate synthetic. All except Marino Wool are scratchy; all are slow to dry and smell when wet. A word of caution regarding, Polypropylene. It is cheaper and does wick very well, but it retains odor and if accidentally thrown in the dryer, it will shrink to doll clothes size. The other synthetics are more expensive, but well worth the higher price tag.

Insulating Layers – May be multiple layers. This layer traps warm air that your body has heated up. As a minimum this layer includes a knit cap or balaclava (face & neck protection), long sleeve shirt and jacket, warm pants, insulating gloves, and insulating socks. Modern winter travelers rely on polar fleece and down or Synthetic lofting fibers like Quallofil, Polarguard or Primaloft as insulation. Commonly combined with the protective layer in ski parkas and jackets used in the city, in the backcountry it is better to keep this separate from the shell to allow for changeable conditions. When you start going up a hill, it is a good idea to remove a layer of insulation to prevent overheating, and then replacing them as you cool down. This isn't possible if your shell and insulation are combined in one piece. For moderate conditions, a Polartec Fleece jacket is the best

choice, and in extreme cold a down sweater can be added. In camp you might find yourself wearing all your layers since you are not working as hard and generating as much heat. A low cost alternative to the high tech garments is an acrylic sweater. Much cheaper than a down or fleece jacket they will provide the necessary air space to insulate you, provided you have a good quality shell over it

Protective layer - Wind and rainproof shell. Next to the wicking layer, this is the most important part of your clothing system. The outer layer protects the two inner layers from wind, rain, and snow. As a minimum this layer includes, pants, jacket, and hat/hood in warmer conditions. In snow camping, you would also add waterproof gloves, boots, and gaiters. The best type of fabric for this layer is Gore-Tex or other waterproof-breathable material. Since you will encounter a wide variety of conditions, you will need an outer shell that will keep you dry, protect you from wind, and still let the perspiration that you will be generating evaporate. That means it has to let moisture vapor pass through but keep water droplets out. In theory, a waterproof-breathable fabric allows moisture vapor to pass through but keeps water droplets out. The fabric has millions of microscopic holes in it which are large enough to allow water vapor through but are too small to let liquid water in. Perspiration evaporates through the shell but rain and snow stays out. If you are really active or a heavy sweater, most of these waterproof breathable fabrics do not do what they are advertised to do. If you are on a budget, some less expensive alternatives are light weight nylon shell jacket and pants that cost under \$40 each. This will work in a pinch. They are lighter weight, and often as breathable as Gore-tex. Some campers even use PVC coated rain suits, but use caution with this type of gear and stay close to shelter, it may not protect you in really nasty conditions. PVC also does not allow moisture to pass out of the system, and is not breathable at all. Thus, in periods of high activity in wet conditions, you will have 100% humidity both inside and outside your clothing system.

Footwear - Protective footwear should be sturdy and supportive, but not necessarily waterproof. Consideration of a person's activity undertaken, and footwear that provide proper ventilation should be chosen. In rocky, wet conditions, leather boots might be needed. However, if someone is on a day hike with a few sprinkles, tennis shoes with frequent sock changes may be adequate.

Spare clothing – If we are anticipating wet weather, it is important to bring a spare change of clothing. That is the purposes of these “tailgate” camping trips. They are a chance to try different things and see what works and what doesn't in a safe environment.

Sleeping Gear

Sleeping Bags - Thoughts on sleeping gear are similar to clothing. Sleeping Bags provide insulation and the thicker the insulation, the more warmth. Many of the same insulating materials that are used in jackets and vests are used in sleeping bags. The same thoughts apply. Extra care should be taken to maintain the dryness of a sleeping bag, since this truly represents the last line of defense. If the temperature drops, and a

person gets cold, then their final piece of gear to turn to is their sleeping bag. If the bag is wet or damp, the camper could experience a very cold if not hypothermic night.

Sleeping bag liner – This is not required but is a good piece of equipment to have. A washable, insulating liner can also be used in the sleeping bag. Sleeping bags that are not adequate can have their insulating value increased with one of these liners. Polarfleece liners can add 10 to 15 degrees Fahrenheit to the warmth of a bag. A thinner silk liner can be used in warm weather and then pulled out of the bag and washed, thus keeping the inside of the bag clean.

Sleeping Pad - As far as sleeping pads go, foam provides the best insulation, though not the best comfort. If you have air mattresses, you might want to double up with a foam mattress on the top. Air mattresses provide zero insulation from the ground. Without additional insulation, you will definitely feel the ground conducting your body heat away if you don't get some insulation in place.

Night time Clothing – If your sleeping bag is inadequate or the night is especially cold, you can wear some of your clothing. The lightweight long underwear layer, a pair of socks and a stocking cap can go a long way toward making a night's sleep more comfortable.

Conclusion -A good experience in the cold is possible as long as the weather and the body are considered and addressed. Proper clothing, nutrition, and attitude will make the difference in staying warm when it's cold.

Source materials:

Okipik: Cold-Weather Camping, published by the Boy Scouts of America, available through the Golden Empire Council store or at <http://www.scoutstuff.org/bsasupply>, Item #34040

Golden Empire Council High Adventure Team Website, Hints and Tips
www.gec-bsa.org/program/training/adulttraining/highadventure/articles/layeredclothing