The Layering System 1/7

Why layer your outdoor clothing?

When you walk out the door to go to work, to a restaurant or to go shopping, it's normal to check the weather and grab a heavy coat if it's cold outside or a light jacket if the temperatures are mild to cool. You usually carry one garment (and a rain jacket if it's raining), that's all you need for a short trip away from home.

When on a hiking or backpacking adventure, not only can temperatures change but your activity level changes as well. A hard uphill hike expends a lot more energy and body heat than a level or downhill hike. Breaking for lunch and just sitting around will find you much cooler than a moderate hike at the same given temperature.

The layering system allows you to easily adjust your clothing, by adding or removing layers, or by venting layers (with zippers). This is a very effective way to regulate your body temperature during changing conditions of not only weather but activity level.

Layering also helps insulate you from the cold by creating "dead air space", a layer of static, unmoving air which is heated by your body and is a fantastic insulator.

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Knowing what to wear for outdoor activities (Hiking & Backpacking) can be challenging for the following Reasons:

1) There are many different materials that do similar things, and new products are constantly coming out.

2) There are choices between synthetic materials, natural materials and blends of the two.

3) There are materials left in their natural state as well as materials that are chemically treated to aid with moisture control.

4) In the winter you want tighter fitting layers to help with moisture control, you want the layers (especially the base layer) to fit snug so it can absorb perspiration and "wick" it away. In the summer you want loose clothing to help with ventilation.

5) Based on environmental temperatures and how your body runs (hot or cold) there are choices to be made that involve fabric thickness and loft of your layers that meet your individual requirements.

6) Regardless of weather or body type (running hot or cold), the general principle of layering remains the same, what changes is the thickness/loft of the layers and the combination of layers (or lack there of).

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Heat Loss Mechanisms?

It's important to understand how your body loses heat when deciding on what to wear for you outdoor adventures. In winter you want to prevent this heat loss. In summer you welcome the heat loss.

CONDUCTION: Heat travels from a warmer object to a cooler object. An example would be sitting on a cool rock. The heat travels from your warm butt to the rock and soon your butt will feel cold and your body starts to cool. This is why we use a sleeping pad between us and the ground (tent floor), it's not just for comfort, it insulates us from the cold ground preventing body heat loss through conduction. Conduction occurs 25-Times faster with wet clothing than with dry.

WINTER - Dry, Thick Layers

SUMMER - Moist, Thin, Layers can help cool you.

CONVECTION: Your body keeps a warm layer of air next to the skin. Wind displaces this air, thus cooling you. This is why at the same given temperature, you are cooler on a windy day when not wearing wind stopping garments.

WINTER - Windproof Garments

SUMMER - Enjoy the cooling breeze.

RADIATION: The transfer of heat, through electromagnetic waves from the body into space. Exposed skin is the main culprit of radiative heat loss, head, face and neck.

WINTER - Thick layers, multiple layers, reflective clothing, cover up your head, neck and face.

SUMMER - Less clothing can encourage radiative heat loss but watch for Sunburn.

EVAPORATIVE: Your body tries to remove moisture on your skin via evaporation. It takes energy to change a liquid to a gas which draws heat from your body. This is why even on a hot day, you feel chilled when you get out of a pool.

WINTER - Minimize sweating with proper layering, wear moisture wicking fabrics to move sweat away from your skin, vapor barriers.

SUMMER - Sweating helps you cool off. Cotton clothing can hold moisture which can aid you in staying cool.

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Clothing Materials

Wicking Materials:

There are a several different materials available that act in a similar manner, they move perspiration away from your body to the outside of the garment where it can be more easily evaporated away. Manufacturers seem to be continually bettering “active wear” products with new technology and wicking fabrics.

There are synthetic “wicking” fabrics such as Polyester or Polypropylene that do not absorb water nearly as much as cotton. These fabrics are worn directly against the skin to move moisture away from your skin to the outside of the fabric where the moisture can be more easily evaporated.

Some of these fabrics have chemical components to them as well. The part closest to the skin may be “Hydrophobic” (Water Hating), thus pushing the water away from the skin. The outside of the garment may be “Hydrophilic” (Water Loving) that will pull the moisture to the outside of the garment. These garments should not be worn inside out.

Some fabrics use “Capilary” action which draws moisture away from your skin to the outside of the garment

Wool is able to absorb about 30% of it’s weight in water and still retain insulating properties due to dead air space trapped in it’s fabric. Wool dries slower than synthetics. It is probably better served for people that don’t sweat a lot.

Wool retains less odor than synthetics, however, newer synthetics are being produced that have properties that are odor resistant.

Moving perspiration away from your skin is vital in cold weather conditions since water conducts heat away from the body 25 times faster than air. You want dry skin to avoid rapid cooling in cold weather.

Warm conditions - loose fitting to provide ventilation.

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The “4 tier” method of layering

Each of the 4 tiers should be adjusted to your environment and the season you are hiking.
For example, the base layer for a summer hike in So. California will be much lighter and thinner than a base layer used on a winter hike in Alaska.
Your body may run warmer or cooler so the weight of a given garment in a given environment may differ from person to person.

Some outdoor clothing manufacturers use a “system” to indicate the weight (warmth) of their clothing.
An example might be: Silk Weight / Light Weight / Mid Weight / Heavy Weight.

1) Wicking Base layer: A moisture wicking layer directly against your skin (Traps warmth, wicks away moisture).

Materials: Merino Wool, Polyester, Nylon or silk
Weight: Dependent on your environment and your body type.
Top: Short or long sleeve undershirt (crew neck or 1/4 zip)
Bottoms: Wicking long John’s, briefs or boxer underwear (not as critical as your top due to body core, more necessary in very cold conditions or as sleeping clothing)
Note: Your base layer can double as your sleeping clothes.

2) Mid Layer: A warm layer to go over your base layer

Materials: Fleece is typical, Merino Wool
Weight: Dependent on your environment and your body type.
Top: Fleece pull-over, 1/4 zip or full zip
Bottoms: Synthetic pants
Note:

3) Warmth / Insulation Layer: Sometimes multiple layers starting with a fleece pullover, 1/4 zip or full zip then going to a jacket insulated with poly fill or down (Provides warmth by trapping body heat and provides insulation from the environment.)

Materials: Fleece or Wool Jacket / Nylon Jacket with polyester or down fill.
Weight: Suited to the environment conditions and your body type
Top: Fleece shirt / Down or synthetic jacket
Bottoms: Long synthetic pants / Snow Pants
Note: Typically the fleece warmth layer is used for hiking in cold weather while the poly or down filled jacket is normally used when stopped or in camp.

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4) Shell Layer: A shell to protect against rain and sometimes wind conditions.
Pullover, 1/4 zip or full zip then going to a jacket insulated with poly fill or down (Provides warmth by trapping body heat and provides insulation from the environment.)

Materials: Synthetic materials
Weight: Suited to the environment conditions and your body type
Top: Rain Jacket w/ hood
Bottoms: Rain pants / rain kilt
Note: Temperature and moisture build-up can be regulated by a breathable membrane such as Goretex or eVent as well as things like "pit zips".

Head: Sun hat / Beanie / Buff
Feet: Socks appropriate for the temperature and environment
Hands: Sun Gloves / warm gloves / Snow Gloves/Mittens

Some clothing scenarios: (remember you can wear cotton on hot dry days but for the purpose of these scenarios we will not include cotton)

Hiking Condtions:

Sunny, Warm, & Calm - Base Layer alone

Warm & Rain - Base Layer with Shell

Warm, Dry & Windy - Base Layer with Shell (can be a wind shirt)

Sunny, Calm & Cold - Base Layer with Fleece Mid Layer

Cold, Windy & Wet - Base Layer, Fleece & Shell (possibly rain / wind pants)

Very Cold, Rain (or snow) - Base Layer, Fleece, Insulating Jacket, shell (possibly rain / wind pants)

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For ultralight hiking/backpacking the layers normally carried for 3 season conditions:
Top:
Base Layer
Fleece Pull-Over / 1/4-Zip or Full-Zip (first warmth layer)
Insulated Jacket (Down or Synthetic Fill) (Second warmth layer normally at camp)
Shell (rain jacket) (can double as a wind jacket worn with just the base layer underneath in warm conditions).
Bottoms:
Typically shorts are common with U/L hikers. Synthetic pants. Rain Kilt and as taught by the Sierra Club - Shorts over long thermal underwear.