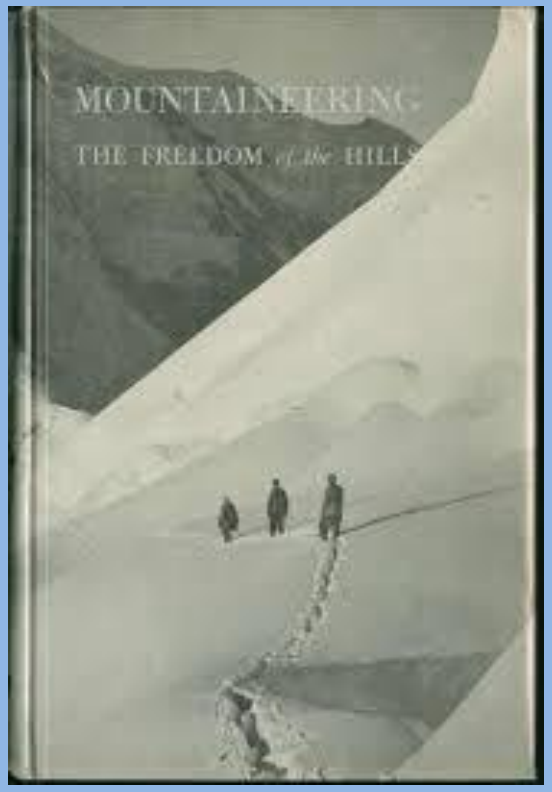
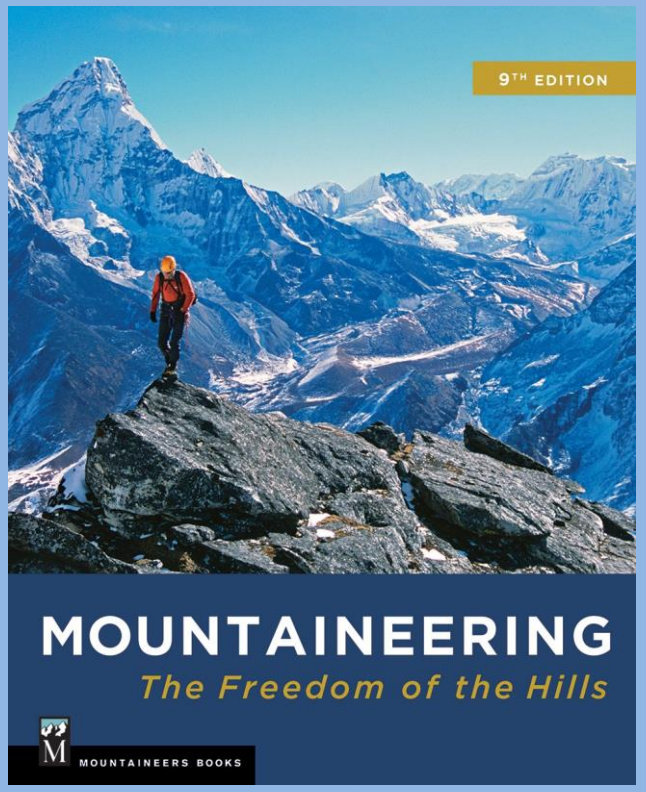




Freedom, 9th

Clothing, Equipment, Camping, and Navigation

By: Steve McClure, Mountaineers Board, Freedom 9 co-author (ch. 2, 3, 5)

December 2, 2017

New introduction to Chapter 2:

CHAPTER 2

CLOTHING AND EQUIPMENT

Packing everything you might need to keep you safe, dry, and comfortable on a wilderness trip can paradoxically lead to danger, chill, and misery. The challenge is to limit the load enough to allow for fast and light travel while still having the gear essential for success and survival. Each onerous ounce limits how far, fast, or high you can climb and how speedily you can retreat to safety.

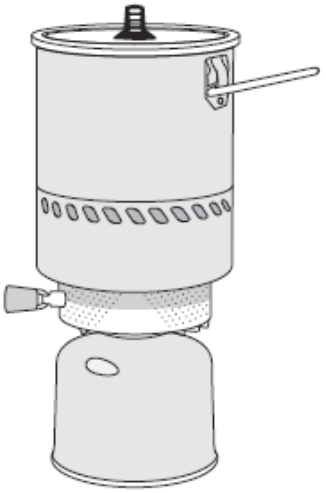
Former introduction to Chapter 2:

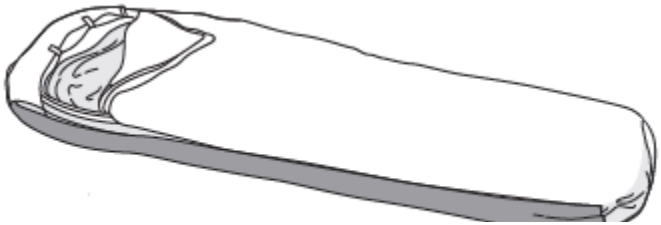
Packing for a wilderness trip is a question of take it or leave it. With thousands of choices available in outdoor clothing and equipment, it is no longer a question of how to find what is needed but, rather, of limiting the load to the items necessary to keep you safe, dry, and comfortable. The idea is to carry what is needed and leave the rest at home. More clothing and equipment may make you more comfortable, but the extra weight may also limit how far, fast, or high you can go.

The Ten Essentials

Steve to John Ohlson:
So, can I mess with the Ten Essentials?

John: What do you want to do…
make it Eleven?





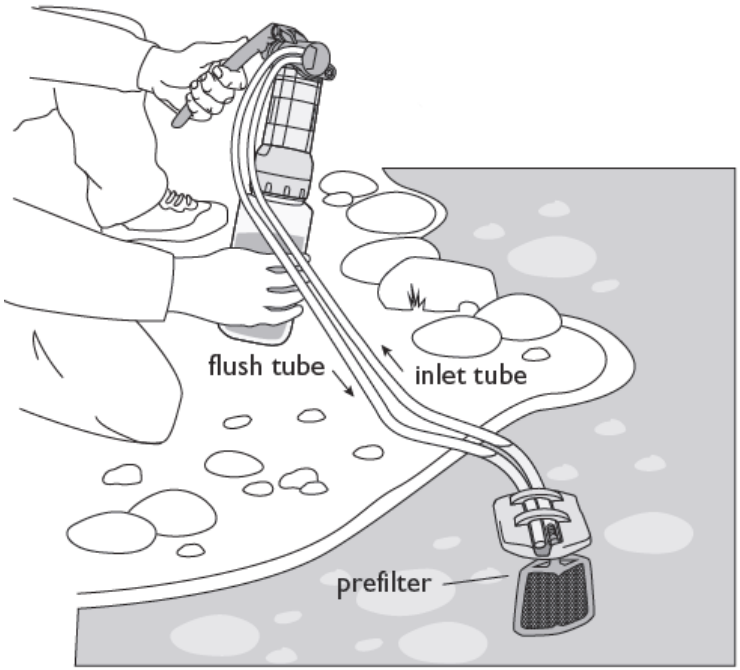


TABLE 2-2. THE TEN ESSENTIALS

Ten Essentials: A Systems Approach	Ten Essentials: The Classic List
1. Navigation	1. Map 2. Compass
2. Sun protection	3. Sunglasses and sunscreen
3. Insulation (extra clothing)	4. Extra clothing
4. Illumination	5. Headlamp or flashlight
5. First-aid supplies	6. First-aid supplies
6. Fire	7. Firestarter 8. Matches
7. Repair kit and tools, including knife	9. Knife
8. Nutrition (extra food)	10. Extra food
9. Hydration (extra water)	
10. Emergency shelter	

The Classic List was missing…

1. Water
2. Shelter

The Freedom 7 approach made room for these, a clear improvement

“Insulation”

What we mean is:

“Extra Clothes”

“Illumination”

What we mean is:

“Headlamp”

“Nutrition”

What we mean is:

“Extra Food”

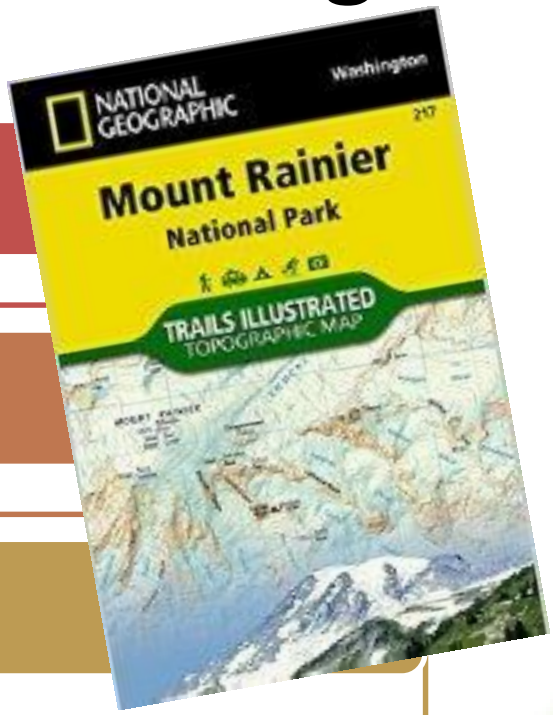
“Hydration”

What we mean is:

“Extra Water”

New Quintet of Navigation

- Map (digital OK)
- Altimeter
- Compass
- GPS (Cell phone preferred)
- PLB (means to contact 1st responders)



Goals for the *Revised* Ten Essentials

1. **Primarily for mountaineers, not kayakers…**
2. **Brief (e.g., “Fire”)**
3. **Clear language**
   (“Extra Clothes” vs “Insulation”)
4. **Logical Groupings:**
5. **“Own it!” It’s now the:**

THE MOUNTAINEERS’ TEN ESSENTIALS

The *Revised* Ten Essentials

Navigation	For safety or to respond positively to an emergency
Headlamp	
Sun protection	
First aid	
Knife	
Fire	To safely spend a night—or more—out
Shelter	
Extra food	
Extra water	
Extra clothes	

The Revised Ten Essentials

Navigation	*Essentials 1-7 are small and change little based on the trip and so are easy to keep permanently grouped together with gear, ready to go.*
Headlamp	
Sun protection	
First aid	
Knife	
Fire	
Shelter	
Extra food	*Essentials 8-10: Add extra food, water and clothes, which vary with the trip, and you're ready to go!*
Extra water	
Extra clothes	

WARM WHEN WET?

Wool used to carry the banner of "warm when wet," a badge now heralded by synthetic fabrics and fills. But a wet fabric is a cold fabric, and there's no getting past the physics: it takes a lot of energy (warmth) to convert the liquid sweat in damp clothes into vapor. If you want to stay warm, *stay dry.*

Merino wool. Under such brands as SmartWool, Ibex, and Icebreaker, modern wool fabrics use small-diameter silky fleece, primarily of merino sheep. Chemical descaling removes most of the fabric's itchiness and tendency to shrink. The downsides are that this luxurious fabric is expensive and delicate, and lightweight versions are especially prone to holes. Wool, in general, can become heavy with absorbed moisture and is slower to dry than synthetics.

Nevertheless, merino wool gets high marks for comfort and warmth next to the skin. One hundred percent wool has amazing natural anti-stink qualities currently unrivaled by synthetics and especially appreciated by tent mates on longer trips.

Dyneema (or Spectra). These lightweight fibers, the strongest in the world, are commonly used in climbing runners and utility cord. More recently, Dyneema is being woven into extremely lightweight abrasion-resistant fabrics for backpacks and sandwiched into ultralight-weight, waterproof-nonbreathable Dyneema Composite fabric (formerly Cuben Fiber) for tents and raingear.

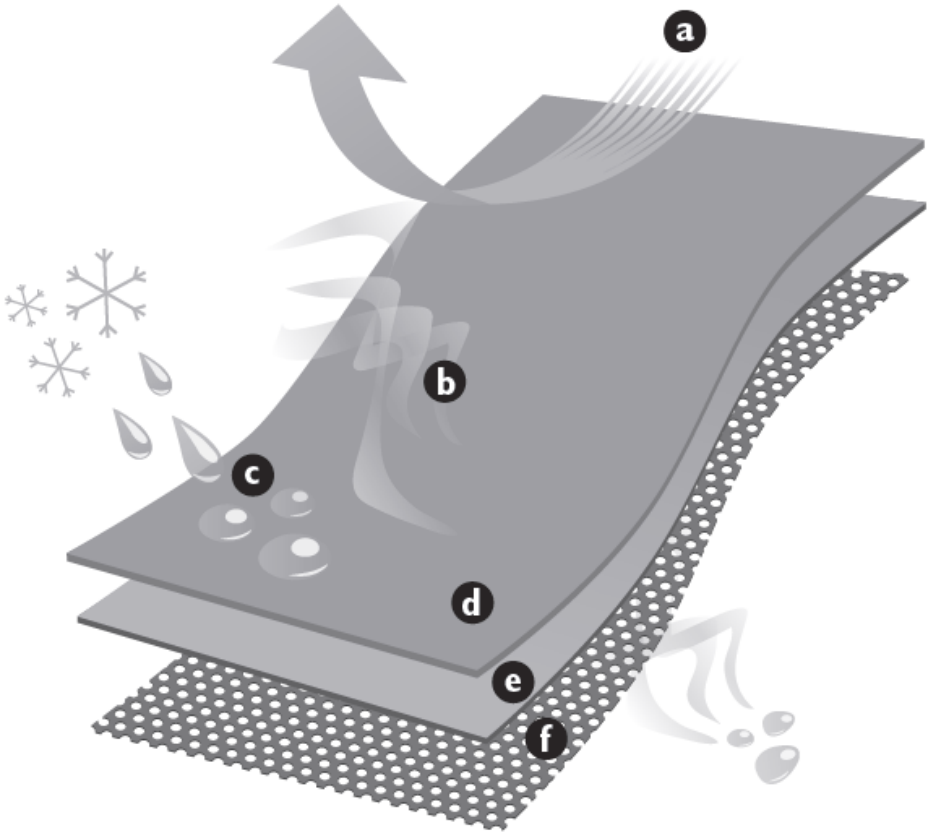


Fig. 2-1. Waterproof-breathable fabric system: a, wind is repelled; b, sweat as water vapor transpires through fabric; c, snow and water bead up due to thin molecular coating of a durable water repellent (DWR) finish; d, outer nylon fabric; e, waterproof-breathable film or coating; f, inner liner (optional).

CARE AND FEEDING OF WATERPROOF-BREATHABLE FABRICS

The DWR feature of waterproof-breathable fabrics fails over time. Following these steps will help keep these fabrics functioning well for as long as possible.

- **Keep it clean.** Wash the garment regularly using a liquid sports wash and do not use fabric softener.
- **Rinse it well.** After washing, put the garment through a second rinse.
- **Dry it.** Drip-dry or use a dryer set on medium (140°F or 60°C).
- **Revive it.** Once the garment is completely dry, tumble dry for an additional 20 minutes on medium heat to revive the DWR.
- **Conduct a spray test.** Water should bead up.
- **Reapply DWR.** If the garment fails the test, reapply the DWR coating.

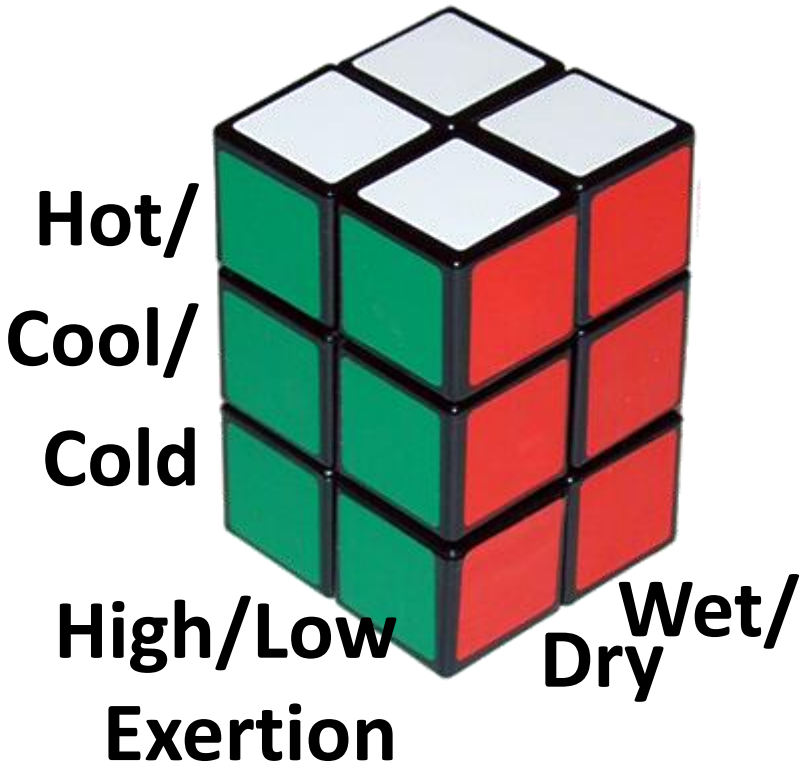
Cotton. Comfortable to wear when dry, cotton loses its insulating qualities when wet, absorbs many times its weight in water, and generally takes a long time to dry—it is dangerous to rely on cotton for warmth. Cotton plays a common role in many hypothermia tragedies, leading to the adage "cotton kills." Wet cotton also chafes the skin, a particularly annoying characteristic in underwear and socks or in sweat-soaked shoulder areas under pack straps. Yet in hot, dry weather, cotton can provide good sun protection and ventilates well. The sweat evaporating from a wet cotton t-shirt on a hot day will cool you off.

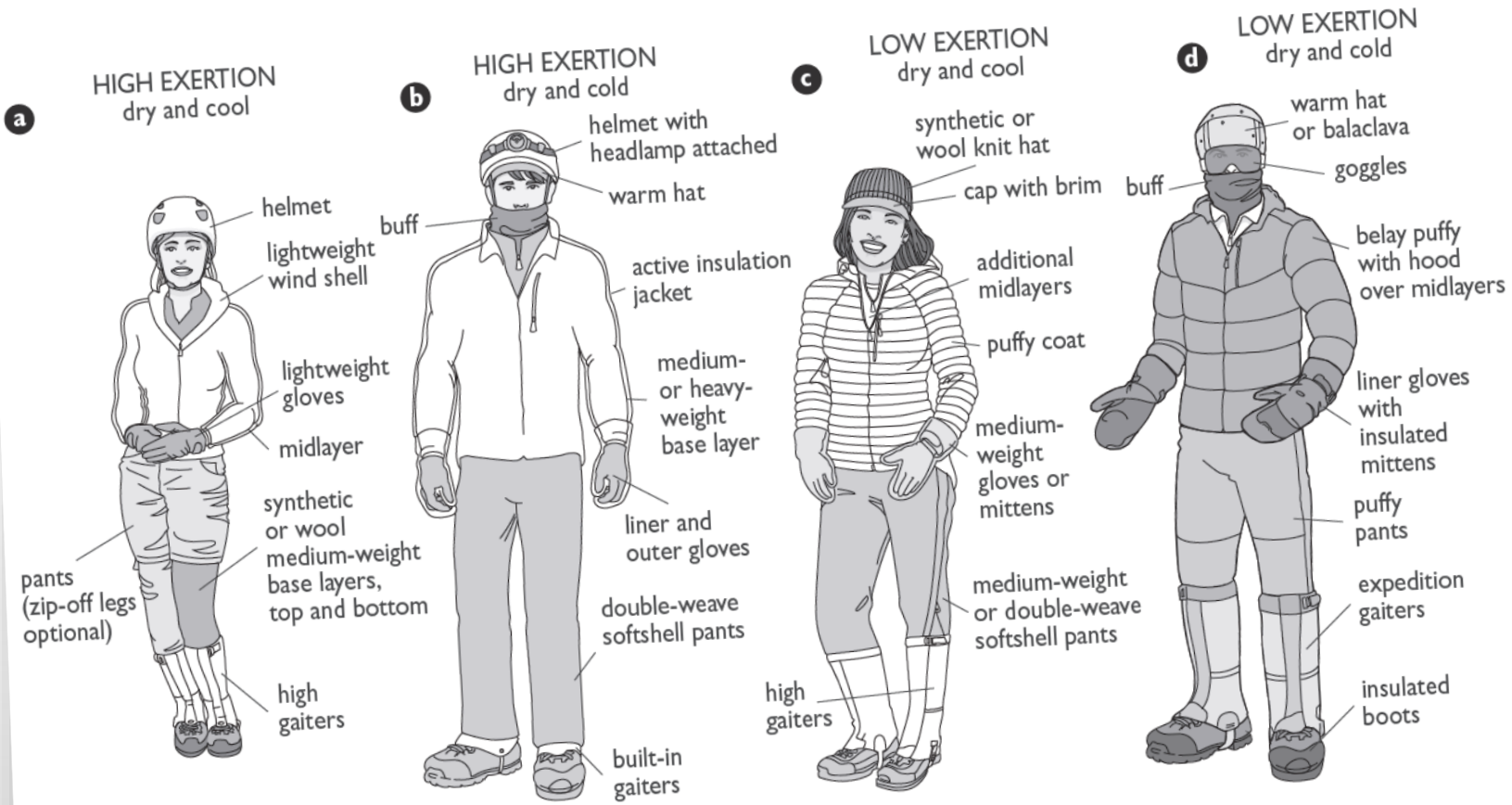
Modal, rayon, and viscose. These yarns are essentially "synthetic" cotton fibers chemically extruded from wood pulp. They exhibit all the downsides of cotton. Avoid them in the outdoors.

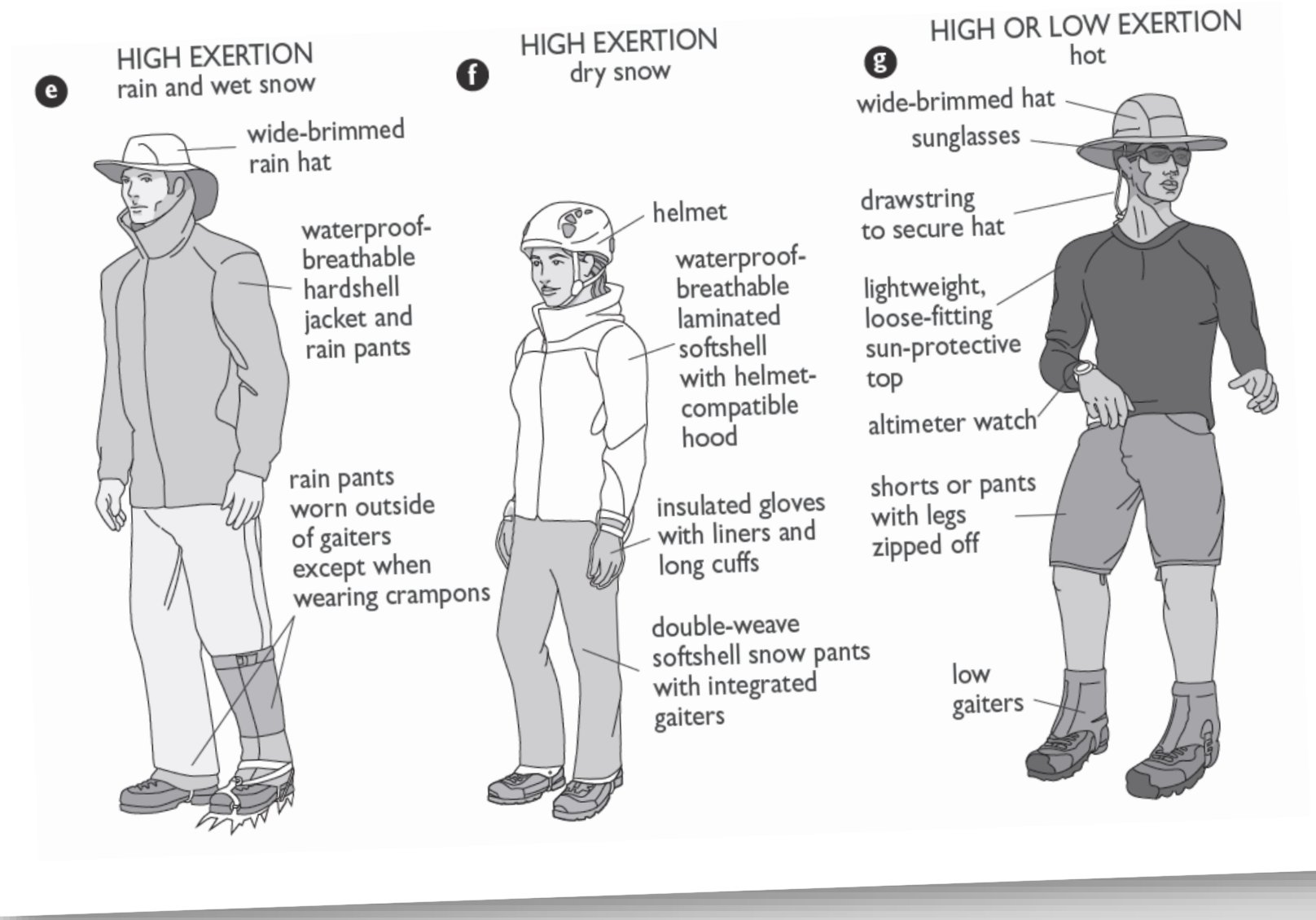
An outdoor clothing layering system consists of four types of layers:

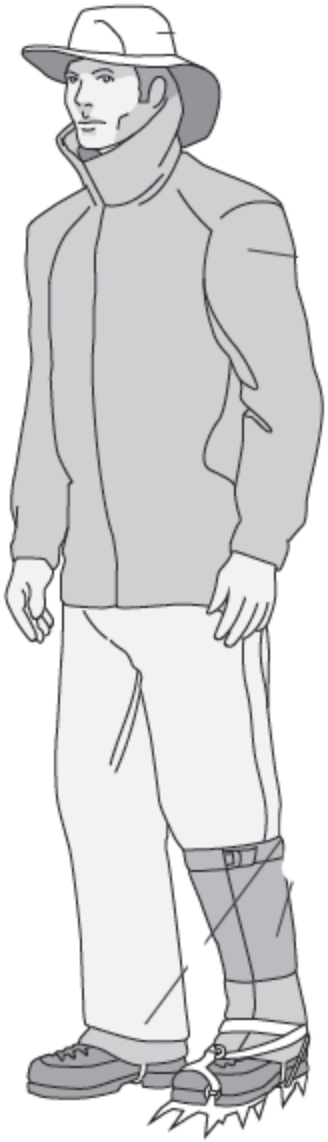
1. **Base layer.** The base layer, immediately next to your skin, allows perspiration to evaporate, keeping your skin warm and dry.
2. **Midlayer.** Midlayers trap warm air close to your body. The thicker the layer of trapped air, the warmer you will be. Although less efficient than a single, monolithic block of "dead" air (as in a down parka, for example), several light, loosely fitting layers can trap a lot of insulating air, and such an arrangement is very adjustable.
3. **Shell layer.** Shells protect midlayers from wind and precipitation. These could be waterproof-breathable hardshells, softshells, or wind shells, depending on conditions.
4. **Belay jacket.** Donned quickly when you stop moving in cold conditions, an insulated jacket sized to fit over everything can preserve hard-won warmth.

A 3-Dimensional outdoor clothing layering system:




a
HIGH EXERTION
dry and cool
helmet
lightweight wind shell
lightweight gloves
midlayer
synthetic or wool medium-weight base layers, top and bottom
pants (zip-off legs optional)
high gaiters
b
HIGH EXERTION
dry and cold
helmet with headlamp attached
warm hat
buff
active insulation jacket
medium- or heavy-weight base layer
liner and outer gloves
double-weave softshell pants
built-in gaiters
c
LOW EXERTION
dry and cool
synthetic or wool knit hat
cap with brim
additional midlayers
puffy coat
medium-weight gloves or mittens
medium-weight or double-weave softshell pants
high gaiters
d
LOW EXERTION
dry and cold
warm hat or balaclava
goggles
buff
belay puffy with hood over midlayers
liner gloves with insulated mittens
puffy pants
expedition gaiters
insulated boots


e
HIGH EXERTION
rain and wet snow
wide-brimmed rain hat
waterproof-breathable hardshell jacket and rain pants
rain pants worn outside of gaiters except when wearing crampons
f
HIGH EXERTION
dry snow
helmet
waterproof-breathable laminated softshell with helmet-compatible hood
insulated gloves with liners and long cuffs
double-weave softshell snow pants with integrated gaiters
g
HIGH OR LOW EXERTION
hot
wide-brimmed hat
sunglasses
drawstring to secure hat
lightweight, loose-fitting sun-protective top
altimeter watch
shorts or pants with legs zipped off
low gaiters




bollé

CHOOSING A COLD-WEATHER STRATEGY

In addition to layering, these tactics can also help with your cold-weather defense:

- Manage moisture carefully.
- Add additional midlayers that can function with the rest of the system.
- Add a belay jacket and puffy pants.
- Eat more, starting with a big breakfast. Fat and calories correlate directly with warmth, so keep high-calorie snacks at the ready in a pocket where they won't freeze and can be eaten gradually.
- Drink more water, even when urinating may be inconvenient. Dehydration results in low blood volume that will make you extra cold.
- Manage cold feet and hands. Rotate wet gloves or mittens and socks with dry ones as needed. Try chemical hand and foot warmers, but to prevent burns, avoid direct skin contact especially while asleep. Monitor for frostbite and have a contingency plan.
- On a day trip bring hot water and a stove.
- From base layers to one-piece climbing suits, consider one-piece options for extreme cold.
- Accept being a little cold, but be vigilant of the line between discomfort and injury.

Puffy pants or skirt. For colder conditions, insulated ("puffy") pants, typically filled with synthetic insulation, help your legs retain heat. Look for full-length side zippers that make it possible to put the pants on while you are wearing boots, crampons, or snowshoes. While less useful, a puffy skirt can help you avoid deeply chilled thighs.


3
2
1

CHOOSING A GPS DEVICE

Modern mountaineers have several options available to them when it comes to GPS technology:

- **A phone combined with a good app** has become the most popular way for climbers to navigate by GPS. The extensive libraries of free digital worldwide maps made available by these apps, if downloaded before entering wilderness areas, allow freedom to travel hills near and far.
- **Dedicated GPS units** are more difficult to use and have fewer maps available, but they are more rugged and weatherproof than phones.
- **Digital wristwatches** can now provide GPS coordinates and altitude, to be used in conjunction with a physical map. Some now show tiny maps.

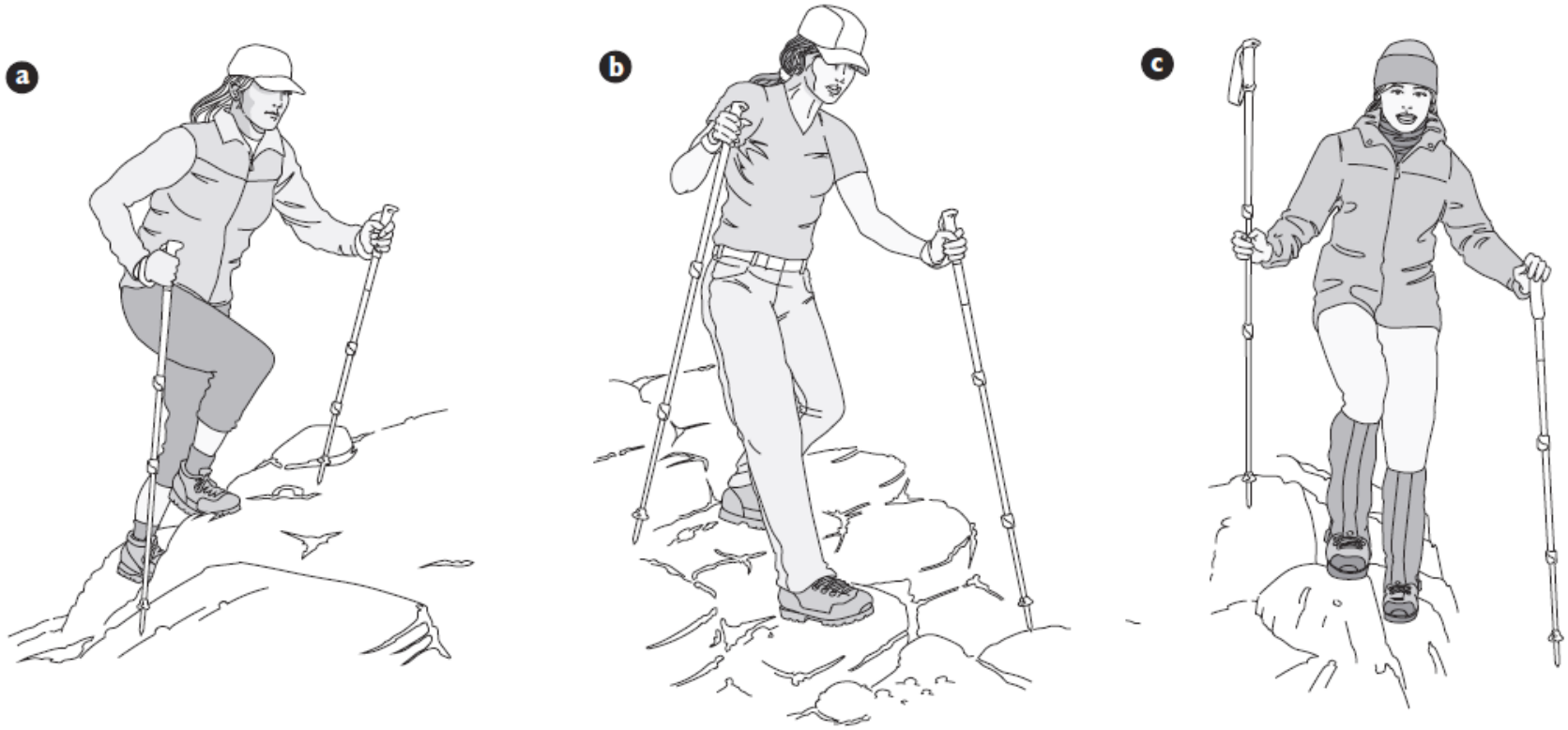


Fig. 2-10. Using trekking poles while traveling: a, shorten poles to go uphill; b, lengthen poles to go downhill; and c, slide hand down the uphill pole for quick changes as needed when scrambling in uneven terrain.

TABLE 2-6. CHOOSING INSECT REPELLENTS

If insects are expected to be a potential health hazard and not just an annoyance, use multiple lines of defense: protective clothes, clothes treated with permethrin, and insect repellents applied in the field.

ACTIVE INGREDIENT (available concentrations)	APPLICATION	EFFECTIVENESS AGAINST		
		Mosquitoes	Ticks & Chiggers	Biting Flies & Blackflies
Field Application				
DEET (5%–100%)	Clothes and skin	2–12 hours	2–10 hours	Poor
Picaridin (5%–20%)	Clothes and skin	4–14 hours	6–14 hours	Good
IR3535 (7.5%–20%)	Clothes and skin	2–10 hours	2–8 hours	Yes
Oil of lemon eucalyptus (30%–40%)	Clothes and skin	6 hours	6 hours	Yes
Home or Factory Application				
Permethrin (0.5%–10%)	Clothes only	Yes	Yes	Yes
Avoid				
Citronella and other natural ingredients	Not applicable	No	No	No

Notes: "Yes" means the repellent's effectiveness in number of hours has not been quantified; "No" means it did not meet the benchmark of more than 2 hours' proven repellency. Permethrin applied at home is good through several launderings; factory applications claim effectiveness for the life of the garment. Catnip oil sold as "refined oil of nepeta cataria 7% lotion" is a new, natural ingredient, registered effective against mosquitoes but not ticks.

CHOOSING A BUG DEFENSE STRATEGY

- First, wear pants, long sleeves, et cetera, as a physical barrier.
- Wear factory- or home-applied permethrin-treated clothes.
- Apply insect repellent to clothes in the field.
- Lastly, carefully apply the minimum needed insect repellent to skin.

CHAPTER 3

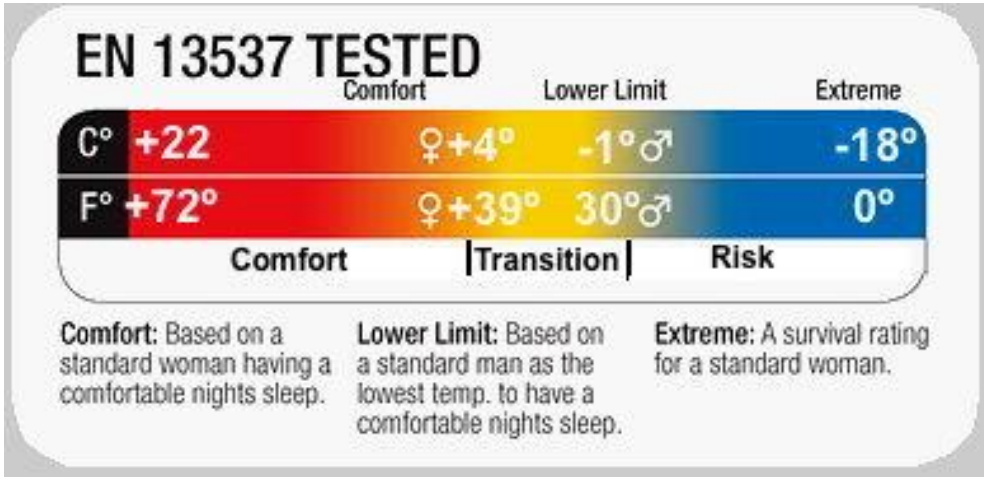
CAMPING, FOOD, AND WATER

The art of alpine camping under the "starry firmament" allows us to pass through primeval mountain locations. Camp offers the restoration of warm food, shelter, and sleep, and the best campers go stealthily through wild spaces, leaving no trace of their passing. In the words of John Muir, founder of the Sierra Club, ". . . standing alone on the mountain-top it is easy to realize that whatever special nests we make . . . we all dwell in a house of one room—the world with the firmament for its roof—and are sailing the celestial spaces without leaving any track."

Int'l Standard ISO 23537 or EN13537

Under the standard, each bag is assigned four temperature ratings:

1. **Upper Limit:** The highest temperature for a "standard man" to sleep without sweating.
2. **Comfort:** The lowest temperature for a "standard woman" to have a comfortable night's sleep.
3. **Lower Limit:** The lowest temperature for a standard man to have a comfortable night's sleep.
4. **Extreme:** The survival rating for a standard woman.



TIPS ON STAYING WARM IN A SLEEPING BAG

- **Eat well and stay hydrated.** If you wake up cold, increase your metabolism by drinking and eating.
- **Use proper ground insulation.** A fully inflated pad or insulating air mattress will maximize the insulation potential.
- **Wear dry clothes,** including a base layer, hat or balaclava, gloves, and dry socks.
- **Augment loft** by wearing insulated clothes inside, or placing an insulated jacket on top of the sleeping bag.
- **Place a leakproof bottle of hot liquid in the bag.**
- **Use a pee bottle** when nature calls to avoid getting cooled down from stepping outside.
- **Change clothes inside the sleeping bag.**

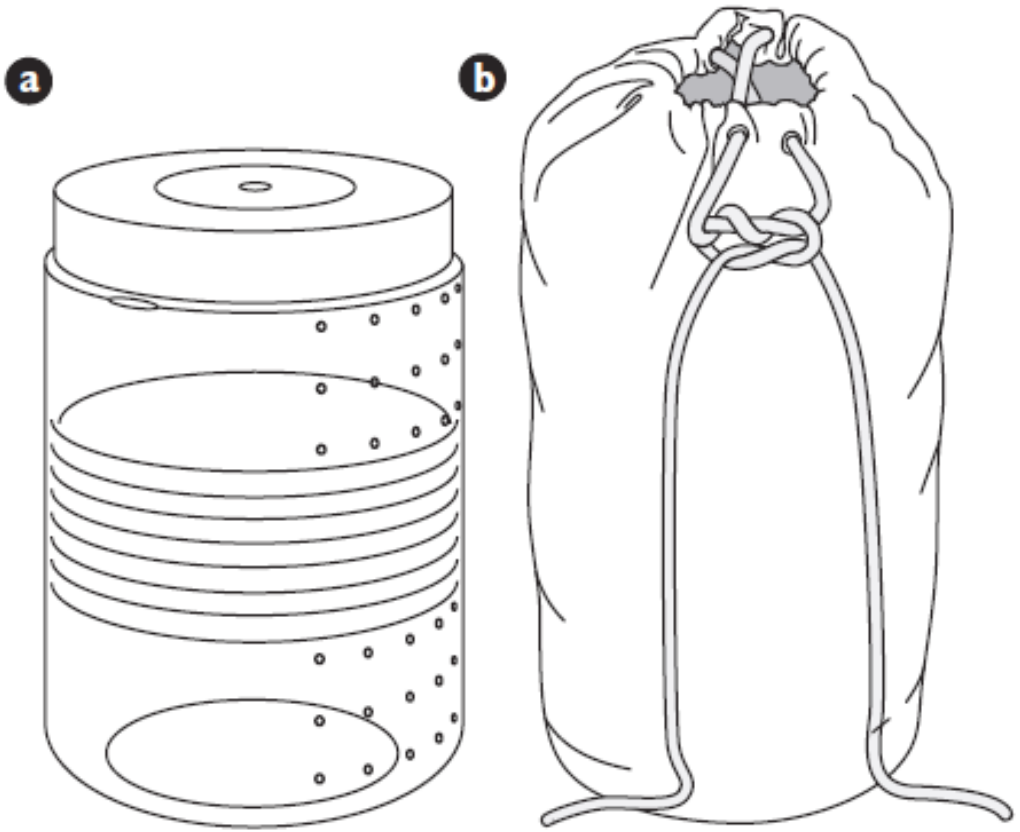


Fig. 3-10. Bear-resistant containers: a, bear canister; b, Ursack. For the latter, cinch the bag tight, leaving no gaps, and secure the cord with a surgeon's knot (shown loose here for clarity).

TABLE 3-3. COMPARISON OF STOVE FUELS

FUEL	ADVANTAGES	DISADVANTAGES	BEST FOR
CANISTER FUELS			
Blends of isobutane, propane, and butane	No priming or pumping required. Near zero maintenance. Immediate maximum heat output. Ability to simmer on some models. Readily available in North America, Patagonia, the Himalaya, Pakistan, Europe, and South Africa.	Spent canisters must be carried out. Not available everywhere. Tricky to judge fuel level. Less efficient in cold temperatures.	Short, light trips under any conditions. Good at high altitudes if temperatures are above freezing or somewhat colder (with a pressure-regulated stove).
LIQUID (PETROLEUM) FUELS			
White gas or naphtha (for example, Coleman fuel, MSR fuel), kerosene, diesel, jet fuel, aviation gas, unleaded automobile gas	Widely available and inexpensive. Stable stove designs. Simple to judge fuel level and pack exact amounts. No spent canisters.	Stoves require priming and are a bit heavier. Require separate fuel bottle. Fuel spills possible. Stoves require periodic maintenance, tinkering (for example, matching jets to fuel).	Winter (very cold) or high-elevation use. International expeditions where fuel availability is unknown. Large groups.

TABLE 3-3. COMPARISON OF STOVE FUELS

FUEL	ADVANTAGES	DISADVANTAGES	BEST FOR
ALTERNATIVE FUELS			
Esbit or hexamine fuel tablets	Simple, ultralight, inexpensive stoves. Fuel output not affected by altitude. Titanium versions are compatible with burning wood.	Leaves a sticky residue on the bottom of pots. Smelly, expensive fuel. Lower heat output.	Ultralightweight cooking on long trips where melting snow or ice is not required.
Alcohol (grain alcohol 95%, pure or denatured alcohol, marine stove fuel, liquid fondue or chafing dish fuel, methyl alcohol [for example, HEET gas-line antifreeze in yellow bottle])	Simple ultralight, inexpensive stoves. Widely available inexpensive fuel.	Lowest heat output.	Ultralightweight cooking on long trips where melting snow or ice is not required.
Biofuel (used in small woodstoves)	Free fuel that does not have to be carried. Uses minimal fuel.	Dry wood is often not available in alpine environments. Burning wood is prohibited in many areas.	Woodland approaches in dry weather.

TIPS FOR IMPROVING THE PERFORMANCE OF CANISTER STOVES

- Use a windproof stove system.
- Alternatively, use a remote-fuel stove that allows a liquid feed (upside-down cartridge) mode. Wrap the windscreen around the pot, allowing about a 1/2-inch (1- to 2-centimeter) gap.
- Use a pressure-regulated stove.
- Use isobutane fuel mixes and keep them warm in a sleeping bag or puffy coat prior to use.
- Insulate canisters from cold ground.
- Keep a lid on the cook pot and don't bother boiling unless necessary.
- During use, the evaporating liquid chills the canister exterior, even causing frost to form. To minimize a loss of pressure and performance, swap out cold canisters for warm ones or sit the canister in a bowl of tepid (even warm) water during use.
- Run the stove a bit below maximum for increased efficiency.

How Much Fuel?

TABLE 3-5. CALCULATING FUEL FOR A SAMPLE TRIP

WATER REQUIREMENTS FOR FOUR CLIMBERS FOR FIVE DAYS

A = Cooking water: boiling 2 liters per day = **40 liters**
B = Drinking water: warming 3 liters per day to 70°F (21°C) = **60 liters**
C = Total water = 100 liters
D = Stove efficiency factors: For each of the three stoves below, this figure is **1.8, 2.5,** and **1.6,** respectively (as in Table 3-4).

FUEL NEEDED TO HEAT WATER	CANISTER STOVE-ON-TOP	WINDPROOF CANISTER SYSTEM	LIQUID FUEL (white gas and a windscreen)
Baseline: Calculate as A ÷ D	22 oz.	16 oz.	25 fl. oz.
Cold water: Calculate as C ÷ D x 25%	14 oz.	10 oz.	16 fl. oz.
Snow or ice: Calculate as C ÷ D x 100%	56 oz.	40 oz.	63 fl. oz.
Subtotal	**92 oz.**	**66 oz.**	**104 fl. oz.**
Windy conditions: Add 100%, 10%, 20%	92 oz.	7 oz.	21 fl. oz.
TOTAL	**184 oz. (5.2 kg)**	**73 oz. (2.1 kg)**	**125 fl. oz. (2.6 kg)**

How Much Fuel?

TABLE 3-7. WATER PATHOGEN SUMMARY

PURIFICATION METHOD	PATHOGENS TREATED			
	Parasites & Protozoa (large)	Bacteria (medium)	Viruses (small)	Purifies?
Boiling	Yes	Yes	Yes	YES
Purifier-Filter	Yes	Yes	Yes	YES
Microfilter	Yes	Yes	No	NO
Chlorine Dioxide Drops or Tablets	Yes	Yes	Yes	YES
Electrochlorinators	Yes	Yes	Yes	YES
Chlorine or Iodine (halogens)	Unreliable	Yes	Yes	NO
UV Light and Microfilter	Yes	Yes	Yes	YES

The Mountaineers

TRIP PREPARATION • MAP • ALTIMETER • COMPASS • CLINOMETER • GPS • ORIENTATION BY INSTRUMENT • ORIENTING A MAP • ORIENTATION USING GPS • NAVIGATION BY INSTRUMENT • COMMUNICATION DEVICES • LOST • FINDING THE FREEDOM OF THE HILLS

CHAPTER 5

NAVIGATION

"Where am I now, and how can I find my way to the summit—and back? What if I need help in an emergency?" These are the most frequently asked questions in mountaineering. This chapter shows how to find the answers with the first of the Ten Essentials: navigation.

FoTH, 9th, Ch. 5: Navigation

Seven Major New Subjects Covered:

1. ***Five*** **tools of navigation (remember?)**
2. **Workflow**
3. **Situational Awareness**
4. **Ethic of Self-reliance**
5. **PLBs (and Sat phones)**
6. **Digital maps**
7. **Datums**

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Bob Burns
Mike Burns
John Bell
Steve McClure

Navigation Innovations Course Status

- April 2015, SCC approved resolution re Navigation.
- HUGE EFFORT by committee on current course
- Two navigation summits: 2015, 2016
- Course renamed to “Wilderness Navigation”
- Some focus on altimeter and GPS foundation (i.e., UTM)
- “Paper maps and High-Accuracy (<2°)magnetic compass bearings”:
  - measuring, plotting, taking, shooting, and following
- Developing Gold Standard for Navigation
- Started to develop course to meet Gold Standard

NAV Course status: Navigation Tools Covered

	Maps	Altimeter	Compass	Cell GPS	PLB
Current "Wilderness Navigation"	✓ [Paper only]	Minor	✓	No	No
Freedom 9 and Proposed "Modern Navigation"	✓ [Paper & digital]	✓	✓	✓ [Cell primary with dedicated units for harsh conditions]	✓


To **NAVIGATE HEAD** for the **SUN**
With **FIRST AID** and **KNIFE** on the run
Bring **FIRE** and **SHELTER**
EXTRA FOOD is a helper
But **WATER** and **CLOTHES** weigh a ton
S. McClure
Steve McClure, Cape Alava, 2014


To **NAVIGATE HEAD** for the **SUN**
With **FIRST AID** and **KNIFE** on the run
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But **WATER** and **CLOTHES** weigh a ton
S. McClure
Steve McClure, Cape Alava, 2014


Thank You!
Steve McClure, Cape Alava, 2014

Steve McClure

- **Credentials & roles in club:**

- Committees: Alpine Scrambling, Climbing, Navigation, Board of Directors , Finance, Freedom 9, Navigation
- Courses as Instructor: Alpine Scrambling Intense, Intense Basic Climbing , Smart Phone GPS

- **Experience:**

  35 years of hiking, scrambling & climbing including Bailey Range traverse, White and Sawtooth ranges in Idaho, Peru trek, and 100 miles of the mostly cross-country Sierra High Route (2015), 38 of 100 Rainier peaks.