The Ten Essentials

Packing the "Ten Essentials" whenever you step into the backcountry, even on day hikes, is a practice that could one day save your life. As a former operator in Naval Special Warfare I can say that we continually engaged in extremely dangerous and life-threatening activities because we routinely planned and prepared to execute every aspect of those activities in a manner that would allow all those engaged to arrive home safely. This philosophy is the basis of what the "Ten Essentials" is built upon. It is meant to help you control a difficult or possible life-threatening situation should it arise. If heading out on a multi-day adventure into the backcountry you will obviously need more than these 10 items, but this list is intended for any stroll into the wilderness. It's when something goes wrong that you'll truly appreciate the value of carrying these items that could be the difference between survival or tragedy.

The original Ten Essentials list was assembled in the 1930s by The Mountaineers, a Seattle-based organization for climbers and outdoor adventurers. Their goal was to help people be prepared for emergency situations while in the backcountry. The original list included a map, compass, sunglasses and sunscreen, extra clothing, headlamp/flashlight, first-aid supplies, fire starter, matches, knife and extra food.

Since that time, the list has evolved to a "systems" approach rather than including individual items due to the advances in technology. Based on the systems approach I have created my own as you can see here:

1. **Navigation**: compass, map, altimeter, GPS device, satellite messenger or personal locator beacon (PLB)
2. **Illumination**: headlamp/flashlight plus extra batteries
3. **Sun protection**: sunglasses, sun-protective clothes and sunscreen
4. **First aid**: to treat minor injuries but can include foot care and insect repellent (as needed)
5. **Tools/Knife**: plus a gear repair kit
6. **Fire**: matches, lighter, tinder and/or stove
7. **Shelter**: should be readily available (can be a light emergency bivy)
8. **Nutrition**: Enough to endure a longer than expected
9. **Hydration**: Enough to endure a longer than expected
10. **Insulation**: Enough to endure a longer than expected

The exact items from each system that you take can be tailored to the conditions and length of trip you're planning. For example, if you're looking to take a day-hike that you can easily navigate you might choose to take only a map, compass and PLB. On a longer, more navigationally complex hike, you might decide you also now want your GPS and altimeter to help you find your way. When deciding what to bring, you should consider all the environmental factors like weather, difficulty, duration, and distance from help.

I will discuss further, more information about each of the Ten Essential systems and then I will discuss other important items that may be significant on your outing.

1 Navigation

Modern-day navigational tools include five essentials for traveling in the backcountry: a map, compass, multi-sport adventure watch, GPS device and personal locator beacon (PLB). Here's more detail:

1.1 Map

A topographic map is always a must. Becoming familiar with these pieces of paper and how to read them is essential. These maps should accompany you on any trip that entails anything more than a short, difficult-to-miss footpath or commonly visited nature trail.

1.2 Compass

A compass, combined with map-reading knowledge (which we will cover in this course), is an essential tool if you become disoriented and lost in the backcountry. Even though many smartphones, GPS devices and watches have some type of compass capability, it's always wise to also carry a standard baseplate compass. This is because its weight is next to nothing and it does not rely on batteries, making it an always reliable backup.

Note: If compass is equipped with a signal mirror it can also be used to reflect sunlight to a helicopter or rescuer during an emergency.

1.3 GPS Device

A GPS device uses a satellite to accurately relay your grid point coordinates. This then allows you to accurately find your location on a map. Those designed specifically for backcountry use are often built durable and weatherproof. Another common option is to use a smartphone with a GPS app. With that in mind you should consider that most phones are more fragile, so you'll likely need to protect it with a durable case. Whichever you choose, keep in mind that these devices run on battery power. With that in mind you will need to monitor your battery power levels and probably carry extra batteries or a power supply capable of recharging all of your devices.

1.4 Multi-Sport GPS Adventure Watch

Over the last 5 years these accessories are like having a computer strapped to your wrist. It uses a multitude of sensors that can detect altitude, temperature, location, speed, bodily movement and so on... This info helps you track your progress and determine your location on a map. They also have the added benefit of being readily available on your wrist and getting up to date information is as easy as picking up your arm. I have used the Garmin Fenix now for five years and it has never let me down.

TIP: GPS DEVICES

Modern backpackers have several options available to them when it comes to GPS technology.

- **A Smart Phone App** has become one of the most popular way for hikers to navigate by GPS. The extensive libraries of free digital worldwide maps made available by these apps, if downloaded before entering the wilderness areas, allow freedom to travel hills near and far. In my experience the Gaia GPS app has been the most useful and reliable thus far.
- **Dedicated GPS Units** are not as user friendly and have fewer maps available, but they are rugged and weatherproof as compared to phones. I typically use the Garmin line which can also double as an SOS device.
- **Digital Wristwatches** can now provide GPS coordinates, speed, temperature, and altitude just to name a few that can be used in conjunction with a physical map. Some even now show tiny maps. I have used the Garmin Fenix now for 5 years and it has never let me down.

1.5 Personal Locator Beacon (PLB) or Satellite Messenger

These gadgets can be used to alert emergency personnel if you need help in the backcountry. When activated in an emergency, they will determine your position using GPS and send a message via government or commercial satellites. A satellite messenger or PLB can be a wonderful backup to have in case something goes amiss. In addition, they will work in remote locations where a cell phone cannot be counted on to have a signal. The SpOT device and the Garmin line of Iridium Satellite PLB devices have proven themselves in the field. They now also offer a texting capability when connected to your Smart Phone.

2 Illumination

Unless you possess the ears of a bat, you need to be able to see in low light situations in the wilderness, so you always need to have a light source with you. The headlamp is the go-to choice of most backcountry travelers because it keeps your hands free for all types of tasks, whether that's cooking dinner or setting up your tent. Always carry extra batteries. A small backup LED flashlight with a reverse clip (for attaching to the brim of your hat) is also advisable.

3 Sun Protection

It does not matter where you are going or when, you should always pack with you and wear sunglasses, sun-protection clothing and sunscreen. Not doing so is an example of poor judgement and can result in sunburn and/or snow blindness in the short term. The long-term effects are much more serious and can potentially include premature skin aging, skin cancer and cataracts.

3.1 Sunglasses

Nothing beats a great pair of shades because they protect your eyes from potentially damaging radiation, not to mention they make you look cool. You'll need extra-dark glacier glasses if you're preparing for extended travel on snow or ice. The threat of snow burn is real. You will need a pair that is effective at blocking 100% of ultraviolet light (UVA and UVB)—a key function of quality lenses. UVB rays, the rays that can burn your skin, have also been related to the development of cataracts. Groups should carry at least one extra pair of sunglasses in case someone loses, damages or forgets to bring theirs.

3.2 Sunscreen

Long hours in the sun and continuous exposure to UV light to exposed skin can cause serious damage if unchecked. UV light is the cause of sunburn, premature skin aging and skin cancer. In order to help limit your exposure to UV it is recommended that a suitable sunscreen is worn. When choosing a sunscreen, health professionals advise selecting:

TIP: A SUNPROTECTION STRATEGY

- First, wear proper sunglasses.
- Then, sun-protective clothes such as: hat, long sleeves, and pants.
- Adequately apply a minimum SPF 30 broad-spectrum sunscreen to all exposed skin.
- Use sunscreen or an SPF-rated lip balm to protect lips.
- Reapply sunscreen frequently.
- When using both sunscreen and insect repellent, first apply sunscreen and allow it to dry. Once it has dried to your skin, apply the insect repellent.

- A minimum sun protection factor (SPF) of at least 15, though SPF 30 is recommended for extended outdoor activity.
- A sunscreen that blocks both UVA and UVB rays.

Apply the sunscreen liberally and completely to the exposed skin on your body. Keep in mind that UV rays can reflect off of snow and water so don't neglect to get spots like the bottom of your chin and nose. Depending on many factors such as the time of day, sweat and more, you should reapply as frequently as every two hours. It is also advisable to apply a SPF-rated lip balm as well.

3.3 Sun-Protection Clothing

Clothing can be an effective way of blocking UV rays from reaching your skin. But don't forget you'll still need sunscreen for any exposed skin, like your face, neck and hands. Many lightweight, synthetic pieces of clothing are made with an ultraviolet protection factor (UPF) rating. The purpose of this is to indicate how effective the pieces are against UVA and UVB light. A key accessory for sun protection is a hat, preferably one with a full brim.

4 First Aid

It's essential to carry a first aid kit that is capable of treating most minor injuries you may encounter in the backcountry. Minor wounds can lead to more serious conditions not treated for infection and left unchecked. Pre-assembled first-aid kits take the guesswork out of creating your own, though as you gain more experience you may personalize these kits to suit individual needs. Key items your kit needs to stock are:

- treatments for blisters
- adhesive bandages of various sizes
- several gauze pads
- adhesive tape
- disinfecting ointment
- over-the-counter pain medications
- nitrile gloves ought to be included as well

The length of your trip and the number of people involved will influence the contents of your kit. It's also good practice to ensure that everyone in the group carries their own kit so to ensure there is an adequate supply. Carrying some sort of compact guide to handle medical emergencies is also advisable.

5 Tool Kit/Knife

Knives are useful for gear repair, food preparation, first aid, stabbing a ferocious attacking animal or other emergency needs, making them vital for every outing. A knife can be as simple as a single foldout blade or it can be much more elaborate featuring multitools that can include things like one or two flathead screwdrivers, a can opener and/or a pair of plyers. A multi-tooled knife makes itself indispensable especially when repairs are needed for your gear. A small gear repair kit should also be included because it can get you

TIP: CHOOSING A HEADLAMP

- **Beam Type, Output, and Distance**. When selecting a headlamp, choose one that has both a wide beam and a spot beam. The source output of headlamps are rated in lumens, a beam distance measured In meters, and a runtime measured In hours. For general-purpose backpacking, a lamp rated at least 50 lumens' that casts a beam at least 160 feet (50 meters) and has a runtime of at least 24 hours will suffice. Keep In mind that the amount of daylight varies considerably depending on the time of year and location. If you anticipate considerable nighttime operations (for example, search and rescue), choose a higher rated beam with a top strap and larger battery pack positioned at the back of the head. More illumination utilizes more battery power.
- **Weight**. The average headlamp weighs 3 to 4 ounces (85 to 115 grams), and all are similar in size. High-powered models are larger and heavier (up to 11 ounces, 300 grams). Ultralight models can weigh less than an ounce.
- **Brightness Modes**. Most headlamps offer varying brightness. Use low for around camp to conserve battery life and not annoy your belay partners. A high beam is useful for moving through terrain at night.
- **Battery Type**. Choose a headlamp powered by AA or AAA batteries, a battery type shared by other electronics you may be taking such as a SpOT Messenger or dedicated GPS device (for more on batteries see "Batteries" later in this lecture).
- Additional features include a red lamp to protect nighttime vision, a flashing mode for use as an emergency beacon. and a regulated output to keep the beam brightness steady until the batteries are depleted.

out of a jam in the backcountry (and the more isolated you are, the more valuable your kit turn out to be). Popular items include duct tape, parachute cord, fabric repair tape, zip ties, safety pins and repair parts for a water filter, tent poles, stove, sleeping pad, crampons, snowshoes and skis.

6 Fire

In case of an emergency, you need to have dependable resources with you for starting and maintaining a fire. This is usually a disposable butane lighter, but matches are also appropriate as long as they are waterproof or stored in a waterproof container. General-use matchbooks are often too weak and inadequately structured to be trusted for wilderness use.

A fire-starter is an element that helps you kickstart a fire and is essential in wet conditions. The ideal fire starter ignites rapidly and maintains heat for more than a few seconds. Examples of this include candles, priming paste, dry tinder stored away in a plastic bag, heat "nuggets" (wood clusters soaked in resin) and even lint trappings from a household clothes dryer.

For excursions where firewood is not available, a stove is recommended as an emergency heat and water source. This can be the case on trips above tree line and/or on snow.

7 Emergency Shelter

Protection from the wind and rain in case you get stranded or injured on the trail is essential. Because of this you should Always carry some type of emergency shelter. Options include:

- an ultralight tarp
- a bivy sack
- an emergency space blanket (compact and lightweight)
- or even a large plastic trash bag.

It's important to understand that if your tent is your only emergency shelter then you should have it with you at all times (it's much better to have it and not need it than to need it and not have it).

8 Nutrition

When heading out on the trail you will need to keep your energy levels up and stay nourished. You need to bring with you snacks and meals to sustain yourself for the duration you plan to be out in the backcountry. In addition, you should bring an extra day of food in case something happens that causes an extended outing such as an injury or bad weather. The type of food to bring are items that are ready to eat and have a long shelf life such as energy bars, jerky, and dried fruit.

9 Hydration

Even more critical than carrying enough food is staying hydrated. The rule of thumb for the backcountry is to plan to consume about a gallon of water a day. Now you can plan to carry all the water you need in or you can treat water that you find. If this is the case, then you need to have a water plan. You need to know exactly where you can find water and when and how you are going to treat it. There are several different methods:

- filter/purifier
- chemical treatment
- stove for melting snow

The water consumption above is based on moderate activity in moderate temperatures. You may need to carry more than that subject to factors like the outdoor temperature, altitude, level of exertion or an emergency.

10 Insulation

Conditions can abruptly turn wet, windy or chilly in the backcountry or an injury can result in an unplanned night out, so it's necessary to carry extra clothes beyond those required for your trip.

When deciding what to bring, think about what you would need to survive a long, inactive period out in the elements. Common options include a layer of underwear (tops and bottoms), an insulating hat or balaclava, extra socks, extra gloves and a synthetic jacket or vest. For winter outings, bring insulation for your upper body and legs.

TIP: CHOOSING TREKKING POLES

These are the features you want to take into consideration when selecting trekking poles:

- **Grips.** Cork or foam grips are designed for bare hands. Rubber grips are for use with gloves but after extended use tend to cause blisters on bare hands.
- **Shafts.** Aluminum poles have the tendency to bend before they break. Carbon fiber poles are light weight but more expensive and may fracture unexpectedly.
- **Shock Absorbers**. They add weight and cost. I personally do not use them as they tend to wear out over time.
- **Baskets**. Most poles come with snow baskets, beneficial also on ground or rock where it's easy to jam a pole tip. Larger baskets are helpful when the snow is soft.
- **Tips**. Carbide steel withstands abrasion. Option for rubber tip for traction.
- **Length**. Most poles are adjustable using a locking mechanism. Proper fit is when they are long enough to allow a 90-degree angle at the elbow when standing on level ground. Poles should retract or fold for easy stowing inside the pack.
- **Locking mechanisms**. Older designs primarily used twist-locks, which were prone to slipping when heavy loads were applied. External lever and push button locks are more reliable and faster to adjust in the field. Folding poles use an internal cord to keep sections together and securely aligned.

The footwear you utilize are among some of the most important pieces of equipment that you bring into the backcountry. With every step, they are the direct interface between your body and the landscape. Boots come in an almost infinite array of heights, weights, materials, soles, etc. They should be selected according to your needs, meaning, day trip vs. multiday, pack weight, terrain, season, temperature, your hiking style (traditional versus ultralight), and your physical characteristics (e. g., weak ankles) to name a few. And there isn't one boot that is best for every condition. The boots that are best for a day hike are not the best boots for a multiday winter camping expedition. Boots are an investment in protecting your feet. Selecting, fitting, breaking and caring for your boots will help them last a long time and will maximize your own comfort and safety.

11 Other Gear to Keep in Mind

In addition to the 10 Essentials there are many other items that will prove useful should you need them. Over time you will develop what works best for you in different conditions. Just remember as what was stated in the beginning of this lecture to be prepared. Think ahead. Take the time to envision scenarios of possible dangers and unforeseen circumstances, which can include being injured, separated from your party, and lost. How would you react in those situations? What is your response plan? What equipment would be necessary to execute that plan? What risks are you willing to accept and what risks can you mitigate? Let's take a look at some additional equipment that can assist you in those situations.

11.1 Trekking Poles

Trekking poles are a travel assistance tool that can greatly assist in balancing and carrying heavy loads. They help boost climbers uphill and help put on the brakes when going down. They offer balance and stability when fording rivers, traversing over uneven terrain, and travel on snow or scree. They redistribute effort across arms and legs, which helps in minimizing the stress on lower extremities allowing you to increase overall endurance.

A common tactic used by some backpackers and climbers is to shorten adjustable trekking poles slightly when traversing uphill (Figure 2a) and lengthen them slightly when traversing downhill (Figure 2b). For traversing uneven terrain, slide your uphill hand as far as necessary down the shaft of the pole below the handle (Figure 2c). Using the wrist strap is also meant to help distribute the weight and make it easier on your grip. To do this, first, put your hand up through the strap loop and then gab the pole grip so that the strap comfortably supports the wrist (Figure 1). In order to scramble a short, steep section, let the poles dangle by the wrist straps being careful not to get your poles caught in something. For a longer stretch, collapse the poles and stow them on the loopholes or bungie loops on the pack. In addition, some ultralight tents make use of the trekking poles in lieu of tent poles to reduce weight.

Figure 1: Proper trekking pole strap placement

Figure 2: Using trekking poles while traveling on different terrain.

11.2 Toilet Kit

The items you may need to stay as civilized as possible while in the backcountry can include toilet paper, sanitary wipes, a small digging trowel, "blue bags," and hand sanitizer. Depending on where you are land managers will have regulations in place that will dictate how you are to manage your 2nd order of business. Regardless of the location each backpacker needs to act responsibly to not allow your ghost of breakfast past to foul the wilderness we all love. Typically, alpine areas are some of the most remote and lack facilities and so hikers and climbers must squatty potty all feces and toilet paper into blue bags and pack them out. Alpine areas lack the soil to decompose your doodoo or toilet paper which if left behind foul the area for decades and make you look like an a**hole. If you plan to dig a cat-hole, sites at lower-elevation may have sufficient soil to aid the decomposition of brown town, but few areas have sufficient capacity to decompose TP. Wipes are primarily made from polyester and do not decompose but there are wipes on the market that advertise biodegradable. I prefer to use "DUDE Wipes" because they are made from plant fibers and are 100% biodegradable. Backpackers should always plan to remove toilet paper and wipes for disposal at the end of the trip. (We will discuss further in the "Leave No Trace" principles lecture)

11.3 Insect Repellent

If you're going to get eaten in the backcountry it will most likely be from an insect, namely mosquitoes, ticks, chiggers, biting flies, and those pesky gnats. To make matters worse, in the past 20 years the United States has seen a substantial increase in reported cases of mosquito-borne and tick-borne diseases. For winter trips or high elevation alpine snow treks any time of year, an insect enforcement

***Table 1: Insect Repellant; credit** - (Ronald C. Eng and Julie Van Pelt, 2017)*

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 concentration)	APPLICATION	EFFECTIVENESS AGAINST		
		Mosquitoes	Ticks & Chiggers	Biting Flies & Blackflies
Field Application				
DEET (5% - 20%)	Clothes & skin	2 – 12 hours	2 – 12 hours	Poor
Picaridin (5% - 20%)	Clothes & skin	4 – 14 hours	6 – 14 hours	Good
IR3535 (7.5% - 20%)	Clothes & skin	2 – 10 hours	2 – 8 hours	Yes
Oil of Lemon Eucalyptus (30% - 40%)	Clothes & 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 repellents 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.

plan may be unnecessary; but for a low-elevation summer hikes, beating down these pests may be vital. When traveling in areas of the U.S. with disease-carrying mosquitoes (such as West Nile virus) or disease-carrying ticks (such as Lyme disease and Rocky Mountain spotted fever), you should take extra safeguards to avoid being infected by theses blood suckers. When you grab your passport and venture beyond our borders the situation gets really weird and the risk of malaria, Zika, and dengue loom large. In tropical areas, bed-netting and antimalaria medications may be justified.

The front line of your defense strategy is a clothing barrier heavy enough to provide a protective shield, including gloves and head nets in really saturated areas. When the weather gets hot, long shirts and pants made of netting may prove worthwhile.

The next defensive measure is to wear factory-or home-applied permethrin-treated clothes as a chemical barrier and applying a spritz of (non-permethrin) repellent (for example, picaridin) as needed in the field to the outer layer of clothing (whether permethrin treated or not). A robust application to the hat and scarf aids to protect the face and pay specific attention to socks as these little suckers have an uncanny ability to target ankles. Finally, take the time to carefully apply a suitable insect repellent to uncovered skin being particularly careful around the face. And know that sometimes the bugs win the battle and retreating to a tent with a full bug screen may be the only way to preserve your sanity.

In the United States, insect repellents must be registered with the Environmental Protection Agency (EPA) and is a great source for all safety and effectiveness claims (**Table 1**). As of when this lecture was researched, only five active ingredients with EPA registrations claim to repel mosquitoes and ticks for more than two hours. These include DEET, Picaridin, Permethrin, 1R3535, and oil of lemon eucalyptus. Botanical oils (citronella, soybean, lemongrass, cedar, et cetera) are only marginally effective. Insect repellent modes of delivery can vary but most come in spray, liquid, cream, stick, and wipe forms and in various concentrations, with sprays the only easy option for clothes.

The prime feeding times of most insects are the hours between dawn and dusk so be on guard. Mosquitoes have trouble tracking targets in windy conditions so use this to your advantage and camp and take breaks accordingly. When using sunscreen and repellent, you should first apply sunscreen and allow it to dry. Once dried, then apply the repellent. To lessen your allure to insects (and bears!), avoid wearing fragrances. In the backcountry that's just weird. In tick country (especially on days when you have been thrashing through brush) be sure to check your clothes, body, and hair carefully at night.

11.3.1 DEET

This tried and true chemical is considered the gold standard against mosquitoes. Is was developed in 1944 for the US Army and entered civilian use in 1957, although permethrin and picaridin are solid competitors. One application of a repellent with a high concentration of DEET will keep mosquitoes from attacking for several hours, though they may still hover about irritatingly. Be mindful that DEET is a strong chemical that can dissolve plastics and synthetic fabrics. While products can be purchased in varying concentrations up to 100%, a 30% concentration is safer and likely sufficient. For extended multi-hour protection use a 30% concentration in a time-release formula. DEET is not particularly effective at repelling biting flies. Blackflies, deer flies, and gnats are more effectively repelled using permethrin-treated clothes and picaridin repellents.

11.3.2 Permethrin

For tong-lasting use on clothes only, never on skin, permethrin does not prevent insects from landing but rather kills them before they can bite. It is the only insect repellent registered for factory treatment of fabrics. The amount of permethrin allowed in clothes is very low and is inadequately absorbed through the skin, so contact is not a safety concern. With this chemical there is strength in numbers,

so the more members of the hiking team that use permethrin-treated clothes, the more effective it will be. Permethrin-treated clothes are odorless and compatible with being incorporated with the other four repellents listed here.

11.3.3 Picaridin

This is also known as KBR 3023, Bayrepel, Icaridin, and Saltidin. It has been available in Europe since 2001 and first registered with the US EPA in 2005. This odorless, non-greasy, non-plastic-melting repellent is the alternative to DEET. Picaridin is recommended to repulse disease-carrying mosquitoes by both the World Health Organization and the US Centers for Disease Control and Prevention. According to the EPA, it claims effectiveness for up to 14 hours for the 20 percent concentration.

11.3.4 1R3535

According to the EPA, 1R3535 has been used as an insect repellent in Europe for 20 years with no substantial adverse effects. It is solely a repellent and has no killing action and it does not give rise to selection pressure or development of resistance. It is a colorless and almost odorless oil and is intended to be applied to the skin. It has a strong efficacy against various insects like mosquitoes, ticks, and lice. 1R3535 is safe for use on infants, pregnant and breastfeeding women. It is biodegradable and totally degraded in the environment within a short time.

11.3.5 Oil of Lemon Eucalyptus

(also known as OLE and PMD). Commercially available oil of lemon eucalyptus is chemically synthesized to mimic a naturally occurring molecule similar to menthol. This ingredient is effective against mosquitoes, ticks, biting flies, and gnats.

11.4 LOCAL COMMUNICATION DEVICES

Your team may need the capability to communicate when not in eyesight of one another. Whistles, avalanche transceivers, and walkie-talkies can facilitate communication among a hiking party that could find itself spread out along the route or to locate a lost or injured member.

11.4.1 Whistle

A whistle's penetrating blast greatly exceeds the range of the human voice and can serve as a rough means of communication in situations in which cries for help cannot be heard. This is certainly true in situations such as being trapped in a crevasse or becoming separated from the party in fog, darkness, or thick forest. Whistles can be much more useful if a hiking party designates specific signals before the trip for "Where are you?", “I’m here and OK," and "Help!" A signal repeated three times from any signaling device is universal for "SOS."

11.4.2 Avalanche Transceiver

Conditions may call for those heading to the high lands to carry avalanche transceivers, which are used to locate victims of a snow-slide. For the purposes of this course a detailed explanation of their use is not necessary as high alpine snow travel is not a basic skill.

11.4.3 Walkie-Talkie or Handheld Two-Way Radio

The sound of wind and water can muffle sounds and physical obstacles between the two ends of a hiking party blocking line of sight can make communication difficult. Walkie-talkies can greatly ease communication between hiking partners or between a hiking party out exploring and base camp. Walkie-talkies include both handheld amateur "ham" radios and family radio service (FRS) two-way radios. FRS radios are commonly used by hiking parties for short-range comms (up to a few miles or kilometers). Modern handheld amateur "ham" radios are low-cost, lightweight, and in certain areas, can communicate worldwide through "repeaters." In order to be useful, all walkie-talkies in the team must be set to operate at the same frequency. Make sure to bring sufficient batteries and only turn on when needed. For summoning help in remote mountain areas, walkie-talkies are generally not reliable due to line of sight. You should have a PLB satellite communicator, or satellite phone instead.

11.5 BATTERIES

As technology grows so does the available tools at your disposal when stepping out into the wilderness. An ever-growing list of backcountry electronics have now become available to include GPS devices, satellite communicators, headlamps, walkie-talkies, and avalanche beacons. All of which run on batteries, so battery type and size are part of the modern equipment checklist. The standard batteries for most handheld electronics are 1.5-volt AA and AAA. The AA cells contain approximately twice the power capacity of the smaller AAA at a similar price. Batteries operate through a chemical process that are adversely affected by cold temperatures (**Table 2**) and you should be mindful of their effectiveness when heading out into cooler temperatures.

Table 2: Battery Performance at Cold Temperatures; *credit - (Ronald C. Eng and Julie Van Pelt, 2017)*

Temperature in Degrees	*Disposable Alkaline*	*Lithium*	*Rechargeable NiMH*	*Li-ION*
Overall	Poor	Excellent	Poor	Excellent
32°F (0°C)	70%	100%	75%	90%
-4°F (-20°C)	25%	80%	25%	80%
-40°F (-40°C)	0%	50%	0%	50%

Note: The minimum recommended operating temperature for each type of battery (in order from left to right) is -4° (-20°C), -40°F (-40°C), 32°F (0°C), -40°F (-40°C)

11.5.1 Alkaline Batteries

Alkaline batteries are the most commonly available general-purpose power source. Their major drawback is that the voltage (therefore, brightness) drops considerably as they discharge. Cooler temperatures can drastically accelerate this voltage drop which results in a significantly shorter battery life.

11.5.2 Lithium batteries

Lithium batteries have a much longer life than alkaline, they are much lighter, but they also cost more. Voltage remains virtually consistent over the life of their charge, and effectiveness at 0 degrees Fahrenheit (minus 18 degrees Celsius) is nearly the same as at room temperature. The more powerful the electronic device, the more of an advantage that lithium batteries have over their alkaline cousins. Cooler temperatures only compound this advantage. For cold-weather trips, lithium batteries are the best choice for high-powered headlamps and other critical devices such as the PLB satellite communicators.

11.5.3 Rechargeable Batteries

One popular strategy is to use rechargeable batteries for your main power source and disposable batteries as spares. Nickel-metal, hydride (NIMH) rechargeable batteries have replaced the once common nickel-cadmium (Nicd) in standard AA and AAA sizes, while lithium-ion (Li-ion) batteries are usually found in higher-voltage consumer electronics such as phones. Caution NIMH batteries tend to self-discharge rapidly in storage at approximately 30% per month. Always start with a full charge.

11.5.4 Lithium-Ion Batteries

Li-ion batteries (not to be confused with disposable lithium batteries) are the powerplants inside phones, cameras, and most battery packs (see below). Li-ion batteries are not yet available in standard 1.5-volt AA and AAA sizes, Li-ion batteries perform well in cold temperatures.

11.5.5 Portable Battery Packs

Based on Li-ion technology, portable battery packs are a handy way to store additional power to recharge Li-ion-powered devices such as phones, PLBs and GPS devices. Their capacity is rated in milliamp hours (mAh), with about 3000 mAh currently needed to juice back up your typical cell phone. As these may also loose power while in storage, as with all devices, you should ensure they are fully charged before you step out onto the trail.

11.5.6 Solar Panels

Affected by cloud cover, adverse weather, length of day, and amount of sunlight, the use of portable solar panels requires planning and attention. The higher a panels wattage, the faster it charges. While panels can charge devices directly each passing cloud or shade from a tree can disrupt the process. A more reliable option is to charge an intermediate portable battery pack.

Regardless of your choice, make sure you start each trip with batteries compatible with your headlamp and navigation tools, all with more than sufficient charge to handle any reasonable emergency.

11.6 Winter Specific Items

11.6.1 Ice Axe

The ice axe is essential for preventing or arresting falls on steep snow and glaciers by allowing the user to perform a self-rescue. In addition, the ice axe is very useful tool on snow-covered alpine trails and for traveling in steep heather, scree, or brush. It can assist in crossing streams and used for digging sanitation holes.

11.6.2 Crampons and MICROspikes

While an ice axe is essential, especially in a self-rescue for a fall on steep snow or ice, crampons will help prevent a fall from ever occurring. On icy alpine trails, MicROspikes (essentially "tire chains" for your boots) can prevent an inadvertent summersault into a tree and are crucial when traversing ice covered switchbacks.

12 Preparing for the Backcountry

When you go into the wilderness, you should carry essential gear and leave the rest at home. Achieving that balance takes knowledge and good judgment. Understanding the basics of clothing and equipment will help you decide on those essentials needed to be safe, dry, and comfortable in the wilderness. This is only the beginning of your discovery of the backcountry. The next lecture on gear systems will further expand your horizons on what is needed for multi-day adventures into the backcountry.

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13 Adapted From

Ronald C. Eng and Julie Van Pelt. (2017). *Mountaineering: the freedom of the hills.* Seattle: The Mountaineers.