CURRICULUM ON MILITARY SUBJECTS

Strand M10: Survival

Level 11

This Strand is composed of the following components:

A. Prepare to Survive
B. Survival Care and First Aid
C. Basic Survival Techniques
D. Advanced Survival Techniques

Nature provides my basic needs: Water, Food, Fire, Shelter, and Signals. It also provides dangers which can end my life.

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C. Basic Survival Techniques

OBJECTIVES

DESIRED OUTCOME (Self-Mastery) / PRACTICUM A
After completing sections A, B, and C, Cadets will have the foundational knowledge to be able to successfully complete a Basic Survival Course during Summer Encampment and earn their red beret. After completing a Basic Survival Course and section D, Cadets will have the experience and knowledge to complete an Advanced Survival Course and earn the Red Beret with advanced flash.

Video 1 CACC Survival Program (2017)

1. Given a scenario, Cadets will be able to identify potential water sources. (C1)
2. List the three biological classifications of water-borne contaminants that must be neutralized prior to consumption. (C2)
3. Match the purification methods to an image and a list of given pros and cons for each method. (C2)
4. Given a purification method (filter, chemical, UV, etc) demonstrate how to safely purify contaminated water. (C2)
5. Describe in a short paragraph what to look for when selecting a shelter location. (C3)
6. Successfully build a debris hut that will keep an occupant warm and dry. This can be tested by pouring 5-gallons of water over the hut with the occupant in it. (C3)
7. List three types of fire materials. (C4)
8. Be able to safely start, maintain, and extinguish a fire with the following methods: (C4)
    a. One Match
    b. Convex Lens
    c. Flint/Steel
    d. Battery
9. Identify sources of food and given a list of wilderness food sources, identify which sources are safe to eat and which are not. (C5)

10. Demonstrate trapping and snaring techniques. (C6)
11. Identify and correct unsafe knife-handling procedures. (C7)
12. Identify 2 edible plants. (C8)
13. Given the steps of the Universal Edibility Test out of order, place them in correct sequence order. (C8)

C1 Water Sources

Almost any environment has water present to some degree. Figures 1, 2 and 3 (US Army, 2002) list possible sources of water in various environments. It also provides information on how to make the water potable.

Environment	Source of Water	Means of Obtaining and/or Making Potable	Remarks
Frigid areas	Snow and ice	Melt and purify.	**Do not eat** without melting! Eating snow and ice can reduce body temperature and will lead to more dehydration. Snow and ice are no purer than the water from which they come. Sea ice that is gray in color or opaque is salty. Do not use it without desalting it. Sea ice that is crystalline with a bluish cast has little salt in it.
At sea	Sea	Use desalter kit.	**Do not** drink seawater without desalting.
	Rain	Catch rain in tarps or in other water-holding material or containers.	If tarp or water-holding material has become encrusted with salt, wash it in the sea before using (very little salt will remain on it).
	Sea ice		See remarks above for frigid areas.

Figure 1 Water Sources in Different Areas

Environment	Source of Water	Means of Obtaining and/or Making Potable	Remarks
Beach	Ground	Dig hole deep enough to allow water to seep in; obtain rocks, build fire, and heat rocks; drop hot rocks in water; hold cloth over hole to absorb steam; wring water from cloth.	Alternate method if a container or bark pot is available: Fill container or pot with seawater; build fire and boil water to produce steam; hold cloth over container to absorb steam; wring water from cloth.
Desert	Ground • in valleys and low areas • at foot of concave banks of dry river beads • at foot of cliffs or rock outcrops • at first depression behind first sand dune of dry desert lakes • wherever you find damp surface sand • wherever you find green vegetation	Dig holes deep enough to allow water to seep in.	In a sand dune belt, any available water will be found beneath the original valley floor at the edge of dunes.
	Cacti	Cut off the top of a barrel cactus and mash or squeeze the pulp. **CAUTION: Do not eat pulp. Place pulp in mouth, suck out juice, and discard pulp.**	Without a machete, cutting into a cactus is difficult and takes time since you must get past the long, strong spines and cut through the tough rind.

Figure 2 Water Sources in Different Areas (Cont)

Environment	Source of Water	Means of Obtaining and/or Making Potable	Remarks
Desert (continued)	Depressions or holes in rocks		Periodic rainfall may collect in pools, seep into fissures, or collect in holes in rocks.
	Fissures in rock	Insert flexible tubing and siphon water. If fissure is large enough, you can lower a container into it.	
	Porous rock	Insert flexible tubing and siphon water.	
	Condensation on metal	Use cloth to absorb water, then wring water from cloth.	Extreme temperature variations between night and day may cause condensation on metal surfaces. Following are signs to watch for in the desert to help you find water: • All trails lead to water. You should follow in the direction in which the trails converge. Signs of camps, campfire ashes, animal droppings, and trampled terrain may mark trails. • Flocks of birds will circle over water holes. Some birds fly to water holes at dawn and sunset. Their flight at these times is generally fast and close to the ground. Bird tracks or chirping sounds in the evening or early morning sometimes indicate that water is nearby.

Figure 3 Water Sources in Different Areas (Cont)

Note: If you do not have a canteen, a cup, a can, or other type of container, improvise one from plastic or water-resistant cloth. Shape the plastic or cloth into a bowl by pleating it. Use pins or other suitable items--even your hands--to hold the pleats.

If you do not have a reliable source to replenish your water supply, stay alert for ways in which your environment can help you. Rainwater collected in clean containers is the easiest method since it doesn't require decontamination.

CAUTION

Do not substitute the fluids listed in Figure 4, for water.

Fluid	Remarks
Alcoholic beverages	Dehydrate the body and cloud judgment.
Urine	Contains harmful body wastes. Is about 2 percent salt.
Blood	Is salty and considered a food; therefore, requires additional body fluids to digest. May transmit disease.
Seawater	Is about 4 percent salt. It takes about 2 liters of body fluids to rid the body of waste from 1 liter of seawater. Therefore, by drinking seawater you deplete your body's water supply, which can cause death.

Figure 4 Effects of Substitute Fluids for Water

Heavy dew can also provide water. Tie rags or tufts of fine grass around your ankles and walk through dew-covered grass before sunrise. As the rags or grass tufts absorb the dew, wring the water into a container. Repeat the process until you have a supply of water or until the dew is gone. Australian natives sometimes mop up as much as a liter an hour this way.

Bees or ants going into a hole in a tree may point to a water-filled hole. Siphon the water with plastic tubing or scoop it up with an improvised dipper. You can also stuff cloth in the hole to absorb the water and then wring it from the cloth.

Water sometimes gathers in tree crotches or rock crevices. Use the above procedures to get the water. In arid areas, bird droppings around a crack in the rocks may indicate water in or near the crack.

CAUTION

Purify the water before drinking it.

The milk from green (unripe) coconuts is a good thirst quencher. However, the milk from mature coconuts contains an oil that acts as a laxative. Drink in moderation only.

You can get water from plants with moist pulpy centers. Cut off a section of the plant and squeeze or smash the pulp so that the moisture runs out. Catch the liquid in a container.

Plant roots may provide water. Dig or pry the roots out of the ground, cut them into short pieces, and smash the pulp so that the moisture runs out. Catch the liquid in a container.

Fleshy leaves, stems, or stalks, such as bamboo, contain water. Cut or notch the stalks at the base of a joint to drain out the liquid.

Palms, such as the buri, coconut, sugar, rattan, and nips, contain liquid. Bruise a lower frond and pull it down so the tree will "bleed" at the injury.

CAUTION

Do not keep the sap from plants longer than 24 hours. It begins fermenting, becoming dangerous as a water source.

C2. Water Purification

Water from lakes, ponds, swamps, springs, or streams must be purified since every fresh-water source in the world requires purification to prevent sickness.

Contaminants

There are 3 categories of water-borne contaminates that even in a survival situation need to be neutralized prior to consumption.

- **Protozoa**
  - Types: Giardia, Cryptosporidium
  - Size: 4 - 12 microns
  - Function: Parasites that attach to the intestinal tract
  - Symptoms: Diarrhea, nausea, fatigue, cramping, dehydration (2-4 weeks)

Figure 5 Protozoa

- **Bacteria**
  - Types: Salmonella, campylobacter, E. coli
  - Size: 0.2 - 4 microns
  - Function: Gut bacteria
  - Symptoms: Diarrhea, vomiting, cramping, dehydration, fever (4-7 days)

Figure 6 Bacteria

- **Viruses**
  - Types: hepatititis a, norovirus, rotavirus, enterovirus
  - Size: 0.004 – 0.1 microns
  - Function: Intestinal tract viruses
  - Symptoms: Diarrhea, nausea, fatigue, cramping, dehydration (3-8 days)

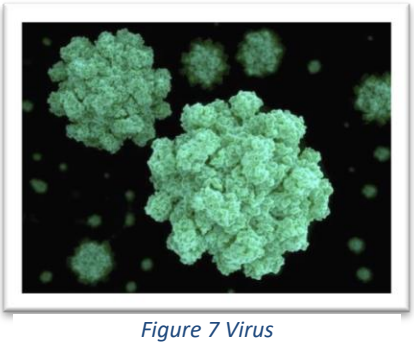


Figure 7 Virus

Introduction of even just a few of these three categories of parasites can make a bad survival situation even worse. It is imperative that a survivor believes the dangers lurking unseen in that crystal-clear mountain stream. Just a drop of contaminated water on the outside lip of your canteen or cup placed to your mouth is enough to turn you from a survivor into a casualty, or make you wish you were one!

So, let's look at the different methods of purifying that water

Purification Methods

Boiling Water

Boiling water at a rolling boil kills all protozoa, bacteria, and viruses. No special equipment is needed other than a pot and a heat source. It is the only method that works with disinfecting contaminated ice and snow. It is also less likely to cause secondary contamination since the container (pot) is also decontaminated over the fire. However, it is fuel intensive and the process is slow since you have to build a fire, boil the water, and then wait for it to cool. It also does not remove chemicals, dirt, oils (such as urushiol-the oil from the poison oak plant) or other matter so it

Figure 8 Purification by Boiling

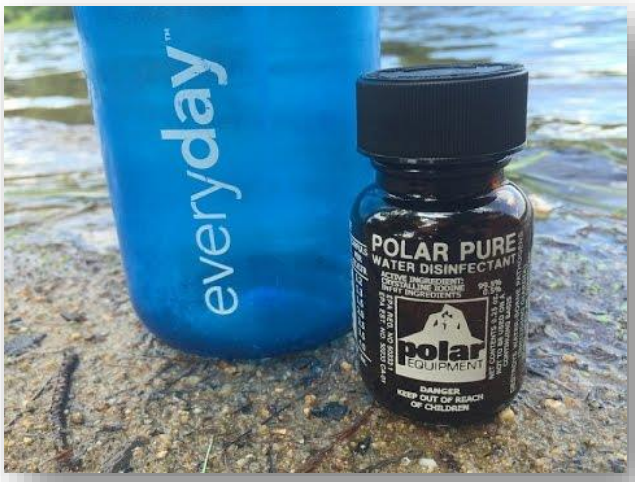
does not improve the taste of the water. The process of boiling and cooling will allow some debris to settle to the bottom of the pan.

Most pathogens are killed at approximately 160 degrees Fahrenheit, so make sure the water comes to a rolling boil (212 degrees Fahrenheit) for one minute, or three minutes if you're above 6,000' elevation.

Chemical Treatment

Chemical purification is a common choice for people who build their own emergency disaster kit, hikers, and the military. The low cost and small size make them likely to appear in many survival kits. They work well against viruses and bacteria, but not as well against all protozoa. There are a few different types of chemical purifiers:

Iodine Crystals (Name brand Polar Pure) come in a bottle and the three ounces will treat about 500 gallons of water. It is effective against Giardia and viruses and has an indefinite shelf life. Iodine does discolor the water and makes the water taste poor. To purify a canteen add water to the PolarPure bottle, wait an hour, and then pour the directed amount of liquid into the canteen. Wait 20 minutes, rinse the threads with clean water, wait another 15 minutes for the threads to get purified, then drink.



Video 2 Purification with Iodine Crystals ((6m:21s), 2018)

Video 3 Purification with Chlorine Dioxide ((1m:4s), 2018)

Chlorine Dioxide (Name brand Aquamira) uses the same chemicals at water treatment plants to neutralize bacteria, viruses, and most protozoa. It does not discolor the water or give it a bad taste. It has a 4-year shelf life and will treat up to 30 gallons of water. It comes in 2 bottles; bottle A contains chlorine dioxide and bottle B contains a phosphoric acid activator. To purify a canteen or bottle, just add 7 drops from part A and 7 drops from part B in the cap and let them mix for 5 minutes. Pour them into your canteen and shake, and then wait 15 minutes before drinking

Iodine Tablets (Name brand Portable Aqua) kills most water-borne pathogens. It has a 4-year shelf life until opened and comes in a small bottle with 50 tablets to treat 25 quarts. It discolors the water and makes it taste bad unless used with a two-stage taste neutralizer. Just add two tablets to a quart of water, wait 5 minutes, then shake the water over the screw threads, recap and wait 30 more minutes before drinking. You can add two neutralizer tablets, wait 5 more minutes and then drink the better-tasting water.

Video 4 Purification with Iodine Tablets (Potable Aqua (2m:40s), 2018)

WARNING: CLEAN YOUR THREADS!

If you don't clean your threads after using chemical water purification, then place your lips on the bottle you just dipped, you are asking for trouble. After waiting the 30 minutes for the chemical to work, loosen the bottle cap about 1/4 turn then shake the bottle so water seeps out onto the threads.

Filtration

While chemical treatment kills the parasites that can make us sick, filtration removes the contaminants all-together from the water. It also has the benefit of removing larger particles including dirt, algae, leaves which generally makes the water taste better. A final universal advantage of filtration is that it works immediately-as soon as the water has passed through the filter it is ready. No curing time is required. On the down side, the filters in the systems can get clogged when processing dirty water, the unclean end of the filter needs to be transported separately from the clean end to prevent cross-contamination, and, depending on the size of the filter, they do not address the smallest particles (viruses and bacteria) as well as chemical treatment.

There are many types of filters and many levels of filtration. Filters are designed to allow water to pass through while blocking particles of a certain size. The simplest type of filter would be to just run water through a cloth. Tighter weaves of cloth will capture smaller particles. Most commercial filters today are *microfilters* which range from .05 microns to 5 microns in size. Lets look at some of the most prominent types on the market today.

Pump Filters

Figure 9 Purification with Pump Filters

Drop the intake hose into the water and put the outlet hose into your water bottle then work the pump. Pumps, flow rates, and filter levels vary between models. Some, like the one pictured have a pre-filter on the end of the hose to keep out the larger debris. The internal filters (ceramic typically) can be replaced and may need to be cleaned out in the field when they get dirty.

Gravity Filters

Figure 10 Purification with Gravity Filters

Gravity filters typically come with two reservoir bags, one that is filled with dirty water and one for clean water. The dirty bag is placed into the water, filled and hung up. It's then connected with a tube and an inline filter to the clean bag which is kept below the level of the dirty-water bag. Gravity then forces the dirty water through the filter and into the clean bag usually in just a few minutes. This is a good method for large groups when there is a deep-enough water source to submerge and fill the dirty reservoir.

Straw-Style Filters

Figure 11 Purification with Straw-Filters

These filters are easy to work, have no moving parts, and are very light for transport. Though the image shows how you can drink right out of the stream, you can do the same out of a water bottle that has contaminated water in it.

Purifiers

Ultraviolet light sterilizes clear water by killing virtually all protozoa, bacteria, and even viruses. To purify water, just press a button on a SteriPen (most common type) and gently stir water in your Nalgene bottle for 90 seconds. When the light goes off the process is complete. Some models require batteries, which may need replacing after 50 liters of water. Other models are USB-rechargeable. Another drawback is that it needs fairly clean water to operate. UV purifiers work well when used on water that has already been filtered.

Figure 12 Purification with Ultraviolet Light

What if you don't have a commercial filter, purifier, a way to boil the water, or chemical treatment?

The advanced section of this strand will cover distillation, solar stills, and transpiration bags. These methods, if used correctly do not require filtration or purification. But if you are unable to make any of

those work, making a decision to drink contaminated water may be your only option. Here's some tips if you decide to risk contracting all the illnesses and disease. The more of these methods you can do, the better chance you have of surviving- **but realize it is very likely you will get sick.**

1) Filter the water as much as you can by creating a makeshift filter with several inches or layers of filtering material such as sand, crushed rock, charcoal, cloth, sphagnum moss (which has some iodine in it) and trickle the water through it.

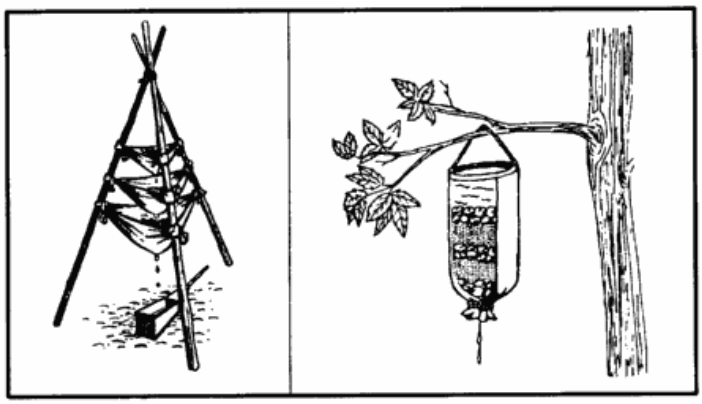


Figure 13 Field Expedient Filtration

2) Set contaminated water in a clear bottle in the bright sun for 8 hours. UV rays will help reduce the live population if the water is clear and not turbid.
3)

Remove the odor from water by adding charcoal from your fire. Let the water stand for 45 minutes before drinking it.

Drinking Water Treatment Methods Summary:

This document should only serve as a guide for individuals intending to use untreated or poorly treated water as a drinking water source. This document may also aid travelers and backcountry water users in researching drinking water treatment methods. Except for boiling, few of the water treatment methods are 100% effective in removing all pathogens.

Table Key for Pathogen Removal	
-	not effective
+	low effectiveness
++	moderate effectiveness
+++	high effectiveness
++++	very high effectiveness

Contaminant	Potential Health Effects from Ingestion of Water	Sources of Contaminant in Drinking Water	Methods that may remove some/all of the contaminant				
			REMEMBER: If boiling water is not a feasible option, the most effective pathogen reduction method in untreated or poorly treated drinking water is a combination treatment, using the appropriate filtration and disinfection methods.				
			Boiling (Rolling boil for 1 minute minimum) *	Filtration **	Disinfection***		Combination Filtration and Disinfection****
					Iodine or Chlorine	Chlorine Dioxide	
Protozoa- *Cryptosporidium*	Gastrointestinal illness (e.g., diarrhea, vomiting, cramps)	Human and animal fecal waste	++++	+++ Absolute ≤ 1.0 micron filter (NSF Standard 53 or 58 rated "cyst reduction / removal" filter)	–	+ to ++	++++ Absolute ≤ 1.0 micron filter (NSF Standard 53 or 58 rated "cyst reduction / removal" filter)
Protozoa- *Giardia intestinalis* (aka *Giardia lamblia*)	Gastrointestinal illness (e.g., diarrhea, vomiting, cramps)	Human and animal fecal waste	++++	+++ Absolute ≤ 1.0 micron filter (NSF Standard 53 or 58 rated "cyst reduction / removal" filter)	+ to ++	+++	++++ Absolute ≤ 1.0 micron filter (NSF Standard 53 or 58 rated "cyst reduction / removal" filter)
Bacteria- (e.g., *Campylobacter*, *Salmonella*, *Shigella*, *E. coli*)	Gastrointestinal illness (e.g., diarrhea, vomiting, cramps)	Human and animal fecal waste	++++	++ Absolute ≤ 0.3 micron filter	+++	+++	++++ Absolute ≤ 0.3 micron filter
Viruses- (e.g., enterovirus, hepatitis A, norovirus, rotavirus)	Gastrointestinal illness (e.g., diarrhea, vomiting, cramps)	Human and animal fecal waste	++++	–	+++	+++	+++

Treatment methods listed above:

* **Boiling** can be used as a pathogen reduction method that should kill all pathogens. Water should be brought to a rolling boil for 1 minute (at altitudes greater than 6,562 feet (>2,000 m), boil water for 3 minutes.)

****Filtration** can be used as a pathogen reduction method against most microorganisms, depending on the pore size of the filter, amount of the contaminant, particle size of the contaminant, and charge of the contaminant particle. Manufacturer's instructions must be followed. More information on selecting an appropriate water filter can be found at www.cdc.gov/crypto/factsheets/filters.html. Only filters that contain a chemical disinfectant matrix will be effective against some viruses.

*** **Disinfection** can be used as a pathogen reduction method against microorganisms. However, contact time, disinfectant concentration, water temperature, water turbidity (cloudiness), water pH, and many other factors can impact the effectiveness of chemical disinfection. The length of time and concentration of disinfectant varies by manufacturer and effectiveness of pathogen reduction depends on the product. Depending on these factors, 100% effectiveness may not be achieved. Manufacturer's instructions must be followed.

**** If boiling water is not possible, a **Combination of Filtration and Chemical Disinfection** is the most effective pathogen reduction method in drinking water for backcountry or travel use. Manufacturer's instructions must be followed.

Other treatment methods can be effective against some of the above pathogens:

- **Ultraviolet Light (UV Light)** can be used as a pathogen reduction method against some microorganisms. The technology requires effective prefiltering due to its dependence on low water turbidity (cloudiness), the correct power delivery, and correct contact times to achieve maximum pathogen reduction. UV might be an effective method for pathogen reduction in untreated or poorly treated water; there is a lack of independent testing data available on specific systems. Manufacturer's instructions must be followed.
- **MIOX®** systems use a salt solution to create mixed oxidants, primarily chlorine. As a result, refer to the category above for chlorine disinfection. Manufacturer's instructions must be followed.

Important: Water that has been disinfected with iodine is **NOT** recommended for pregnant women, people with thyroid problems, those with known hypersensitivity to iodine, or continuous use for more than a few weeks at a time.

In addition to using the appropriate drinking water treatment methods listed above, you can also protect yourself and others from waterborne illness by:

- **Burying human waste 8 inches deep and at least 200 feet away from natural waters.**
- **Practicing good personal hygiene. Wash hands before handling food, eating, and after using the toilet.**

Figure 14 Water Treatment Summary

(Centers for Disease Control, 2018)

C3. Shelters

Figure 15 Debris Hut Shelter

- *A shelter can protect you from the sun, insects, wind, rain, snow, hot or cold temperatures. It can give you a feeling of well-being. It can help you maintain your will to survive.*
- *In some areas, your need for shelter may take precedence over your need for food and possibly even your need for water. For example, prolonged exposure to cold can cause excessive fatigue and weakness (exhaustion). An exhausted person may develop a "passive" outlook, thereby losing the will to survive.*
- *The most common error in making a shelter is to make it too large. A shelter must be large enough to protect you. It must also be small enough to contain your body heat, especially in cold climates.* (US Army, 2002)

When lying down, you will lose 80% of your body heat through the ground unless you insulate <u>under</u> yourself.

Shelter Site Selection

When you are in a survival situation and realize that shelter is a high priority, start looking for shelter as soon as possible. As you do so, remember what you will need at the site. Two requisites are--

- It must contain material to make the type of shelter you need.
- It must be large enough and level enough for you to lie down comfortably.

When you consider these requisites, however, you cannot ignore your potential rescue or your safety. You must also consider whether the site--

- Is suitable for signaling, if necessary.
- Provides protection against wild animals and rocks and dead trees that might fall.
- Is free from insects, reptiles, and poisonous plants.

You must also remember the problems that could arise in your environment. For instance--

- Avoid flash flood areas in foothills.
- Avoid avalanche or rockslide areas in mountainous terrain.
- Avoid sites near bodies of water that are below the high-water mark.
- Avoid sites near stagnant water with mosquitos

In some areas, the season of the year has a strong bearing on the site you select. Ideal sites for a shelter differ in winter and summer. During cold winter months you will want a site that will protect you from the cold and wind, but will have a source of fuel and water. During summer months in the same area you will want a source of water, but you will want the site to be almost insect free.

Types of Shelters

When looking for a shelter site, keep in mind the type of shelter (protection) you need. However, you must also consider--

- How much time and effort you need to build the shelter.
- If the shelter will adequately protect you from the elements (sun, wind, rain, snow).
- If you have the tools to build it. If not, can you make improvised tools?
- If you have the type and amount of materials needed to build it.

To answer these questions, you need to know how to make various types of shelters and what materials you need to make them.

Poncho Lean-To (Good Observation, Limited shelter, No warmth)

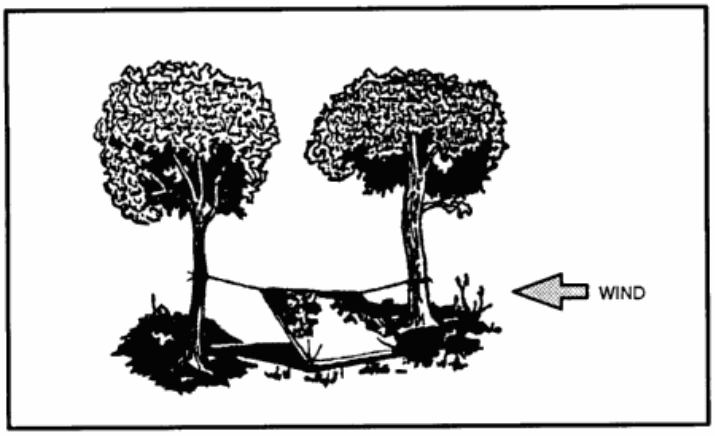


Figure 16 Poncho Lean-To

Poncho Tent (Limited Observation, Good shelter, Limited warmth)

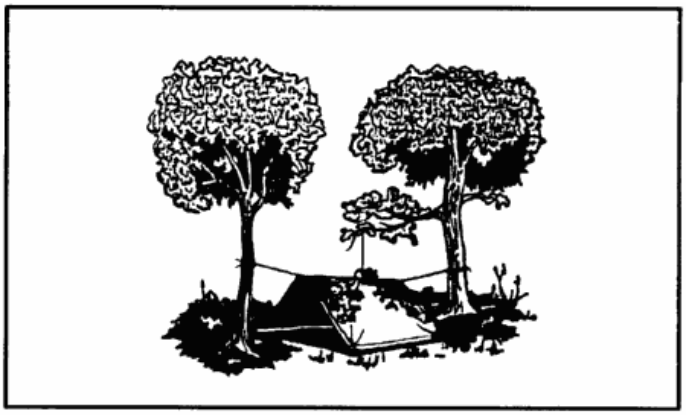


Figure 17 Poncho Tent Using Overhanging Branch

Field-Expedient Lean-To

If you are in a wooded area and have enough natural materials, you can make a field-expedient lean-to (Figure 18) without the aid of tools or with only a knife. It takes longer to make this type of shelter than it does to make other types, but it will protect you from the elements.

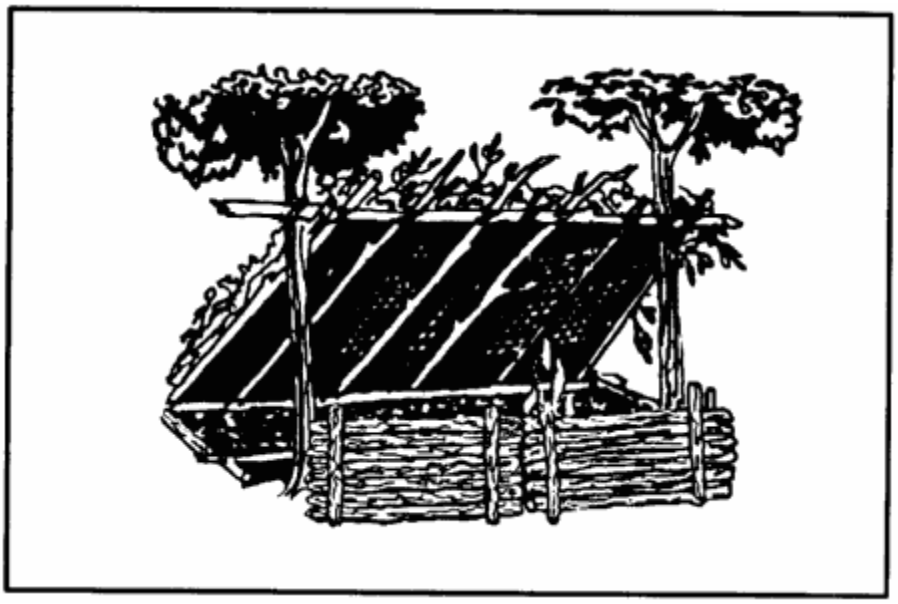


Figure 18 Field-expedient Lean-to and Fire Reflector

You will need two trees (or upright poles) about 2 meters apart; one pole about 2 meters long and 2.5 centimeters in diameter; five to eight poles about 3 meters long and 2.5 centimeters in diameter for beams; cord or vines for securing the horizontal support to the trees; and other poles, saplings, or vines to crisscross the beams.

To make this lean-to--

- Tie the 2-meter pole to the two trees at waist to chest height. This is the horizontal support. If a standing tree is not available, construct a biped using Y-shaped sticks or two tripods.
- Place one end of the beams (3-meter poles) on one side of the horizontal support. As with all lean-to type shelters, be sure to place the lean-to's backside into the wind.
- Crisscross saplings or vines on the beams.
- Cover the framework with brush, leaves, pine needles, or grass, starting at the bottom and working your way up like shingling.
- Place straw, leaves, pine needles, or grass inside the shelter for bedding.

In cold weather, add to your lean-to's comfort by building a fire reflector wall (Figure 18). Drive four 1.5-meter-long stakes into the ground to support the wall. Stack green logs on top of one another between the support stakes. Form two rows of stacked logs to create an inner space within the wall that you can fill with dirt. This action not only strengthens the wall but makes it more heat reflective. Bind the top of the support stakes so that the green logs and dirt will stay in place.

With just a little more effort you can have a drying rack. Cut a few 2-centimeter-diameter poles (length depends on the distance between the lean-to's horizontal support and the top of the fire reflector wall). Lay one end of the poles on the lean-to support and the other end on top of the reflector wall. Place and tie into place smaller sticks across these poles. You now have a place to dry clothes, meat, or fish.

Natural Shelters

Do not overlook natural formations that provide shelter. Examples are caves, rocky crevices, clumps of bushes, small depressions, large rocks on leeward sides of hills, large trees with low-hanging limbs, and fallen trees with thick branches. However, when selecting a natural formation--

- Stay away from low ground such as ravines, narrow valleys, or creek beds. Low areas collect the heavy cold air at night and are therefore colder than the surrounding high ground. Thick, brushy, low ground also harbors more insects.
- Check for poisonous snakes, ticks, mites, scorpions, and stinging ants.
- Look for loose rocks, dead limbs, coconuts, or other natural growth than could fall on your shelter.

Debris Hut

For warmth and ease of construction, this shelter is one of the best. When shelter is essential to survival, build this shelter.

- Build it by making a tripod with two short stakes and a long ridgepole or by placing one end of a long ridgepole on top of a sturdy base.
- Secure the ridgepole (pole running the length of the shelter) using the tripod method or by anchoring it to a tree at about waist height.
- Prop large sticks along both sides of the ridgepole to create a wedge-shaped ribbing effect. Ensure the ribbing is wide enough to accommodate your body and steep enough to shed moisture.
- Place finer sticks and brush crosswise on the ribbing. These form a latticework that will keep the insulating material (grass, pine needles, leaves) from falling through the ribbing into the sleeping area.
- Add light, dry, if possible, soft debris over the ribbing until the insulating material is at least 1 meter thick--the thicker the better.
- Place a 30-centimeter layer of insulating material inside the shelter.
- At the entrance, pile insulating material that you can drag to you once inside the shelter to close the entrance or build a door.
- As a final step in constructing this shelter, add shingling material or branches on top of the debris layer to prevent the insulating material from blowing away in a storm.

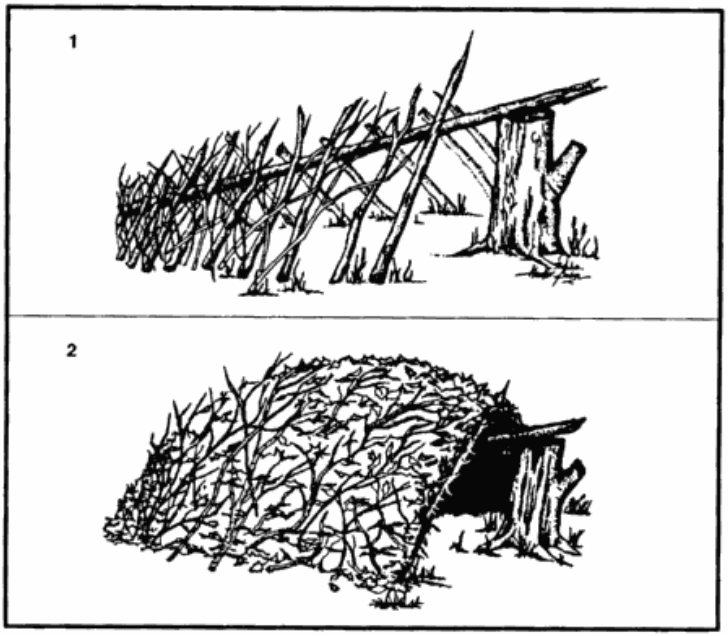


Figure 19 Debris Hut

Video 5 How to Construct a Debris Hut (Animal Man Survivor, 2018)

C4. Firecraft

In many survival situations, the ability to start a fire can make the difference between living and dying. Fire can fulfill many needs. It can provide warmth and comfort. It not only cooks and preserves food, it also provides warmth in the form of heated food that saves calories our body normally uses to produce body heat. You can use fire to purify water, sterilize bandages, signal for rescue, and provide protection from animals. It can be a psychological boost by providing peace of mind and companionship. You can also use fire to produce tools and weapons.

Fire can cause problems, as well. It can cause forest fires or destroy essential equipment. Fire can also cause burns and carbon monoxide poisoning when used in shelters.

BASIC FIRE PRINCIPLES

To build a fire, it helps to understand the basic principles of a fire. Fuel (in a nongaseous state) does not burn directly. When you apply heat to a fuel, it produces a gas. This gas, combined with oxygen in the air, burns.

Understanding the concept of the fire triangle is very important in correctly constructing and maintaining a fire. The three sides of the triangle represent *air, heat,* and *fuel.* If you remove any of these, the fire will go out. The correct ratio of these components is very important for a fire to burn at its greatest capability. The only way to learn this ratio is to practice.

SITE SELECTION AND PREPARATION

You will have to decide what site and arrangement to use. Before building a fire consider--

- The area (terrain and climate) in which you are operating.
- The materials and tools available.
- Time: how much time you have?
- Need: why you need a fire?

that--

- Is protected from the wind, rain or snow.
- Is suitably placed in relation to your shelter (if any).
- Will concentrate the heat in the direction you desire.
- Has a supply of wood or other fuel available. (See *Figure 20* for types of material you can use.)

If you are in a wooded or brush-covered area, clear the brush and scrape the surface soil from the spot you have selected. Clear a circle at least 1 meter in diameter so there is little chance of the fire spreading.

CAUTION
Do not use wet or porous rocks on the fire as they may explode when heated.

Tinder	Kindling	Fuel
• Birch bark • Shredded inner bark from cedar, chestnut, red elm trees • Fine wood shavings • Dead grass, ferns, moss, fungi • Straw • Sawdust • Very fine pitchwood scrapings • Dead evergreen needles • Punk (the completely rotted portions of dead logs or trees) • Evergreen tree knots • Bird down (fine feathers) • Down seed heads (milkweed, dry cattails, bulrush, or thistle) • Fine, dried vegetable fibers • Spongy threads of dead puffball • Dead palm leaves • Skinlike membrane lining bamboo • Lint from pocket and seams • Charred cloth • Waxed paper • Outer bamboo shavings • Gunpowder • Cotton • Lint	• Small twigs • Small strips of wood • Split wood • Heavy cardboard • Pieces of wood removed from the inside of larger pieces • Wood that has been doused with highly flammable materials, such as gasoline, oil, or wax	• Dry, standing wood and dry, dead branches • Dry inside (heart) of fallen tree trunks and large branches • Green wood that is finely split • Dry grasses twisted into bunches • Peat dry enough to burn (this may be found at the top of undercut banks) • Dried animal dung • Animal fats • Coal, oil shale, or oil lying on the surface

Figure 20 Materials for Building Fires

FIRE MATERIAL SELECTION

You need three types of materials (*Figure 20*) to build a fire--tinder, kindling, and fuel.

Tinder is dry material that ignites with little heat--a spark starts a fire. The tinder must be absolutely dry to be sure just a spark will ignite it. If you only have a device that generates sparks, charred cloth will be almost essential. It holds a spark for long periods, allowing you to put tinder on the hot area to generate a small flame. You can make charred cloth by heating cotton cloth until it turns black, but does not burn. Once it is black, you must keep it in an

airtight container to keep it dry. Prepare this cloth well in advance of any survival situation. Add it to your individual survival kit.

Kindling is readily combustible material that you add to the burning tinder. Again, this material should be absolutely dry to ensure rapid burning. Kindling increases the fire's temperature so that it will ignite less combustible material.

Video 6 How to Start a Fire ((7m:16s), 2018)

Fuel is less combustible material that burns slowly and steadily once ignited.

HOW TO BUILD A FIRE

There are several methods for laying a fire, each of which has advantages. The situation you find yourself in will determine which fire to use.

Tepee

To make this fire (*Figure 21*), arrange the tinder and a few sticks of kindling in the shape of a tepee or cone. Light the center. As the tepee burns, the outside logs will fall inward, feeding the fire. This type of fire burns well even with wet wood.

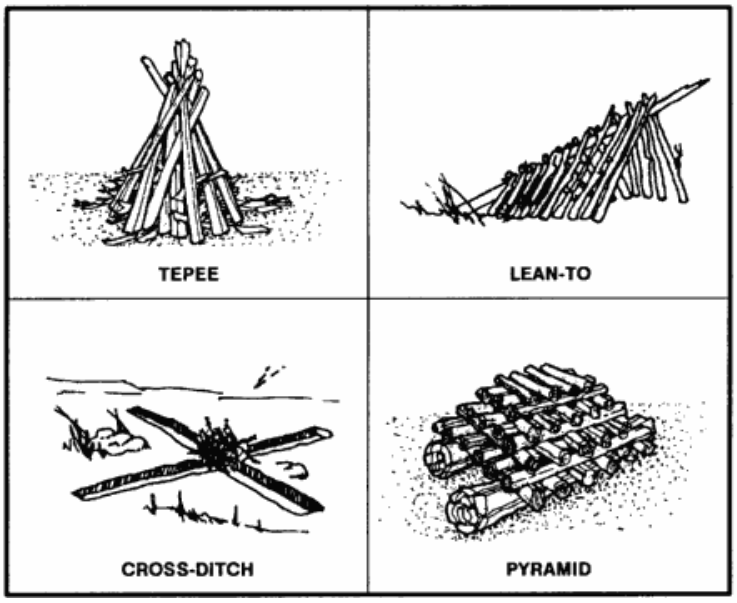


Figure 21 Methods for Layering Fires

Lean-To

To lay this fire (*Figure 21*), push a green stick into the ground at a 30-degree angle. Point the end of the stick in the direction of the wind. Place some tinder deep under this lean-to stick. Lean pieces of kindling against the lean-to stick. Light the tinder. As the kindling catches fire from the tinder, add more kindling.

Cross-Ditch

To use this method (*Figure 21*), scratch a cross about 30 centimeters in size in the ground. Dig the cross 7.5 centimeters deep. Put a large wad of tinder in the middle of the cross. Build a kindling pyramid above the tinder. The shallow ditch allows air to sweep under the tinder to provide a draft.

Pyramid

To lay this fire (*Figure 21*), place two small logs or branches parallel on the ground. Place a solid layer of small logs across the parallel logs. Add three or four more layers of logs or branches, each layer smaller than and at a right angle to the layer below it. Make a starter fire on top of the pyramid. As the starter fire burns, it will ignite the logs below it. This gives you a fire that burns downward, requiring no attention during the night.

There are several other ways to lay a fire that are quite effective. Your situation and the material available in the area may make another method more suitable

HOW TO LIGHT A FIRE

Always light your fire from the upwind side. Make sure to lay your tinder, kindling, and fuel so that your fire will burn as long as you need it. Igniters provide the initial heat required to start the tinder burning. They fall into two categories: modern methods and primitive methods.

Modern Methods

Modern igniters use modern devices--items we normally think of to start a fire. These include matches and lighters. There are also several other methods that you should be aware of to start a fire. Survival situations will always require you to use what is available.

The advanced section of this strand will cover primitive method fire starting. These methods are usually friction based, are very difficult to learn, and require a large output of calories. So before resorting to them, try to use easier methods covered in this section first.

Matches / Lighter

Make sure these matches are waterproof. Also, store them in a waterproof container along with a dependable striker pad. You should be able to start a fire with one match every time. Even if the fuel is spent in a lighter, the ignitor may produce enough spark to light your tinder.

Convex Lens / Fresnel Lens

Use this method only on bright, sunny days. The lens can come from binoculars, camera, telescopic sights, magnifying glasses, Fresnel lens, plastic water bottle, ziplock bag filled with water, even the bottom of a polished coke can. Angle the lens to concentrate the sun's rays on the tinder. Hold the lens over the same spot until the tinder begins to smolder. Note dark colored tinder or paper are best for absorbing the suns rays and will ignite much faster than light or white coloring. Gently blow or fan the tinder into flame and apply it to the fire lay.

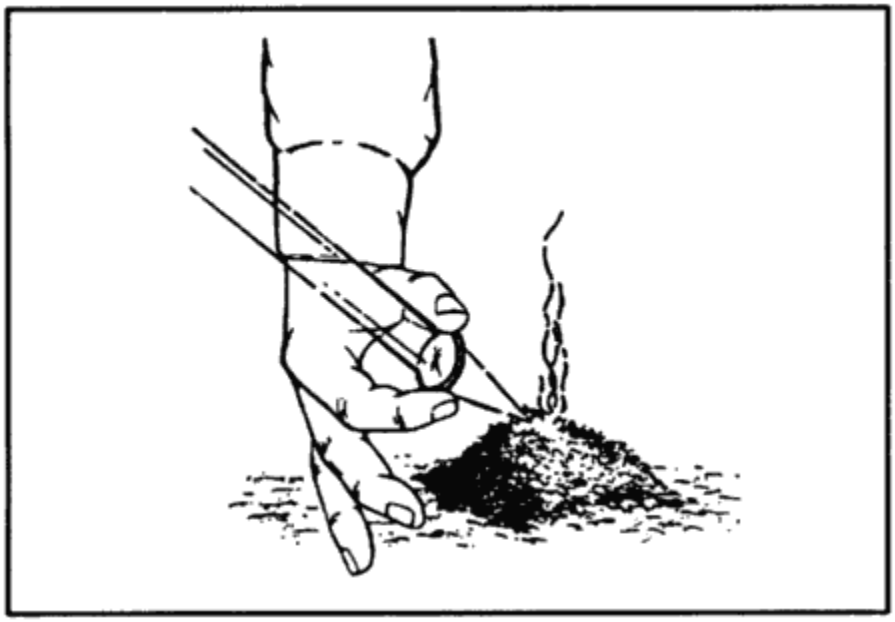


Figure 22 Lens Method

Metal Match

Place a flat, dry leaf under your tinder with a portion exposed. Place the tip of the metal match on the dry leaf, holding the metal match in one hand and a knife in the other. Scrape your knife against the metal match to produce sparks. The sparks will hit the tinder. When the tinder starts to smolder, proceed as above.

Video 7 Fire with a Battery/Gum Wrapper ((1m:17s), 2018)

Battery

Use a battery to generate a spark. Use of this method depends on the type of battery available. Attach a wire to each terminal. Touch the ends of the bare wires together next to the tinder so the sparks will ignite it.

This can also be done with steel wool connected to a 9-volt battery, or a gum wrapper connected to a AA battery.

Gunpowder

Often, you will have ammunition with your equipment. If so, carefully extract the bullet from the shell casing, and use the gunpowder as tinder. A spark will ignite the powder. Be extremely careful when extracting the bullet from the case.

Primitive Methods

Primitive igniters are those attributed to our early ancestors.

Flint and Steel

The direct spark method is the easiest of the primitive methods to use. The flint and steel method is the most reliable of the direct spark methods. Strike a flint or other hard, sharp-edged rock edge with a piece of carbon steel (stainless steel will not produce a good spark). This method requires a loose-jointed wrist and practice. When a spark has caught in the tinder, blow on it. The spark will spread and burst into flames.

Other primitive methods will be covered in advanced survival.

C5. Food Procurement

After water, man's most urgent requirement is food. In contemplating virtually any hypothetical survival situation, the mind immediately turns to thoughts of food. Unless the situation occurs in an arid environment, even water, which is more important to maintaining body functions, will almost always follow food in our initial thoughts. The survivor must remember that the three essentials of survival--water, food, and shelter--are prioritized according to the estimate of the actual situation. This estimate must not only be timely but accurate as well. Some situations may well dictate that shelter precede both food and water.

Animals for Food

Unless you have the chance to take large game, concentrate your efforts on the smaller animals, due to their abundance. The smaller animal species are also easier to prepare. You must not know all the animal species that are suitable as food. Relatively few are poisonous, and they make a smaller list to remember. What is important is to learn the habits and behavioral patterns of classes of animals. For example, animals that are excellent choices for trapping, those that inhabit a particular range and occupy a den or nest, those that have somewhat fixed feeding areas, and those that have trails leading from one area to another. Larger, herding animals, such as elk or caribou, roam vast areas and are somewhat more difficult to trap. Also, you must understand the food choices of a particular species.

You can, with relatively few exceptions, eat anything that crawls, swims, walks, or flies. The first obstacle is overcoming your natural aversion to a particular food source. Historically, people in starvation situations have resorted to eating everything imaginable for nourishment. A person who ignores an otherwise healthy food source due to a personal bias, or because he feels it is unappetizing, is risking his own survival. Although it may prove difficult at first, a survivor must eat what is available to maintain his health.

Insects

The most abundant life-form on earth, insects are easily caught. Insects provide 65 to 80 percent protein compared to 20 percent for beef. This fact makes insects an important, if not overly appetizing, food source. Insects to avoid include all adults that sting or bite, hairy or brightly colored insects, and caterpillars and insects that have a pungent odor. Also avoid spiders and common disease carriers such as ticks, flies, and mosquitoes.

Video 8 Tips to Eating Insects for Survival (Survival Times (1m:35s), 2017)

Rotting logs lying on the ground are excellent places to look for a variety of insects including ants, termites, beetles, and grubs, which are beetle larvae. Do not overlook insect nests on or in the ground. Grassy areas, such as fields, are good areas to search because the insects are easily seen. Stones, boards, or other materials lying on the ground

Caution: Insects such as beetles and grasshoppers that have a hard, outer-shell will have parasites. Cook them before eating. Remove any wings and barbed legs also.

provide the insects with good nesting sites. Check these sites. Insect larvae are also edible. You can eat most insects raw.

The taste varies from one species to another. Wood grubs are bland, while some species of ants store honey in their bodies, giving them a sweet taste. You can grind a collection of insects into a paste. You can mix them with edible vegetation. You can cook them to improve their taste.

Worms

Worms (*Annelidea*) are an excellent protein source. Dig for them in damp humus soil or watch for them on the ground after a rain. After capturing them, drop them into clean, potable water for a few minutes. The worms will naturally purge or wash themselves out, after which you can eat them raw.

Figure 23 Eating Worms

Crustaceans

Freshwater shrimp range in size from 0.25 centimeter up to 2.5 centimeters. They can form rather large colonies in mats of floating algae or in mud bottoms of ponds and lakes.

Crayfish are akin to marine lobsters and crabs. You can distinguish them by their hard exoskeleton and five pairs of legs, the front pair having oversized pincers. Crayfish are active at night, but you can locate them in the daytime by looking under and around stones in streams. You can also find them by looking in the soft mud near the chimneylike breathing holes of their nests. You can catch crayfish by tying bits of offal or internal organs to a string. When the crayfish grabs the bait, pull it to shore before it has a chance to release the bait.

Figure 24 Crayfish

You find saltwater lobsters, crabs, and shrimp from the surf's edge out to water 10 meters deep. Shrimp may come to a light at night where you can scoop them up with a net. You can catch lobsters and crabs with a baited trap or a baited hook. Crabs will come to bait placed at the edge of the surf, where you can trap or net them. Lobsters and crabs are nocturnal and caught best at night.

Mollusks

This class includes octopuses and freshwater and saltwater shellfish such as snails, clams, mussels, bivalves, barnacles, periwinkles, chitons, and sea urchins (*Figure 25*). You find bivalves similar to our freshwater mussel and terrestrial and aquatic snails worldwide under all water conditions.

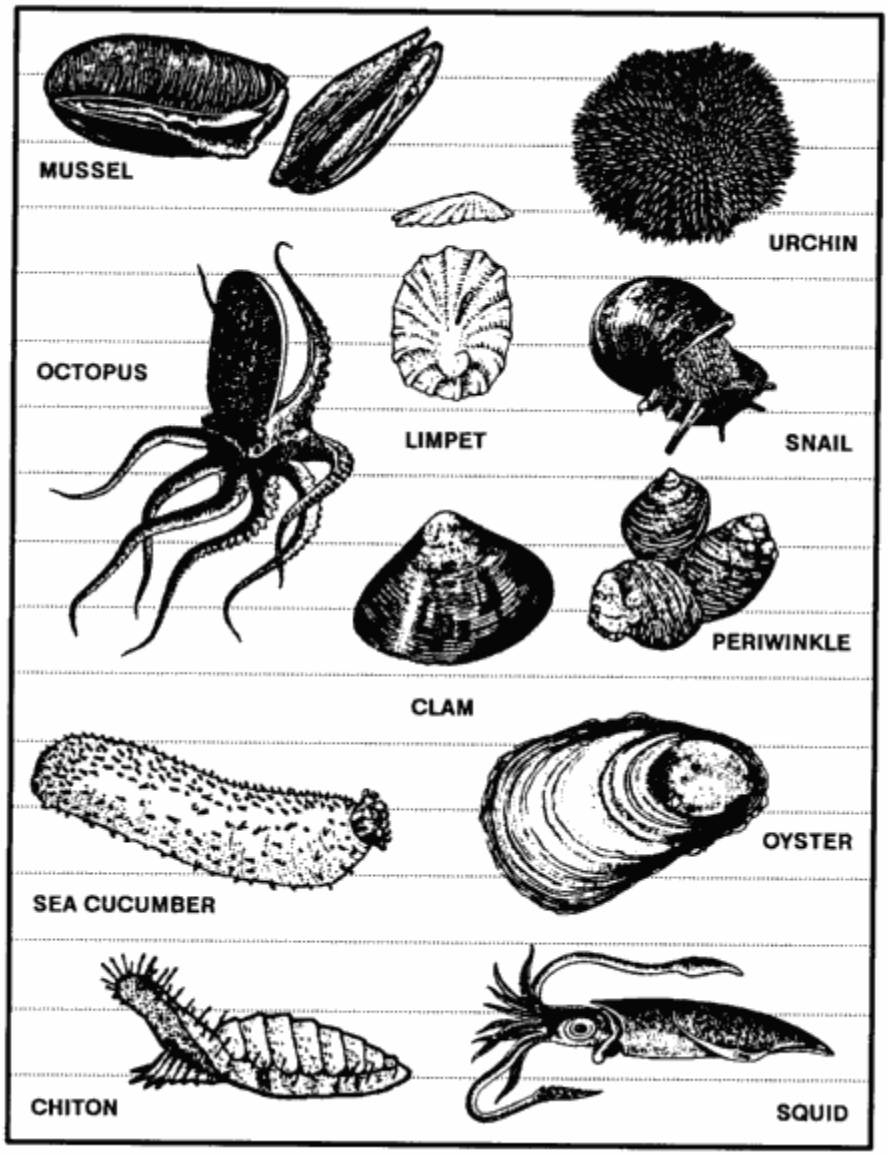


Figure 25 Edible Mollusks

River snails or freshwater periwinkles are plentiful in rivers, streams, and lakes of northern coniferous forests. These snails may be pencil point or globular in shape.

In fresh water, look for mollusks in the shallows, especially in water with a sandy or muddy bottom. Look for the narrow trails they leave in the mud or for the dark elliptical slit of their open valves.

Near the sea, look in the tidal pools and the wet sand. Rocks along beaches or extending as reefs into deeper water often bear clinging shellfish. Snails and limpets cling to rocks and seaweed from the low water mark upward. Large snails, called chitons, adhere tightly to rocks above the surf line.

Mussels usually form dense colonies in rock pools, on logs, or at the base of boulders.

Steam, boil, or bake mollusks in the shell. They make excellent stews in combination with greens and tubers.

CAUTION
Do not eat shellfish that are not covered by water at high tide!

Fish

Fish represent a good source of protein and fat. They offer some distinct advantages to the survivor or evader. They are usually more abundant than mammal wildlife, and the ways to get them are silent. To be successful at catching fish, you must know their habits. For instance, fish tend to feed heavily before a storm. Fish are not likely to feed after a storm when the water is muddy and swollen. Light often attracts fish at night. When there is a heavy current, fish will rest in places where there is an eddy, such as near rocks. Fish will also gather where there are deep pools, under overhanging brush, and in and around submerged foliage, logs, or other objects that offer them shelter.

There are no poisonous freshwater fish. However, the catfish species has sharp, needlelike protrusions on its dorsal fins. These can inflict painful puncture wounds that quickly become infected.

Cook all freshwater fish to kill parasites. Also cook saltwater fish caught within a reef or within the influence of a freshwater source as a precaution. Any marine life obtained farther out in the sea will not contain parasites because of the saltwater environment. You can eat these raw.

Certain saltwater species of fish have poisonous flesh. In some species the poison occurs seasonally in others, it is permanent. Examples of poisonous saltwater fish are the porcupine fish, triggerfish, cowfish, thorn fish, oilfish, red snapper, jack, and puffer (*Figure 26*). The barracuda, while not actually poisonous itself, may transmit ciguatera (fish poisoning) if eaten raw.

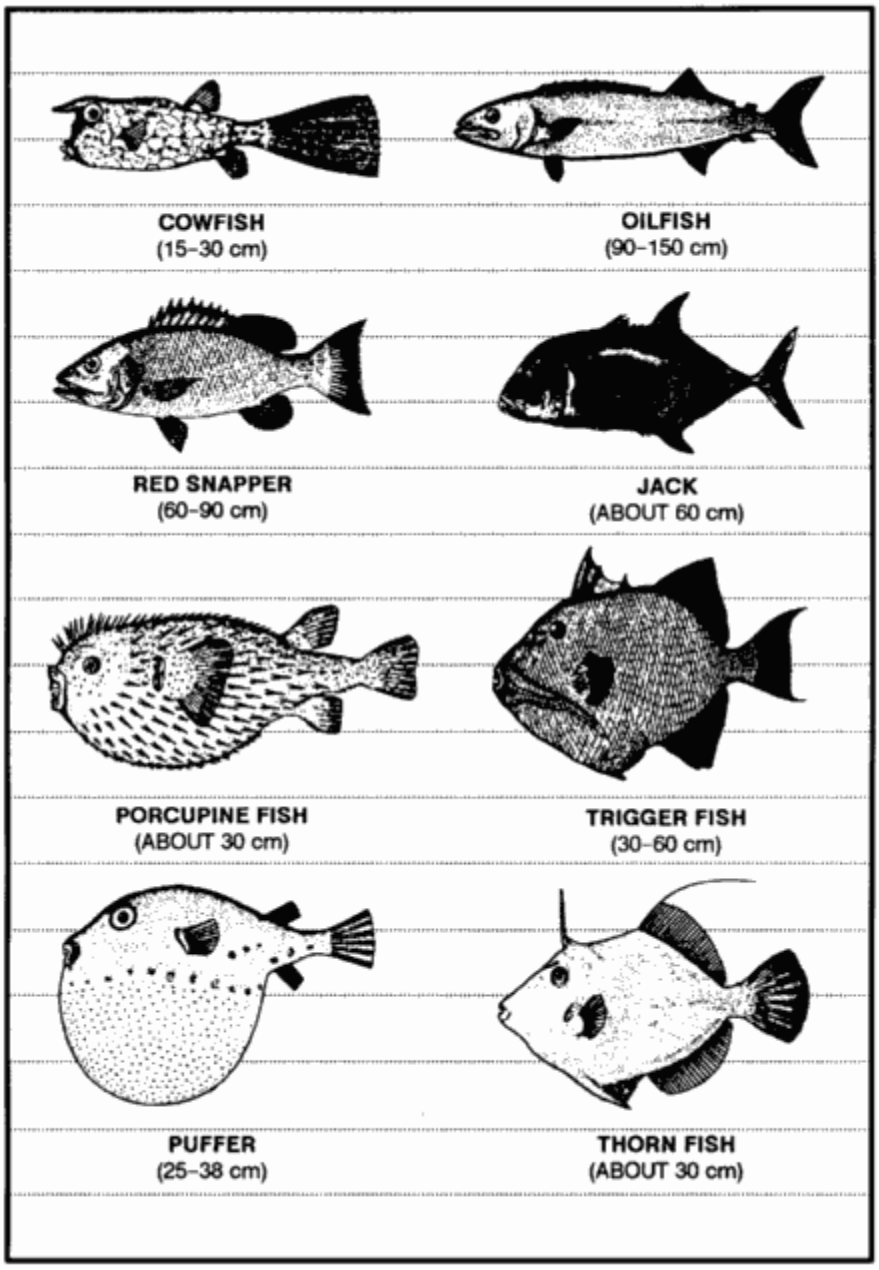


Figure 26 Fish with Poisonous Flesh

Frogs

Frogs are easily found around bodies of fresh water. Frogs seldom move from the safety of the water's edge. At the first sign of danger, they plunge into the water and bury themselves in the mud and debris. There are few poisonous species of frogs. Avoid any brightly colored frog or one that has a distinct "X" mark on it's back. Do not confuse toads with frogs. You normally find

toads in drier environments. Several species of toads secrete a poisonous substance through their skin as a defense against attack. Therefore, to avoid poisoning, do not handle or eat toads.

Reptiles

Reptiles are a good protein source and relatively easy to catch. You should cook them, but in an emergency, you can eat them raw. Their raw flesh may transmit parasites, but because reptiles are cold-blooded, they do not carry the blood diseases of the warm-blooded animals.

The box turtle is a commonly encountered turtle that you should not eat. It feeds on poisonous mushrooms and may build up a highly toxic poison in its flesh. Cooking does not destroy this toxin. Avoid the hawksbill turtle, found in the Atlantic Ocean, because of its poisonous thorax gland. Poisonous snakes, alligators, crocodiles, and large sea turtles present obvious hazards to the survivor.

Birds

All species of birds are edible, although the flavor will vary considerably. You may skin fish-eating birds to improve their taste. As with any wild animal, you must understand birds' common habits to have a realistic chance of capturing them. You can take pigeons, as well as some other species, from their roost at night by hand. During the nesting season, some species will not leave the nest even when approached. Knowing where and when the birds nest makes catching them easier (*Figure 27*). Birds tend to have regular flyways going from the roost to a feeding area, to water, and so forth. Careful observation should reveal where these flyways are and indicate good areas for catching birds in nets stretched across the flyways (*Figure 28*). Roosting sites and waterholes are some of the most promising areas for trapping or snaring.

Types of Birds	Frequent Nesting Places	Nesting Periods
Inland birds	Trees, woods, or fields	Spring and early summer in temperate and arctic regions; year round in the tropics
Cranes and herons	Mangrove swamps or high trees near water	Spring and early summer
Some species of owls	High trees	Late December through March
Ducks, geese, and swans	Tundra areas near ponds, rivers, or lakes	Spring and early summer in arctic regions
Some sea birds	Sandbars or low sand islands	Spring and early summer in temperate and arctic regions
Gulls, auks, murres, and cormorants	Steep rocky coasts	Spring and early summer in temperate and arctic regions

Figure 27 Bird Nesting Places

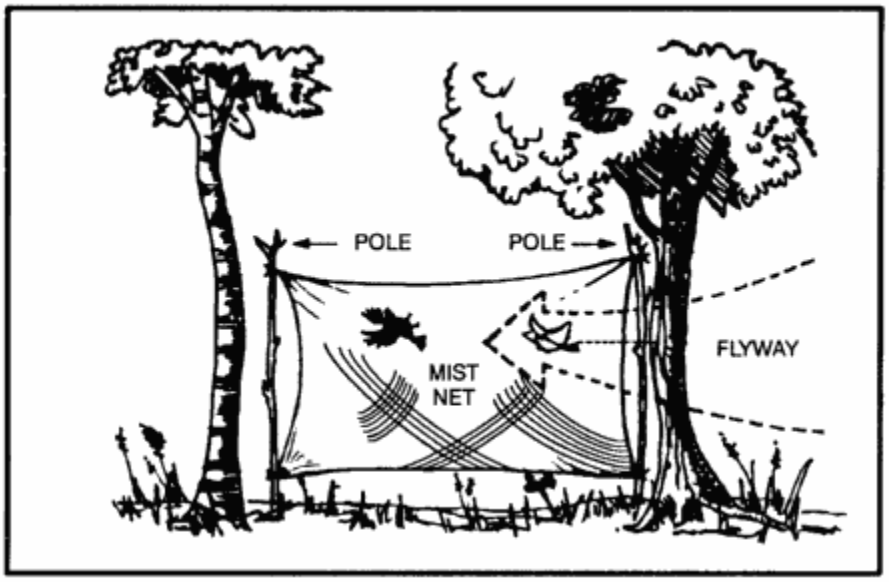


Figure 28 Catching Birds in a Net

Nesting birds present another food source--eggs. Remove all but two or three eggs from the clutch, marking the ones that you leave. The bird will continue to lay more eggs to fill the clutch. Continue removing the fresh eggs, leaving the ones you marked.

Mammals

Mammals are excellent protein sources and, for Americans, the most tasty food source. There are some drawbacks to obtaining mammals. The amount of injury an animal can inflict is in direct proportion to its size. All mammals have teeth and nearly all will bite in self-defense. Even a squirrel can inflict a serious wound and any bite presents a serious risk of infection. Also, a mother can be extremely aggressive in defense of her young. Any animal with no route of escape will fight when cornered.

All mammals are edible; however, the polar bear and bearded seal have toxic levels of vitamin A in their livers. Scavenging mammals, such as the opossum, may carry diseases.

Preparation of Fish and Game

You must know how to prepare fish and game for cooking and storage in a survival situation. Improper cleaning or storage can result in inedible fish or game.

Fish

Do not eat fish that appears spoiled. Cooking does not ensure that spoiled fish will be edible. Signs of spoilage are—

- Sunken eyes.
- Peculiar odor.
- Suspicious color. (Gills should be red to pink. Scales should be a pronounced shade of gray, not faded.)
- Dents stay in the fish's flesh after pressing it with your thumb.
- Slimy, rather than moist or wet body.
- Sharp or peppery taste.

Eating spoiled or rotten fish may cause diarrhea, nausea, cramps, vomiting, itching, paralysis, or a metallic taste in the mouth. These symptoms appear suddenly, one to six hours after eating. Induce vomiting if symptoms appear.

Fish spoils quickly after death, especially on a hot day. Prepare fish for eating as soon as possible after catching it. Cut out the gills and large blood vessels that lie near the spine. Gut fish that is more than 10 centimeters long. Scale or skin the fish.

You can impale a whole fish on a stick and cook it over an open fire. However, boiling the fish with the skin on is the best way to get the most food value. The fats and oil are under the skin and, by boiling, you can save the juices for broth. You can use any of the methods used to cook plant food to cook fish. Pack fish into a ball of clay and bury it in the coals of a fire until the clay hardens. Break open the clay ball to get to the cooked fish. Fish is done when the meat flakes

off. If you plan to keep the fish for later, smoke or fry it. To prepare fish for smoking, cut off the head and remove the backbone.

Snakes

To skin a snake, first cut off its head and bury it. Then cut the skin down the body 15 to 20 centimeters (*Figure 29*). Peel the skin back, then grasp the skin in one hand and the body in the other and pull apart. On large, bulky snakes it may be necessary to slit the belly skin. Cook snakes in the same manner as small game. Remove the entrails and discard. Cut the snake into small sections and boil or roast it.

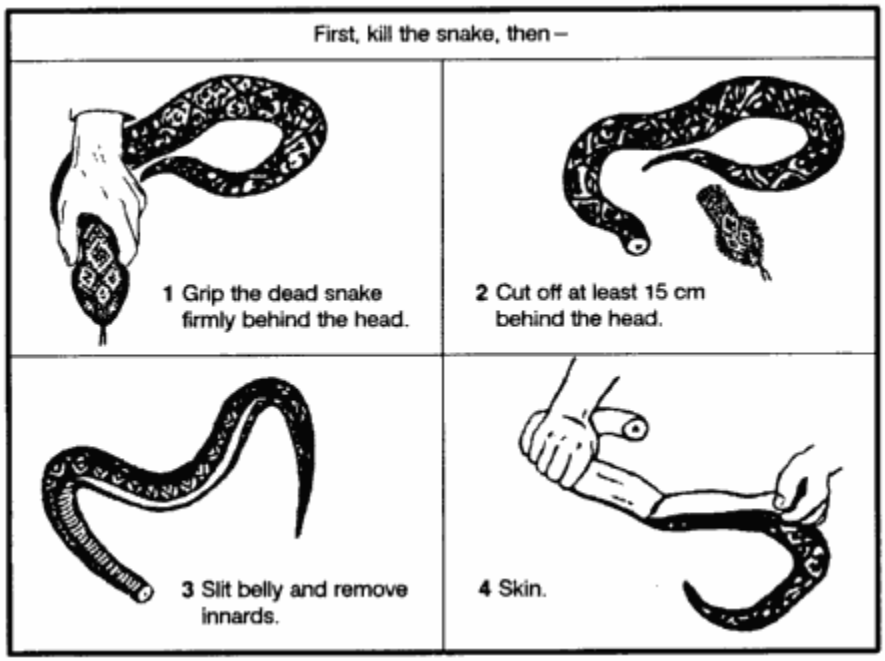


Figure 29 Cleaning a Snake

Birds

After killing the bird, remove its feathers by either plucking or skinning. Remember, skinning removes a layer of fat that is very high in calories. Open up the body cavity and remove its entrails, saving the craw (in seed-eating birds), heart, and liver. Cut off the feet. Cook by boiling or roasting over a spit. Before cooking scavenger birds, boil them at least 20 minutes to kill parasites.

Skinning and Butchering Game

Killing an animal: Bleed the animal by cutting its throat. If possible, clean the carcass near a stream. Place the carcass belly up and split the hide from throat to tail, cutting around all sexual organs (*Figure 30*). Remove the musk glands at points A and B to avoid tainting the meat. For

smaller mammals, cut the hide around the body and insert two fingers under the hide on both sides of the cut and pull both pieces off (*Figure 31*).

Note: When cutting the hide, insert the knife blade under the skin and turn the blade up so that only the hide gets cut. This will also prevent cutting hair and getting it on the meat.

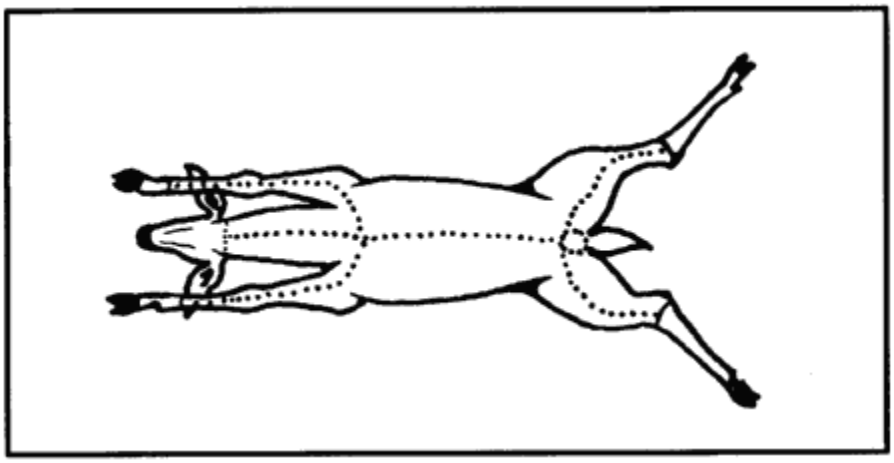


Figure 30 Skinning and Butchering Large Game

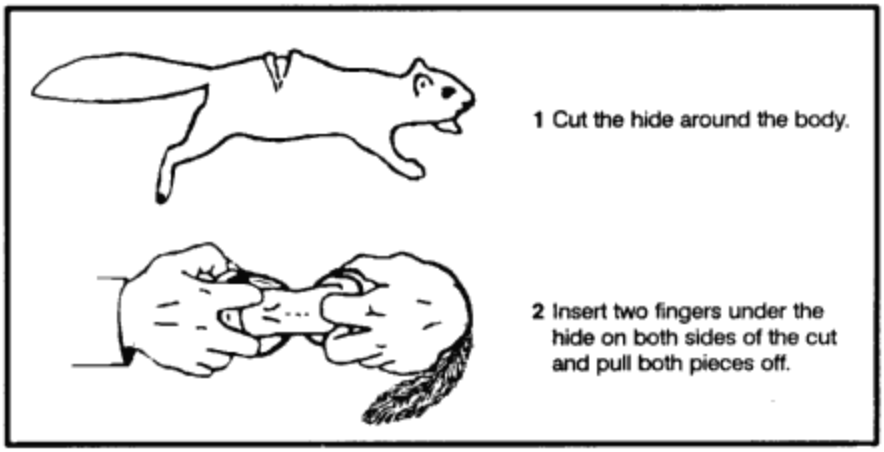


Figure 31 Skinning Small Game

Remove the entrails from smaller game by splitting the body open and pulling them out with the fingers. Do not forget the chest cavity. For larger game, cut the gullet away from the diaphragm. Roll the entrails out of the body. Cut around the anus, then reach into the lower abdominal cavity, grasp the lower intestine, and pull to remove. Remove the urine bladder by pinching it off and cutting it below the fingers. If you spill urine on the meat, wash it to avoid tainting the meat. Save the heart and liver. Cut these open and inspect for signs of worms or

other parasites. Also inspect the liver's color; it could indicate a diseased animal. The liver's surface should be smooth and wet and its color deep red or purple. If the liver appears diseased, discard it. However, a diseased liver does not indicate you cannot eat the muscle tissue.

Cut along each leg from above the foot to the previously made body cut. Remove the hide by pulling it away from the carcass, cutting the connective tissue where necessary. Cut off the head and feet.

Cut larger game into manageable pieces. First, slice the muscle tissue connecting the front legs to the body. There are no bones or joints connecting the front legs to the body on four-legged animals. Cut the hindquarters off where they join the body. You must cut around a large bone at the top of the leg and cut to the ball and socket hip joint. Cut the ligaments around the joint and bend it back to separate it. Remove the large muscles (the tenderloin) that lie on either side of the spine. Separate the ribs from the backbone. There is less work and less wear on your knife if you break the ribs first, then cut through the breaks.

Cook large meat pieces over a spit or boil them. You can stew or boil smaller pieces, particularly those that remain attached to bone after the initial butchering, as soup or broth. You can cook body organs such as the heart, liver, pancreas, spleen, and kidneys using the same methods as for muscle meat. You can also cook and eat the brain. Cut the tongue out, skin it, boil it until tender, and eat it.

C6. Traps and Snares

For an unarmed survivor trapping or snaring wild game is a good alternative. Several well-placed traps have the potential to catch much more game than a person with a rifle is likely to shoot. To be effective with any type of trap or snare, you must--

- Be familiar with the species of animal you intend to catch.
- Be capable of constructing a proper trap.
- Not alarm the prey by leaving signs of your presence.

There are no catchall traps you can set for all animals. You must determine what species are in a given area and set your traps specifically with those animals in mind. Look for the following:

- Runs and trails.
- Tracks.
- Droppings.
- Chewed or rubbed vegetation.
- Nesting or roosting sites.
- Feeding and watering areas.

Position your traps and snares where there is proof that animals pass through. You must determine if it is a "run" or a "trail." A trail will show signs of use by several species and will be rather distinct. A run is usually smaller and less distinct and will only contain signs of one species. You may construct a perfect snare, but it will not catch anything if haphazardly placed in the woods. Animals have bedding areas, waterholes, and feeding areas with trails leading from one to another. You must place snares and traps around these areas to be effective.

When setting the trap, do not create a disturbance that will alarm the animal and cause it to avoid the trap. Therefore, if you must dig, remove all fresh dirt from the area. Most animals will instinctively avoid a pitfall-type trap. Prepare the various parts of a trap or snare away from the site, carry them in, and set them up. Such actions make it easier to avoid disturbing the local vegetation, thereby alerting the prey. Do not use freshly cut, live vegetation to construct a trap or snare. Freshly cut vegetation will "bleed" sap that has an odor the prey will be able to smell. It is an alarm signal to the animal.

You must remove or mask the human scent on and around the trap you set. Although birds do not have a developed sense of smell, nearly all mammals depend on smell even more than on sight. Even the slightest human scent on a trap will alarm the prey and cause it to avoid the area. Actually removing the scent from a trap is difficult but masking it is relatively easy. Use the fluid from the gall and urine bladders of previous kills. Do not use human urine. Mud, particularly from an area with plenty of rotting vegetation, is also good. Use it to coat your hands when handling the trap and to coat the trap when setting it. In nearly all parts of the world, animals know the smell of burned vegetation and smoke. It is only when a fire is actually burning that they become alarmed. Therefore, smoking the trap parts is an effective means to mask your scent. If one of the above techniques is not practical, and if time permits, allow a trap to weather for a few days and then set it. Do not handle a trap while it is weathering. When you position the trap, camouflage it as naturally as possible to prevent detection by the enemy and to avoid alarming the prey.

Traps or snares placed on a trail or run should use channelization. To build a channel, construct a funnel-shaped barrier extending from the sides of the trail toward the trap, with the narrowest part nearest the trap. Channelization should be inconspicuous to avoid alerting the prey. As the animal gets to the trap, it cannot turn left or right and continues into the trap. Few wild animals will back up, preferring to face the direction of travel. Channelization does not have to be an impassable barrier. You only have to make it inconvenient for the animal to go over or through the barrier. For best effect, the channelization should reduce the trail's width to just slightly wider than the targeted animal's body. Maintain this constriction at least as far back from the trap as the animal's body length, then begin the widening toward the mouth of the funnel.

Use of Bait

Baiting a trap or snare increases your chances of catching an animal. When catching fish, you must bait nearly all the devices. Success with an unbaited trap depends on its placement in a good location. A baited trap can actually draw animals to it. The bait should be something the animal knows. This bait, however, should not be so readily available in the immediate area that the animal can get it close by. For example, baiting a trap with corn in the middle of a corn field would not be likely to work. Likewise, if corn is not grown in the region, a corn-baited trap may arouse an animal's curiosity and keep it alerted while it ponders the strange food. Under such circumstances it may not go for the bait. One bait that works well on small mammals is the peanut butter from a meal, ready-to-eat (MRE) ration. Salt is also a good bait. When using such baits, scatter bits of it around the trap to give the prey a chance to sample it and develop a craving for it. The animal will then overcome some of its caution before it gets to the trap.

If you set and bait a trap for one species but another species takes the bait without being caught, try to determine what the animal was. Then set a proper trap for that animal, using the same bait.

Note: Once you have successfully trapped an animal, you will not only gain confidence in your ability, you also will have resupplied yourself with bait for several more traps.

Trap and Snare Construction

Traps and snares *crush, choke, hang,* or *entangle* the prey. A single trap or snare will commonly incorporate two or more of these principles. The mechanisms that provide power to the trap are almost always very simple. The struggling victim, the force of gravity, or a bent sapling's tension provides the power.

The heart of any trap or snare is the trigger. When planning a trap or snare, ask yourself how it should affect the prey, what is the source of power, and what will be the most efficient trigger. Your answers will help you devise a specific trap for a specific species. Traps are designed to catch and hold or to catch and kill. Snares are traps that incorporate a noose to accomplish either function.

Simple Snare

A simple snare (*Figure 32*) consists of a noose placed over a trail or den hole and attached to a firmly planted stake. If the noose is some type of cordage placed upright on a game trail, use small twigs or blades of grass to hold it up. Filaments from spider webs are excellent for holding nooses open. Make sure the noose is large enough to pass freely over the animal's head. As the animal continues to move, the noose tightens around its neck. The more the animal struggles, the tighter the noose gets. This type of snare usually does not kill the animal. If you use cordage, it may loosen enough to slip off the animal's neck. Wire is therefore the best choice for a simple snare.

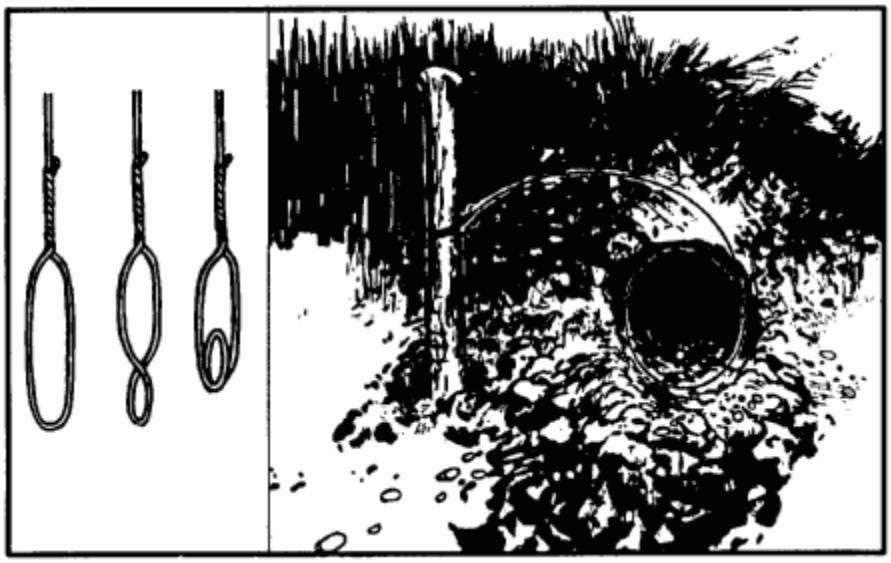


Figure 32 Simple Snare

Figure 4 Deadfall

The figure 4 is a trigger used to drop a weight onto a prey and crush it (*Figure 33*). The type of weight used may vary, but it should be heavy enough to kill or incapacitate the prey immediately. Construct the figure 4 using three notched sticks. These notches hold the sticks together in a figure 4 pattern when under tension. Practice making this trigger before-hand; it requires close tolerances and precise angles in its construction.

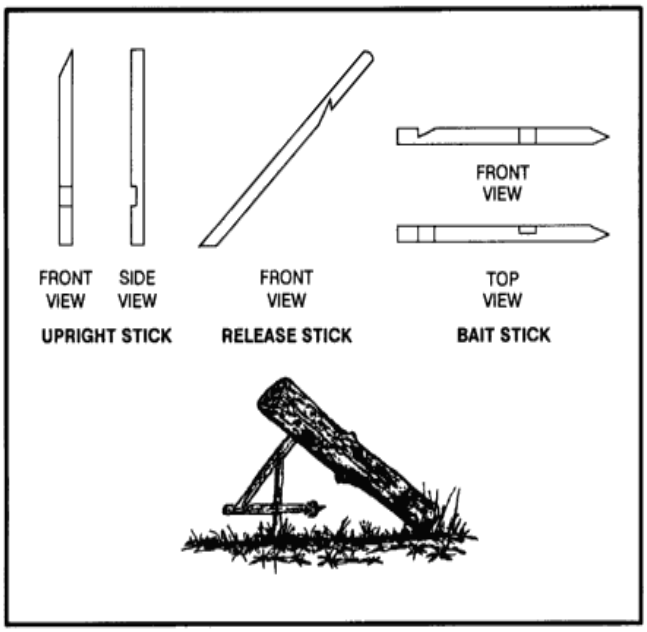


Figure 33 Figure 4 Deadfall

C7. Tools

Knife

Safety

Video 9 Knife Safety ((1m:23s), 2017)

Sharpening

In a survival situation your knife sharp is critical. Here's a way to sharpen a knife with just rocks:

Figure 34 Sharpen a Knife with Rocks (Kullcraven Bushcraft & Survival (3m:58s), 2017)

Killing Devices

There are several killing devices that you can construct to help you obtain small game to help you survive. The rabbit stick and spear are two basic tools you should be able to make or acquire.

Rabbit Stick

One of the simplest and most effective killing devices is a stout stick as long as your arm, from fingertip to shoulder, called a "rabbit stick." You can throw it either overhand or sidearm and with considerable force. It is very effective against small game that stops and freezes as a defense.

Spear

You can make a spear to kill small game and to fish. Jab with the spear, do not throw it. See spearfishing below.

Spearfishing

If you are near shallow water (about waist deep) where the fish are large and plentiful, you can spear them. To make a spear, cut a long, straight sapling (*Figure 35*). Sharpen the end to a point or attach a knife, jagged piece of bone, or sharpened metal. You can also make a spear by splitting the shaft a few inches down from the end and inserting a piece of wood to act as a spreader. You then sharpen the two separated halves to points. To spear fish, find an area where fish either gather or where there is a fish run. Place the spear point into the water and slowly move it toward the fish. Then, with a sudden push, impale the fish on the stream bottom. Do not try to lift the fish with the spear, as it with probably slip off and you will lose it; hold the spear with one hand and grab and hold the fish with the other. Do not throw the spear, especially if the point is a knife. You cannot afford to lose a knife in a survival situation. Be alert to the problems caused by light refraction when looking at objects in the water.

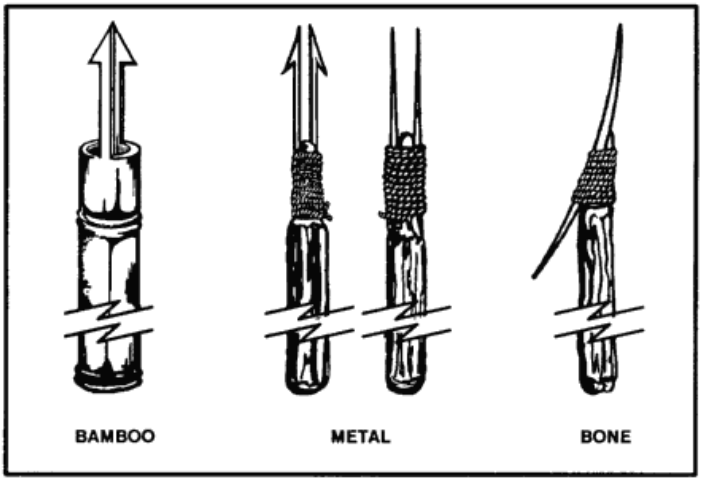


Figure 35 Types of Spear Points

C8. Survival Use of Plants

After having solved the problems of finding water, shelter, and animal food, you will have to consider the use of plants you can eat. In a survival situation you should always be on the lookout for familiar wild foods and live off the land whenever possible.

You must not count on being able to go for days without food as some sources would suggest. Even in the most static survival situation, maintaining health through a complete and nutritious diet is essential to maintaining strength and peace of mind.

Nature can provide you with food that will let you survive any ordeal, if you don't eat the wrong plant. You must therefore learn as much as possible beforehand about the flora of the region where you will be operating. Plants can provide you with medicines in a survival situation. Plants can supply you with weapons and raw materials to construct shelters and build fires. Plants can even provide you with chemicals for poisoning fish, preserving animal hides, and for camouflaging yourself and your equipment.

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EDIBILITY OF PLANTS

Plants are valuable sources of food because they are widely available, easily procured, and, in the proper combinations, can meet all your nutritional needs.

WARNING

The critical factor in using plants for food is to avoid accidental poisoning. Eat only those plants you can positively identify, and you know are safe to eat.

Absolutely identify plants before using them as food. Poison hemlock has killed people who mistook it for its relatives, wild carrots and wild parsnips.

At times you may find yourself in a situation for which you could not plan. In this instance you may not have had the chance to learn the plant life of the region in which you must survive. In this case you can use the Universal Edibility Test to determine which plants you can eat and those to avoid.

Video 10 Overview of Universal Edibility Test (Peak Survival (2m:27s), 2010)

It is important to be able to recognize both cultivated and wild edible plants in a survival situation. Most of the information in this chapter is directed towards identifying wild plants because information relating to cultivated plants is more readily available.

Remember the following when collecting wild plants for food:

- ✓ Plants growing near homes and occupied buildings or along roadsides may have been sprayed with pesticides. Wash them thoroughly. In more highly developed countries with many automobiles, avoid roadside plants, if possible, due to contamination from exhaust emissions.
- ✓ Plants growing in contaminated water or in water containing *Giardia lamblia* and other parasites are contaminated themselves. Boil or disinfect them.
- ✓ Some plants develop extremely dangerous fungal toxins. To lessen the chance of accidental poisoning, do not eat any fruit that is starting to spoil or showing signs of mildew or fungus.
- ✓ Plants of the same species may differ in their toxic or subtoxic compounds content because of genetic or environmental factors. One example of this is the foliage of the common chokecherry. Some chokecherry plants have high concentrations of deadly cyanide compounds while others have low concentrations or none. Horses have died

from eating wilted wild cherry leaves. Avoid any weed, leaves, or seeds with an almond-like scent, a characteristic of the cyanide compounds.

- ✓ Some people are more susceptible to gastric distress (from plants) than others. If you are sensitive in this way, avoid unknown wild plants. If you are extremely sensitive to poison ivy, avoid products from this family, including any parts from sumacs, mangoes, and cashews.
- ✓ Some edible wild plants, such as acorns and water lily rhizomes, are bitter. These bitter substances, usually tannin compounds, make them unpalatable. Boiling them in several changes of water will usually remove these bitter properties.
- ✓ Many valuable wild plants have high concentrations of oxalate compounds, also known as oxalic acid. Oxalates produce a sharp burning sensation in your mouth and throat and damage the kidneys. Baking, roasting, or drying usually destroys these oxalate crystals. The corm (bulb) of the jack-in-the-pulpit is known as the "Indian turnip," but you can eat it only after removing these crystals by slow baking or by drying.

WARNING

Do not eat mushrooms in a survival situation! The only way to tell if a mushroom is edible is by positive identification. There is no room for experimentation. Symptoms of the most dangerous mushrooms affecting the central nervous system may show up after several days have passed when it is too late to reverse their effects.

Best Edible Plants in California

Yucca

Flowers that have opened in the previous 2-3 days are edible and sweet. The sword-like leaves can be used for cordage and the root makes a good soap.

Figure 37 Yucca (Century Plant)

Figure 36 Black Sage

Black Sage

Fl ip over the seed pods to pour out some edible seeds. The aromatic leaves can also be boiled for tea.

Cattail

Stalks, shoots, rhizomes, and even the flower-heads can be eaten. Should be cooked to prevent water-borne contamination since these plants grow in water.

Figure 38 Cattail

Figure 39 Native Grasses

Native Grasses

99% of grasses are edible. The seed heads have the most nutrients. However, this image shows foxtails late in the season that have dried out and have a sharp needle-like point on them that should not be eaten, ever. They will get stuck in the esophagus/gut and can require surgery to remove.

Learn as much as possible about plants you intend to use for food and their unique characteristics. Some plants have both edible and poisonous parts. Many are edible only at certain times of the year. Others may have poisonous relatives that look very similar to the ones you can eat or use for medicine.

Universal Edibility Test

There are many plants throughout the world. Tasting or swallowing even a small portion of some can cause severe discomfort, extreme internal disorders, and even death. Therefore, if you have the slightest doubt about a plant's edibility, apply the Universal Edibility Test (*Figure 40*) before eating any portion of it.

1	Test only one part of a potential food plant at a time.
2	Separate the plant into its basic components – leaves, stems, roots, buds, and flowers.
3	Smell the food for strong or acid odors. Remember, smell alone does not indicate a plant is edible or inedible.
4	Do not eat for 8 hours before starting the test.
5	During the 8 hours you abstain from eating, test for contact poisoning by placing a piece of the plant part you are testing on the inside of your elbow or wrist. Usually 15 minutes is enough time to allow for a reaction.
6	During the test period, take nothing by mouth except purified water and the plant part you are testing.
7	Select a small portion of a single part and prepare it the way you plan to eat it.
8	Before placing the prepared plant part in your mouth, touch a small portion (a pinch) to the outer surface of your lip to test for burning or itching.
9	If after 3 minutes there is no reaction on your lip, place the plant part on your tongue, holding it there for 15 minutes.
10	If there is no reaction, thoroughly chew a pinch and hold it in your mouth for 15 minutes. **Do not swallow.**
11	If no burning, itching, numbing, stinging, or other irritation occurs during the 15 minutes, swallow the food.
12	Wait 8 hours. If any ill effects occur during this period, induce vomiting and drink a lot of water.
13	If no ill effects occur, eat 0.25 cup of the same plant part prepared the same way. Wait another 8 hours. If no ill effects occur, the plant part as prepared is safe for eating.

CAUTION

Test all parts of the plant for edibility, as some plants have both edible and inedible parts. Do not assume that a part that proved edible when cooked is also edible when raw. Test the part raw to ensure edibility before eating raw. The same part or plant may produce varying reactions in different individuals.

Figure 40 Universal Edibility Test

Before testing a plant for edibility, make sure there are enough plants to make the testing worth your time and effort. Each part of a plant (roots, leaves, flowers, and so on) requires more than 24 hours to test. Do not waste time testing a plant that is not relatively abundant in the area.

Remember, eating large portions of plant food on an empty stomach may cause diarrhea, nausea, or cramps. Two good examples of this are such familiar foods as green apples and wild onions. Even after testing plant food and finding it safe, eat it in moderation.

You can see from the steps and time involved in testing for edibility just how important it is to be able to identify edible plants.

To avoid potentially poisonous plants, stay away from any wild or unknown plants that have--

- Milky or discolored sap.
- Beans, bulbs, or seeds inside pods.
- Bitter or soapy taste.
- Spines, fine hairs, or thorns.
- Dill, carrot, parsnip, or parsleylike foliage.
- "Almond" scent in woody parts and leaves.
- Grain heads with pink, purplish, or black spurs.
- Three-leaved growth pattern.

Using the above criteria as eliminators when choosing plants for the Universal Edibility Test will cause you to avoid some edible plants. More important, these criteria will often help you avoid plants that are potentially toxic to eat or touch.

Seaweeds

One plant you should never overlook is seaweed. It is a form of marine algae found on or near ocean shores. There are also some edible freshwater varieties. Seaweed is a valuable source of iodine, other minerals, and vitamin C. Large quantities of seaweed in an unaccustomed stomach can produce a severe laxative effect.

When gathering seaweeds for food, find living plants attached to rocks or floating free. Seaweed washed onshore any length of time may be spoiled or decayed. You can dry freshly harvested seaweeds for later use.

Its preparation for eating depends on the type of seaweed. You can dry thin and tender varieties in the sun or over a fire until crisp. Crush and add these to soups or broths. Boil thick, leathery seaweeds for a short time to soften them. Eat them as a vegetable or with other foods. You can eat some varieties raw after testing for edibility.

California Edible Seaweeds

- Bull Kelp
  - Can be dried, roasted, and ground into flour
  - Wrap food to cook on hot coals

- Giant Kelp
  - Edible raw
  - Herring eggs attached to leaves are edible

- Alaria
  - Edible raw
  - Blades can be cooked as spinach

- Eel Grass
  - Rhizomes-lightly colored and edible raw
  - Stems and leaf bases are edible raw

- Purple Laver
  - Edible raw
  - Very thin-used as sushi wrappers

- Sea Lettuce
  - Edible Raw

Preparation of Plant Food

Although some plants or plant parts are edible raw, you must cook others to be edible or palatable. Edible means that a plant or food will provide you with necessary nutrients, while palatable means that it actually is pleasing to eat. Many wild plants are edible but barely palatable. It is a good idea to learn to identify, prepare, and eat wild foods.

Methods used to improve the taste of plant food include soaking, boiling, cooking, or leaching. Leaching is done by crushing the food (for example, acorns), placing it in a strainer, and pouring boiling water through it or immersing it in running water.

Boil leaves, stems, and buds until tender, changing the water, if necessary, to remove any bitterness.

Boil, bake, or roast tubers and roots. Drying helps to remove caustic oxalates from some roots like those in the *Arum* family.

Leach acorns in water, if necessary, to remove the bitterness. Some nuts, such as chestnuts, are good raw, but taste better roasted.

You can eat many grains and seeds raw until they mature. When hard or dry, you may have to boil or grind them into meal or flour.

The sap from many trees, such as maples, birches, walnuts, and sycamores, contains sugar. You may boil these saps down to a syrup for sweetening. It takes about 35 liters of maple sap to make one liter of maple syrup!

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