EMERGENCY PREPAREDNESS WORKSHOP:

Fire Starting

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Cooking Your Food Storage

- Any number of emergencies can lead to you relying on your emergency supplies.
- Some may be for a brief period of time or limited in scope.
  - Power outage with no social unrest.
  - Temporary shipping strike resulting in a few day food or fuel shortage.
- Others may require you to rely exclusively on your emergency supplies for short or long periods.

Cooking Your Food Storage

- Imagine any scenario that includes a less than short-term power outage or requiring you to leave your home.
- Relying on your food storage is one thing when you are at home and all the utilities are working…when utilities are not available, preparing meals or keeping warm become much more difficult.
- Your cooking and heating needs will rely on you being able to provide these needs, at home or in the wild, without gas or electricity.
- In most cases, this means being able to start a fire!

Cooking Your Food Storage

- Your 90-day food supply, if planned properly, will consist of food that needs little to no cooking or refrigeration.
- This will allow you to eat even if you can't cook at all.
- Most of your food supply, however, will require preparation.
- To do this, you will need to store the necessary, fuel, fire starting supplies and know how to start and efficiently use a cooking fire.

The Fire Triangle

The Fire Triangle

- Fire needs 3 elements to exist:
  1. Oxygen (at least 16%, normal air contains 21%)
  2. Heat
  3. Fuel
- Removal of any of these three elements from an existing fire will cause it to extinguish.
  - For example; covering it with sand and removing its access to oxygen.

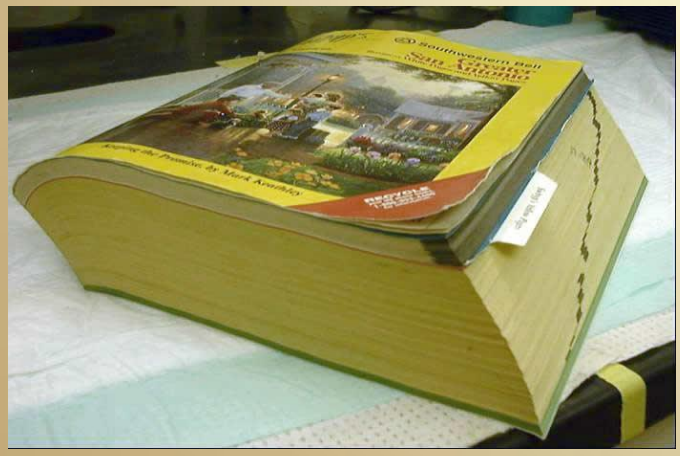
Fire Starting Supplies

- The ability of making a fire can often mean the difference between life and death.
- Plan on having fire starting supplies to make it easier to start. Here is what to store:
- 10-12 250 count boxes of Large Strike Anywhere Matches.
- 2 dozen Bic lighters in an airtight container.

Fire Starting Supplies

- If you are planning on using an outdoor grill or hibachi without a built in spark lighter, consider several BBQ lighters. They are also great for lighting candles or gas lamps and stoves as well.

Fire Starting Supplies



Fire Safety

- Build fires at least 10’ away from trees, brush, buildings, tents, firewood, etc…

- Keep plenty of water handy and have a shovel for throwing dirt on the fire if it gets out of control.

- Keep the fire small. A good bed of coals or a small fire surrounded by rocks give plenty of heat.

- Never leave a campfire unattended. Even a small breeze could quickly cause the fire to spread.

- Drown the fire with water, stir and drown again. Make sure all embers, coals and sticks are extinguished and cooled before leaving the fire unattended. Do not bury your coals, they can smolder and break out.

Fire Safety

- Learn how to safely start a fire. Avoid using flammable liquids to ignite or keep your fire burning.

- Only start a fire in a well constructed firepit or fire ring.

- Avoid starting a fire underneath low-hanging branches. Fires can often flame-up higher then anticipated.

- Don't allow children and pets near fire unsupervised.

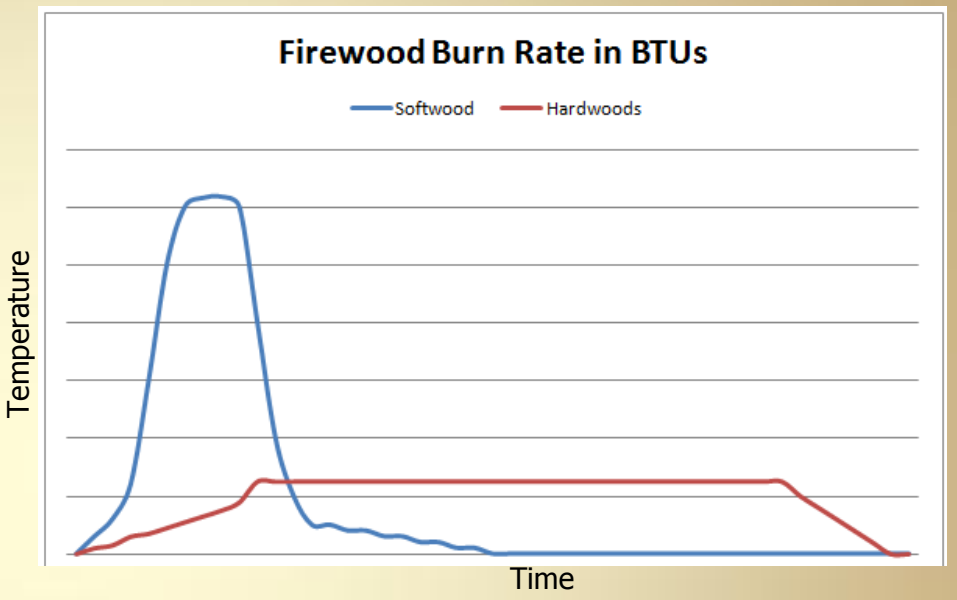
- Teach kids fire safety and how to stop, drop, and roll if their clothing catches fire. Have a fire extinguisher on-hand for emergencies.

Firewood

- When making a cooking fire, it is best to keep it small and wait until you have a nice hot bed of coals.
- Hardwoods typically produce better, and longer lasting coals than softwoods.
- Hardwoods, due to their higher density, produce more BTUs thus have a higher heat output than softwoods of the same size.
- 1 cord of hardwood will produce many more hours of cooking time than 1 cord of softwood.
- Despite the higher cost of buying hardwood over softwood it is still more cost effective per BTU.

Firewood

- Pound for pound, every species of wood will produce the same amount of heat.



- Softwoods, which are less dense and contain more resin, is easier to light, burns hotter and faster than hardwoods but produces a poor coal base for cooking.
- Hardwoods, which are more dense and contain less resin, are harder to light but, in general, burn long and steady and produce a better coal base for cooking.

Firewood

Hardwoods:

- From deciduous trees (usually with broad leaves that lose them each year).
- Trees grown in tropical climates are generally hardwood.
- Hardwood grows faster than softwood.

Firewood

Softwoods:

- From conifer trees (have needle like or scale like leaves that usually remain on the tree all year, chiefly evergreen, cone-bearing trees).
- Generally grown in cold climates.
- Softwood grows slower than hardwood.

Firewood

Heat Output:

- Heat output is measured in BTUs (British Thermal Unit). 1 BTU = The amount of heat needed to raise the temperature of 1 lb. of water 1° F.

- Dense hardwoods (beech, some maples, hickory, oak)=about 21 to 25 million BTUs/cord.

- Soft hardwoods and harder softwoods = 30% less heat.

- Other softwoods = 1/2 as much heat.

Firewood

So why even burn softwoods?

- They burn hot and fast.
- They are great for quickly heating a cold room but not ideal for steady cooking.
- Softwoods are great for kindling to get harder-to-light hardwoods burning. They tend to be very resinous and ignite easier, and are easier to split into smaller kindling-sized pieces.

What is the overall best firewood to use for cooking?

- Dense hardwood is best.
- Oak seems to be the best with its even flame and steady glowing bed of coals that keep on giving off heat long after the actual flame dies down.

Firewood

Seasoning Firewood:

- Whatever kind of wood you buy or harvest yourself, the wood should be seasoned.
- Burning wet (green) wood, will use up thousands of BTUs heating up the moisture in the wood before it will even burn.

Firewood

Seasoning Firewood:

- To properly season firewood, stack it, preferably off the ground with a rack, and leave it in the sun to dry out.
- To keep the rain off the pile, just cover the top and not the sides. Keep the air circulating for better seasoning.
- Split wood will dry out faster than unsplit (but allow between 6 and 18 months for the wood to dry).
- Wood cut to shorter lengths, dead or dying wood will also dry faster. Wood that has been seasoned properly gives a clean, hot burning fire.

Lighting A Fire

- Building a fire requires 3 types of materials:

Tinder

Kindling

Fuelwood

Lighting A Fire

Tinder:

- Any easily combustible material that can be lit with a match or catch a spark. Lit tinder is used to ignite kindling which is larger in diameter than tinder.

- Ex. Dry grass, leaves, pine needles, small twigs, paper, char cloth, fine steel wool, cotton, shaved magnesium, birch bark, dried fungus, etc…

Lighting A Fire

Kindling:

- Any fairly easily combustible material that can be lit from ignited tinder. Kindling varies in diameter from that of a matchstick to that of a pencil. Usually consists of easy to light, resinous softwoods. The more exposed surface area the better.

Fuzz Stick

Lighting A Fire

Fuelwood:

- Wood the diameter of a finger and larger used to create heat for warmth or to create a bed of coals for cooking.

Lighting A Fire

Step 1:

- Collect all the tinder, kindling and as much of the fuelwood as you can before starting the fire. Things progress quickly and you won't have much time to search for them until the fire is self-sustaining. Whenever possible, collect all the wood you will need before dark. It will save you a lot of time and potential injury.

Lighting A Fire

Step 2:

- Gather the tinder and light it with an ignition source. Tinder that catches a spark may need to be blown across gently to increase the oxygen to the ember until it catches flame.

- Ignition sources include matches, lighters, magnifying lenses, fire pistons, rubbing two sticks together, flint & steel, etc…

Lighting A Fire

Step 3:

- As soon as the tinder is alight, add matchstick diameter dry twigs until they catch flame. Adding additional fuel too the fire should be done carefully so the tiny fire is not smothered and goes out. Adding additional sticks in progressively larger diameter in a teepee-like pattern will allow good airflow while exposing a lot of surface area of the wood to the existing flames.

Lighting A Fire

Step 4:

- Once the kindling is burning, add progressively larger sticks to the fire until wood 2”in diameter or larger light without problems. Add your fuelwood to the fire. Add enough to create the desired light or heat output or enough to create a sufficient bed of coals for cooking. Depending on the wood, it may take up to an hour to have a sufficient coal base for cooking.

Fire Lay

Tepee

- Pros:
  - Convenient and easy to light
  - High surface area of wood exposed to flames making lighting easier.
  - Excellent Airflow
- Cons:
  - Tepee may collapse smothering ember or flame.

Fire Lay

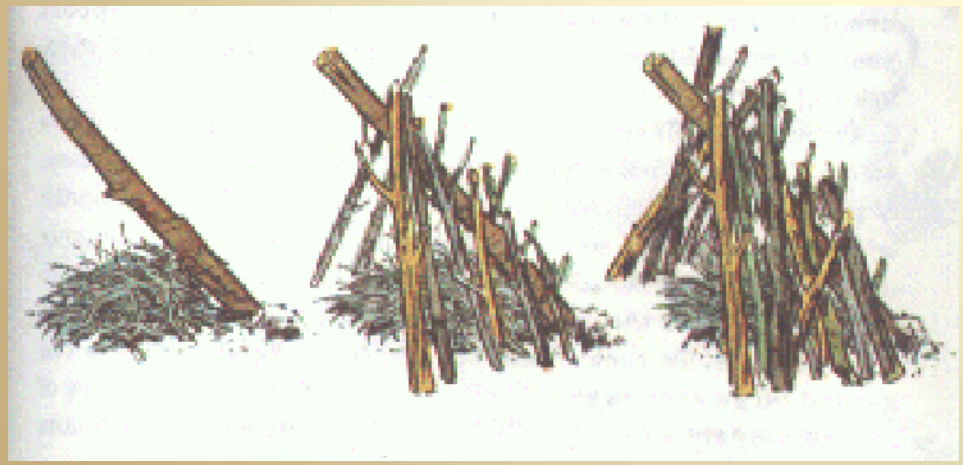
Log Cabin

- Pros:
  - Easy to Construct
  - Provides a wider spread of coals without the need for moving them.
  - Larger logs on the bottom can provide a temporary cooking platform.
- Cons:
  - Difficult to reach the interior to light.
  - Surrounding logs are not in direct contact with flames making it harder to light other logs.

Fire Lay

Lean-To

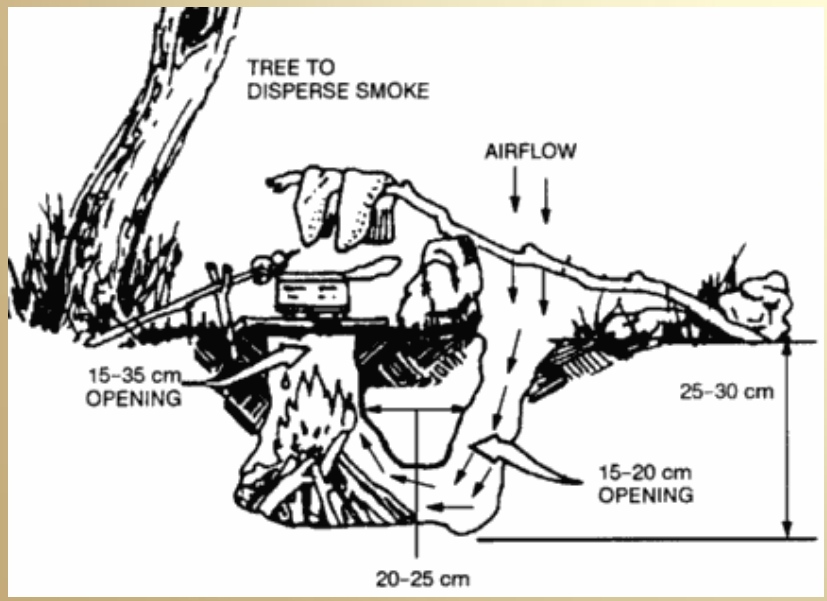
- Pros:
  - Easy to construct
  - The log in "method 2" acts as a windbreak in windy conditions.
- Cons:
  - Provides more airflow and less sticks are in contact with flames as the tepee method providing less transfer of heat to other kindling.



Fire Lay

Dakota Fire Hole

- Pros:
  - More Fuel Efficient
  - Produces less smoke.
  - Less likely to spread outside fire ring
  - Easy to cook over
- Cons:
  - Harder and more labor intensive to construct



Lighting Charcoal

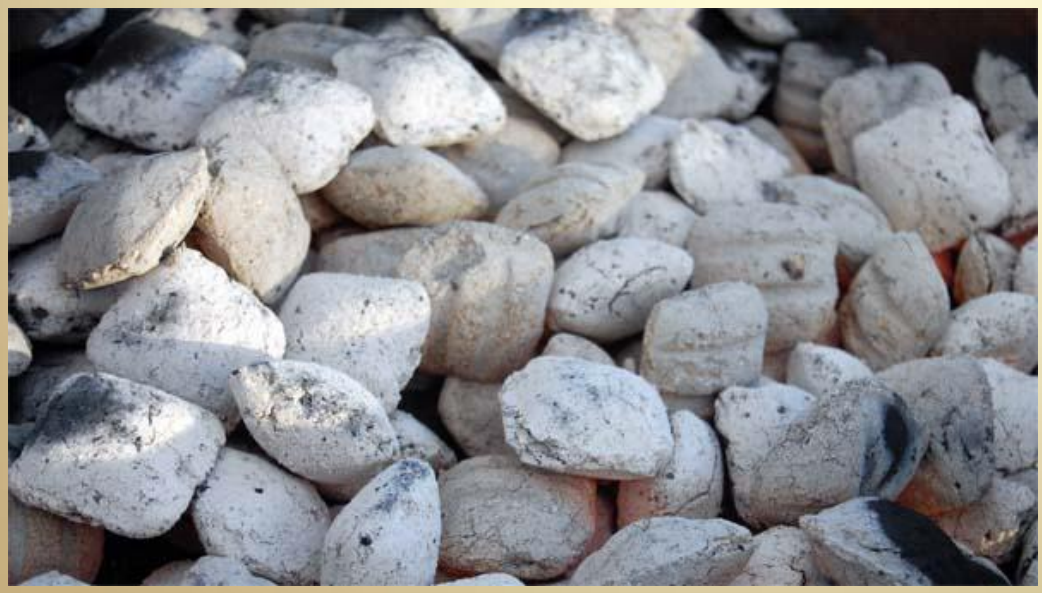
- In your fuel storage, only store charcoal that is not impregnated with lighter fluid. It breaks down the coal quickly and could spontaneously combust.

Lighting Charcoal

- The best way to light charcoal is not by using lighter fluid.
- Charcoal chimneys are inexpensive and very easy to use.
- Start by filling the chimney with charcoal and place loosely crumpled newspaper underneath. Then light the newspaper in several places with a match.

Lighting Charcoal

- The fire will draw air from the bottom and direct the hot air and flames through the charcoal above it.
- This method will ignite the charcoal quickly until it is ready to cook with. (about 5-8 minutes)
- When the charcoal is ready, those on the bottom will be glowing orange and those on the top will have turned white.



Fuel Efficiency

- Open fires are the least fuel efficient way of cooking.
  - Much of the energy is lost as heat to the surrounding air
  - We usually make our fires too large when a very small fire is all we need.
- In emergencies, fuel efficiency is important because there is no way of knowing how long the crisis will last or how other factors will change along the way… such as uses (cooking, purifying water, light, heat, etc…) or size of party. (others who join your group needing help).
- Plan ahead to be fuel efficient.
  - Use alternative cooking methods when possible.
  - Plan your meals to maximize the use of these methods.

Fuel Efficient Cooking Methods

- Solar Oven
  - Uses the Sun to cook your meals
  - Free Energy
  - A “must have” in all preparedness plans

Fuel Efficient Cooking Methods

- Rocket Stove
  - A few sticks is all the fuel you need to cook a meal.
  - Store small sticks in a garbage can with lid. It will be enough fuel for a hundred meals.

Fuel Efficient Cooking Methods

- Volcano Stove
  - Use Wood, Charcoal or Propane
  - A 20 lb. bag of charcoal has enough fuel to cook 25 hot meals using the Volcano Stove.

Fuel Efficient Cooking Methods

- Propane Stoves
  - Only use the fuel you need to cook, then shut it off
  - Relatively inexpensive stoves and fuel
  - Propane has a long shelf life

Alternative Fire Starting

- What happens if you run out of matches or you are in an unexpected survival situation?

- Learning alternative fire starting techniques could mean the difference between life and death.

Alternative Fire Starting Techniques

Fire Starting Using The Sun

Magnifying Glass

- Focuses the power of the sun to a single point. Raises the temperature of that point of light higher than the flashpoint of the tinder. Requires sunshine to start a fire.

Parabolic Fire Starters

- Focuses the power of the sun to a focal point. The tinder is placed at this point. It raises the temperature of that point of light higher than the flashpoint of the tinder. Requires sunshine to start a fire.

Polished Bottom of a Soda Can

Fresnel Lens

- Similar to a magnifying glass but constructed in a flat format.

Ice Lens

- Using clear ice, lenses can be made to work like a magnifying glass.

Water Lens

- Using plastic wrap and clear water a sphere can be carefully formed.
- Light passing through the sphere can be focused like a magnifying glass to start a fire.

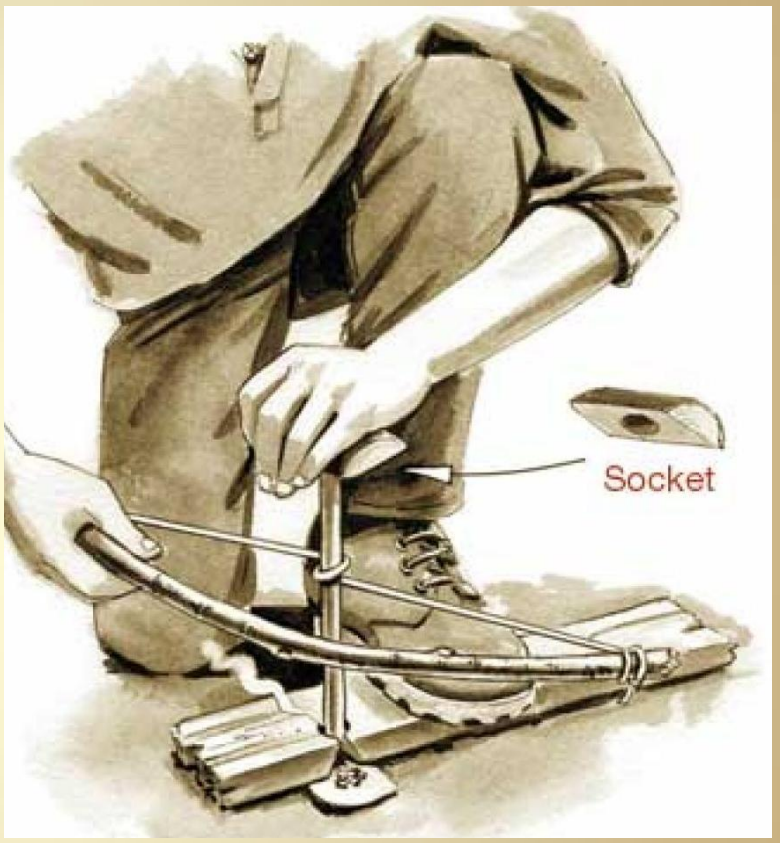

Fire Starting
By Friction

Fire By Friction

- Any method of fire by friction requires a fair amount skill and exertion. In essence, it is rubbing two sticks together until the temperature rises enough that an ember is created. This ember is carefully transferred to your tinder bundle. Gently blowing on the ember will cause it to glow and ignite the tinder surrounding it.

Bow Drill


Bow
Hearth board
Drill
Bearing block
Tinder
Ember Pan


Socket

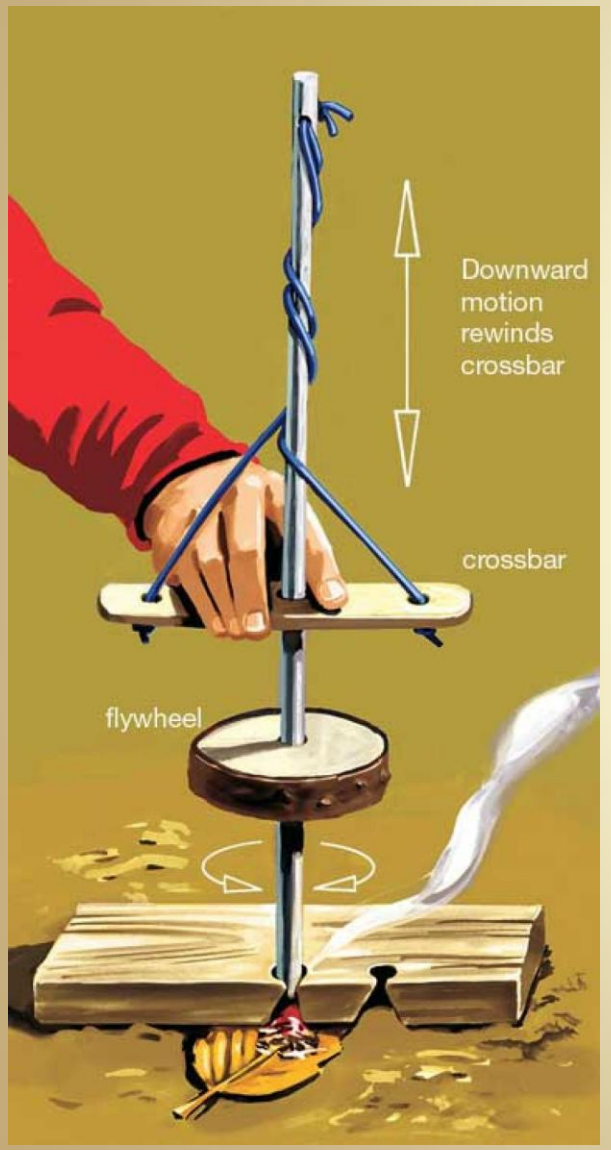
Bow Drill

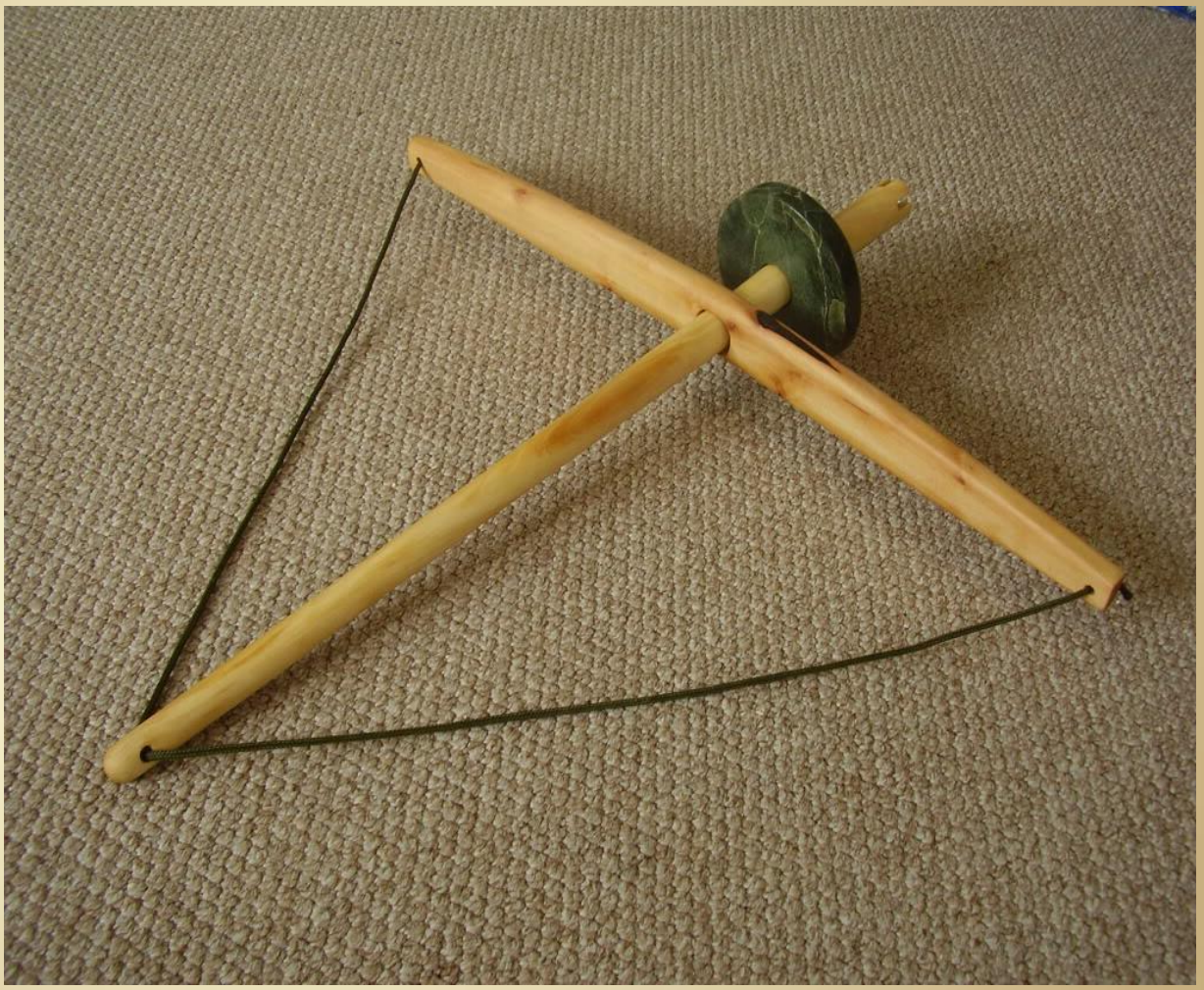
- The bow drill is the easiest, fire by friction method that can be done by one person after the pump drill (based on same principle). The selection of the correct materials for the spindle and fireboard is important to success. Woods that fall in the middle of the hardness scale typically work better. Hard woods require too much pressure and soft woods typically contain to much moisture and resin. The spindle should be as hard or slightly harder than the fireboard.

- Step by step instructions can be found here:

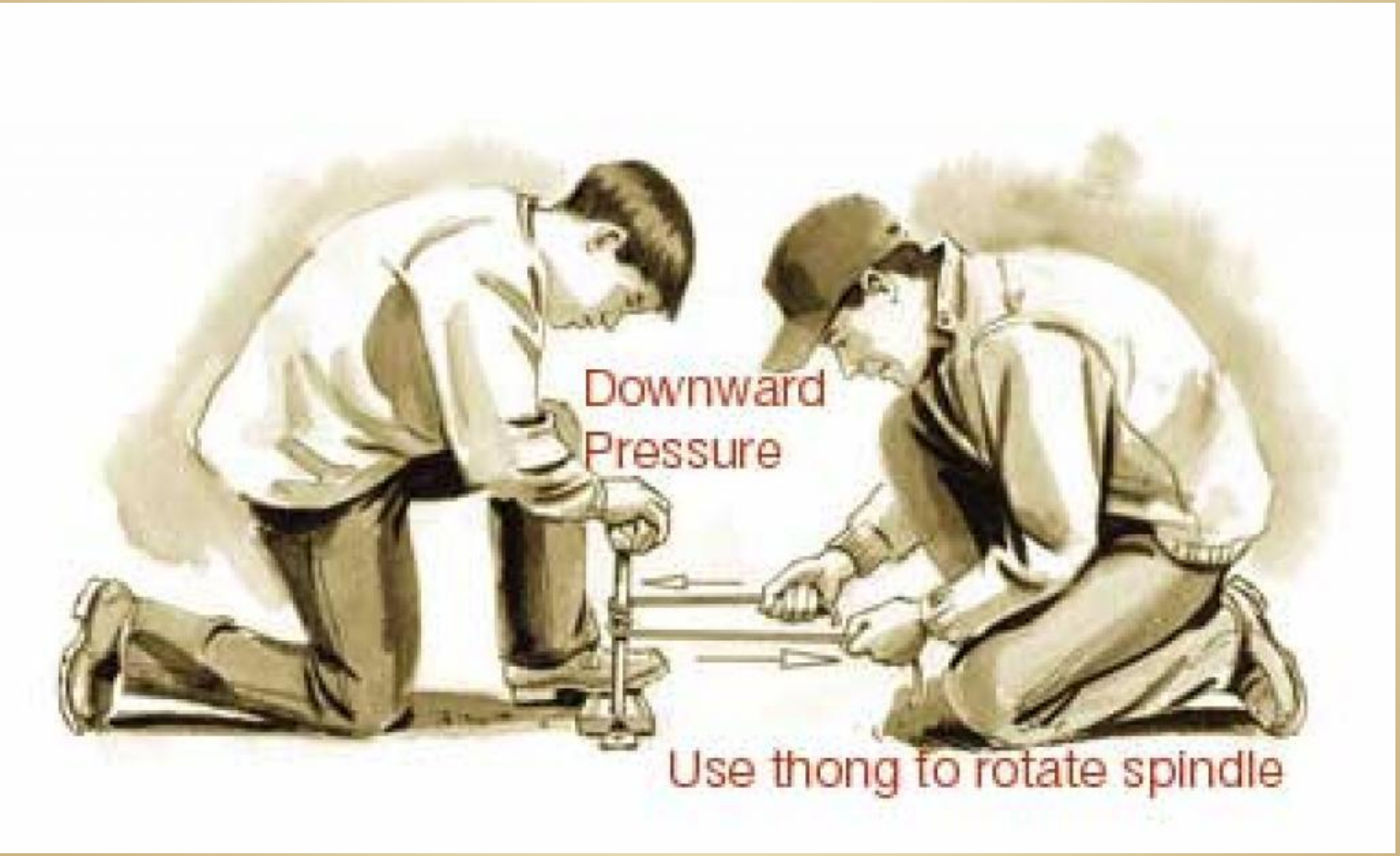
  http://www.bushcraft.ridgeonnet.com/bowdrill%20tutorial.htm

Pump Fire Drill

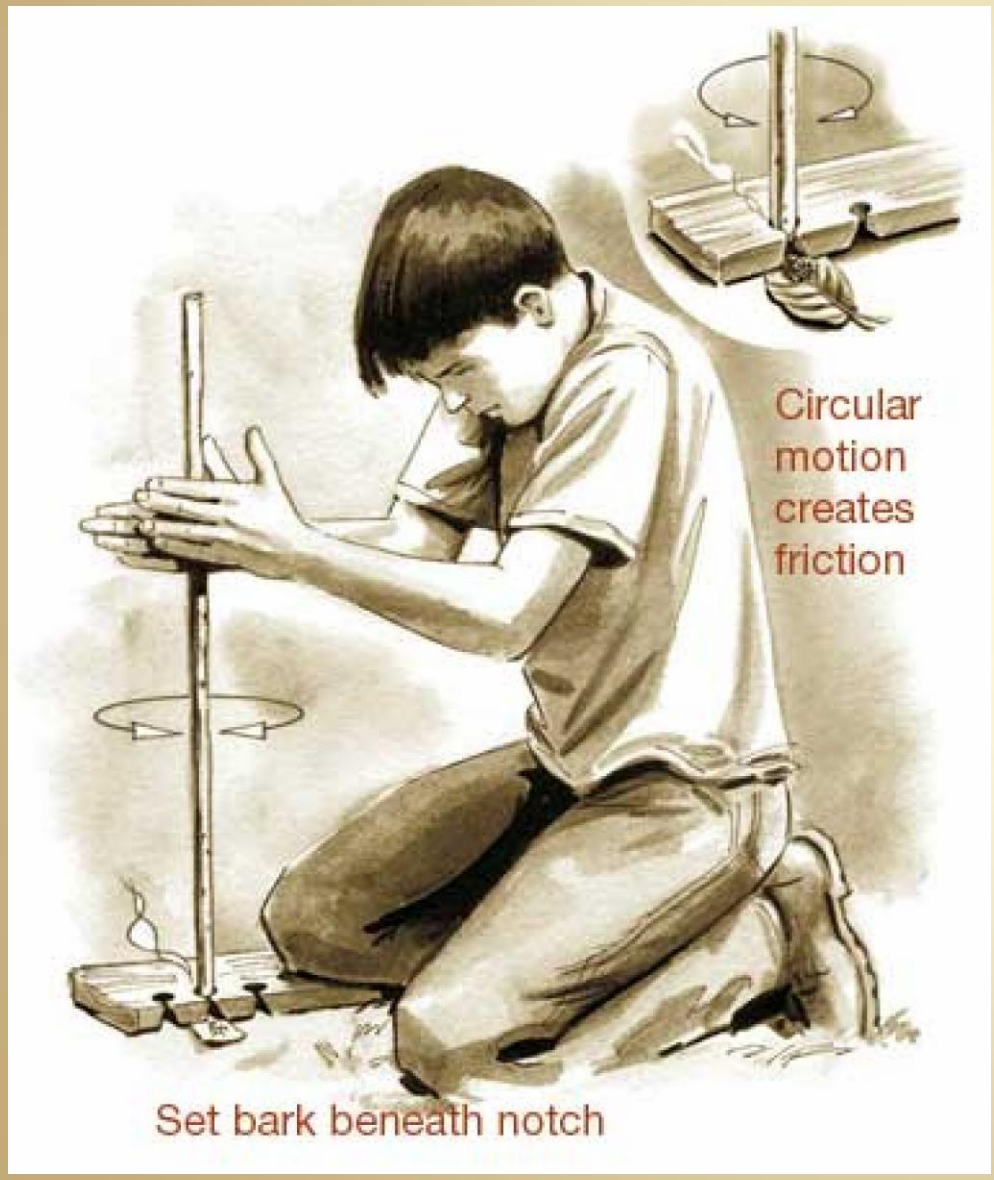




Two-Man Friction Drill



Hand Drill

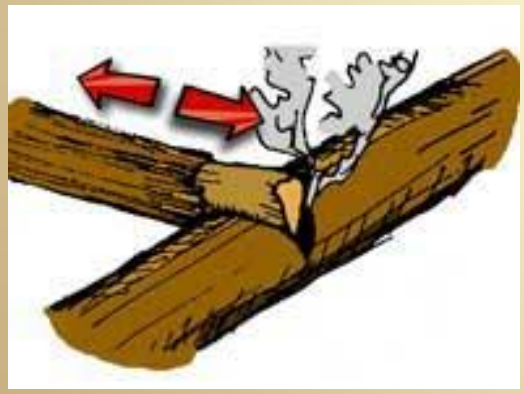


Fire Plough


Tinder ignites as
temperature rises


Starting a fire
with a
Sotol Fire Plow.

Fire Saw



Rattan Fire Thong


Fire Starting
Using Flint & Steel

Flint & Steel

- Iron is a pyrophoric. (a substance that spontaneously ignites at ambient temperatures).
- In the presence of oxygen, iron auto ignites.
- As iron comes in contact with the air, a exothermic chemical reaction occurs developing a thin coating of iron oxide (rust). This chemical reaction releases a small amount of heat.
- With a small enough piece of iron being chipped off of a larger one, with a relatively large surface area ratio, the iron fragment will burst into flame. The smaller the fragment, the hotter the flame. By catching these glowing fragments in a tinder bundle or char cloth, one can start a fire.
- Iron is soft which means it doesn't chip very well. If we add carbon to the iron to make steel, it makes the iron harder and more brittle. The harder the steel, the more brittle it will be and easier to break tiny fragments from it.
- Also, the sharper and harder of an object we strike the steel against will make the fragments even smaller. Flint is used most often but other materials like chert, jasper, quartz, obsidian and others work as well.
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Starting a fire using Flint & Steel

1. Find a piece of high carbon steel (about 98% iron and 2% carbon)
2. Find a piece of flint or other similar hard/brittle/sharp mineral.
3. Strike a sharp piece of the flint with the steel. A glancing blow is best.
4. Tiny fragments of unoxidized iron fly out from the steel.
5. The fragments instantly oxidize and ignite as they come in contact with the air. (Sparks)
6. Catch the sparks in a tinder bundle or char cloth and use it to start a fire.

Flint & Steel

Firesteel

- Ferrocerium rods or Firesteel are metal rods that are designed to make it easier to chip fragments from the rod, thus more sparks.
- Can create sparks even when wet

Blastmatch

- Spring-loaded Ferrocerium rod or Firesteel for one handed fire Starting.

Torch Flint Striker

Spark-Lite


FIRE STARTER
AVIATION
SURVIVAL
SPARK-LITE
NSN: 1680-01-233-006
FIRE STARTER,
AVIATION SURVIV
SPARK-LITE
NSN-1680-01-233-0061
INSTRUCTIONS

Magnesium Fire Starter

- With the magnesium fire starter, just scrape some shavings from the block and ignite them by striking the built-in firesteel.
- The fire generated burns extremely hot, even igniting damp kindling. The block of magnesium is waterproof and fireproof in its solid form.


Fire Starting
Using
Chemical
Reactions

Potassium Permanganate

- Potassium Permanganate and Glycerin
- The combination of Potassium Permanganate and Glycerin causes an exothermic chemical reaction. The reaction will raise the temperature enough to start a fire.

Fire Starting Using Electricity

Battery & Steel Wool

- Very Fine Steel Wool (0000) is made from steel so it is a great conductor of electricity as well as its thin fibers being flammable.
- Place the steel wool across the two poles of the battery to create a short circuit. The steel wool will ignite.

Fire Starting Using Air Pressure

Fire Piston

- Fire pistons work the same principle as diesel engines. Air is trapped in the cylinder and then the piston compresses the air. As the air molecules are compressed, heat is created. A piece of tinder placed in the end of the piston ignites.


Various
Tinder & Fire Starters

Tinder & Fire Starters

Hexamine [Esbit]
(Fuel Tablet)

Pressed Saw
Dust & Wax

Fast Fire
(Fuel Tablet)

Char Cloth

Fire Paste

Gelled Alcohol

Trioxane
(Fuel Tablet)

Tinder & Fire Starters

Shaved Magnesium

Candles

Trick Candles

Maya Sticks
Pine (high resin)

Fire Log

Newspaper

Cotton and
Petroleum Jelly

How to Make Char Cloth

- Get any 100% cotton material and cut it into 1”-1.5” squares. (I prefer old jeans because the material is a little thicker which makes the char cloth a little stronger).
- Place the squares in a metal container with a lid. Fill up the container living little empty space. (I use an old altoids container)
- The lid should be on tight. I take a medium sized nail and punch a hole through the center of the lid to allow smoke to escape.
- Take the metal container full of cloth and place it on a bed of coals, on your lit BBQ or over your gas stove. (outside of course)
- The container will soon start billowing smoke through the nail hole.
- The process is complete as soon as the smoke stops.
- Their should not be enough oxygen inside the container for the material to catch on fire. A few flare-ups are ok.
- After removing the container from the heat source, let it cool for several minutes before opening. Adding oxygen too soon will cause it to catch fire.

How to Make Char Cloth

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