How to use Flaming in Wildland Weed Control Ken Moore March 2009

Before proceeding, read both the Introduction to Flaming article and the Flaming Safety Sheet.

THE TECHNIQUE
FIRST, AND MOST IMPORTANT, READ THE FLAMING SAFETY SHEET BEFORE PROCEEDING.

This equipment is built with user safety in mind, but careless or improper use can result in serious injury. Follow correct procedures for assembly and use of all components. Check all connections for leaks before proceeding.

Flame only when sites are too wet to carry fire, or when you have employed appropriate prescribed burn procedures for containing any fire that may start. Flaming while it is raining is optimum. Always have McClouds and backpack water pumps on site to control fire, should it occur.

First, you must determine whether the conditions are suitable for flaming, unless it is already raining and the site is completely saturated. This is the safest time to flame. If you are not sure if it is safe to flame, use the McCloud to scrape a clear 2 foot wide strip completely around a representative small test plot. (Illustration 2.)
Then, direct the torch into this small plot, and hold the torch in one spot in the center until it just begins to burn. When you withdraw the torch, if the fire begins to go out, it is safe to flame at that time. But be aware that conditions can change quickly on anything less than rainy days. If the sun comes out or the wind comes up, site conditions can change within minutes, and may support fire! If the fire holds in your test plot when you withdraw the torch but does not spread readily, conditions are very marginal for flaming, and it is not safe to proceed. If the fire begins to spread in your test area, stamp it out quickly with the McCloud, douse it thoroughly with water, and pick another project for the day. You're not flaming! NEVER FLAME WHEN CONDITIONS SUPPORT FIRE, AND CHECK REGULARLY FOR CHANGING CONDITIONS. ALWAYS HAVE ADEQUATE HELP ON HAND TO INSTANTLY SUPPRESS ANY FLAME WHICH APPEARS. IF YOU ARE FLAMING IN SAFE CONDITIONS, YOU WILL NOT HAVE FLAME OCCURRING ON COMBUSTIBLE MATERIAL.

To light the torch, first make sure the valve on the torch handle is closed, then slowly open the tank valve. If you open it too fast, the safety shut-off may activate, preventing fuel from leaving the tank. Point the torch away, and slowly open the valve on the torch enough to hear a small hiss. Then light the torch, and open the valve until the flame is full, with little or no trace of yellow. This is the optimum temperature.

Hold the torch 6 to 12" from the plant. This is where the flame is hottest. Keep the torch moving. The object is to use just enough heat to cause wilting. This point is more easily seen on some plants than others. If you burn the plant, you are wasting time and fuel. A leaf pressed between the thumb and forefinger will show a fingerprint when enough heat has been applied.

Flaming is most effective when plants are at the dicotyledon stage, and up to when they have 4 or 5 true leaves. If flaming taller plants, you must concentrate heat all the way around the lower stem. If the torch blows out frequently, change position, or you may be holding it too close to the ground. NEVER FLAME UNDER TREES OR SHRUBS WITH LOW BRANCHES, ESPECIALLY CONIFERS!

The torch tip gets very hot, so be careful where you set it down. To shut off the torch when finished, hold the lit torch in the air and shut off the gas first at the valve on the tank, letting all the gas in the hose burn off. Then shut off the valve on the torch, and disconnect the hose from the tank before transporting. Do not transport an LPG cylinder in a closed vehicle.
THE EQUIPMENT

A portable flaming system used in wildland weed control consists of a propane tank with a shut-off valve, a connecting hose, and a hand-held torch, also with a shut-off valve. A pressure regulator may also be used. There are two types of equipment, vapor withdrawal systems, and liquid withdrawal systems.

Vapor Systems, And the Icing Issue The most commonly used torches employ what is called a vapor withdrawal system. In this system, the gas (propane) in the cylinder is under high pressure, which turns it into a liquid. When withdrawn, the resulting expansion of the gas creates rapid cooling of the tank and valves, producing frost and ice which restricts flow. The larger the torch and/or the smaller the tank, the faster this happens. Icing is greatly accelerated when air temperatures are low and humidity is high. So on the cold wet days when wildland flaming can be safely done, it is a major factor. As the ice builds up, the output of the torch is gradually reduced to the point where flaming becomes ineffective. If the torch is on continuously, output can be significantly reduced in 15 minutes or less of steady usage.

One way to reduce icing is to use a liquid withdrawal system. In liquid systems, propane is delivered to the tip of the torch as a liquid, and vaporized and ignited there. Since the gas expansion occurs at the tip of the torch, icing is significantly reduced, but not completely eliminated... A liquid supply torch and a liquid withdrawal cylinder are required with this system. Liquid cylinders and torches cannot be used with vapor systems, nor can vapor equipment be used with liquid systems. Both the liquid withdrawal torches and cylinders are considerably heavier than vapor system components, and more tiring to use. They are best suited for tractor or vehicle mounted applications with very large mounted cylinders. Flame Engineering, www.flameengineering.com/ is a source for liquid equipment, but they do not sell cylinders. Liquid cylinders can be obtained at most propane suppliers.

I use vapor system equipment due to the availability of torches with better features and the lighter weight of all components, so I evolved a way to work around icing issue. I use several cylinders, and place them around the site so that when the cylinder in use ices up, a fresh cylinder is nearby. I have a quick coupler between the torch and the hose, so I can change cylinders in a few seconds. After I rotate through 4 or 5 cylinders, the first ones thaw out enough to be usable again, so I can keep working.

Torches

Vapor torches are by far the most commonly used type, and are best suited for most applications. Unless you are only spot flaming very small sites, I do not recommend torches which do not have a pilot light. A good and very inexpensive small torch with a pilot light and electric ignition is available at Harbor Freight, www.harborfreight.com/ Although not specified, I would estimate its output at around 400,000 BTU, which is adequate for many sites. Unfortunately it has a very short wand, making it less suitable for tall users. It can be bought with piezoelectric ignition, which is very handy. For larger sites, the best torch I have found is The PowerJet Torch, made by Manchester Tank www.mantank.com/products/hand_torch.htm. It is a 750,000BTU vapor torch, very light in weight, and well made. Both of these torches have an adjustable pilot light, which is very handy in windy conditions to keep the torch from blowing out.

Cylinders

The size of propane cylinders is normally expressed in pounds. This is not the weight of the cylinder; it is the liquid capacity in pounds. A 20 pound cylinder holds 20 pounds of liquid propane, which is about 5 gallons. This is the commonly used size for hand carried cylinders, and they are readily available. 10 pound cylinders may be more suitable for small jobs, but can be harder to find.

If you have large and accessible areas to flame, you can use 30 or 40 pound cylinders mounted on dollies. For very large fields, truck or trailer mounted cylinders can be used. For real production work, multi-head flamers are available for tractor mounting. Most readily available smaller cylinders are steel, but if you do a lot of hand-carried flaming you may want to look into aluminum cylinders, which are much more expensive but about 30% lighter. Flame Engineering, www.flameengineering.com/ is a source for liquid equipment, but they do not sell cylinders. Liquid cylinders can be obtained at most propane suppliers. Flame Engineering, www.flameengineering.com/ is a source for liquid equipment, but they do not sell cylinders. Liquid cylinders can be obtained at most propane suppliers.
Regulators
Torches can be ordered either alone or with a pressure regulator. The regulator helps to control the output with cylinders when they are completely full and under maximum pressure. However, the pressure quickly drops to optimum levels with use, so a regulator is not needed most of the time. I do not use regulators because they project out well beyond the edge of the tank and could break off if the tank falls on its side and rolls, and this is a common occurrence with hand carried cylinders in field conditions. Without the regulator, you do have to be a bit more careful with the torch when the cylinder is full, as it puts out a more powerful flame for the first few minutes.

Backpack Flaming
Since a backpack set-up typically comes with a small 10 pound cylinder, it will ice up quickly, so they are usually supplied with low output torches. This limits their usefulness on large sites. However, the larger PowerJet can be used for spot flaming with a backpack rig because of its trigger shutoff. But if you need to do continuous flaming with a backpack (as on large steep slopes), you can put together a liquid withdrawal backpack setup. However, both the torch and tank are considerably heavier, and liquid withdrawal cylinders are not available in less than a 20 pound size, and only in steel. Although 20 pound cylinders can be adapted to backpack use with good pack frames (or even sturdy baby carriers!) they are not for everybody.

Hoses And Quick Couplers
Many torches are sold packaged with a hose and fittings. Larger output torches may be packaged with a regulator as well. I buy the torch separately, since I don't use regulators, and my local propane dealer can make up a hose for me in any length. For open country flaming with hand carried cylinders I like a 15 foot hose. Longer hoses tend to snag and tangle up. In denser habitat I switch to a 10 foot hose. For pre-packaged backpack setups, the supplied 5' hose is fine. Quick couplers are available at the propane dealers and from flaming equipment suppliers. I now use air hose quick couplers which are more commonly available, and they work equally well. There are several styles, so make a note of which one you start with to avoid future compatibility issues.