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Vegetation Control Using Directed Heat Treatment

Introduction

Consumers, commercial growers, and land managers have become increasingly interested in alternative methods of controlling unwanted vegetation, especially invasive species, in areas where herbicide use is restricted. Organic farming practices, proximity to rare species, and general concern of possible environmental contamination are other reasons for using non-chemical weed control.

One alternative to using herbicides is the use of directed heat treatments. This factsheet summarizes the basic principles of directed heat treatments, some practical applications, and important safety information.

What is directed heat treatment?

Directed heat treatment, or flame weeding, is a method of vegetation control that has been around for approximately 75 years. Prior research investigated a wide range of vegetation control, from Johnson grass in Louisiana sugarcane plantations, junipers in Oklahoma pastures, American beech in New Hampshire, and here in Connecticut, Japanese barberry.

The concept behind directed heat treatments is using a propane torch to apply a high-intensity flame directed onto the plant base for a sufficient period of time to girdle aboveground stems and kill dormant buds. As plant tissues rise over 140° F, the plant vascular system will collapse. Further heating causes cells to rupture, plant proteins to break down, and forces moisture out of the plant.

An early Spring directed heat treatment on Japanese barberry using a backpack torch.

Several propane torch models are available, ranging from consumer to agricultural grade models. The typical propane torch has an output of between 50,000 to 500,000 BTU, and can produce a 2,000° F flame. The backpack version consists of a 10-pound

propane tank attached to a frame, hose, nozzle, and pilot light. Another style consists of a 20-pound propane tank, approximately 10 feet of hose, squeeze valve, torch, and a transport caddy. Some models may not have a pilot light and therefore need to be re-ignited after releasing the squeeze valve. Agricultural applications generally have multiple propane torches mounted to a tractor. Small handheld torches typically used in plumbing applications, are not recommended as they produce too little heat to effectively kill all but the smallest of seedlings.

What are some applications?

There are a several uses for directed heat treatments. For the homeowner, propane torches can be used to control weeds in driveways, stone walkways, and patios. The application time can vary from several seconds for weed seedlings to a minute (or longer) for larger shrubs. Some important considerations include:

- herbaceous plants are more susceptible to directed heat treatment than woody plants (which are partially protected by their bark),
- it is not necessary to burn off the plant being treated, and
- repeat applications at 4-8 week intervals may be needed to fully deplete the carbohydrate reserves of woody plant roots or kill newly germinated weed seedlings.

Lastly, it is essential that the torch does not contact any flammable material such as dry grass, downed leaves, mulch, wood chips, or any other wood.

For the commercial grower, directed heat treatments can be used in controlling herbaceous weeds, especially in fields with bare soil between the crop plants. Herbaceous plants need only need a few seconds per plant of application time.

A tractor mounted flame weeding unit, developed at the University of Nebraska-Lincoln

For woodland managers, we developed a two-step treatment protocol that optimizes time and resources. It begins with an initial mechanical control that cuts aboveground stems, and followed by one or more directed heat treatments. Our experience has found the smaller rated units (50,000-100,000 BTU) apply a narrow flame which can minimize damage to surrounding vegetation, but at a cost of increased treatment time.

Invasive plants such as Japanese barberry (*Berberis thunbergii*) can be controlled with the more powerful (500,000 BTU) torches mounted to a backpack. The flame is applied at ground level to the base of the stem until it begins to glow. It is not necessary, and indeed is a waste of time and resources, to treat the entire plant.

What are some basic safety concerns?

Accident, injury, or misuse can occur with any type of equipment, including propane torches, and every concern cannot be covered in this factsheet. However, the risks associated with directed heat treatment can easily be mitigated by incorporating some basic practices into your routine. This strategy, based on the acronym ***YES***, can be a helpful guide to safely using directed heat treatments. It is a safety model for situational awareness, and stands for ***Yourself, Equipment, and Surroundings***.

Beginning with ***yourself***, individuals should first be aware of their own physical limitations. Simple strategies, such as stretching, hydration breaks, and wearing proper personal protective equipment can reduce the risk of physical injury. Flame resistant apparel made of natural fibers (cotton duck, wool, leather) should be worn, as synthetic fabrics can melt, stick to the skin, and cause serious burns. Head protection must include eye and ear protection from occasional flying embers and to decrease torch noise. It is also necessary to wear work boots, thick gloves, pants, and long-sleeved shirts.

Familiarity with the ***equipment*** is the second part of the acronym. A "must-do" item is to read and understand the owner's manual for your device. In addition, the propane tank, hoses, and torch should be inspected prior to each use to ensure they are in good working order. A simple way to check for leaks is to spray soapy water on all connections and along the hose. After pressurizing the lines, any bubbles forming on these areas would indicate a leak. Propane also contains ethyl mercaptan, an inert ingredient with a strong odor. Safety equipment, such as a first aid kit, fire extinguisher, shovel, and cell phone must also be on hand.

Individuals should be attentive to the ***surroundings*** of the work zone. This includes being mindful of local weather conditions, as they are likely to change during the day. In general, favorable working conditions include high humidity and calm winds, which tend to occur in early morning. Decreasing humidity will favor conditions that could ignite a wildfire. A sudden wind gust could ignite grasses and small twigs, so it is important to keep a close eye on the recently treated areas behind you.

Slippery conditions can be another concern, especially with uneven terrain or following a recent rainstorm. Tripping hazards such as exposed tree roots or downed limbs may be present. Plants such as poison ivy can also pose a hazard through direct or indirect contact. Noxious fumes from inadvertent combustion can cause irritation to the eyes, nasal tissues and lungs.

There are no existing regulations concerning directed heat treatments in Connecticut, but it is strongly encouraged to consult with local officials to confirm that there are no ordinances or emergency orders prohibiting directed heat treatments in your area. The CT DEEP daily forest fire danger report and local weather report are excellent resources to visit to ensure that the danger is low prior to commencing any activities.

Lastly, two other common sense safety strategies are to follow “the buddy system”, and to write out and share a simple work plan with colleagues. Not only do these practices help define and distribute the workload, it is important in the event of an emergency.

Summary

Directed heat treatments can be an effective alternative method to herbicides for control of undesirable vegetation. Not only are there several models available on the market, there are many different applications, so it’s important to find the proper combination to suit your needs.

Before starting out, individuals using propane torches in woodlands and natural areas are strongly encouraged to seek out professional training concerning proper technique and safe use. Anyone using directed heat treatments should practice in controlled settings in order to gain familiarity with safe usage and improve technique.

In review, directed heat treatments are another tool for individuals, growers, and land managers to efficiently control unwanted vegetation provided care is taken to minimize the potential safety risks.

A “before and after” series illustrating directed heat treatment using a propane torch on Japanese barberry. Stems and latent buds were treated at the soil surface, and although some surface leaves also burned, they quickly self-extinguished.

Note: stems were painted yellow to increase visibility.