## **Directed Heating/Spot Burning**

*o* woodyinvasives.org/management/directed-heating-spot-burning/

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## Introduction to Directed Heating/Spot Burning

Directed heating of woody invasive plants involves applying intense heat to target plants using a propane torch or similar tool. It is different than prescribed burning because it is targeted to the species being controlled. Direct heating can often destroy woody invasive plant seedlings. However, single instances of spot burning are generally not effective for controlling mature woody invasives due to their ability to regrow from the root crown.

## How it works

Intensely hot flame is applied to the base of plants, as close to the root crown/soil interface as possible. When seedlings are directly heated, the root is usually sufficiently damaged to prevent regrowth (Zouhar et al. 2008). When applied to mature plants, stems are flame-girdled, killing the above-ground growth (Ward et al. 2013). However, direct heating does not destroy the root system of mature plants, and regrowth should be expected. Frequent repeated spot burning of regrowth may eventually lead to mortality, though the frequency and duration required are often unknown and likely vary by species and age of target plants.

## Methodology in Detail

Directed heating can be conducted at any time of year, provided site conditions are suitable and plant stem bases are accessible. For a two-step application to control mature Japanese barberry, Ward and Williams recommend a first treatment in early spring and a second treatment of regrowth six weeks after the first (2011). Direct heating/spot burning is best conducted during or after rainfall when soil and leaf litter are moist and wildfire risk is minimal. It should not be conducted during drought conditions, during periods of high wind, or when authorities have alerted of wildfire risk.

Directed heating can be practiced on seedlings of any woody species. When treating mature individuals, this method is only practicable in terms of labor and fuel cost for multi-stemmed thickets where the diameter of each stem is relatively small (Ward and Williams 2011, Lee et al. 2017). Japanese and common barberry, wineberry, border

privet, and multiflora rose often grow in this form. For thicker stemmed species, directed heating may be used as a secondary treatment on regrowth following cutting, grazing or girdling, though multiple treatments of regrowth may be necessary to exhaust the root.

Certain woody species sprout from the entire root system in response to stem damage. This treatment may actually increase the density of the infestation of these species. WIGL Collaborative species known for aggressive root sprouting in response to stem damage include black locust, white poplar, tree-of-heaven, Russian olive and Oriental bittersweet.

Directed heating equipment includes a filled propane tank, usually mounted on a specialized backpack, and a vapor torch with a wand nozzle and squeeze valve. In sites with dense woody brush, the fuel supply line should be no more than 5' long to allow sufficient movement without snagging on branches (McGowan-Stinski 2001). Studies demonstrating effectiveness of spot burning woody species have utilized torches that produce 100,000 - 150,000 BTUs of energy (Ward and Williams 2011, Lee et al. 2017). Wand nozzle diameters used for spot burning range from 2 - 3" (Ward and Williams 2011, Lee et al. 2017, McGowan-Stinski 2001). The wand nozzle diameter determines the total length of the flame produced, the distance between the nozzle and the hottest part the flame, and the degree of precision provided. Narrower nozzles produce shorter flames that can be used more precisely to target invasive plants without impacting nearby desirable plants.

Users should wear protective eyewear, hearing protection, leather or other flame resistant gloves, leather boots with leather laces and flame resistant soles, and clothing made of fire-proof material such as Nomex (Ward et al. 2013, McGowan-Stinski 2001). Directed heating equipment poses safety risks due to the intense heat generated and the use of highly flammable, pressurized fuel. Always follow any additional or alternate safety recommendations supplied by the equipment manufacturer.

Managers seeking to conduct direct heating should consult with their local jurisdiction for burn permit and training/certification requirements. Some municipalities that do not typically allow prescribed burning may make exceptions for directed heating or spot burning (Wisconsin DNR).

The hottest part of the torch's flame is passed around the root crown of the target plant (where the stem meets the ground) until all sides have been treated and the bases of all stems are glowing. With a torch output of 140,000 BTUs, treatment required between 10 - 40 seconds of flame exposure on clumps of Japanese barberry depending on clump size (Ward and Williams 2011). It is not necessary to burn further up the stems.

If invasive plant seeds are likely present on site (e.g., the plants being treated are fruiting or have fruited previously), all equipment and operator clothing and footwear should be cleaned before leaving the site to prevent spreading invasive plant seeds to new locations.

Any invasive species treatment needs to be monitored in the years following treatment. Regrowth should be anticipated when mature invasive woody plants are flame girdled. Managers should also monitor for new seedlings.

- Lee, TD, Eisenhaure, SE, and IP Gaudreau. 2017. Pre-logging treatment of invasive glossy buckthorn (*Frangula alnus* Mill.) promotes regeneration of Eastern white pine (*Pinus strobus* L.). Forests 8(1): 16.
- McGowan-Stinski, J. 2001. Spot-burning using propane torches. In: Weed Control Methods Handbook: Tools and Techniques for Use in Natural Areas. The Nature Conservancy. Available:

https://www.invasive.org/gist/products/handbook/methods-handbook.pdf

- Ward, JS and SC Williams. 2011. Controlling an invasive shrub, Japanese barberry (*Berberis thunbergii* DC), using directed heating with propane torches. Natural Areas Journal. 31(2): 156-162.
- Ward, JS, Williams, SC, and TE Worthley. 2013. Japanese barberry control methods: reference guide for foresters and professional woodland managers. Connecticut Agricultural Experiment Station. Available: https://portal.ct.gov/-/media/CAES/DOCUMENTS/Publications/Special\_Bulletins/S pecialBulletinFeb2013Wardpdf.pdf
- Wisconsin DNR. Controlling invasive species (website). https://dnr.wi.gov/topic/Invasives/control.html
- Zouhar, K, Smith, JK, Sutherland, S and ML Brooks. 2008. Wildland fire in ecosystems: fire and nonnative invasive plants. U.S. Forest Service, Rocky Mountain Research Station. Online:

https://www.fs.usda.gov/treesearch/pubs/30622