

Girdle Treatment and Stem Injection of Woody Invasive Species

woodyinvasives.org/management/girdle-stem-injection/



Combined Method: Girdle Treatment and Stem Injection (Hack-and-Squirt)

Girdle treatment and herbicide injection are methods of controlling woody invasive species that involve injuring the trunk or stems of target plants and spraying or injecting herbicide into the injury. Stem injury can be done in a number of different ways – by drilling bore holes, making horizontal downward angled cuts (sometimes called “hack-and-squirt”), or by making a full frill or girdle. Stem injection techniques are generally practicable on stems that are more than 2” diameter at breast height (Miller et al. 2015). There is no maximum size, though a full girdle treatment may be most effective on large trees (Enloe 2016). This method is most practicable for low-to-moderate density infestations at sites where the presence of standing dead plants is acceptable.

How it works

Trunks or stems are injured to expose the vascular tissue that transports materials to the plant roots. The injury is treated with a systemic herbicide using appropriate equipment based on the size and shape of the wound. The exposed vascular tissue carries herbicide down to the roots and prevents regrowth.

Methodology in Detail

Timing Considerations

Seasonality

Girdle and stem-injection treatments can be practiced during most of the year. They should not be conducted during heavy sap flow during early spring. If stems are wounded during sap flow, they may leak water or sap, preventing herbicide from being properly absorbed.

Weather

Stem injection techniques (including hack-and-squirt) can be conducted during wet weather because angled cuts or bore holes prevent rain from interfering with the herbicide. Full girdle treatments should not be conducted if rain is forecast before the selected herbicide is rainfast as this may decrease effectiveness.

Timing of Herbicide Application Relative to Stem Injury

Herbicide should be applied to the injuries as soon as possible. Woody species are often able to seal off their vascular tissues following injury. The same laborer can perform both the cut and herbicide application, or two individuals or teams (one cutting, one applying chemical) can work closely in conjunction.

Making the Stem Injury

Girdle/Frill – See our summary on girdling.

Horizontal cuts – Cuts should be made with a bladed hand tool, generally a sharp hatchet (Enloe 2016). Cuts should be made downward at a 45o angle and should be placed at the lowest height that is comfortable for the person conducting the labor. The number of cuts needed depends on the size of the target and the herbicide being used. Herbicides that are labeled for this application usually recommend an amount of product per cut and cut spacing on the product label. On very large trunks, a full girdle may be needed. On multi-stemmed species, all stems must be treated (Enloe 2016).

Bore holes – Holes for injecting herbicide can be made using specialized injecting equipment or with a battery powered drill with a 3/8"- 5/16" bit (Enloe 2016). If using a drill, holes should be placed at the lowest height that is comfortable for the person conducting the labor. The number of holes needed depends on the size of the target and the herbicide being

used. Herbicides that are labeled for this application usually both an amount of product per bore hole and bore hole spacing on the product label. On multi-stemmed species, all stems must be treated.

Species Considerations

Injection techniques including hack-and-squirt are preferred over full girdle treatments for species that are prone to aggressive growth from the root system in response to stem damage. Girdling may increase the density of the infestation of these species and is not recommended. Invasive woody species known for aggressive root sprouting in response to stem damage include black locust, white poplar, tree-of-heaven, Russian olive and Asian bittersweet.

This method is unlikely to be practicable on multi-stemmed plants, particularly those that grow in dense thickets or that rarely reach 2" in stem diameter (barberries, multiflora rose, wineberry).

Choosing Herbicide

Herbicides that are suitable for girdle and injection treatments are systemic, meaning that they are absorbed into the target's tissues and transported throughout the plant. When choosing a systemic herbicide, a site manager should consider the site characteristics (particularly any presence of surface water or saturated soils), the species being treated, and the environmental behavior of the chemical relative to long-term goals for the site.

Certain herbicides in certain formulations are known to have adverse impacts on surface water, doing significant harm to aquatic life. If the site where stem injection or girdle application is being considered has a high water table (saturated or near-saturated soils) or surface water present, herbicide labeled/approved for this type of setting should be selected (read environmental hazards section on the label). Two of the most common herbicide active ingredients for use on woody invasives – glyphosate and triclopyr – come in both aquatic safe and unsafe formulations.

Due to differences in species biology, certain chemicals or chemical mixtures work better on some species than others. Herbicide product labels include a list of weed species controlled. If a species does not appear on a product label's control list, it does not necessarily mean that the herbicide will not work but that the manufacturer has not tested it and does not guarantee efficacy. University programs and state agencies engaged in forestry and invasive species control are often great sources of species-specific herbicide recommendations. The Midwest Invasive Plant Network consolidated these recommendations for many species in its Invasive Plant Control Database.

Equipment for Application

Equipment should correspond to the type of stem incision that will be made. A chemical proof hand spray bottle with a nozzle that produces a stream of liquid is frequently used to apply herbicide when horizontal cuts are made (hack-and-squirt). A potential issue in using a spray bottle is that a single scoot from the bottle may release more than the label-specified amount of herbicide into each cut, increasing the potential for leakage and for exceeding acreage application limits (Enloe 2016). Disposable plastic syringes and metered draw-off syringes (most commonly used to administer livestock vaccinations) can be used to more accurately measure and deliver herbicide to cuts (Byrd 2018, Enloe 2016). The advantage of the more expensive draw-off syringe over the disposables is that it can be connected to an herbicide backpack making reloading easier. If bore holes are made, application via syringe or a squeeze bottle with a narrow nozzle is necessary.

If treating fully girdled trees, the equipment described in the basal bark treatment summary is suitable.

There are a few pieces of specialized equipment that make the stem injury and inject herbicide at the same time. There is a hollow-bladed hatchet with an internal herbicide reservoir on the market. There are also specialized lance injectors that are thrust into target stems near the base, injecting a cartridge that releases herbicide slowly over time. These cartridges are not registered for use in all jurisdictions.

Personal Protective Equipment

Always follow personal protective equipment recommendations on the herbicide product label.

Regulations, Training, and Applicator Certification

Each Great Lakes jurisdiction has regulations regarding the registration and labeling of pesticide products and the training and certification of pesticide users. Note that not all herbicides are registered for use in all jurisdictions and it is illegal to use a product in a jurisdiction where it is not registered. In Ontario, Canada the use of most synthetic herbicides on non-agricultural and non-forestry land is prohibited by law. Persons seeking to use herbicide to control invasive plants for the benefit of natural resources in Ontario are required to seek an exemption under the Pesticide Act.

U.S. state governments generally require that anybody applying herbicides on non-residential or non-farm properties or applying herbicide in exchange for payment undergo training and pass a certification or licensing exam (see program links below). Certain pesticides are labeled as restricted use at the federal and state levels that require certification for purchase and use in all cases. Ontario requires licensing of all persons seeking to purchase and apply pesticides. It is usually necessary to renew certification or

licensing periodically. Managers should be certain that all staff and volunteers using herbicide have adequate training and current certification. Any hired applicators should be asked for proof of current jurisdictional certification.

Pesticide Training and Certification Programs:

IL IN MI MN NY OH ON PA WI

Application Method

Using the selected equipment, spray, squeeze or inject the label-specified amount of herbicide into each stem injury immediately after the injury is made. For a full girdle, apply chemical all the way around the stem but not to the point of run-off. If using a spray bottle for hack and squirt, the hatchet or machete blade can be left in the cut and spray directed down the top surface of the blade to improve accuracy (University of Kentucky 2012). If injuries are deep enough and the correct amount of chemical is used, there should not be significant leakage.

Stop the Spread

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.

Monitoring and Follow-up

Any invasive species treatment needs to be monitored for effectiveness and for invasive species re-growth in the years following treatment. Stem injection treatments can be repeated if necessary, though herbicide label-specified annual application limits must be followed.

References and Further Reading

- Byrd, JD Jr. 2018. Applying herbicides with the hack and squirt method. Mississippi State University Extension Publication 3276 (URL)
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- Midwest Invasive Plant Network. 2012. Invasive Plant Control Database.

- Miller, JH, Manning, ST and SF Enloe. 2015. A Management Guide for Invasive Plants in Southern Forests. United States Department of Agriculture, Forest Service, Southern Research Service. SRS-131.
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Header Photo: James H. Miller, USDA Forest Service, via bugwood.org