

Overview of Control Methods

Compiled by Michael Van Clef, Ph.D., Stewardship Director, Friends of Hopewell Valley Open Space

Method Name	Method Type(s)	Method Code	Typical Herbicide Concentrations	Target Type(s)	Basic Technique	Pros	Cons	Notes
biological control	Biological Control	BC	N/A	few selected species	Release of approved biological control agents that attack only target species	Method can provide effective control and is cost effective	There are no species at Brightwood Park with an available biological control agent.	A biological control agent for garlic mustard is under development and may be ready for release in the near future.
basal bark	Chemical Control	BB	20 - 25%	woody species	Application of herbicide within a 6-12 inch band around entire stem approximately 12 inches above base of plant	Method provides effective control and is cost effective	Some suggested oil diluents are not environmentally friendly, but vegetable or citrus oils with triclopyr can be effective (Rathfon 2006)	Herbicide application is performed using a backpack sprayer. Method used for woody stems ≤ 6" in diameter. This method should be considered an important control technique.
foliar spray	Chemical Control	FS	1-3%	Any plant less than 4 feet tall	Application of herbicide using a backpack sprayer to wet all leaves	Method provides effective control and is cost effective	Method has potential to injure non-target species and cannot be used on taller plants due to increased risk to applicator and non-target species (i.e., spraying upward increases risk of drift); Method can be sensitive to weather conditions (e.g., heat may dry spray before effective absorption)	Foliar applications generally include use of a backpack sprayer (Recommend use of Thinvert system ¹). Some foliar application methods include wipe-on applications (e.g., "bloody glove"), but these methods are not recommended because they are extremely time consuming and increase likelihood of exposure to the applicator. The use of boom applications is not recommended, but may be useful in the establishment of native warm season grasses where all existing vegetation must be removed prior to seeding.
pre-emergent spray	Chemical Control	PS	1-3%	herbaceous species	Application of herbicide to prevent seed germination	Method can provide effective control	Requires a broad application in areas known or suspected to contain invasive species; Timing of application can vary between years for targeted species; Suppresses germination of all species	This method is not recommended at Brightwood Park.
hack-and-squirt	Chemical & Mechanical Control	HS	20 - 25%	woody species	Make downward cuts with a hand axe (one cut per inch of diameter) and apply herbicide to cuts	Method provides effective control and is cost effective; Volunteers can assist with stem cutting	Stem cutting may be difficult for thick-barked plants	Herbicide applied with squirt bottle or paint brush. Herbicide should be applied immediately after cutting.

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stem injection	Chemical & Mechanical Control	SI	20 - 25%	woody species	E-Z-Ject Lance loaded with herbicide pellets	Method provides effective control	Equipment is difficult to operate under field conditions; Injection for thick-barked trees requires significant force; Equipment is expensive	A modified approach using a drill and manual insertion of herbicide may be more practical. This method is not recommended at Brightwood Park.
cut stump	Chemical & Mechanical Control	CS	20 - 25%	woody species	Cutting stems just above ground level followed by targeted application of herbicide to cut stems	Method provides effective control; Volunteers can assist with stem cutting	Mechanical removal of stems is very time consuming	Cutting is performed by loppers, handsaws or chainsaws depending upon size of stems. Herbicide applied with a squirt bottle, paint brush or backpack sprayer. Herbicide should be applied immediately after cutting.
prescribed fire	Cultural Control	PF	N/A	many species	Should follow a site-specific Prescribed Burning Plan that is part of a comprehensive Grassland Management Plan	Method provides effective control and is cost effective	Requires highly trained personnel; Insurance requirements may restrict application to an outside contractor; Requires public outreach to neighbors and public officials	Prescribed fire is most effective for grasslands with dense stands of native warm season grasses that provide ample fuel to eliminate woody seedlings; Prescribed fire may be utilized to remove dense thatch before application of herbicides (e.g., common reed, reed canary grass) in wetland habitats. The effectiveness of prescribed fire to control invasive species in forest habitats is currently uncertain.
prescribed grazing	Cultural Control	PG	N/A	many species	Rotational system using multiple livestock species; Should follow a site-specific Prescribed Grazing Plan that is part of a comprehensive Grassland Management Plan	Method may be effective; Method can be assisted by volunteers	Method requires significant expertise in selection of livestock species, density of animals per unit area and timing of grazing; Method requires installation of fencing; Method may spread some invasive species through feces; Trampling of vegetation may encourage invasive species	Implementation will require consultation with experts in the use of livestock for the purpose of eliminating invasive species; Method may be considered for shrub control in forest settings if native species are currently absent

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soil tilling	Cultural Control	ST	N/A	herbaceous species and woody seedlings	Turning of soil using typical farm equipment	Method may provide effective control and is cost effective	Method destroys native species along with invasive species; Method may increase invasive species through extensive soil disturbance	This is an extreme method with limited use in natural areas. Successive tilling events may be used to exhaust weed seed bank prior to re-planting pollinator meadows.
mulching	Cultural Control	MU	N/A	herbaceous species	Application of a thick layer (3-4 inches) of organic materials	Method is effective for herbaceous species within cultivated garden beds or roadsides; Method can be assisted by volunteers	Method is not practical in natural areas where vehicle access is limited	Only effective on species with small seeds or weakly growing plants that cannot germinate/grow through the mulch. Japanese stiltgrass and garlic mustard are sensitive to heavy mulching.
solarization	Cultural Control	SO	N/A	herbaceous species	Application of plastic sheeting over infested areas	Method may be effective in some situations; Method can be assisted by volunteers	Method may alter soil chemistry and biology more significantly than herbicides	Plastic sheeting increases soil temperature to kill seeds and plants. This method is not recommended at Brightwood Park.
girdling	Mechanical Control (may be combined with Chemical Control)	GI	N/A	woody species	Cutting and removing a ≥ 3 inch band of bark from a trunk	Method can provide effective control; Method can be assisted by volunteers	Method may be ineffective on species with re-sprouting ability; Method is time consuming and difficult for thick-barked species; Method cannot be utilized where the risk of standing dead trees is unacceptable	Method may be combined with chemical control (i.e., apply herbicide to girdled area); Do not attempt on species such as black locust, tree-of-heaven or Japanese angelica tree, which will vigorously re-sprout multiple stems in response to girdling (hack-and-squirt may be effective on these species)
mowing	Mechanical Control	MO	N/A	many species	Cutting tops of plants using a mower, brush cutter or weed whacker	Method may be used as a pre-treatment for herbicide application to cut stumps or foliar applications to re-sprouts using a backpack sprayer	Method is ineffective for most species because of re-sprouting ability	Japanese stiltgrass can sustain itself as a "lawn" by producing seeds on plants that are two inches or smaller

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pulling	Mechanical Control	PU	N/A	small woody plants and herbaceous species	Removal of entire plant by hand or use of specialized tools such as a "Weed Wrench"	Method can provide effective control; Method can be performed by volunteers	Method is extremely time consuming and ineffective when root system cannot be completely removed; Method creates soil disturbance that stimulates germination of invasive species such as garlic mustard and Japanese stiltgrass	This method should only be considered on a limited basis at Brightwood Park.
hot foam spray	Mechanical Control	HF	N/A	herbaceous species	Rental of Waipuna Hot Foam System	No herbicides are required	System rental cost is \$700/month with a two-year lease commitment and there are other related equipment costs; system can only be used within 200 feet of a vehicle that carries the specialized hot foam generator, many herbaceous plants require multiple treatments	This is an innovative system, but has significant financial and practical limitations. This method is not recommended for Brightwood Park.

¹Thinvert system involves use of specialized spray nozzles combined with a thin invert emulsion spray fluid (instead of using water to mix with herbicides). The primary advantage is less herbicide drift to non-target plants and an overall lower volume of spray required to treat a given area. Although the system is more expensive than typical spray systems, it is ultimately cost effective because of labor-savings generated through reduction of re-filling of sprayers.