Chapter 10 B. Habitat Management Tools: Herbiciding

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For many people the decision of whether or not to use herbicides to control vegetation is a difficult one. Herbicides are effectively used to control invasive exotic plants that threaten natural communities and rare species, to control vegetation under power lines that provide electricity to our homes and businesses, and for a variety of other situations. However, to many, their use is somewhat controversial. Many people are concerned that herbicides contaminate groundwater, harm desirable as well as undesirable organisms, pose a threat to human health, and cause other negative impacts to people and the environment. However, if used correctly, herbicides can be a safe and effective means of helping to conserve our natural resources and our native species.

Whether or not negative impacts are realized is largely dependent on the herbicide applicator. Did the applicator have sufficient knowledge of the site where herbicides were applied? Did he select the right herbicide, the right concentration, and the right application technique for the job? Did he follow all of the safety precautions recommended by the herbicide manufacturer, the federal Environmental Protection Agency, and/or state pesticide regulatory agency? This section is dedicated to helping you, the potential herbicide applicator, answer "yes" to all of these questions.

Before deciding to use herbicides consider the following:

- Are unwanted plants threatening conservation targets or management goals on the site?
- Given the scope of the project and available labor pool, are there manual (mechanical) techniques that could effectively control the unwanted vegetation? Refer to chapter 8 for information on mechanical tools to control invasive exotic plants.

If you don't believe that manual control techniques will work or if they haven't worked in the past, then herbicides may be the only means left to conserve the resource under consideration. As such, arm yourself with as much information as possible before deciding which herbicide or application technique to use.

Applicator's license

Find out if your state requires an applicator's license. Some states require all applicators to have a license. Others allow private landowners to apply herbicides on their own land without a license. Contact the pesticide regulatory agency in your state to find out what is required. Visit http://npic.orst.edu/state1.htm to obtain contact information for your state agency.

Know your site

Get to know the project site. Are there any wetlands, rare species, or other sensitive natural resources within or near the project site? If wetlands are present, find out if your town or state regulates them and if a permit is needed to apply herbicides in or near them. You can only use an herbicide that the EPA has approved for aquatic uses when applying near or over wetlands or open water. Some herbicides with the active ingredient glyphosate are approved for use in wetlands (e.g., Accord® Concentrate and Rodeo®). Glyphosate is also the active ingredient in Roundup® herbicide, but Roundup® is not approved for use over water because the surfactant (the soapy substance that helps the herbicide stay on the leaf surface longer) in the Roundup® formulation is toxic to aquatic organisms. If using Accord® Concentrate or Rodeo®, a surfactant that is not toxic to aquatic organisms (such as Kinetic®) can be mixed in.

Figures 1a & 1b. The presence of wetlands such as this vernal pool (a), rare species such as this marlbed salamander (b), and other sensitive natural resources will play a major role in deciding whether the use of an herbicide is appropriate and which herbicide and application technique to use. Photos by James D. Oehler (a) and Paul Fusco (b).

If rare species are present, contact your state's natural heritage bureau and/or fish and wildlife agency to determine if there are any laws or regulations that pertain to your project. The presence of rare species may also influence what type of herbicide or application technique is used. For instance, if a rare plant was growing next to a plant targeted for control, a foliar spray application would not be appropriate. A more targeted technique, such as a cut-stem application, might be better suited (but note that in some cases herbicides applied to cut stumps or as a basal bark treatment have moved from the roots of the target plant into the roots of adjacent plants, perhaps through natural root grafts). You will find out more about application techniques later in this section.

Selecting the right herbicide

Find out which herbicides are effective against the targeted plant(s) (Table 1). Contact federal (U.S. Fish & Wildlife Service, U.S. Forest Service, and U.S. Department of Agriculture), state (state wildlife, forestry, and agriculture offices, and university cooperative extension programs), non-profit, or other conservation land managers in your area to find out what they have found to be effective. The Internet also provides a great deal of information on chemical plant control, especially on invasive exotic plants. Refer to the list of suggested readings at the end of this article for recommended websites.

Behavioral properties

Once a list of potential herbicides is chosen, review the behavioral properties of each product (Table 2). How long do they last in the environment? How toxic are they to animals? How mobile are they in the ground? Choose the least persistent, least toxic, and least mobile herbicide(s) that will do the job safely and effectively. Another consideration is the herbicide's selectivity. That is, does the herbicide kill a wide range of plants, or a select group of plants? If trying to control glossy buckthorn in a grassland community using a foliar spray application, an herbicide that doesn't kill grasses, such as triclopyr (active ingredient in Garlon® and Brush-be-Gone®), would be preferred, all other things being equal.

Figure 2. Buckthorn that has been mowed annually for numerous years can degrade a grassland community. When choosing an herbicide to help restore such a community, choose one that will not have an impact on the underlying grasses. Photos by James D. Oehler.

Read herbicide labels and Material Safety Data Sheets [MSDS sheets (the list of suggested readings provides a website where you can obtain these materials)]. Herbicide labels and MSDS sheets have information on the properties of the specific formulation in question. They also provide safety precautions, directions for handling, mixing, and applying the herbicide, information on required personal protection equipment, storage, cleanup, posting of the project site, and much more. When reading an herbicide label, the word "must" is used for actions that are required by law, while the word "should" is used for actions that are recommended but not required. After reading the label, consider whether or not you have the resources or can readily obtain the resources to handle the herbicide(s) safely. ALWAYS FOLLOW LABEL DIRECTIONS. IT IS AGAINST FEDERAL LAW TO DO OTHERWISE.


Roundup PRO

The complete broad spectrum postemergence professional herbicide for industrial, turf and ornamental weed control.

Complete Directions for Use

AVOID CONTACT OF HERBICIDE WITH FOLIAGE, GREEN STEMS, EXPOSED NON-WOODY ROOTS OR FRUIT OF CROPS, DESIRABLE PLANTS AND TREES, BECAUSE SEVERE INJURY OR DESTRUCTION IS LIKELY TO RESULT.

1.0 INGREDIENTS

3.0 PRECAUTIONARY STATEMENTS

3.1 Hazards to Humans and Domestic Animals

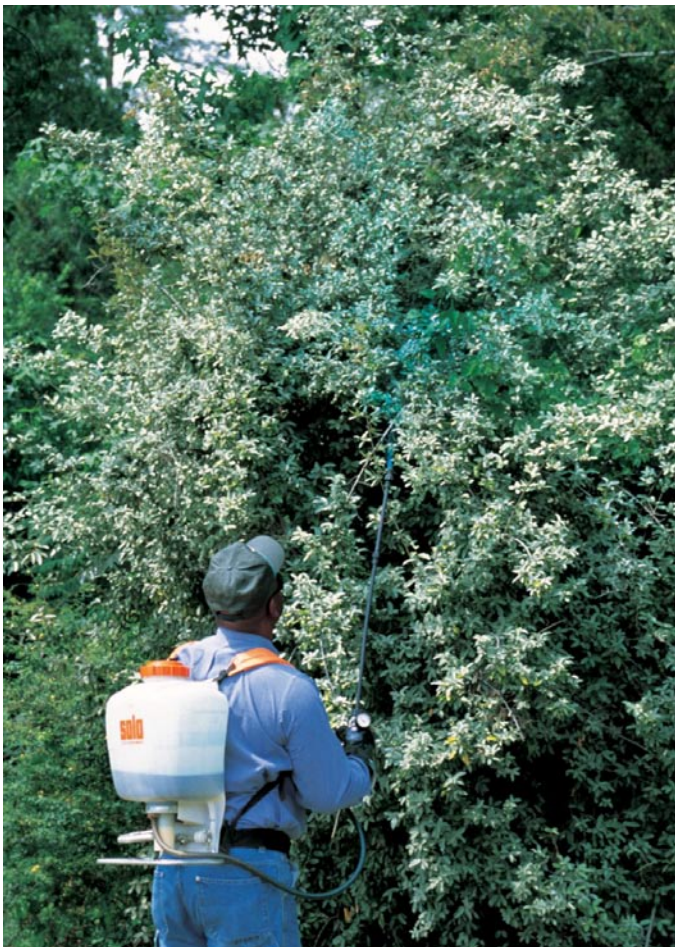
CAUTION!

3.2 Environmental Hazards

Figure 3. Herbicide labels and MSDS sheets provide a plethora of information regarding the safe application and handling of herbicides.

Selecting the right application technique

The next step is to learn about the various application techniques. Some of the more popular techniques include:



Foliar spray application

Herbicide is sprayed onto the leaves of targeted plants. Care must be taken to avoid over spraying onto nearby non-target plants. Avoid using boom spray applications where possible because it can result in a relatively high amount of herbicide contacting non-target species and bare ground.

Figure 4. Foliar spray applications are a common technique for controlling large invasions of problem plants. Photo by James H. Miller, USDA Forest Service, www.invasive.org.

Cut-stem

A tree or shrub is cut near the base and herbicide is immediately sprayed, squirted, or painted on the exposed cambium (living inner bark) of the stump. Care must be taken to avoid applying too much herbicide and allowing it to run-off. Because it is so targeted, this technique has a low probability of affecting non-target species or contaminating the environment. A homemade PVC applicator is a cheap, effective, and pain-saving tool for applying water-soluble herbicides to cut-stem surfaces. For more information on how to construct an applicator, visit the following websites:

- The Maryland Department of Agriculture: www.mda.state.mn.us/ipm/thicket/volume3no1/wickapplicator.htm
- The Nature Conservancy Weeds on the Web: tncweeds.ucdavis.edu/products/handbook/22.PVCapplicator.pdf

Figure 5. Cut-stem applications are more targeted than foliar applications and therefore produce fewer non-target impacts. Photo by James H. Miller, USDA Forest Service, www.invasive.org.

Basal bark

A 6 to 12 inch band of herbicide is sprayed or painted around the circumference of the trunk of the plant, approximately one foot above ground. This technique works best on young trees with smooth bark. It is usually not effective against older plants or those with thick, corky bark. Girdling a tree first may substantially increase the success of this technique.

Figure 6. Basal bark treatments can be effective at controlling certain tree species including autumn and Russian olive and tree-of-heaven. Photo by James H. Miller, USDA Forest Service, www.invasive.org.

Wick application

This technique utilizes a three to four inch pipe usually made of PVC with wicking rope that winds from inside to outside of the pipe along its entire length. The pipe is capped at both ends, with one end threaded so it can be filled with herbicide. The rope winds through tight-fitting grommets that prevent herbicide drip. The applicator is mounted on a tractor

so it can be raised and lowered as necessary to treat undesirable plants as the tractor drives along. This technique is commonly used in Mid-Atlantic states to treat tall weeds (e.g., Johnsongrass) growing among lower growing crops (e.g., soybeans). In wildlife habitat management applications, a wick applicator can be used to treat tall-growing weeds in a newly planted native warm-season grass field. If built ruggedly enough, a wick applicator may also be useful in treating seedling-sapling trees growing above other plants in an old-field setting. Kits to build wick applicators are commonly available through farm service supply companies. For more information on wick applicators, visit the following website:

- Kansas Forest Service: www.oznet.ksu.edu/library/forst2/mf2342.pdf

or contact:

- Speidel Applicator, Inc., 7800 South 40th St, Lincoln, NE 68516, (402) 423-4003

Injection

A specialized tool called the EZ-ject® lance injects .22 caliber-sized capsules filled with herbicide into the trunk of a tree. The lance is a 5-foot long metal tube that is manually operated. It provides a convenient, easy, and safe way of applying herbicides with minimal cleanup and exposure to other organisms. However, the lance and capsules are not inexpensive ($425/lance and $500/4,800 capsules) and can be difficult to use in densely vegetated areas. For more information on the EZ-ject lance visit:

- The Nature Conservancy Invasives on the Web website: tncweeds.ucdavis.edu/tools/ezject.html
- Odum Engineering, the manufacturers of the EZ-ject lance: www.ezject.com.

Figure 7. The EZ-ject® lance is can be an efficient means of controlling larger shrubs and trees without non-target impacts. Photos ©2003 Forestry Suppliers, Inc. All rights reserved. Used by permission. 540010.

Targeted application techniques, such as cut-stem and basal bark, usually require a much more concentrated solution of herbicide (25-100% active ingredient), as compared to foliar spray applications (typically 2-5% active ingredient). As such, be especially diligent when applying herbicides using these techniques so no other organisms will be affected. Regardless of the herbicide(s) used, be prepared to repeat treatments one or more times, as no treatment is 100% effective.

The use of herbicides to control unwanted vegetation is not a management technique that should be taken lightly. However, if knowledgeable about all of the issues pertaining to herbicides, a land manager can use this tool safely and effectively and can rest assured that he has accomplished more conservation good than harm.

Suggested reading

Wisconsin Manual of Control Recommendations for Ecologically Invasive Plants. www.dnr.state.wi.us/org/land/er/invasive/manual_toc.htm.

The National Pesticide Information Center website (herbicide properties, labels, MSDS sheets, more). npic.orst.edu/index.html.

The Nature Conservancy's Element Stewardship Abstracts (ESAs provide detailed information on many invasive exotic plants and how to control them). tncweeds.ucdavis.edu/esadocs.html.

The Nature Conservancy, Weed Control Methods Handbook (detailed information on controlling invasive exotic plants). tncweeds.ucdavis.edu/handbook.html.

Biography

Jim Oehler has a B.S. in Wildlife Management from the University of Wisconsin – Stevens Point and an M.S. in Wildlife Ecology from the University of New Hampshire. Prior to joining the New Hampshire Fish & Game Department in January 2003, Jim spent five years with the Massachusetts Division of Fisheries & Wildlife reclaiming and maintaining early-successional habitats and controlling the invasive exotic plants commonly found in those habitats.

Table 1. List of selected invasive exotic plants and commonly used herbicide(s) known to be effective at controlling them.[a]

Plant Name	Cut-stem[b]	Basal Bark	Foliar[c]	Notes
Asiatic bittersweet	100% glyphosate or 40% triclopyr	--	1-2% triclopyr	Cut stem: apply after last killing frost. Foliar: Cut stems early in spring, and spray resprouts.
Barberries	20% glyphosate or 25% triclopyr	--	5% glyphosate	Cut stem: apply anytime in August through October. Foliar: apply when in bloom.
Buckthorns	20% glyphosate or 25% triclopyr	--	5% glyphosate + 1/4 oz metsulfuron methyl per 100 gals.	Cut stem: apply in August or September.
Bush honeysuckles	20% glyphosate or 25% triclopyr	--	2-5% glyphosate or triclopyr	Cut stem: apply late in the growing season or throughout the dormant season. Foliar: apply when in bloom.
Common reed	30-50% glyphosate (Rodeo® or Accord® for wetlands)	--	3-5% glyphosate (Rodeo® or Accord® for wetlands)	Cut stem: inject herbicide into stem with eye dropper. Foliar: apply after plants have formed tassels.
Multiflora rose	20% glyphosate or 25% triclopyr	--	5% glyphosate + 1/4 oz metsulfuron methyl per 100 gals.	Cut stem: apply anytime in August through October. Foliar: apply when in bloom.
Olives	10-20% glyphosate	1% triclopyr (Garlon® 4) in diesel oil	5% glyphosate + 1/4 oz metsulfuron methyl per 100 gals.	Basal bark: a basal bark ready formulation is available and marketed under the brand name Pathfinder II®.
Sericea lespedeza	--	--	2% triclopyr	Apply in early to midsummer during the flower bud stage.
Purple loosestrife	30% glyphosate (Rodeo or Accord for wetlands)	--	3-5% glyphosate (Rodeo® or Accord® for wetlands)	Cut-stem: apply when flowering (Aug./Sept.)
Tree-of-heaven	100% triclopyr (Garlon® 3A formulation which is already somewhat diluted with water) or 100% glyphosate.	20% triclopyr (Garlon® 4) in diesel oil or 15% triclopyr (Garlon® 4) + 5% imazapyr in diesel oil or 100% glyphosate.	2% triclopyr or glyphosate	Basal bark: a basal bark ready formulation is available and marketed under the brand name Pathfinder II®. Cut stem: apply anytime in August through October.

[a] Listed herbicides and treatments are also effective against a number of other plants including many native plants. Care must be taken during application not to affect non-target plants.

[b] Remove and dispose of stems with seeds or root segments. Cut-stem applications are most effective when applied in late summer or fall when the plant is sending all resources down to the root system in preparation for the dormant season. Listed herbicide concentrations refer to solutions in water.

[c] Foliar applications are most effective when plants are in flower or forming fruits. Listed herbicide concentrations refer to solutions in water.

Table 2. Behavioral properties of selected herbicides (modified from a table presented in The Nature Conservancy's Weed Control Methods Handbook).

Herbicide	Brand Name Examples	Target Weeds	Average Half-life in Soil	Mobility in Soil	Average Half-life in Water	Mechanism of Degradation	Toxicity to Animals	Notes
Glyphosate	RoundUp®, Rodeo®, Accord®	Annual and perennial weeds	47 days	Low	12 days to 10 weeks	Primarily microbial	Low	Little to no soil activity. Some formulations are highly toxic to aquatic organisms (e.g., Roundup®).
Metsulfuron methyl	Escort®	Annual and perennial broadleaf weeds and some annual grasses	14-180 days	Low-moderate	29 days	Primarily microbial and chemical	Low	Useful in establishing native warm-season grass stands.
Imazapic	Plateau®, Plateau Eco-Pak®, Cadre®	Annual and perennial broadleaf weeds and some annual grasses	120-140 days	Low	< 8 hours	Primarily microbial	Low	Degree of control depends on selectivity of individual plants. Especially useful in establishing native warm-season grass stands.
Imazapyr	Arsenal®	Annual and perennial weeds	25-141 days	Low-moderate	2 days	Primarily microbial, but also solar	Low	Provides long-term total vegetation control.
Triclopyr	Garlon®, Remedy®	Annual and perennial broadleaf weeds	30 days	Moderate-high	4 days	Primarily microbial, but also solar	Low	Commonly used herbicide. The ester formulation is highly toxic to aquatic organisms.