

# Ohio Pesticide Applicator Training

Weed Control in  
Non-Cropland Areas

**Student Workbook**

**Prepared by:**

*Glen Arnold*, County Extension Agent,  
Agriculture/ Natural Resources  
Putnam County, 219 S. Oak St.  
Ottawa, OH 45875

*Greg LaBarge*, County Extension Agent, Agriculture/  
Natural Resources  
Fulton County, 135 Court House Plaza  
Wauseon, OH 43567

**Edited by:**

*Joanne Kick-Raack*, Assistant Coordinator  
Pesticide Applicator Training

Compiled by:  
*June Allen*, Extension Associate  
Pesticide Applicator Training

**Acknowledgements**

We would like to express our appreciation to the following individuals for contributing to or reviewing the manuscript prior to publication:

*Mark Loux*, Department of Agronomy  
The Ohio State University

*David Savage*, Department of Agronomy  
The Ohio State University

**Preface**

This workbook was prepared by the Ohio Cooperative Extension Service for use as a self-study guide or in combination with an educational program. It has been developed to assist pesticide applicators in better preparing themselves for taking the exams required for certification in the non-cropland category. The sample questions presented in this manual will help the reader obtain a general understanding of non-cropland pest problems, approaches to control, and general information needed to apply and use pesticides safely.

**How to Use this Workbook**

This workbook is designed to serve as a supplementary study guide to the following bulletin published by the Ohio State University Extension. These and other references are available through local county Extension offices.

Bulletin L- 303 *Multiflora Rose Control*

Bulletin F-20 *Calibration of Hand Sprayers for Herbicide Application*

Bulletin F-23 *How much herbicide do I need*

Bulletin F-45 *Controlling Undesirable Trees, Shrubs, and Vines in your Woodland*

Users of this workbook should read the references before attempting the workbook. When completing this workbook, use the flap on the back cover to conceal the answers while answering the questions on the left-hand page. Once all the questions are answered, the user should check to see if the responses are correct, mark those incorrect, and read the explanation for each question. If the explanation is the least bit confusing or if you disagree with the answer or explanation, refer to the section indicated in the reference.

Your comments and suggestions to improve this study tool for future users would be appreciated. Comments should be directed to;

Pesticide Applicator Training,  
Extension Entomology  
1991 Kenny Road  
Columbus, OH 43210

**TDD #1 (800) 589-8292 (Ohio only)  
or (614) 292-1868**



Copyright © The Ohio State University, 1994

All educational programs conducted by Ohio State University Extension are available to clientele on a nondiscriminatory basis without regard to race, color, creed, religion, sexual orientation, national origin, gender, age, disability or Vietnam-era veteran status.

12/94—2M—122544

Issued in furtherance of Cooperative Extension work, Acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture, Keith L. Smith, Director, Ohio State University Extension.

# Ohio Pesticide Applicator Training

Weed Control in  
Non-Cropland Areas

**Student Workbook**



# Index

## General Information

Importance of Weed Management .....	4
Plant Life Cycle/Effects on Control Methods .....	4
Selection and Establishment of a Cover Crop .....	5
Noxious Weeds .....	5
General Herbicide Information .....	6

## Specific Recommendations for Different Non-Cropland Applications

Selection of Application Techniques .....	8
Weed Control in Grass Pastures and Fencerows .....	12
Weed Control on Government Set-aside and CRP .....	14
Ditch Bank Weed Control .....	15
Control of Problem Weeds .....	16

## Appendix A. Herbicide Effectiveness Charts

Herbaceous Weeds .....	18
Cut Stump and Injection Treatments for Brush .....	19
Basal Bark Treatments for Brush .....	20
Soil Applied Brush Treatments .....	21
Foliar Applied Brush Treatments .....	22

## Appendix B.

Glossary of chemicals and manufactures .....	23
----------------------------------------------	----

## Appendix C.

Study Questions for Category 9, Non-Cropland Private Applicator's Test .....	24
---------------------------------------------------------------------------------	----

# GENERAL INFORMATION

## Importance of Weed Management in Non-Cropland Areas

The unchecked growth of weeds in pastures, ditchbanks, fencerows, and other non-cropland areas can cause several problems for landowners. Poor weed management may:

- 1) Increase weed seed reservoirs and potential for weed problems if the land is ever brought into row crop production.
- 2) Provide for a source of new weed problems in adjoining fields through seed dispersed by wind/ animals or perennials creeping in from field edges.
- 3) Lower economic land values.
- 4) Reduce the value of land as wildlife habitat.
- 5) Increase the potential fines for noncompliance with ASCS provisions for weed control in government program enrolled acres or if noxious weed laws are not followed.
- 6) Increase weed competition with the growth of desirable cover crops planted to non-cropland areas.

Several chemical and non-chemical methods of weed control can be used to reduce weed competition and promote the growth of desirable cover in non-cropland areas. A basic knowledge of plant life cycles, herbicides, and application techniques will increase the effectiveness of control methods used on farms.

## Plant Life Cycle Effects on Control Methods

Plants are classified as annuals, biennials, or perennials based on the length of their life cycle from seed emergence until the plant flowers and reproduces.

**Annual weeds require less than one year to emerge, flower and produce seed.** Annual plants produce large numbers of seeds thus removal of the plant prior to flowering or seed production can help reduce future weed problems. Control of annuals can be accomplished by one or two timely mowings or herbicide applications prior to seed formation.

Summer annuals, such as giant or common ragweed, velvetleaf, shattercane, and giant foxtail, emerge

in spring through early summer, flower and produce seed in summer through early fall. Winter annuals, such as mustards, chickweed, henbit, and downy brome, emerge in fall or early spring, flower and produce seed in late spring.

**Biennial weeds have a two-year life cycle.** In year one, biennials emerge from seed and form a rosette with a substantial taproot to survive the winter. Plants regrow from the taproot in the second year, flower, produce seed, and then die. Examples of biennial weeds are wild carrot, bull thistle, and common burdock.

Control of biennials by mowing should be geared toward interrupting growth frequently to prevent the plants in year one from building root reserves and plants in year two from producing seed. Most biennials form rosettes close to the ground making mowing in year one ineffective in many cases. Thus, the primary focus of mowing should be prevention of seed formation. Herbicides should be applied when plants are fairly small and actively growing, but before seed production. Control of biennial weeds may require higher herbicide rates than for annual weeds.

**Perennial weeds live more than two years.** Reproduction occurs primarily through underground reproductive root structures that store carbohydrates (sugars) used to produce new shoots. Small numbers of seeds are produced which help spread the plant. Examples include johnsongrass, Canada thistle, hemp dogbane, yellow nutsedge, trumpetcreeper and other woody plants.

One recommendation for controlling perennial weed populations is eradication of single plants and small patches before they become significant problems. Left undisturbed, perennials can become a problem which is costly and difficult to control.

Perennial plants use root reserves to produce new plants. The plant uses carbohydrate reserves in the early vegetative stages. As flowering approaches, the plant shifts to building root carbohydrate reserves. Control with mowing should be geared toward constant interruption of growth in mid to late vegetative stages, forcing the plant to use up root

reserves and prevent movement of additional reserves from the leaves to the roots.

A single chemical application should generally be applied at the early bud to flower stage. Systemic herbicides such as glyphosate (Roundup) and 2,4-D are most effective since they will move into the root, with the carbohydrates being stored by the plant, and kill the reproductive root structure. Contact herbicides will burn off vegetative growth, but the plant will soon produce new shoots from the underground root structure.

One approach, combining chemical and non-chemical control, is to mow one or more times in spring through early summer. After mowing, allow the plant to regrow to the bud or early flower stage, then apply herbicide (usually in the fall). The mowing maximizes the number of plants in the susceptible bud stage at the time of herbicide application. Control of perennial weeds generally requires higher herbicide rates than used for control of biennial or annual weeds.

### **Selection and Establishment of a Cover Crop**

Planting a legume and/or grass cover in non-crop areas is desirable to suppress weeds and prevent erosion from bare soil. The cover may also provide a harvestable crop which can add to farm income.

For areas that may be used for crop production in the future, choose a cover that is not extremely difficult to kill. Most legumes can be killed with applications of 2,4-D, Banvel, Roundup, or even by Atrazine/Bladex combinations. Where a mixed grass/legume cover is used, Gramoxone or Roundup will usually be required. Grass species, including orchardgrass, fescue, switchgrass, and brome grass, may be difficult and expensive to kill. Timothy is a good choice, since it is more easily controlled than some other grasses.

The establishment of a grass cover is desirable, where recropping will not occur for long periods, to facilitate broadleaf weed control. In most cases where a herbicide application is required in non-crop areas, the target weeds will be broadleaves or woody perennials. Most herbicides required for control of these plants will kill or severely injure legumes, but often have little effect on grasses. While there are

benefits to using legumes as a cover, planting a grass alone will allow the use of many herbicides, including 2,4-D, Banvel, and Crossbow, that cannot be used on legumes.

Where a legume is to be established in a non-crop area the following recommendation may assist in establishment by suppressing weed competition:

\*If the cover is to be used for hay or pasture, Eptam or Balan can be applied pre-plant and incorporated.

\*Where there are no plans to use the cover for hay or pasture, Treflan (up to 1 1/2 pints per acre) or Prowl can be applied and incorporated prior to planting. Do not use preplant herbicides where a grass is being established with the legume, as these herbicides will kill germinating grasses. Prowl or Treflan may cause some early-season injury to the legume, but this is considered negligible compared to the effect that weeds can have during cover establishment.

\*Alternative grass control methods include applying Poast, Fusilade, or a similar herbicide if the label allows this use (Poast and Poast Plus are the only postemergence grass herbicides labeled for legumes that will be fed to animals).

\*If broadleaf weeds become a problem during establishment of a legume, grass, or mixed legume/grass cover, Butyrac 200 (2,4-DB) can be applied when weeds are small and actively growing.

### **Noxious Weeds**

Ohio has laws related to the control of weeds designated as noxious on public and private lands, commonly referred to as the noxious weed legislation. The specifics of this code can be found in Ohio Revised Code Chapters 5579 and 5589 and will not be presented here. Following is a list of noxious weeds and a general explanation of the responsibilities of landowners or land managers with regard to noxious weeds.

A noxious weed is any plant designated as such by the Director of Agriculture, on the basis that the weed is especially undesirable, troublesome, and difficult to control. In Ohio, the following plants are designated as 'prohibited noxious weeds':

Shattercane	Canada thistle
Russian thistle	Wild parsnip
Wild carrot	Oxeye daisy
Wild mustard	Johnsongrass
Poison Hemlock	Cressleaf Grounself
Musk Thistle	Purple Loosestrife
Mile-a-Minute Vine	
Grapevines (when growing in groups of 100 or more and not maintained for 2 consecutive years)	

The noxious weed laws state that those responsible for maintaining roads within a county, township, or municipality must destroy noxious weeds during the first twenty days of June, August, and September. Private landowners who do not control noxious weeds will be notified by the township board of trustees that they are in violation of the Noxious Weed Law. Within five days of notification, the noxious weeds must be mowed or otherwise destroyed, unless a good case can be made for not doing so. On public lands, the county extension agent and supervisor of the local conservation district are responsible for meeting with the manager of the land, and should notify the township trustees of a plan to control noxious weeds within five days. Penalties do exist for non-compliance with noxious weed legislation.

### General Herbicide Information

Several factors must be kept in mind when applying herbicides to protect the environment, minimize damage to desirable plants in/around the treatment area, and increase the chance of successful control.

Generally surface water is found to be more vulnerable to contamination by pesticides than groundwater in Ohio. Herbicides in runoff water or attached to eroding soil particles can move into irrigation ditches, streams, ponds, and lakes. Maintaining a grass buffer zone between the point of application and water areas will reduce the potential for water contamination. Avoid herbicide applications that kill all vegetation and expose the soil to erosion. Herbicides selective for broadleaf weeds should be used on ditchbanks so that soil-holding grasses are not killed.

Off-target movement of certain herbicides through drift or movement within the soil can have a severe impact on desirable vegetation. For any herbicide possessing soil residual activity, stay at least as far away from a desirable tree as that tree is tall. Also, be aware that downhill slopes can aid herbicide movement.

Table 1 lists the soil residual properties for different herbicide products used in noncropland applications. Tebuthiuron (active ingredient in Spike), picloram (a.i. in Tordon), and hexazinone (a.i. in Velpar) can cause death to nearby desirable plants through soil movement if proper precautions are not taken. The active ingredient in Contain, imazapyr, has considerable soil residual. The Contain label states that foliar applications are most effective for controlling a range of species, and the soil residual from these applications is sufficient to prevent reinfestation for a fairly long period. Do not treat soil with Spike, Contain, Hyvar, Velpar, or high rates of Banvel in areas where the roots of desirable trees or shrubs extend.

Some other herbicides, including Stinger and Banvel, have sufficient soil residual to injure new grass seedings or sensitive crops that are planted too soon after application. The soil residual of many herbicides is generally not a problem when at least a year occurs between application and crop planting. Where non-crop land will be returned to crop production, check labels for recrop restrictions before using a non-crop herbicide.

Some herbicides are prone to volatilization/drift and may cause injury to nearby susceptible crops. High temperatures and windy conditions can increase volatilization and movement. Banvel, and 2,4-D are the most volatile commonly used herbicides. Any herbicide application should avoid direct spray contact or drift of spray onto desirable vegetation.

When reading the label, study more than just rate information. Often, the “General Information/Hazards” area near the front of the label will provide quick insight on human and environmental risks. Taking the proper precautions minimizes risk of herbicide usage.

Proper identification of target weed species is important, since weeds vary in susceptibility to herbicides. Timing of herbicide application also affects the degree of weed control achieved. Annuals and biennials are most easily controlled while young and relatively small. A fall or early spring treatment is most effective if biennials or winter annuals are the main weed problem. Summer annuals are most easily controlled by spring or early summer applications. Apply herbicides to control established perennials when weeds are in the bud to bloom stage. Perennials are most susceptible at this reproductive stage because translocated herbicides move downward with food reserves to the roots, potentially killing the entire plant.



For most situations, the maximum length of control from a single herbicide application is achieved when herbicides are applied in summer after most weeds have emerged, but before plants flower and go to seed. An alternative is to mow once in the summer before most weeds go to seed, followed by a fall herbicide application to control late-emerging weeds and perennials that have regrown.

Table 1 shows the range of activity of various herbicides used in non-crop areas. All of the herbicides

listed have activity on broadleaf weeds, and most are active on woody species at higher rates. Postemergence activity on grasses is limited to only a few herbicides, making it possible to selectively remove broadleaf weeds and brush from grassy areas. Most of the herbicides listed will kill or injure legumes, with the exception of Butyrac 200.

Appendix A shows the effectiveness of herbicides with different application methods on various weeds that may occur in non-crop areas.

**Table 1. Range of activity, type of application, and soil life for various herbicides used in non-crop areas.**

	Range of Activity <sup>1</sup>	Type of Applications <sup>2</sup>	Soil Residual for Different Plants <sup>3</sup>	
			Weeds	Crops
Access	W	BB	Short	Medium
Arsenal	G/B/W	FS	Medium	Long
Banvel	B/W	FS/CS	Short	Medium
Butyrac 200	B	FS	Short	Short
Chopper	W	BB/S	Medium	Long
Contain	G/B/W	FS	Medium	Long
Crossbow	B/W	FS/CS	Short	Medium
Escort/Ally	B/W	FS	Short	Medium
Garlon 4	B/W	BB/CS	Short	Medium
Hyvar	G/B/W	FS/Soil	Long	Long
Krenite	W	FS	Short	Short
Roundup	G/B/W	FS/CS	None	None
Spike	G/B/W	Soil	Long	Long
Stinger	B	FS	Short	Long
Stomp	G/B	Soil	Short	Short
Tordon	B/W	FS/CS	Short	Medium
2,4-D	B/W	FS	Short	Short
Velpar	G/B/W	Soil	Medium	Long

<sup>1</sup>G = grasses; B = broadleaf weeds; W = woody plants and trees.  
<sup>2</sup>BB = basal bark, FS = foliar stem (application to foliage); CS = cut stump (application to freshly cut surfaces); soil = application to soil at base of plant.  
<sup>3</sup>Short = several weeks; medium = several months; long = many months to over a year.

The performance of herbicides is affected by both environmental factors and application conditions at the time of herbicide application. Soil conditions will affect the mobility and activity of herbicides. Weather

conditions such as humidity, stress from drought/heat, and rain after application affect herbicide performance. Spray pattern distribution, rate, and method of application can enhance or reduce the effectiveness of control.

## SPECIFIC RECOMMENDATIONS FOR DIFFERENT NON-CROPLAND APPLICATIONS

### Selection of Application Techniques

While herbicide recommendations for different non-cropland situations vary, some generally accepted applications techniques can be used to target plants for control. The techniques vary from targeted application on a single plant to general broadcast treatment. Table 2 defines application techniques that can be used for brush and herbaceous weed control. The table describes cut surface treatments; bark, foliage & soil treatments; planting site preparation; and woody vine

control. Appendix A lists specific chemicals recommended for use with different application techniques and plant susceptibilities.

When selecting a chemical treatment technique, consider ease of application, effectiveness in your situation, ability to protect desirable plants, and the potential to contaminate water sources.

**Table 2. Techniques for Application of Herbicides in Non-Cropland Environments.**

#### Part A. Cut Surface Treatments.

Application Technique	Target Plant Size	When to Apply	Comments
1. Girdle	Trees 12 inches in diameter and larger	Spring, April through June, when bark is loose <sup>1</sup>	Remove 3 to 5 inch wide ring of bark and phloem completely around trunk. Can use axe, Power Girdler or Brady Tree Girdler. Tree death is slow (2-5 years), and shoots arise below girdle allowing regrowth of tree. The process is hard work, time consuming and costly.
2. Frill Girdle (continuous cuts)	Trees 5-6 inches in diameter	Any season. Most effective treatment in spring or any time the plants are actively growing <sup>1</sup>	Apply herbicide to overflowing in single line of overlapping, downward axe cuts completely encircling the trunk. Frills made waist high above ground level are most convenient to the applicator. An oil soluble red stain added to the solution will indicate treated trees. Do not remove chips made by axe.
3. Frill Girdle (spaced cuts)	Trees 5 inches in diameter or larger	Any season. Most effective treatment in spring or any time the plants are actively growing. <sup>1</sup>	Apply 1 ml of herbicide in each axe cut made about waist high and spaced 2 inches from edge to edge encircling the entire tree.

**Part A. Cut Surface Treatments (continued)**

Application Technique	Target Plant Size	When to Apply	Comments
4. Frill with Notches	Trees 5 inches in diameter or larger	Any season <sup>1</sup>	Place dry crystals directly in notch or cup formed by the axe. Notches should encircle the tree trunk every 4-6 inches near ground level. Make two downward axe cuts, one above the other and remove the chip left in between.
5. Injector (spaced cuts)	Trees 5 inches in diameter or larger.	Most effective from May until August on all species <sup>1</sup>	Use a special tree injector calibrated to deliver 1 ml of herbicide per cut. Space cuts evenly 2 inches apart from edge to edge of the cut.
6. Hypo-hatchet (spaced cuts)	Trees 5 inches in diameter or larger	Most effective in summer and fall with spaced injections <sup>1</sup>	Apply herbicide to cuts placed waist high with specialized hatchet injector. Trees less than 8 inches in diameter and hardwoods 8-16 inches in diameter require one cut per inch of diameter during all seasons.
7. Stump Treatment	Sprout control on cut hardwood stumps. Effective on species such as oak, maple, beech, hickory, black locust, sassafras and sumac.	Apply immediately after cutting for greatest effectiveness. Material should be applied to the cambium layer of the stump, located between the bark and the heart wood. <sup>1</sup>	Paint or spray herbicide on flat stump surface. Several Ready to Use (RTU'S) products are available for cut stump treatment.

<sup>1</sup>Cut surface treatments are not recommended during periods of heavy sapflow.

**Part B. Bark, Foliage, Soil Treatments.**

Application Technique	Target Plant Size	When to Apply	Comments
1. Basal Bark	Scattered clumps of hardwood brush or small trees. Can be used on species resistant to a first foliage spray. Expect poor control on root suckering species.	Any season.	Drench the lower 12-15 inches of plant. Brush density will determine rate of application.

**Part B. Bark, Foliage, Soil Treatments. (continued)**

Application Technique	Target Plant Size	When to Apply	Comments
2. Foliage Sprays (low volume)	Large tracts of mixed brush and hardwoods growing in utility line areas and right-of-ways. Adaptable for conifer release on forest lands, ranges or for pasture establishment. Can be used in advance of forest seeding or planting	All hardwood species during late spring and summer.	Use aerial application, low volume sprayer or powered mistblower for best coverage. Good root collar coverage is necessary. Use a drift retardant.
3. Foliage spray (high volume)	Scattered brush, herbaceous weeds, or clumps of brush can be controlled. Can be used on species not controlled with prior sprays growing along fence rows, roadways, right-of-ways, or other non-crop areas.	Late spring and summer from time foliage is fully developed and prior to leaf turning. Ineffective as a dormant treatment.	Apply uniformly over the top of brush as a coarse spray. Ash is resistant to most herbicides.
4. Soil Application (dry materials)	Individual tree, herbaceous weeds, clumps of brush (all species and size), for release of underplanted trees (stand conversion), right-of-ways, pasture, and selective control of roadside vegetation.	Apply on all species during any season. Late winter and early spring applications are most effective.	Apply as pellets, granules, and beads to individual trees or clumps of brush according to label.
5. Spot Gun (low volume)	Clumps of brush or basal sprouts from cut stumps of all hardwood species.	Apply on all hardwood species early or late in the growing season depending upon geographic region and soil type.	Apply with spot gun to soil in metered doses in a random or grid pattern to release planted pine and hardwood.

**Part C. Planting Site Preparation.**

Application Technique	Target Plant Size	When to Apply	Comments
1. Foliage sprays (on all woody species in planting site)	Unwanted small shrubs, trees, and brush in advance of planting or seeding.	Late spring, summer, and early fall.	Apply aerially or from the ground or tractor mounted sprayer in June, July, or August.

**Part D. Woody Vines.**

Application Technique	Target Plant Size	When to Apply	Comments
1. Poison Ivy Foliage or Basal Bark Spray	Climbing or procumbent vines	Late spring applications are most effective.	Thoroughly wet all plant surface and woody stems using a knapsack-type garden sprayer. Spot treat regrowth as required.
2. Grape Vines	Grape tangles and large climbing vines.	Foliage sprays in June or July. During the dormant season use a basal bark spray.	Apply as foliage or basal bark spray. Spray vine with herbicide for a distance of 15 feet on both sides moving away from the growing point. Apply herbicide on cut surfaces, stumps and stubs.

## Weed Control In Grass Pastures and Fencerows

A healthy, properly established cover planting can often compete effectively with weeds, minimizing the need for herbicides. However, broadleaf herbaceous perennial and woody plants can become serious weed problems in grass pastures or fencerows that are not properly managed. Weeds compete directly with forage grasses and reduce the nutritional value and longevity of the pasture. Certain species, such as white snakeroot, poison hemlock and wild cherry, are also poisonous to livestock and may require special consideration.

The use of good cultural practices such as maintaining optimum soil fertility, rotational grazing, and periodic mowing will help keep grass pastures in good condition and competitive with weeds. Grass pastures void of legumes need 80 to 120 pounds per acre of actual nitrogen annually to remain productive.

Where broadleaf weeds become a problem, 2,4-D or Banvel (dicamba) may be used. Crossbow (2,4-D + triclopyr) and Ally are labeled for control of broadleaf and woody plant species in permanent grass pastures. Banvel, 2,4-D, and Crossbow will kill or severely injure most legumes that may be in pastures. Roundup (glyphosate) may also be used as a spot treatment. Any grass or other desirable vegetation coming into contact with Roundup will be injured or killed. Certain formulations of Spike (tebuthiuron) may also be used for spot treatment of brush and woody plant in grass pastures.

Woody shrubs and trees, such as multiflora rose and osage orange, can be controlled by herbicide application or a combination of mowing or hand-cutting plus herbicides. Mowing alone will control some species. Foliar-applied herbicides should generally be applied in late spring or summer after the plant has fully leafed out. When dense stands of woody plants prohibit foliar application, hand-cut or mow prior to herbicide application. Where cutting alone is used, resprouting will often occur.

Prevent resprouting by treating cut surfaces with herbicide immediately following cutting. Ready-to-use (RTU) formulations of several herbicides are available for treatment of cut surfaces without further dilution. Readily available RTU's include Banvel CST (dicamba), Weedone CB (2,4-D + 2,4-DP), and Tordon RTU (picloram). RTU formulations are often sold in bottles with built-in application devices. Herbicides

other than RTU's may need to be mixed with oil for application to cut surfaces.

The target area for cut stump treatments is the cambium layer. The cambium is the area of the stump just inside the outer bark. This layer provides for nutrient and sugar flow. The area quickly heals after cutting, which prevents movement of chemical into the root where it can prevent resprouting. Timing is particularly critical with water based materials that rely on the downward movement through the cambium. Make application shortly after cutting. Oil-based materials have a wider window of application since they are moved into the plant through the bark.

For control of woody brush, apply 2,4-D, Banvel, or Crossbow when plants are fully leafed and actively growing. Where regrowth occurs, a second treatment may be needed in the fall. During the dormant season, oil-soluble formulations of 2,4-D, Banvel, or Crossbow may be applied in fuel oil.

Spike can be applied to the soil in the root area of unwanted woody plants any time during the year when the ground is not saturated with water or frozen. Rainfall is required to move Spike into the root zone of woody species. Grass injury or kill is likely from Spike application; apply as a spot treatment or when grasses are dormant to minimize injury.

Several application methods and herbicides are effective for control of multiflora rose in pastures. These include dormant season spot concentrate and basal bark applications of Banvel and summer foliar applications of Banvel, Ally, or Roundup. See Appendix A and herbicide labels for more information on control of multiflora rose and other woody species.

Butyrac can be applied to mixed grass/legume covers where the legume is alfalfa, birdsfoot trefoil, or alsike, ladino, or red clover. Do not apply Butyrac 200 to sweet clover, peas, or other legumes. Butyrac is less broad-spectrum than most of the other herbicides listed, with little activity on perennial weeds. It should generally be applied when annual weeds are small (less than 3 inches tall).

The chemical weed control options for grass pastures are shown in Table 3. The effectiveness of each herbicide on various weeds is shown in Appendix A. Consult the herbicide label for specific information about the use of a given product.

**Table 3. Herbicide Treatments for Grass Pastures.**

HERBICIDE	RATE	REMARKS	RESTRICTIONS
2,4-D AMINE or ESTER	(3.8 lb/gal): 1 to 4 pt/A	Broadleaf weeds should be actively growing. Higher rates may be needed for less susceptible weeds and some perennials. Spray bull or musk thistles in the rosette stage (spring or fall) while they are actively growing. Spray perennials such as Canada thistle in the bud stage. Spray susceptible woody species in the spring when leaves are fully expanded.	Do not graze animals within 14 days after treatment. Do not apply to newly seeded areas or after heading begins. Do not apply to grass when it is in the boot to milk stage.
BANVEL (4 lb/gal)	<i>Annuals</i> - 1/2 to 1 1/2 pt/A; <i>Biennials</i> - 1/2 to 3 pt/A; <i>Perennials</i> - 1 to 6 qt/A; <i>Woody brush</i> - 1 to 8 qt/A	Use lower rates for susceptible annuals when they are small and actively growing and for susceptible biennials in the early rosette stage. Use higher rates for larger weeds, for less susceptible weeds, for established perennials in dense stands, and for certain woody brush species.	Refer to label for specific grazing restrictions for lactating dairy animals. Do not graze meat animals in treated fields within 30 days of slaughter.
CROSSBOW (3 lb/gal)	<i>Annuals</i> - 1 to 2 qt/A; <i>Biennials and herbaceous perennials</i> - 2 to 4 qt/A; <i>Woody perennials</i> - 6 qt/A	Apply to foliage during warm weather when brush and broadleaf weeds are actively growing. When applying as a spot spray, thoroughly wet all foliage. Be cautious of vapor and particle drift, as Crossbow may injure susceptible crops growing nearby. A foliar application of a 1 1/2 percent Crossbow solution applied in late April to June has proven effective for multiflora rose control. Dormant season basal bark applications of a 4 to 5 percent solution will also control multiflora rose. See herbicide label for more specific rate recommendations.	2 gallons per acre or less: Do not graze dairy animals for 14 days after treatment, remove livestock from treated areas 3 days before slaughter. More than 2 gallons per acre: do not graze dairy animals until next growing season, do not graze other livestock for 14 days after treatment, remove livestock from treated areas 3 days before slaughter
ALLY (60DF)	Broadcast - 1/10 to 3/10 ounce/A; Spot treatment - 1 ounce per 100 gallons water	Apply to foliage when weeds and brush are actively growing. Always apply with nonionic surfactant (1 pint per 100 gallons water). Spot treatments can be used to control multiflora rose, blackberry, and Canada thistle. In OSU trials, Ally has been highly effective for multiflora rose control; foliar applications provide best control of rose. The maximum use rate for fescue pastures is 2/10 ounce/A. Ally application to fescue may cause stunting, temporary discoloration, and seed head suppression. Bluegrass, orchardgrass, timothy, brome grass, and bermudagrass pastures have demonstrated good tolerance to Ally. Ryegrass is highly sensitive to Ally. Grasses should be well-established at time of application.	Ally is a long-residual herbicide and is labeled with extensive restrictions on overseeding with legumes, pasture renovation, and crop rotation (34 months to most crops). Cautionary and other restrictive statements on the pasture label should be read and understood by the user prior to Ally use. There is no grazing restriction on the Ally label.

**Table 3. Herbicide Treatments for Grass Pastures (continued)**

HERBICIDE	RATE	REMARKS	RESTRICTIONS
ROUNDUP	2% solution for spot treatment	Controls a variety of herbaceous and woody brush species such as multiflora rose, brambles, poison ivy, and quackgrass. Spray foliage of target vegetation completely and uniformly, but not to the point of runoff. Roundup is very effective for the selective killing of multiflora rose near desirable trees, due to the lack of soil activity. However, avoid contact with foliage of desirable nontarget vegetation. Consult label for recommended timing of application for maximum effectiveness on target species.	No more than one tenth of an acre of pasture should be treated at one time. Further applications in the same area may be made at 30-day intervals. Do not graze or harvest for 14 days after application.
STINGER	1/2 to 1 1/3 pt/A	Established grasses are tolerant but new seedlings may be injured. For Canada thistle control apply when the rosette basal diameter is at least 4 inches but before the bud stage.	No grazing restrictions. Do not use hay or straw from treated areas for composting or mulching susceptible plants.
SPIKE 20P	10 to 20 lb/A	See label for rates on specific species. Controls brush and woody plants in rangeland and grass pastures. Requires sufficient rainfall to move herbicide into root zone. May kill or injure desirable legumes and grasses where contact is made. Apply as a spot treatment or when grasses are dormant to minimize injury.	Do not apply on or near field crops or other desirable vegetation. Do not apply where soil movement is likely. Refer to label for additional restrictions.

**Weed Control in Government Set-aside and CRP**

The Feed and Grains program utilized by the United States Department of Agriculture often requires farmers to leave idle a certain percentage of their acreage to qualify for participation. Weed control on this acreage is very important since it is more likely to come back into crop production. Other programs such as the Conservation Reserve Program are long term setaside programs. All of these USDA sponsored programs require that weeds be controlled and impose penalties for non-compliance.

Participation in the government programs do provide farmers with an advantage for the control of perennials. Since no crop is planted, chemical control

or mowing can be done when the plant is most susceptible to these practices. The following products have labels for use on setaside and/or CRP acres: Banvel, Butyrac 200, Crossbow, Rodeo, Roundup, Stinger, and 2,4-D. All products except Roundup and Rodeo are active on broadleaf weeds only. Roundup and Rodeo are active on both grasses and broadleaf weeds, and should only be used for spot applications.

A precaution to chemical control is to closely observe recrop intervals on the chemical label. Consider the future use of the area treated so that chemicals with long residuals are not chosen for application.



## Ditchbank Weed Control

Identification of the weeds, trees or brush which are targeted for control as well as desirable vegetation is an important step in selecting a method and product for control on ditchbanks. Some herbicides are selective, controlling broadleaves while leaving grasses unharmed. Non-selective herbicides kill brush, broadleaves, grasses, and can kill desirable plants. Careful application and proper application method can allow non-selective herbicides to be used effectively to control undesirable vegetation that is in close proximity to desirable plants.

When applying herbicides to ditchbanks or other areas near water, make sure that the herbicide label allows this type of application. Many herbicide formulations and/or spray adjuvants are toxic to fish and other aquatic organisms. Few herbicides are labelled for application directly to water or to ditches that contain water most of the year (wet ditchbanks). A number of herbicides are labelled for application to ditches that carry water infrequently and are dry at the time of application (dry ditchbanks).

Table 4. Herbicide Treatments for Ditchbanks.

Herbicide	Application	Soil Activity	Select <sup>1</sup>	Dry Ditchbank	Wet Ditchbank
2,4-D	FS	NSR	Y	Yes	Yes
Contain/Arsenal	FS	SR	N	Yes	Yes
Banvel	FS,BB,CS,DS	SR	Y	Yes	No
Br. Killer (3 form.)	FS, BB, CS	NSR	Y	Yes	No
Chopper	BS, CS	NSR	Y	Yes	Yes
Crossbow (Garlon)	FS,BB,CS,DS	NSR	Y	Yes	No
Hyvar X, XL <sup>2</sup>	FS, BB	SR	N	No	No
Krenite S	FS	NSR	Y	Yes	No
Roundup	FS, CS	NSR	N	Yes	No <sup>3</sup>
Spike	SAP	SR	N	Yes	No
Velpar	FS, BB, CS	SR	N	No	No

APPLICATION: FS = Foliar Stem; BB = Basal Bark; CS = Cut Stump; SA = Soil Applied; SAP = Soil Applied Pellets; DS = Dormant Stem. ACTIVITY: NSR = No Soil Residual; SR = Soil Residual.

<sup>1</sup>Selectivity: “Yes” means the herbicide kills brush and not grass. “No” means the herbicide kills both brush and grass.

<sup>2</sup>Only Hyvar “XL” can be used on drainage ditch banks.

<sup>3</sup>The surfactant in Roundup is not approved for use in aquatic areas. Other glyphosate formulations (Rodeo & Accord) are labeled for use in aquatic areas, but only in conjunction with EPA approved “aquatic-type” surfactants.

A grass cover should be maintained around and on ditchbanks to prevent soil erosion and serve as a filter strip for herbicide or fertilizer runoff. Use of herbicides that result in bare ground in or around ditches is strongly discouraged.

Restrictions on herbicide applications may vary depending upon the intended use of water in a ditch. Table 4 summarizes restrictions on the use of common non-crop herbicides on ditchbanks, based on the

assumption that water will not be used for irrigation. Where irrigation uses of the water are intended, consult the product label. If a surfactant or other spray additive is required, make sure that the additive is approved for use around water.

Even where herbicides and adjuvants are approved for application to water, directing applications to minimize the amount of chemical actually applied to the water is suggested.

# CONTROL OF PROBLEM WEEDS

## Canada Thistle

Canada thistle is a perennial that reproduces by seed or underground stem, called rhizomes. Flowering occurs at two different times, once in mid to late June, and then again in the fall. The plant stem is erect, hollow, smooth to slightly hairy, up to four feet tall and branched at the top. Flowers are numerous, small and vary from light lavender to rose purple.

Herbicide treatments are usually most effective when applied at the bud to early-bloom stage. Cultural control (mowing) is difficult in row crops but usually very successful in areas where cutting is done at regular intervals.

In some situations chemical control will be the best alternative. For non-selective postemergence control, low-volume application (10 GPA of water) of Roundup (1qt/A) plus non-ionic surfactant (0.5% by volume) plus spray grade ammonium sulfate (17 lbs/100 gal spray) has performed very well. In pastures and other areas where grass will be maintained, best control is provided by Stinger (2/3 - 1 1/3 pts/A) or Transline (2/3 - 1 1/3 pt/A). Banvel (1.5 - 2 qts) is another option for grass areas, but provides less consistent control than Stinger or Roundup. 2,4-D ester (1.5 qt) will control some thistle strains. Crossbow and Garlon will control thistle top-growth, but are often ineffective in killing the entire plant. Although it is not specified on all labels, addition of a surfactant in the spray solution may improve control.

## Johnsongrass

Johnsongrass is a perennial grass reproducing by over-wintering rhizomes or by seed. The plant stem is erect, smooth and 3 to 10 feet tall. The plants above ground appearance is similar to sudangrass. The roots are freely branched and fibrous with large, fleshy rhizomes that are white with red or pink coloration. The rhizomes are a key identifying characteristic of johnsongrass.

Typically found south of I-70 in Ohio, johnsongrass has been found as far north as Wood County in north-western Ohio. Cultural control is difficult in row crop situations, but successful in areas where cutting can be accomplished on a regular basis before plants reach 2

or more feet in height. Regular cutting will prevent rhizome and seedhead formation.

Although several options exist for chemical control of johnsongrass in corn and soybeans, relatively few exist for control in non-crop situations. Horizon (2 - 2.8 pts/A) will selectively suppress or control 18-24 inch johnsongrass in smooth brome, perennial ryegrass, fine fescue, tall fescue and common bermudagrass. A second application of Horizon at (0.8 - 2.8 pts/A) may be applied if regrowth occurs. Tank-mixing with 2,4-D reduces control. Addition of non-ionic surfactant is recommended for spray solutions between 30-100 gals/A. Thorough coverage is essential for optimum results.

Roundup (2qts/A or a 2% spot spray solution) provides excellent control of johnsongrass while in the boot stage. Arsenal (2 - 3 pts/A) applied in the boot stage provides excellent control of existing johnsongrass and also offers some residual control. Postemergence soybean herbicides (Assure II, Fusilade, and Select) may also be used in non-crop areas, but will injure or kill grass covers.

## Multiflora rose

Multiflora rose is a perennial bush which spreads by seed or by layering where tips of canes touch the ground and form roots. Over the past several years, it has invaded nearly every county in Ohio and is a particularly serious problem in southern and eastern Ohio.

Cutting and grubbing are both successful means of control, but are not always possible. Research at West Virginia University indicated that three to six mowings per season for more than one year may be necessary to provide a high percentage of plant death. Sheep and goats have also been utilized to control multiflora rose using intensive grazing pressure.

Foliar herbicide applications are effective for a period following spring leaf-out. Research at OSU has shown that Roundup (1% solution), Ally/Escort (0.5% solution + 2 pts surfactant), or Arsenal/Contain(0.75% solution) foliar-applied from leaf-out through July provide good control. Banvel (1% solution) or Cross-

bow (1.5% solution) foliar-applied from leaf-out through mid-June, also provide good control of multiflora rose. Krenite (2% solution) applied in July provides control, but effects are not seen until the following spring.

Basal bark application of Access (20% solution), Garlon 4 (20% low vol. or 10% high vol.), Chopper (8-12 oz. in 1 gal. water or diesel), Weedone CB (undiluted), or Weedone 170 (25% solution in diesel) provide good control. A low-oil basal treatment of Banvel (8% Banvel, 15% diesel, 0.5% surfactant, in water) will control multiflora rose when applied from late December through early April. Treatments should not be applied after leaf-out in the spring.

Soil-applied spot concentrate treatments of Banvel (undiluted) or Escort/Ally (1 oz/gal water) applied near the plant base in early spring have provided acceptable control. Spike 80W (1 lb/gal water) applied in a thin band basal application, or Spike 20P applied within the plants' root zone (from dormancy until June) also provide control. Spike 80W has been superior to Spike 20P for multiflora rose control.

Multiflora rose is susceptible to a disease organism called Rose Rosetta Disease (RRD) which is a fatal disease that affects the rose family. The disease can be identified by the red coloration of the stem and foliage. RRD is spread from plant to plant by a small eriophyid mite, *Phyllocoptes fructiphilus*. This natural control has spread from western states and is found in Ohio.

RRD is first seen as a red mosaic pattern on the leaves. The second noticeable stage is the formation of numerous lateral shoots that are normally bright red in color. Other symptoms include numerous small reddish green leaves which are often smaller than normal leaves. The disease spreads from the canes into the roots then throughout the plant. Death occurs after one to two years.

## Ironweed

Ironweed is typically encountered in pasture and long lay fallow ground in Ohio. This perennial plant reproduces by short rhizomes and seed. The plant is erect, reaching 4 feet in height with one to several stems originating from one crown. The stems are stiff and leafy with hairs. The reddish-purple flowers are produced on a compact, flattish head.

Banvel (1-2 lbs of a.i. /A), Crossbow (2-4 qt./A), Tordon (1-2 qt./A), and 2,4-D (1 to 1/2 pt./A) are all labeled for control of ironweed, but Crossbow is generally most effective. 2,4-D may require repeated applications to achieve control. Crossbow should be applied in June when top-growth is 10 inches tall until early August when ironweed often becomes infected with a Puccinia rust. Control with triclopyr is reduced when rust pustules are evident on ironweed leaves or when ironweed begins to naturally die.

## Pokeweed

Pokeweed is a perennial reproducing by seed and a large, fleshy, carrot-like taproot. The stem is tall (6 ft.), smooth, reddish, and branches towards the top. The plant produces berries that are dark purple and produces a reddish-purple juice when crushed. The plant is poisonous.

Pokeweed is found in fallow ground, forested areas and can become a problem in reduced tillage fields.

Arsenal (3-4 pt./A), Banvel (2-4 pt./A) and Crossbow at (4 qt./A) are labeled for pokeweed control.

**APPENDIX A. Herbicide Effectiveness Charts.**

**Table 5. Effectiveness of herbicides on herbaceous weeds commonly found in non-crop areas.**

	<i>2,4-D</i>	<i>Bamvel</i>	<i>Roundup</i>	<i>Crossbow</i>	<i>Ally/Escort</i>	<i>Stinger</i>	<i>Butyrac</i>	<i>Contain</i>
<b>Annual</b>								
Marestail	G	E	E	E	E	E	F	E
Mustards	E	F	E	G	E	P	E	E
Ragweed, common	E	E	E	E	E	E	E	G
Ragweed, giant	E	E	E	E	E	E	E	G
Pennycress, field	E	F	E	G	E	P	E	F
<b>Biennial</b>								
Burdock, common	E	E	G	E	N	E	E	G
Carrot, wild	F	G	G	N	N	E	N	G
Hemlock, poison	G	E	G	E	E	N	E	N
Thistle, bull	E	E	E	E	E	E	F	E
Thistle, musk	E	G	E	G	E	E	F	E
<b>Perennial</b>								
Artichoke, J.	F	P	G	N	N	E	N	N
Dandelion	E	E	F	E	E	E	F	G
Daisy, oxeye	F	E	G	E	N	E	N	E
Dock, curly	P-F	E	G	E	E	E	F	G
Goldenrod	F	G	E	F	E	F	N	P
Hemp dogbane	P-F	G	G	F	N	P	P	N
Ironweed	P	F	E	E	F	P	P	N
Ivy, poison	F	F	G	G	P	P	P	E
Johnsongrass	P	P	E	P	P	P	P	E
Milkweed, common	P	F	F	P	N	P	P	G
Multiflora rose	F	G	E	G	E	P	P	E
Nettle, stinging	G	G	G	G	N	N	P	G
Plantain	E	G	G	E	E	F	G	G
Oak, poison	F	F	G	G	N	P	P	E
Snakeroot, white	F	G	G	G	N	P	N	N
Sorrel, red	N	E	E	E	G	F	F	G
Sowthistle, p.	F	G	G	E	N	F	F	G
Thistle, Canada	F	F	G	P	F	E	P	F-G
Trumpetcreeper	P	G	G	F	N	N	P	E

Control of perennial weeds may require repeat applications. Rating Scale: E = Excellent, G = good, F = fair, P = poor, and N = not recommended or no information.

**Table 6. Cut Stump and Injection Treatments for Brush Control<sup>1</sup>**

	2,4-D	Redeem	Trooper/ Banvel/ Banvel CST	Tordon 101 101R/ Pathway	Roundup	Chopper RTU/ Chopper
Ash, White	I	S	S	S	S	S
Beech, American	—	S	—	—	—	I-S
Birch	—	S	S	S	—	S
Boxelder	—	I-R	—	S-I	—	S
Cherry, Black & Choke	—	S	S-I	S	—	S
Cottonwood, Eastern	S-I	S	—	S	S	S
Crabapple	—	S	—	S	—	S
Dogwood	—	S	S-I	S-I	I	S
Elderberry	—	S	—	S	—	S
Elms, American & Slippery	S-I	S	S-I	S-I	—	I-R
Grapes, Wild	S	S	—	S	—	S
Hackberry	S	S	—	S	—	R
Hawthorn	R	S	S-I	S-I	—	S
Hedge-apple/ Osage Orange	S-I	—	—	S-I	—	R
Hickory	—	—	S-I	S-I	I	S
Honeylocust	—	S-I	—	S	—	I-S
Honeysuckle	—	R	—	S	—	S
Locust, Black	S	S	—	S	I	R
Maple, Red	I-R	S	S-I	S	—	S
Maple, Silver	—	S	S	S	—	S
Maple, Sugar	R	S	S	S-I	—	S
Mulberry, Red	—	S	—	S	—	S
Olive/Privet	—	—	S-I	—	—	S
Persimmon, Eastern	I	S	S	S-I	—	S
Plum, Wild	—	—	—	S-I	—	S
Poison Ivy	—	S	—	S	—	S
Poplar, Yellow	—	S	S-I	—	S	S
Rose, Multiflora	—	S	—	S	—	S
Sassafrass	—	S	S-I	—	—	S
Sumac	—	S	S-I	S	—	S
Sweetgum	—	S	S-I	S	S	S
Sycamore	—	S	S-I	—	S	S
Tree of Heaven	—	S	S-I	S	—	S
Trumpet creeper	—	I-R	—	S	—	S
Virginia creeper	—	S	—	S	—	S
Willow	S	S	S-I	S	—	S

<sup>1</sup>S = Susceptible, I = Intermediate, R = Resistant.

**Table 7. Basal Bark Treatments for Brush Control<sup>1</sup>**

	2,4-D	Trooper/ Banvel	Access	Hyvar	Redeem	Chopper RTU/ Chopper	Crossbow
Ash, White	R	S-I	S	S	S	S	S
Beech, American	—	—	—	—	S-I	I-S	—
Birch	S	—	S	S	S	S	S
Boxelder	S	S	S	S	S-I	S	—
Brambles	I-R	S	S	S	S	R-S	S
Cherry, Black & Choke	S-R	S	S	S-I	S	S	S <sup>2</sup>
Cottonwood, Eastern	—	—	S	S	S	S	—
Crabapple	S-I	S	S	S-I	—	S	—
Dogwood	—	S-I	—	—	S-I	S	—
Elderberry	S-I	S	S	S	S	S	—
Elms, American & Slippery	S-I	S	S	S-I	S	I-R	S-I
Grapes, Wild	—	—	S	—	S	S	—
Greenbrier or Catsbriar	I	R	I-R	R	—	S-I	—
Hackberry	S	—	S	S	S	R	—
Hawthorn	I	S-R	S	S	S	S	—
Hedge-apple or Osage Orange	I	—	S	I	—	R	—
Hickory	—	S-I	S	—	S-I	S	—
Honeysuckle	S	S	S	I-R	S	S	S
Locust, Black	I	S-I	S	S	S	R	S
Locust, Honey	I	S-I	S	S	S	I-S	—
Maple, Red	R	S	S	S	S	S	S
Maple, Silver	I	S	S	S	S	S	S
Maple, Sugar	—	S	S	—	S	S	S
Mulberry, Red	I-R	S	S	I	S	S-I	—
Olive/Privet	—	S-I	—	—	—	S	S-I
Persimmon, Eastern	I-R	S	S	I	S	S	—
Plum, Wild	S-I	S	S	S	—	S	—
Poison Ivy	I	—	S	S	S	S	S
Poplar, Yellow	—	S-I	S	S	S-I	S	—
Redcedar, Eastern	R	S-I	S	S	R	R	—
Rose, Multiflora	—	S	S	—	S	S	S
Sassafrass	S-I	S	S	I	S	S	S
Sumac	R	S	S	S	S	S	S
Sycamore	—	S-I	—	—	S	—	S
Sweetgum	—	S-I	—	S	S-I	—	S-I
Tree-of-Heaven	I-R	S	S	S	S	S	S
Trumpet creeper	—	—	S-I	—	I-R	S	I-R
Virginia creeper	—	—	S	R	S	S	—
Willow	S	S	S	S	S	S	S

<sup>1</sup>S = Susceptible, I = Intermediate, R = Resistant.

<sup>2</sup>Except black cherry.

**Table 8. Soil Applied Herbicides for Brush Control<sup>1</sup>**

	Trooper/ Banvel	Tordon	Hyvar	Velpar	Spike
Ash, White	R	I	S	—	S-I
Birch	I	S	S	—	S
Boxelder	—	S	S	—	S
Brambles	S	S-I	S	—	S-I
Cherry, Black & Choke	—	S	S-I	—	I
Cottonwood, Eastern	—	S	—	—	S
Crabapple	—	S	I	—	—
Elderberry	—	S-I	S	—	—
Elms, American & Slippery	S-I	S	S	—	S
Grapes, Wild	—	S	S	—	S
Greenbriar or Catsbriar	R	R	R	—	I-R
Hackberry	—	S	S	—	S
Hawthorn	R	S	S-R	S-I	S
Hedge-apple/ Osage Orange	—	S-I	R	—	—
Honeylocust	R	S	S	—	I
Honeysuckle	R	S	I-R	—	—
Locust, Black	R	S	S	—	S
Maple, Red	R	S	S	—	S-I
Maple, Silver	R	S	S	—	I
Maple, Sugar	R	S	—	—	S
Mulberry, Red	—	S	I	—	S-I
Persimmon, Eastern	S	S	I	—	R
Plum, Wild	—	S	S	—	S
Poison Ivy	—	S	S	—	I-R
Redcedar, Eastern	S-I	S-I	S	—	S
Rose, Multiflora	S	S	—	—	S
Sassafrass	—	S	I	—	R
Sumac	R	S	S	S-I	S
Tree of Heaven	—	S	S	—	S
Trumpetcreeper	—	S	—	S-I	S
Virginia creeper	—	S	R	—	S
Willow	—	S	S	S-I	S

<sup>1</sup>S = Susceptible, I = Intermediate, R = Resistant.

**Table 9. Foliar Applied Herbicide Treatments for Brush Control<sup>1</sup>**

	2,4-D	Trooper/ Banvel	Tordon 101 & K	Hyvar	Redeem	Escort	Amitrole	Accord/ Roundup	Krenite	Arsenal	Crossbow
White,Ash	R	I	I	I	S	S	S	S	I	S	S
Beech, American	—	—	—	—	S-I	—	—	—	—	I-S	—
Birch	S-I	S	S	S	S	R	—	S	S	S-I	S
Boxelder	S-I	—	S-I	S	S	—	—	S	—	S	—
Brambles	I-R	S-I	S	S-I	S	—	—	S	S-I	R-S	S
Cherry, Black & Choke	I-R	S	S	S-I	S	S	S	S	I	S	S <sup>2</sup>
Cottonwood, Eastern	S-R	R	S	S-I	S	—	—	S	S-I	S	—
Crabapple	S-I	S	S	S	S	—	—	S	—	S	—
Dogwood	—	S-I	—	—	S-I	—	—	—	—	S	—
Elderberry	S-I	S	S	S	S-I	—	—	S	—	S	—
Elms, American & Slippery	I	I	S	S-I	S-I	S	—	S	S-I	R	I
Grapes, Wild	S-I	I-R	S	—	S	I	—	S	S-I	S	—
Greenbrier or Catsbriar	R	R	I-R	R	I-R	R	—	—	—	R-S	—
Hackberry	I-R	I	S	S-I	S	I	—	S	—	R	—
Hawthorn	I-R	R	S	—	S	S-I	—	S	I	S	—
Hedge-apple/ Osage Orange	I-R	I-R	S	—	S	I	—	—	—	R	—
Hickory	—	S-I	S	—	S-I	—	—	—	I	S	—
Honeysuckle	S-I	I	S	S	S	S-I	S-I	S	—	S	S
Locust, Black	S-I	S	S	S	S	S-I	S	S	S	I-R	S
Locust, Honey	I-R	S-I	S	S	I-R	S-I	—	S	—	I-S	—
Maple, Red	R	I-R	S	S	S	S-I	—	S	I	S	S
Maple, Silver	I-R	I-R	S	S	S	S-I	—	S	—	S	S
Maple, Sugar	I-R	I-R	S	—	S	S-I	—	S	—	S	S
Mulberry, Red	I-R	S-I	S	—	S	S-I	—	—	—	I-S	—
Olive/Privet	—	S-I	—	—	—	—	—	—	—	S	I
Persimmon, Eastern	I	S-I	S	—	S	R	—	—	I	S	—
Plum, Wild	S-I	S-I	S	—	S-I	S-I	—	S	S-I	S	—
Poison Ivy	I	S	S	S	S	R	S	S	—	S	S
Poplar, Yellow	—	S-I	S-I	—	S-I	—	—	—	I	S	—
Redcedar, Eastern	R	I-R	S	S	S-I	—	—	S	S	R	—
Rose, Multiflora	I	S	S	—	S	S	—	S	S-I	S	S
Sassafrass	S-I	I	S	S	S	I	—	S	I	S	S
Sumac	S	S	S	S-I	S	—	S	S	S	S	S
Sweetgum	—	S-I	S-I	S	S-I	—	—	—	S	S	I
Sycamore	—	S-I	—	—	S	—	—	—	S	S	S
Tree of Heaven	S-I	S-I	S	S	S	—	—	S	S-I	S-I	—
Trumpetcreeper	—	S	S-I	R	S-I	R	—	S	—	S	—
Virginia creeper	S	S-I	S-I	—	S	—	—	S	—	S	—
Willow	S	S-I	S	S	S	S-I	—	S	I	S	S

<sup>1</sup>S = Susceptible, I = Intermediate, R = Resist <sup>2</sup>Choke cherry only.



**APPENDIX B. Glossary of chemical names and manufacturers.**

<b>TRADE NAME</b>	<b>COMMON NAME</b>	<b>FORMULATIONS</b>	<b>MANUFACTURER</b>
Access	picloram + triclopyr	1 lb + 2 lb/gal	Dow Elanco
Accord	glyphosate	3 lb/gal L	Monsanto
Amitrol-T	amitrol	2 lb/gal L	RhonePoulenc
Arsenal	imazapyr	2 lb/gal L, 0.5% G	Am. Cyanamid
Atrazine, Aatrex	atrazine	4 lb/gal L, 90% DF, 80% WP	Ciba-Geigy
Banvel	dicamba	4 lb/gal L	Sandoz
Banvel 520	dicamba + 2,4-D ester	1 lb + 1.9 lb/gal L	Sandoz
Banvel 720	dicamba + 2,4-D amine	1 lb + 1.9 lb/gal L	Sandoz
Banvel CST	dicamba	Ready-to-use	Sandoz
Bromax	bromacil	4 lb/gal L, 4% G	Hopkins
BK 10-51 amine	2,4-D + mecoprop + dicamba	2.03 + 1.08 + 0.21 lb/g	PBI Gordon
BK 441 L amine	2,4-D + mecoprop + dicamba	1.86 + 2 + 0.5 lb/gal L	PBI Gordon
BK 800 E	2,4-D + 2,4-DP + dicamba	2 + 2 + 0.5 lb/gal L	PBI Gordon
Chopper	imazapyr	2 lb/gal	Am. Cyanamid
Crossbow	triclopyr + 2,4-D ester	2 + 1 lb/gal L	Dow Elanco
Diquat	diquat	2 lb/gal L	Valent
Escort	metsulfuron	60% DF	DuPont
Fusilade 2000	fluazifop	1 lb/gal L	ICI
Garlon 4	triclopyr ester	4 lb/gal L	Dow Elanco
Gramoxone Extra	paraquat	2.5 lb/gal L	ICI
Horizon	fenoxaprop	1 lb/gal L	Am. Cyanamid
Hyvar X, Hyvar XL	bromacil	80% WP, 4lb/gal L	DuPont
Krenite S	fosamine	4 lb/gal	DuPont
Oust	sulfometuron	75% DF	DuPont
Poast	sethoxydim	1.5 lb/gal L	BASF
Pramitol 25E	prometon		
Redeem	triclopyr amine	3 lb/gal L	Dow Elanco
Rodeo	glyphosate	3.7 lb/gal L	RhonePoulenc
Roundup	glyphosate	4 lb/gal L	Monsanto
Spike	tebuthiuron	5% G, 80% WP, 85% DF, 20% P, 40% P	Dow Elanco
Stomp	pendimethalin	4 lb/gal	Am. Cyanamid
Super Trimec	2,4-D + 2,4-DP + dicamba	2 + 2 + 0.5 lb/gal L	PBI Gordon
Surflan	oryzalin	4 lb/gal	Dow Elanco
Tordon K	picloram	2 lb/gal L	Dow Elanco
Tordon 101R, Tordon RTU, Pathway	picloram + 2,4-D amine	3%, 11.2% /gal	Dow Elanco
Trimec Classic	2,4-D + MCPP + dicamba	2.03 + 1.08 + 0.21 lb/gal	PBI Gordon
Velpar	hexazinone	2 lb/gal L, 90% WP	DuPont
Weedone 170	2,4-D + 2,4-DP esters	1.85 lb + 1.85 lb/gal	RhonePoulenc
Weedone CB	2,4-D + 2,4-DP esters	0.67 lb + 0.67 lb/gal	RhonePoulenc
Weedtrine-D	diquat	0.4 lb/gal L	Applied Biochemists

## APPENDIX C.

### Study Questions for Category 9 Private Pesticide Applicator's Test

1. Herbicide performance is *not* affected by:
  - A. Soil conditions
  - B. Weather conditions
  - C. Application evenness
  - D. Application rate
  - E. Cost
  
2. Multiflora rose can spread by both seeds and by layering.
  - A. True
  - B. False
  
3. Where long-term residual vegetation control is desired, a soil-applied residual herbicide is superior to foliar sprays.
  - A. True
  - B. False
  
4. Thorough spray coverage is more critical with systemic herbicides than contact herbicides.
  - A. True
  - B. False
  
5. Which of the following methods of herbicide application that can be used for brush control:
  - A. Foliar stem
  - B. Cut stump
  - C. Basal bark/spray banded
  - D. Dormant stem
  - E. Frill/girdle/injection
  - F. Soil applied
  - G. All of the above
  
6. Generally, Ohio's surface water is more vulnerable to contamination by pesticides than groundwater.
  - A. True
  - B. False
  
7. The brush herbicides most likely to volatilize and move off-target are:
  - A. Banvel and 2,4-D
  - B. Roundup and Spike
  - C. Krenite and Crossbow

1. CORRECT ANSWER: E  
EXPLANATION: Herbicide performance is affected by soil and weather conditions as well as by the application evenness, rate and application procedure. Herbicide performance is not affected by cost.
  
2. CORRECT ANSWER: A  
EXPLANATION: Both are reproductive methods by which multiflora rose can spread. Layering is a process where by the tips of canes touch the ground and form roots.
  
3. CORRECT ANSWER: A  
EXPLANATION: Residual control is better achieved by the selection of soil applied applications. Many foliar herbicides have no soil activity, and still others have soil activity but not long enough for residual weed control.
  
4. CORRECT ANSWER: B  
EXPLANATION: Thorough spray coverage is more important with contact herbicides. Since a contact spray destroys only tissue that it contacts, you must cover as much leaf surface as possible to achieve maximum effectiveness.
  
5. CORRECT ANSWER: G  
EXPLANATION: All of the listed methods can be used in the treatment of woody plants. The method selected should be based upon the treatment which will give the most effective control, minimize environmental damage and protect desirable vegetation.
  
6. CORRECT ANSWER: A  
EXPLANATION: Most of the soils in Ohio provide adequate protection from ground water contamination. Areas of Ohio with shallow water tables or porous soils could be vulnerable to groundwater contamination and care should be taken in these locations when making a herbicide treatment.
  
7. CORRECT ANSWER: A  
EXPLANATION: Both 2,4-D (particularly the ester formulation) and Banvel are volatile and can move off-target, damaging desirable vegetation. Care should be exercised to protect desirable vegetation during herbicide applications.

8. Which of these troublesome weeds/brush are perennials:
- A. Canada thistle
  - B. Johnsongrass
  - C. Multiflora rose
  - D. All of the above
9. The wilted leaves of wild cherry trees are extremely toxic to livestock. Given this fact, which is the best way to handle the elimination of established wild cherry trees in a pasture?
- A. Treat with a foliar applied herbicide (late summer application)
  - B. Cut and remove tree, treating the cut stump with a ready-to-use or similar type herbicide.
10. When applying herbicides to ditchbanks you should be concerned with spray drifting into water or excess spray solution dripping from nearby foliage into the water.
- A. True
  - B. False
11. When controlling brush and weeds on ditch banks or steep slopes, you should use a selective herbicide so that soil-holding grasses are not killed.
- A. True
  - B. False
12. Canada thistle is a perennial weed that reproduces by seed or underground stems, called rhizomes.
- A. True
  - B. False
13. Which of the following factors would influence the persistence of a herbicide in the soil:
- A. Climate
  - B. Rate of application
  - C. Soil type
  - D. Herbicide characteristics
  - E. All of the above
14. An applicator should consider the time between a foliar herbicide application and the next rainfall.
- A. True
  - B. False

8. CORRECT ANSWER: D  
EXPLANATION: All of the listed weeds are perennials. Herbicide treatments are most effective when the plants are in the early bud stage. Mowing can be effective when timed to deplete carbohydrate root reserves.
9. CORRECT ANSWER: B  
EXPLANATION: Cutting and removing the tree minimizes leaves left in the field and protects livestock from poisoning.
10. CORRECT ANSWER: A  
EXPLANATION: Even when herbicides are labeled for use in water, it is best to direct applications away from the water to prevent any discoloration or oily film on the water surface.
11. CORRECT ANSWER: A  
EXPLANATION: Killing all the vegetation on a slope or ditch bank can lead to serious erosion problems.
12. CORRECT ANSWER: A
13. CORRECT ANSWER: E  
EXPLANATION: All of these factors will affect the persistence of a herbicide product. These factors should be considered if a cover crop or cash crop is planned in the treatment area.
14. CORRECT ANSWER: A  
EXPLANATION: Foliar applied herbicides need time between application and the next rainfall to become rainfast /enter the plant. Reapplication will be necessary for adequate weed control if rainfall occurs within the rainfast interval. The amount of time needed will depend upon the product. Applicators should refer to the product label or wait until rainfall will not occur for a couple of days after application.

15. Which of the following methods can be used to control brush on non-cropland areas?
- A. Use of herbicides
  - B. Mowing or bush hogging
  - C. Grazing by livestock
  - D. Grubbing
  - E. All of the above
16. Weeds that germinate, grow and produce seeds and die in a single crop season are called:
- A. Annuals
  - B. Biennials
  - C. Perennials
  - D. Noxious
17. Ohio has a noxious weed law that makes it unlawful for landowners to allow noxious weeds to produce seeds without attempting to control them.
- A. True
  - B. False
18. The preferred application method for brush and trees with greater than 3" basal diameter is:
- A. foliar/stem
  - B. cut stump
  - C. basal bark
  - D. soil applied
19. Cut stump applications are typically made with ready-to-use (RTU) products that are applied directly to the cambium area of the exposed stump. This cambium area lies where on the surface of the stump?
- A. Right at the center of the stump
  - B. Just inside the bark, around the entire circumference of the stump
  - C. In the bark
  - D. All of the above
20. The best time to get translocation of herbicide into a cut stump to avoid resprouting is:
- A. Immediately after cutting
  - B. One hour after cutting
  - C. One day after cutting
  - D. One year after cutting
21. Tordon, Spike, and Velpar are all mobile in the soil and can cause death to nearby desirable plants.
- A. True
  - B. False

15. CORRECT ANSWER: E

EXPLANATION: Low cost methods such as grazing can be effective for some plants. Grubbing or mowing may be effective depending upon the problem weed, and the labor available to perform the task in a timely manner. Herbicides provide a method of control when plants are not grazed by livestock, or not sufficiently controlled by mowing, or when labor is not readily available.

16. CORRECT ANSWER: A

17. CORRECT ANSWER: A

18. CORRECT ANSWER: B

EXPLANATION: While all the listed methods could be used, the most desirable method would be cut stump. It would likely be desirable to remove the tree trunk from the treatment area, plus it can be difficult to treat tall trees with foliar applications.

19. CORRECT ANSWER: B

EXPLANATION: The cambium layer lies just under the bark. Since the cambium layer is the location of sap flow, herbicide materials can be transported into the root system, preventing regrowth from occurring.

20. CORRECT ANSWER: A

EXPLANATION: If the time between cutting and application is delayed, the cambium will start to heal and prevent the entry of the herbicide, particularly if a water based product is used.

21. CORRECT ANSWER: A

EXPLANATION: Since all of these chemicals are mobile in the soil, great care should be taken in application to prevent the destruction of desirable trees and cover.

22. When applying soil residual herbicides near desirable trees, it is advisable to stay at least as far away from the tree as the tree is tall.
- A. True
  - B. False
23. Selective herbicides kill only specific grass or broadleaf weeds, while non-selective herbicides kill both.
- A. True
  - B. False
24. When spraying around ditch banks, rivers, or streams, one should:
- A. Use a herbicide that kills both grass and broadleaf weeds
  - B. Use a herbicide that kills only broadleaf weeds.
25. Before using any herbicide:
- A. Read the label
  - B. Calibrate sprayer
  - C. Look at the surroundings
  - D. Use common sense
  - E. All of the above
26. Perennials are most susceptible to chemical control during what growth stage?
- A. Seedling
  - B. Bud to flower
  - C. After winter kill of vegetation
  - D. Early bud stage
27. Noxious weed control is the responsibility of the:
- A. County agent
  - B. Township trustee
  - C. Landowner
28. Mowing of perennials can be an effective control method if:
- A. The plant reaches maturity before mowing
  - B. Mowing is done once a week
  - C. Mowing interrupts the storage of sugar in the roots



22. CORRECT ANSWER: A

EXPLANATION: Normally the root system of a tree will extend a great distance beyond the drip line of a tree. The height of the tree will be a good indicator of the extent of the root system. Soil applied products applied within this zone may contact roots and kill off the desirable tree.

23. CORRECT ANSWER: A

EXPLANATION: Selective herbicides will kill only specific plant species. Most products will work only on grasses, or only on broadleaves, while there may be limited cross over. (A broadleaf herbicide may kill a limited number of grasses.) Non-selective products will kill most plant species. Knowing the target species and the spectrum of the selected herbicide are essential for an effective weed control program.

24. CORRECT ANSWER: B

EXPLANATION: Most of the undesirable vegetation on a ditchbank are broadleaves. Allowing grass growth to provide a cover to prevent erosion is desirable.

25. CORRECT ANSWER: E

EXPLANATION: To have an effective treatment program and protect the environment all of these factors should be considered.

26. CORRECT ANSWER: B

EXPLANATION: This is the stage of growth where the maximum amount of sugar flow is entering the root. The chemical is carried into the root with the flow of sugars.

27. CORRECT ANSWER: C

EXPLANATION: Ultimately the landowner is responsible for the removal of noxious weeds from his property.

28. CORRECT ANSWER: C

EXPLANATION: Mowing, if done over an extended period of time, constantly interrupts the storage of sugars in the root, therefore weakening and causing death in the plant.

## **Disclaimer**

The information and suggestions in this publication are intended to provide guidelines for weed management in Ohio in the current calendar year only. Because of changing laws and regulations, the Ohio Cooperative Extension Service assumes no liability for the recommendations. The recommendations for using pesticides included in this guide are incomplete and should not serve as a substitute for pesticide labels. Complete instructions for the use of a specific pesticide are on the pesticide label. The pesticide user is responsible for applying pesticides according to label directions, as well as for problems that may arise through misapplication or misuse of the pesticide. Label changes, product cancellations, and changes in recommendations may have occurred since the publication of this guide. Check with your county Extension agent in agriculture if you are in doubt about a pesticide you plan to use. Trade names have been used in this guide for clarity, but do not constitute an endorsement by The Ohio State University, nor do they imply discrimination against other products.