

BRUSH CONTROL IN THE 80'S¹

by Gordon Roskamp and John W. Reeves

On February 28, 1979, the Administrator of the Environmental Protection Agency ordered an emergency suspension of and intent to cancel the use of 2,4,5-T and all pesticides containing 2,4,5-T on forests, rights-of-way, and pastures. More specifically, the suspension includes firetrails and lanes; forest lands, management areas, plantations, and stumplands; rights-of-way: highway, pipelines, utilities, roadsides, roadways, etc.; and pasture. A cancellation hearing is to begin early in 1980. The purpose of this paper is to discuss the herbicide alternatives to 2,4,5-T that will control woody plant species in Illinois.

Prior to the Federal Pesticide Act of 1978, it was illegal to use a pesticide on any pest that was not listed on a pesticide label. Therefore, the pesticide industry endeavored to list all susceptible species on each label. This new act allows the applicator to apply pesticides against a pest not listed on the label, provided all other use directions are followed unless the label states that the pesticide is to be used only against those pests listed. Further, he may employ any method of application not specifically prohibited on the label.

Table 1 lists all the species that appear on various herbicide labels. To the right of each, a number appears that refers to the generic name of a herbicide formulation having that species on one of its labels. The generic names and corresponding numbers appear in Table 2. Each herbicide is listed below by generic name along with a discussion of its formulations and uses. No endorsement of specific products or trade names is implied by the authors. For detailed information on the use of a particular herbicide, read the label.

Table 1. Illinois Checklist for Herbicides on Woody Plants.

ailanthus *Ailanthus altissima* 11,12,15
 alder (*Alnus*) 2,5,6,7,11,12,14
 American elder (not found in literature) 8
 apple (*Malus*) 5
 arrowwood (*Viburnum*) 14

ash (*Fraxinus*) 1,2,5,11,14
 green ash *Fraxinus pennsylvanica* 11,12
 white ash *Fraxinus americana* 1,4,8,13
 aspen (*Populus*) 4,5,7,11,12,14
 quaking aspen *Populus tremuloides* 8
 trembling aspen *Populus tremuloides* 13
 basswood (*Tilia*) 4,5,8
 beech (*Fagus*, *Carpinus*) 4,5,14
 berries (*Rubus*) 9
 birch (*Betula*) 2,5,7,8,11,12,14
 yellow birch *Betula alleghaniensis* 4
 paper birch *Betula papyrifera* 4
 blackberry (*Rubus*) 1,4,8,9,10,12,14
 black raspberry *Rubus occidentalis* 13
 bramble (*Rubus*) 11
 blackgum *Nyssa sylvatica* 4,8,11,14
 boxelder *Acer negundo* 13
 buckbrush *Andrachne phyllanthoides* (*Ceanothus*) 1,7,15
 buttonbush (*Cephalanthus occidentalis*) 11,12
 buttonball (*Cephalanthus occidentalis*) none*
 cactus, pricklypear (*Opuntia*) 11
 cascara (*Rhamnus*), 14
 cedar (*Juniperus*), (*Cupressus*), (*Thuja*) 2,5,11,12
 cherry (*Prunus*) 5,11,12,14
 bitter cherry *Prunus emarginata* 13
 black cherry *Prunus serotina* 6,7,8,15
 chokecherry *Prunus virginiana* 8,11,14
 pin cherry *Prunus pennsylvanica* 8
 wild cherry *Prunus serotina* 1,3
 chestnut (*Castanea*), (*Hippocactanum*) none*
 conifers (*coniferales*) 11
 coffeebean *Gymnocladus dioecus* 15
 coral berry *Symphoricarpos orbiculatus* 2
 cottonwood (*Populus*) 3,4,14
 eastern cottonwood *Populus deltoides* 8
 cucumbertree *Magnolia accuminata* 5
 cypress (*Taxodium*) 11
 dewberry *Rubus flagellaris* 4,9,10
 dogwood (*Cornus*) 4,5,11,12,13,14
 eastern red cedar *Juniperous virginiana* 13
 elder (*Sambucus*)
 red elder *Sanbucus pubens* 7
 elderberry *Sambucus canadensis* 5,11,14,15
 elm (*Ulmus*) 2,5,6,8,11,12,14
 American elm *Ulmus americana* 3,15
 red elm *Ulmus rubra* 7
 slippery elm *Ulmus rubra* 8
 winged elm *Ulmus alata* 3,7,8,13,14
 evergreen black berry *Rubus laciniatus* 13
 fern, bracken *Pteridium aquilinum* 4,8,12
 grape (*Vitus*) 4,5,13
 wild grape (*Vitus* spp.) 8,11
 greenbriar *Smilax rotundifolia* 13
 gum (*Nyssa*, *Liquidambar*) 2,5,11,12
 hackberry (*Celtus occidentalis*) 3
 hawthorn (*Crataegus*) 8,10,11,12,13,14

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hazel (*Corylus*) 14
 hazel bush (*Corylus*) 15
 hickory (*Carya*) 2,4,5,8,10,11,12,14,15
 black hickory (*Carya texana*) 13
 honeysuckle (*Lonicera*) 1,4,7,9,10,12
 Japanese honeysuckle (*Lonicera japonica*) 13
 hornbeam (*Ostrya virginiana*) 5,11,12,14
 huckleberry *Galussacia baccata* 4
 juniper (*Juniperus*) 11
 kudzu (*Pueraria lobata*) 1,4,9,11,12
 locust (*Gleditsia*, *Robinia*) 1,5,11,12,14,15
 black locust *Robinia pseudoacacia* 6,7,8
 maple (*Acer*) 2,3,5,9,10,11,12,14
 red maple *Acer rubrum* 4,7,8,9,12
 sugar maple *Acer saccharum* 4,9
 mulberry (*Morus*) 11,14
 oak (*Quercus*) 2,3,5,7,9,10,11,12,14
 black oak *Quercus velutina* 4
 blackjack oak *Quercus marilandica* 2,4,6,7,8,13
 chestnut oak, *Quercus prinus* 4
 northern pin oak *Quercus rubra v. borealis* 9
 post oak *Quercus stellata* 2,4,6,13
 red oak *Quercus rubra* 1,2,4,6,8,9
 scrub oak *Quercus spp.* 1
 water oak *Quercus nigra* 8
 white oak *Quercus alba* 1,4,6,8,9,13
 osage orange, hedge, hedgeapple, *Maclura pomifera* none*
 pecan *Carya illinoensis* 2,11,12
 persimmon *Diospyros virginiana* 4,5,8,11,12,14
 eastern persimmon *Diospyros virginiana* 4
 pinus (*Pinus*) 2,3,5,6,7,12,14
 eastern white pine *Pinus strobus* 8
 loblolly pine *Pinus taeda* 8
 shortleaf pine *Pinus echinata* 4,13
 virginia pine *Pinus virginiana* 8,13
 persimmon pine (white) (not found in literature) 4
 plum, wild *Prunus americana*, *Prunus mexicana* 4,5,8
 poison ivy *Rhus radicans*, *Toxicodendron radicans*
 1,2,4,12,13
 poison oak *Rhus toxicodendron*, *Toxicodendron quercifolia*
 1,2,4,14
 poplar (*Populus*) *Liriodendron tulipifera* 2,3,5,7,10,14
 prickly ash *Xanthoxylum americanum* 1
 raspberry (*Rubus*) 9
 red raspberry *Rubus idaeus* 13
 redbud *Cercis canadensis* 3,11
 rose, wild (*Rosa*) 11,12
 multiflora rose *Rosa multiflora* 8,9,11
 salmonberry *Symphoricarpos orbiculatus* 1,8,14
 sassafras *Sassafras albidum* 5,8,11,12,14
 serviceberry *Amelanchier arborea* 5,11,12
 spicebush *Lindera benzoin* 5
 sumac (*Rhus*) 1,2,3,4,5,8,10,11,12,14,15
 smooth sumac *Rhus glabra*, 13
 staghorn sumac *Rhus typhina* 3
 sourwood *Oxydendrum arboreum* 8,11,12
 sweetgum *Liquidambar styraciflua* 2,3,4,8,13,14
 sycamore *Platanus occidentalis* 5, 7, 8, 14
 thimbleberry *Rubus occidentalis* 8,14
 thornapple (*Crataegus*) 5
 tree-of-heaven *Ailanthus altissima* 8,15
 trumpet creeper *Campsis radicans* 2,4,9,10,13
 tulip poplar *Liriodendron tulipifera* 7,12,14
 tulip tree, yellow poplar, tulip poplar *Liriodendron tulipifera* 8

Virginia Creeper *Parthenocissus quinquefolia* 13
 yellow poplar *Liriodendron tulipifera* 8
 walnut (*Juglans*) none*
 western hackberry *Celtis occidentalis* 13
 wild blackberry (*Rubus*) 10
 willow (*Salix*) 2,3,4,5,6,7,8,9,10,12,14,15
 witchhazel *Hamamelis vernalis*, *Hamamelis virginiana* 5
 Formerly controlled with 2,4,5-T

Table 2. Key to Herbicides for Brush Control in Illinois.

Common Name	Example
1. amitrole (amino triazole)	Amitrol
2. AMS (ammonium sulfamate)	Ammate
3. bromacil	Hyvar
4. dicamba	Banvel
5. dicamba + 2,4-D	Banvel 720
6. dichlorprop	2,4-DP
7. dichlorprop + 2,4-D	Weedone 170
8. fosamine	Krenite
9. glyphosate	Roundup
10. hexazinone	Velpar
11. picloram	Tordon
12. picloram + 2,4-D	Tordon 101
13. tebuthiuron	Spike
14. triclopyr	Garlon
15. 2,4-D	numerous

1. **Amitrole** (amino triazole) is marketed as Amitrol-T, Amizol, and Weedazol by Union Carbide; and as Amino Triazole Weed Killer and Cytrol Amitrole-T by American Cyanamid. Both liquid and powder formulations can be applied to noncrop areas and hardwood nurseries. They are to be applied to the foliage from the time it is fully developed until plants begin to go dormant. All leaves, stems, and suckers must be thoroughly wet to the groundline. Amitrole can be used in marshes and drainage ditches unless the water will be used for irrigation, drinking, fishing, or other domestic purposes. Microbial breakdown occurs in warm moist soils in approximately 2 to 3 weeks. Amitrole kills the plant by inhibiting chlorophyll formation and regrowth from buds.

2. **AMS** (ammonium sulfamate) is marketed as Ammate X for non-crop land, rangeland, and pasture; and Ammate X-NI for land adjacent to and surrounding domestic water supply reservoirs,

supply streams, lakes, and ponds. It may be applied as a foliage spray, by frill, notch or cup method, or as a stump treatment. The foliage spray can be applied any time after brush has reached the full-leaf stage until foliage begins to discolor, preferably during periods of high temperatures and high humidity. Non-productivity of soil may be caused by heavy applications, but will disappear in the "overwinter" period.

Stumps can be treated by sprinkling the crystals liberally on the freshly cut surface or by spraying the surface with a solution prepared by dissolving the crystals in water. This is most effective on stumps under two inches in diameter.

The frill method involves making a continuous cut completely around the tree with downward axe strokes, cutting well into sapwood. Saturate the frilled area with a solution of AMS.

The notch or cup method is used on trees that are three inches in diameter or larger. Make a notch or cup with two downward axe cuts, one above the other, prying out the chip. This should be done near the base of the tree every four to six inches around the circumference. Apply the crystals in each notch.

3. **Bromacil** is a uracil herbicide marketed in a wettable powder formulation as Hyvar X and a liquid formulation as Hyvar XL. This noncrop herbicide is applied to the soil where it is leached down to the root zone by rainfall and absorbed by the target plant. Bromacil can be broadcast above actively growing roots or the concentrate may be applied near the base of the woody plant as a spot treatment in spring or summer. It is a potent and specific inhibitor of photosynthesis. Bromacil is quite persistent in the soil.

4. **Dicamba** is marketed for pasture, range, and noncrop uses as Banvel in liquid, granule, and pellet formulations. The benzoic acid herbicide is effective when applied to the foliage, injected into the trunk, or applied to the soil. When applied properly, it does not harm grass plants. The herbicide can be injected any time of the year, but the foliage applications must be made after the leaves are fully developed until three weeks before frost. Recent research has shown that applications prior to leaf development in early spring are effective on certain woody species. The soil applications

should be made in the spring because dicamba will only persist from three to twelve weeks depending on rate and soil conditions. Once in the plant, dicamba has the properties of an auxin-like growth regulator.

5. **Dicamba + 2,4-D** has greater activity on many woody species than either herbicide used alone. This combination is sold as Weedmaster for use on pasture, rangeland, and non-cropland. Banvel 520 is an oil soluble formulation and Banvel 720 is a water soluble formulation for industrial use. The combination with oil can be applied as a basal bark treatment and as a broadcast stem treatment during the dormant season. Research is underway on a low-oil mixture to increase effectiveness on some species. Banvel 720 can also be used in aquatics. Nonselective forest brush control is specified on the Banvel 520 and 720 labels.

6. **Dichlorprop** is a phenoxy herbicide available as 2,4-DP from many companies. It can be used as a foliage stem treatment on noncropland. Apply the spray to the entire plant from the time foliage is fully developed until dormancy. Since 2,4,5-T has provided effective control of many species of woody plants, little work has been done on dichlorprop.

7. **Dichlorprop + 2,4-D** is available as an ester formulation (Weedone 170) and on invert emulsion formulation (Envert 171). This combination can be applied as basal bark, foliage stem, modified basal (for regrowth), stump, and frill treatments. Dichlorprop + 2,4-D can be used on noncropland only, including forest site preparation.

8. **Fosamine** is a relatively new phosphonate herbicide sold under the trade name Krenite. This foliar herbicide is most effective when applied during the two-month period prior to leaf discoloration in the fall. Fosamine has little or no apparent effect on the woody plant until the following spring when bud development is either prevented or severely limited. It has very little activity on desirable herbaceous plants. A spray directed to only part of a susceptible plant will provide control of only the portion sprayed, resulting in a trimming effect.

9. **Glyphosate** is a substituted amino acid herbicide sold under the trade name Roundup.

Generally, glyphosate is most effective when applied to the foliage after the plant reaches maturity. The nonselective herbicide can be used for spot treatment of weeds in many crops. It is strongly adsorbed to the soil and therefore, has essentially no soil activity. Glyphosate appears to inhibit amino acid biosynthesis.

10. **Hexazinone** is a new triazine herbicide for noncropland sold under the trade name Velpar. It is available as a soluble powder and recently, as a grid ball. It has good foliar activity on many herbaceous species, but is only effective as a soil treatment on woody plants. Hexazinone is quite persistent in the soil, but best results occur after spring or early summer applications. It is translocated up through the xylem and inhibits photosynthesis. Selective weed control has been obtained in Christmas tree plantations and reforestation areas.

11. **Picloram** is available as a liquid named Tordon 22K and as two dry formulations — Tordon Beads and Tordon 10K pellets. The pellets can be used on permanent grass pastures, rangeland, and in forests to control unwanted brush by soil application. The liquid formulation is recommended as a foliar spray for herbaceous species only. This substituted pyridine herbicide may be applied at any time the soil is not frozen, however best results are obtained from application in the spring. When the dry formulations are broadcast uniformly, little or no damage will occur to grass plants. Microbial degradation is slow, especially in cool or dry soils. Picloram leaches readily, especially in sandy soils low in organic matter.

12. **Picloram + 2,4-D** is available as Tordon 101 Mixture, Tordon 101R, and Tordon 101 RTU from Dow; and Amdon 101 from Union Carbide. The Tordon and Amdon 101 formulations can be used as foliage treatments. All formulations can be used as cut surface, tree injection, and frill or girdle treatments. Tordon 101R and Tordon 101 RTU are ready-to-use formulations that require no further dilution. For stump treatments, only the cut surface must be treated, especially the vascular cambium region.

13. **Tebuthiuron** is a substituted urea available in wettable powder and granule formulations for soil applications on noncropland. It is also labeled

in Texas and Oklahoma for brush control in pasture and rangeland as Graslan. The 20 percent pellet must be applied aerially. Tebuthiuron should be applied before or during the active growth of target plants. Cool-season grasses are susceptible to Spike and will be controlled for one or more seasons after application. Phytotoxicity symptoms occur within two years after application and suggest inhibition of photosynthesis.

14. **Triclopyr** is a new substituted pyridine herbicide available in a water-soluble amine formulation known as Garlon 3A from Dow. It can be used on noncropland including forest site preparation. Do not plant conifer seedlings within six months after application. For best results, apply to the foliage when the woody plant is actively growing. It has little soil activity on woody species and shorter residual than picloram. Triclopyr can be tank-mixed with 2,4-D or Tordon 101. It is a selective herbicide and translocates both up and down in plants, accumulating in the meristematic tissue. Research shows that it is also effective as stump, basal, and tree injection treatments.

15. **2,4-D** is available from several manufacturers under numerous trade names and formulations. It can be used on various crops including pasture and rangeland. The ester formulations are very effective on some plant species when applied to the foliage after it is well-developed yet actively growing. Some are labeled for conifer release. The amine formulations can be used for tree-injection in forests. Two,4-D cannot be used in water that is used for drinking or domestic purposes, but is labeled for other aquatic uses.

In compiling the Illinois Checklist for Herbicides on Woody Plants, the authors found many ambiguities and unclear statements. One well known label suggested spraying "woody trees." One would suppose, then, that "non-woody" trees were excluded. Another label suggested that the product would control willows and "similar species." What is a similar species?

Statements of this nature were not included in the Checklist. However, some sources of confusion could not be eliminated. Common names, without accompanying botanical names are the chief source of confusion. The list includes "gum" trees and "beech" trees. Each of these common

names can be applied to at least 2 unrelated species in Illinois. In the reverse situation, we have several examples of different companies using different common names that refer to the same species. Quaking aspen and trembling aspen would be an example. Buttonbush and buttonball may be another, although "buttonball" could be referring to sycamore. Other labels use very broad generalities. One label specifies "cedar." This term can be applied to several species from 3 different genera, either introduced or native in Illinois. With these handicaps in mind, the authors have attempted to compile an alphabetical list of the woody plants in Illinois with accompanying botanical names. For the most part, the list is at the genus or genus and species level. Thus, if the list refers to apple (*Malus*), it means all species of apple whether prairie crab or red delicious of the common eating variety. On the other hand, where the list refers to winged elm *Ulmus alata*, it does not imply that the listed products can be used on red elm or American elm. In a few cases, no botanical name could be determined. The name "berry," for example, has no real meaning in this

context. In another case, the term "persimmon pine (white)" could not be found in the literature and is undoubtedly a typographical error.

These inconsistencies are not surprising. Label requirements have changed drastically over the last thirty years. Generally, the more recent labels are much improved. They give details on hazard to the applicator and the environment. They also discuss methods of application for optimum results. Several labels recommend different rates for specific woody plants. A few list target species by botanical name. Even though the 1978 Amendments of FIFRA (Federal Insecticide, Fungicide, and Rodenticide Act) do not require all application methods and target species to be listed, the authors wish to encourage the pesticide manufacturers to continue. May it always be stated that the label is the best source of information on the effective and safe use of a pesticide.

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ABSTRACT

Whitcomb, C.E. 1979. **Research findings examined at Oklahoma field day.** Am .Nurseryman 150(11): 9, 54, 56, 58-59, 62-66.

Steve Shoup determined if the general recommendation of pruning 30 percent of the top of bare-root trees at planting time remains valid with current nursery practices. He also examined the widely promoted practice of withholding fertilizer from newly planted trees. Neither pruning nor fertilizer treatments at planting time had any effect on survival of any of the 10 species, a total of 480 trees. Pruning in excess of 15 percent reduced the visual quality of all species. Rick Reavis studied the effects of a root stimulator on root initiation and growth of newly planted pin oaks. No consistent benefit could be measured from either of the root stimulator treatments. Ken Preaus studied four ways of transplanting trees. For each species putting spade-dug trees into spade-dug holes brought the worst results. Dr. Whitcomb said studies have shown repeatedly that incorporating soil amendments in planting holes is harmful, not beneficial, to newly planted trees and shrubs.