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# Chemical Control of Woody Plants

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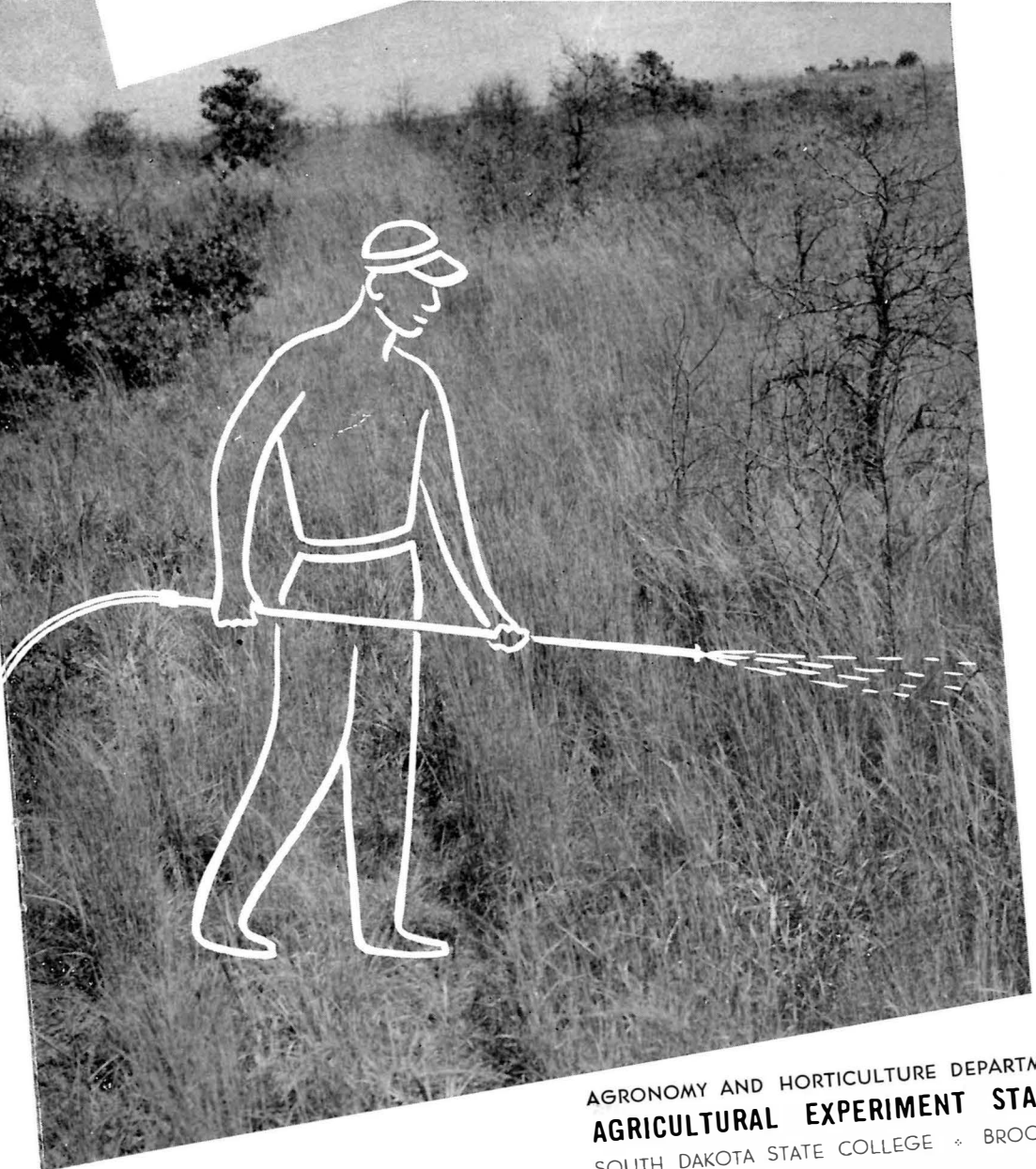
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Circular 114 - April 1955

# CHEMICAL CONTROL OF WOODY PLANTS

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AGRONOMY AND HORTICULTURE DEPARTMENT  
AGRICULTURAL EXPERIMENT STATION  
SOUTH DAKOTA STATE COLLEGE \* BROOKINGS

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This publication discusses the use of chemicals for the control of woody plants.

Other publications, "Perennial and Annual Herbaceous Weed Control," "Weed Control in Lawns and Gardens," and "Equipment Used for Weed Control," are available at your County Agent's office or the Experiment Station Bulletin Office, South Dakota State College, College Station, South Dakota.

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# Chemical Control of Woody Plants

LYLE A. DERSCHIED and E. K. FERRELL<sup>1</sup>

Many woody plants are problems in rangeland, along roadsides, under utility lines, and along irrigation and drainage ditches. It is often desirable to control these plants on rights-of-way, but it is advisable to study the situation before controlling them on rangeland.

Chemicals used to control undesirable woody species may also kill desirable range forbs and woody plants. One should be certain that the range forage will be improved before he does any large-scale spraying. It may be advisable to conduct a few small-area trials before the entire range is treated.

To make spraying pay on rangeland it is desirable to follow good range management so that grasses will take over as the woody plants die out. Even though the grasses are present, they will not spread after the woody plants have been killed except under light grazing or no

grazing conditions. Many of the grass plants should be allowed to produce seed.

In South Dakota research has been limited to the use of chemicals for the control of buckbrush, sagebrush and poison ivy. Therefore, most of the information presented was obtained from the North Central Weed Control Conference and from states that have more woody plant problems than South Dakota. Most of the suggestions offered here have not been tried extensively in South Dakota, but they have proved to be satisfactory under similar conditions.

## Methods of Applying Chemicals

The same chemical may be applied to woody plants as a foliage spray, a basal spray, a cut-surface application, or as a stump treatment, depending on the season, species, size of plant, and other factors.

### Foliage Sprays

These treatments are applied to the plant leaves in much the same manner as for herbaceous weeds. Esters of 2,4-D or 2,4,5-T or brush-killer mixtures of the two may be applied with water, fuel oil, or an oil-water emulsion as the carrier. Low-volatile ester formulations of

<sup>1</sup>Associate Agronomist, South Dakota Agricultural Experiment Station and Extension Forester, South Dakota Extension Service, respectively.

these chemicals do not give off fumes as do regular formulations and should be used when there is danger of fumes drifting to sensitive vegetation. Treatments should be made shortly after the leaves have attained full size.

Amate (ammonium sulfamate) may also be used as a foliage spray but should have a spreader-sticker added as recommended by the manufacturer. It can be used any time during the growing season and does not give off fumes to injure nearby sensitive plants. However, it is corrosive to sprayers and usually kills all foliage. Perennial grasses frequently recover the next year, however.

Foliage applications may be made with an aerial sprayer, a ground rig, or a handgun, depending on the area to be sprayed. It is

**Handgun application of a foliage spray.**



advisable to use higher volumes of spray than is ordinarily used for herbaceous plants as it is more difficult to get complete coverage. Aerial spraying should be done with a minimum of 2 gallons and preferably 5 gallons of total spray per acre, while a ground rig should use a minimum of 10 gallons and preferably 20 or 30 gallons of spray per acre. The higher volumes give better coverage and more uniform results.

If an oil-water emulsion is used as a carrier, 1 gallon of fuel oil to 4 gallons of water is satisfactory. The chemical should be mixed in the oil and the solution then added to the water. For most species, 1 to 3 pounds acid equivalent of 2,4-D ester; 2,4,5-T ester; or a mixture of the two is sufficient for 1 acre. Aerial or ground rig applications are useful for the control of large areas of woody plants but seldom eliminate them. Therefore, retreatments are often necessary.

When a handgun is used for treating small patches, a mixture of 3 to 6 pounds of chemical in 100 gallons of carrier is satisfactory. If amate is used, it should be mixed at the rate of three-fourths of a pound in 1 gallon of water and a spreader-sticker should be added as recommended by the manufacturer.

#### **Basal Sprays**

Ester formulations of 2,4-D; 2,4,5-T; and brush-killer mixtures of the two are effective on many woody plants that are less than 6 inches in diameter. Such applications may be made during the growing season or after the leaves have fallen. The chemicals should be diluted in fuel

oil (8 to 16 pounds in 100 gallons) and sprayed on the lower 2 or 3 feet of the trunk and the ground line area. Such sprays are generally applied with a handgun until the spray runs off on the ground. Although the trees are generally killed, they usually remain standing.

#### Cut-Surface Applications

Many trees that are too large or too thick-barked to be killed by basal sprays can be killed by cutting "frills" or "girdles" through the bark around the base of the trunk and applying an ester of 2,4,5-T or amate. Esters of 2,4-D are effective on cottonwood or willow. The 2,4,5-T or 2,4-D should be mixed in fuel oil (16 pounds in 100 gallons) and applied liberally to the "frills." Amate may be applied dry or as a spray (6 pounds in 1 gallon of water).

#### Stump Treatments

Where the presence of dead standing trees is objectionable, the trees may be cut down and the stumps treated with esters of 2,4-D; 2,4,5-T; or brush-killer mixtures of the two or with amate. The 2,4-D; 2,4,5-T; or brush-killers should be mixed in fuel oil (8 to 16 pounds in 100 gallons) and applied to the



Applying basal spray with knapsack sprayer. This spray effectively kills trees less than 6 inches in diameter.

freshly-cut stump surface until the top, sides, and exposed roots are wet thoroughly. Amate may be used dry by placing the crystals in holes drilled in the stump (1 tablespoonful for every 6 inches of diameter) or by mixing it in water (6 pounds in 1 gallon) and thoroughly wetting the stump. Resprouting sometimes occurs after 2,4-D or 2,4,5-T is used but seldom occurs after using amate.

## Control of Common Woody Plants

### Barberries

European barberry (*Berberis vulgaris*) can be killed with basal sprays containing 14 pounds of a brush-killer mixture of 2,4-D and 2,4,5-T in 100 gallons of oil. Also a mixture of 6 pounds of amate in 1 gallon of water applied to the cut stubs of barberry will kill it. Colo-

rado barberry (*B. fendleri*) can be killed by wetting it thoroughly with a foliage spray containing 1½ pounds of 2,4-D ester in 100 gallons of water or with a basal spray of 12 pounds of 2,4-D ester in 100 gallons of fuel oil. Allegheny barberry (*B. canadensis*) is killed with 2,4,5-T used in the manner described for

using 2,4-D on Colorado barberry.

### **Buckbrush**

Since sparse stands of this species have some value as a browse plant for sheep, it should be controlled on rangeland only when it becomes too abundant.

Control of buckbrush can usually be obtained by repeated applications of a foliage spray of 1 pound acid equivalent of a 2,4-D ester per acre. Treatment should be made when the leaves have reached maximum size (about May 15). The herbicide may be applied with oil as a carrier or with an oil-water emulsion. If a handgun is used the plants should be wet thoroughly with a spray consisting of 1 pound of chemical in 50 gallons of water. Retreatment is generally necessary.

### **Buckthorn**

A brush-killer mixture of 2,4-D and 2,4,5-T mixed at the rate of 12 pounds of total acid in 100 gallons of fuel oil and applied as a basal spray will kill most species of buckthorn. Also cut surface applications of amate can be used.

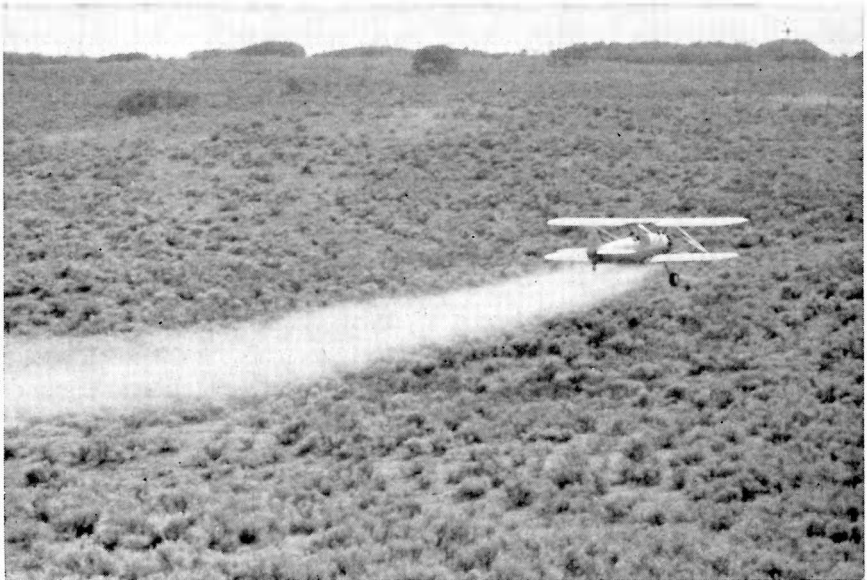
### **Cottonwoods**

Foliage applications of 4 pounds of 2,4-D ester in 5 gallons of fuel oil per acre will control cottonwoods when applied from the air during early June. Handgun applications should be made to the foliage with a spray containing 4 pounds of 2,4-D ester in 100 gallons of water during late spring or early summer.

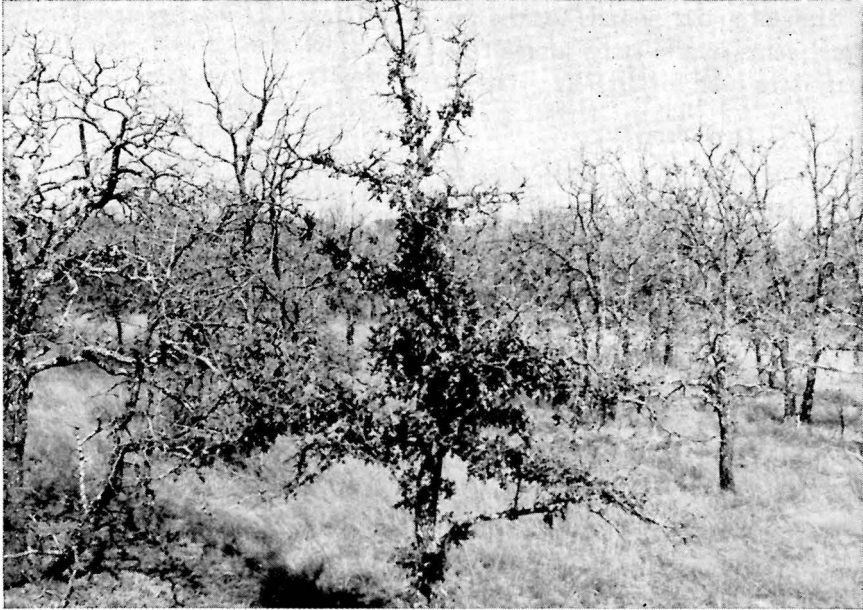
### **Currants and Gooseberries**

Most species of the currants and gooseberries can be killed with 12

Many acres of rangeland have been reclaimed by applying a foliage spray to sagebrush from the air.



June application of 2 pounds of 2,4,5-T per acre for 2 years is effective in oak control.



pounds of 2,4,5-T ester in 100 gallons of fuel oil applied as a basal spray.

#### **Dogwood**

Dogwood has been killed with foliage sprays and with basal sprays containing 2,4-D ester; 2,4,5-T ester; or mixtures of the two. Sprays containing as little as 1 pound of acid in 100 gallons of fuel oil have been satisfactory for handgun application of foliage sprays or basal sprays.

#### **Junipers (Cedars)**

Several Juniper species may be killed with a foliage-wetting spray containing three-fourths of a pound of amate per gallon of water or by soil treatments with sodium chlorate. Red cedars can be controlled with a mixture of 2,4-D and 2,4,5-T ester (5 pounds in 100 gallons of

water) applied with a handgun to the foliage during the summer.

#### **Oaks**

Several species of oaks may be controlled by applying foliage sprays annually for 2 or 3 years. They can be controlled with an ester of 2,4,5-T or with a brush-killer mixture of 2,4-D and 2,4,5-T esters. Treatments with a handgun should be made with a spray containing 3 pounds of chemical in 100 gallons of water.

Aerial treatment has proved successful in large areas. When 2,4,5-T is used, the initial application should be made at the rate of 2 pounds followed by retreatments of 1 to 2 pounds in 1 gallon fuel oil and 4 gallons of water per acre or 5 gallons of oil per acre. A mixture of 2,4-D and 2,4,5-T should be applied



at the rate of 3 pounds for the first treatment and 2 pounds for the re-treatments in the same amount of carrier as used for 2,4,5-T.

### **Poison Ivy**

A thorough wetting with 2,4,5-T ester or a mixture of 2,4-D and 2,4,5-T at the rate of 2 pounds in 100 gallons of water applied as a foliage spray will kill poison ivy. Large open areas can be killed with 1 pound acid equivalent of a mixture of 2,4-D and 2,4,5-T esters per acre. Also this species can be killed with a solution of 12 pounds of 2,4,5-T ester in 100 gallons of fuel oil, or a solution of three-fourths of a pound of amate in 1 gallon of water applied when the plants are dormant. Likewise, 5 pounds of sodium chlorate or 15 pounds of concentrated borascu per square rod have proved effective. Due to the danger of skin poisoning, it is often desirable to treat when the plants are dormant.

### **Sagebrush**

Big sagebrush can be controlled by repeated foliage application of 2 pounds of an ester of 2,4-D per acre during the early part of June. One year's application normally gives 70 to 90 percent control of the sagebrush stands. Second-year applications have resulted in complete kill of all sagebrush plants. Water, oil, or oil-water emulsion can be used as a carrier. For this species of sagebrush 2,4,5-T is effective but costs more than 2,4-D.

Sand sage can be controlled with a foliage application of 1 pound of

2,4-D acid per acre. It can be applied in an oil carrier or an oil-water emulsion. Treatments should be made in early June when the plants have 6 to 8 inches of new growth.

Silver sagebrush is more difficult to kill than either big sagebrush or sand sage. Since sparse stands of this species have some value as a browse plant for sheep, it should be controlled on rangeland only when it becomes too abundant. Limited trials indicate that 2,4,5-T is more effective than 2,4-D. Repeated foliage applications of 1½ pounds of an ester per acre in early June are helpful in controlling this plant and eventually reduce the stand.

Pasture sage is difficult to kill. Top growth can be knocked down with a foliage spray containing 2 pounds of 2,4-D or 2,4,5-T per acre applied at flowering time. However, several retreatments are necessary to materially reduce the stand.

### **Sumac**

Several species of sumac can be killed with the treatments suggested for poison ivy. Due to the danger of skin poisoning from poison sumac, it is suggested that it be treated when the plants are dormant.

### **Willows**

Foliage applications of 2 pounds of 2,4-D ester, 2,4,5-T ester or a mixture of the two in 2 to 5 gallons of fuel oil or water per acre will control willows when applied from the air. Also handgun applications of foliage sprays or basal sprays containing 1 to 2 pounds of chemical in 100 gallons of water or oil are effective. Foliage sprays can be applied during spring or summer and basal

sprays can be applied most any time during the year.

### Wild Plum

A foliage spray of 5 pounds of 2,4,5-T ester in 100 gallons of fuel oil or water will kill wild plums when applied with a handgun during the spring or early summer. A heavy application of 2,4,5-T ester

from a ground sprayer has also been effective.

### Wild Rose

A foliage spray containing 2 pounds per acre of a 2,4,5-T ester or a mixture of 2,4-D and 2,4,5-T esters has been effective in eliminating wild roses in areas where undesirable.

## Reaction of Woody Plants

In 1950 research workers of the North Central Weed Control Conference classified many woody plants according to their reactions to 2,4-D; 2,4,5-T; and mixtures of the two. A condensation of that classification is given below. Since 2,4-D is cheaper than 2,4,5-T or mixtures, it is suggested that 2,4-D be used on species that it will control.

The following species are extremely sensitive to spray drift.

- Boxelder (*Acer negundo*)
- Crab Apple (*Malus baccata*)
- Currant, Golden (*Ribes aureum*)
- Grapes (*Vitis spp.*)
- Honeysuckles (*Lonicera spp.*)
- Siberian (Chinese) Elm (*Ulmus pumila*)

These species are seldom killed by repeated application of 2,4-D; 2,4,5-T; or mixtures. Some may be defoliated but will recover.

- Basswood (*Tilia americana*)
- Hackberry (*Celtis occidentalis*)
- Pines (*Pinus spp.*)
- Rabbit Brush (*Chrysothamnus stenophyllus*)
- Walnuts (*Juglans spp.*)

The species listed in Table 1 can be killed by 2,4-D; 2,4,5-T; or a mixture of the two. Retreatments may be necessary on many of the species. The amount of chemical listed for each has been proven effective, but there are not enough experimental data to be certain they are the minimum rates required.

Table 1. Recommended Treatments for Woody Plants



Table 1. Recommended Treatments for Woody Plants

Species	Type of Application	Season for Treatment*	Chemical*	Amount of Chemical*	Carrier
Apple ( <i>Pyrus malus</i> )	foliage	Su	D	3 lb/hg	water
Ash, Green ( <i>Fraxinus pennsylvanica</i> )	foliage	Sp	D-T	3 lb/hg	water
Ash, Prickly ( <i>Zanthoxylum americanum</i> )	foliage	Su	D or D-T	2 lb/A	water
	foliage	Su	D,T, or D-T	2 lb/hg	water
	basal	W	D or T	15 lb/hg	turpentine
Barberries ( <i>Berberis spp.</i> )	cut-surface	Su	D-T	5 lb/hg	oil
	foliage	Su	D or D-T	2 lb/hg	oil
	basal	F,W,Sp	D-T	12 lb/hg	oil
Birch ( <i>Betula spp.</i> )	foliage	Su	D or T	2 lb/hg	water
	basal	F	D-T	11 lb/hg	oil
Boxelder ( <i>Acer negundo</i> )	foliage	Sp	D	1 lb/A	water
	cut-surface	Sp	D-T	4 lb/hg	oil
Buckbrush ( <i>Symphoricarpos occidentalis</i> )	foliage	Sp	D	1 lb/A	oil
	foliage	Sp	D	2 lb/hg	water
Buckeye ( <i>Aesculus pavia</i> )	foliage	Sp,Su	D-T	4 lb/hg	water
Catalpa ( <i>Catalpa bignonioides</i> )	foliage	Su	D-T	5 lb/hg	water
Cedar, Red ( <i>Juniperus virginiana</i> )	foliage	Su	D-T	5 lb/hg	water
Cedar, Salt ( <i>Tamarix gallica</i> )	foliage	Su	D	5 lb/hg	water
	foliage	Su	D,T, or D-T	4 lb/A	water
	cut-surface	Su	D	16 lb/hg	oil
Cherries (Choke, Pin, and Wild) ( <i>Prunus spp.</i> )	foliage	Su	D,T,D-T	4 lb/hg	water
	cut-surface	W	D	4 lb/hg	oil
Cottonwood ( <i>Populus spp.</i> )	foliage	Su	D,D-T	4 lb/A	oil
	foliage	Su	D	2 lb/hg	water
	basal	Su	D,T,D-T	16 lb/hg	oil
Cranberry ( <i>Vaccinium Oxycoccus</i> )	foliage	Su	D or T	8 lb/hg	water
	foliage	Su	D-T	4 lb/hg	water
Currant, Black ( <i>Ribes americanum</i> )	foliage	Su	D	2 lb/hg	water
	basal	Su	T	12 lb/hg	water
Dogwood ( <i>Cornus spp.</i> )	foliage	Su	D,T, or D-T	1 lb/hg	water
	basal	W	T or D-T	8 lb/hg	oil
Elderberry ( <i>Sambucus canadensis</i> )	foliage	Su	D,T, or D-T	3 lb/hg	water
Elms ( <i>Ulmus spp.</i> )	foliage	Su	T or D-T	6 lb/hg	water
Gooseberries ( <i>Ribes spp.</i> )	foliage	Sp,Su	D,T, or D-T	5 lb/hg	water
	basal	Su	T	12 lb/hg	water
Grape, Wild ( <i>Vitis vulpina</i> )	foliage	Su	D-T	2 lb/A	water
	foliage	Sp,Su	D-T	2 lb/hg	water

Table 1. Recommended Treatments for Woody Plants (Continued)

Species	Type of Application	Season for Treatment*	Chemical*	Amount of Chemical*	Carrier
Hawthorne ( <i>Crataegus spp.</i> )	foliage	Sp,Su	D-T	2 lb/A	water
	foliage		D,T or D-T	4 lb/hg	water
	basal	Sp,F	D-T	16 lb/hg	oil
	cut-surface	Sp,Su	D-T	8 lb/hg	oil
Hazel Brush ( <i>Corylus cornuta</i> )	foliage	Su	D	2 lb/A	water
Honeysuckles ( <i>Lonicera spp.</i> )	foliage	Su	D	5 lb/hg	water
Ironwood ( <i>Ostrya virginiana</i> )	basal	W	T	16 lb/hg	oil
Ivy, Poison ( <i>Rhus toxicodendron</i> )	foliage	Su	D-T	1 lb/A	water
	foliage	Su	D-T	2 lb/hg	water
Juneberry ( <i>Amelanchier alnifolia</i> )	foliage	Sp,Su	T or D-T	2 lb/A	water
	foliage	Sp,Su	T or D-T	2 lb/hg	water
Junipers (See Cedars)	basal	W	T	5 lb/hg	oil
Lilacs ( <i>Syringa spp.</i> )	foliage	Sp,Su	D	3 lb/hg	water
Locusts ( <i>Robinia spp.</i> )	foliage	Su	D or D-T	3 lb/hg	water
Maples ( <i>Acer spp.</i> )	foliage	Su	D-T	3 lb/hg	water
Mulberries ( <i>Morus rubra</i> )	foliage	Su	D-T	5 lb/hg	water
Oaks ( <i>Quercus spp.</i> )	foliage	Su	D-T	2 lb/A	water
	foliage	Su	D-T	3 lb/hg	water
Plum, Wild ( <i>Prunus americana</i> )	foliage	Su	D-T	5 lb/hg	water
Poplars ( <i>Populus spp.</i> )	foliage	Sp,Su	D-T	4 lb/hg	water
	basal	Su	T or D-T	7 lb/hg	oil
	basal	Sp,F	T or D-T	11 lb/hg	oil
Prickly Pear ( <i>Opuntia spp.</i> )	foliage	Su	D or T	16 lb/hg	oil-water
Rose, Wild ( <i>Rosa spp.</i> )	foliage	Sp	T	2 lb/A	water
Sagebrush, Big ( <i>Artemisia tridentata</i> )	foliage	Sp	D or T	2 lb/A	water
Sagebrush, Sand ( <i>Artemisia filifolia</i> )	foliage	Sp	D or T	1 lb/A	water
Sagebrush, Silver ( <i>Artemisia cana</i> )	foliage	Sp	T	1½ lb/A	water
Siberian Pea ( <i>Caragana arborescens</i> )	foliage	Sp	D	1 lb/A	water
	foliage	Sp	D	2 lb/hg	water
Sumacs ( <i>Rhus spp.</i> )	foliage	Su	D-T	1 lb/A	water
	foliage	Su	D-T	2 lb/hg	water
Virginia Creeper ( <i>Parthenocissus quinquefolia</i> )	foliage	Su	D		
Willows ( <i>Salix spp.</i> )	foliage	Su	D,T, or D-T	2 lb/A	water
	cut-surface	Su	D-T	2 lb/A	oil
Yucca ( <i>Yucca glauca</i> )	foliage	Sp,Su	T	20 lb/hg	oil

\*Abbreviations used in table: Sp—spring, Su—summer, F—fall, W—winter; D—2,4-D ester, T—2,4,5-T ester, D-T—mixture of 2,4-D and 2,4,5-T esters; lb/hg—pounds acid equivalent of chemical per 100 gallons of spray for application with a handgun, lb/A—pounds acid equivalent of chemical per acre for application with aerial or ground sprayer.



Ground sprayer mounted on 4-wheel trailer for applying foliage sprays to brush on rangeland.

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