

**BELL SYSTEM PRACTICES**  
**Outside Plant Construction**  
**and Maintenance**

**SECTION G10.360.1**  
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**BRUSH SPRAYING**  
**GENERAL**

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**1. GENERAL**

1.01 This section covers the principles and objectives common to all methods of brush control by chemical means. Related sections, G10.361.1, G10.361.2, G10.361.3, and G10.362.1, cover detailed instructions.

**2. PURPOSE OF RIGHT-OF-WAY BRUSH SPRAYING**

2.01 Brush spraying uses chemicals to eliminate and control undesirable growth on roadside and private rights-of-way, in contrast with keeping down the height of the brush by periodic cutting or by other mechanical means. The season of the year, the height, density and varieties of brush and the type of equipment which can be used will determine which of several available methods of treatment will be most likely to produce the desired results.

2.02 The objective of spraying should be to place the right-of-way in a condition appropriate to the manner in which maintenance operations are carried out. It is not necessary to eliminate entirely all growth of a brushy nature. On the other hand, a right-of-way which is accessible only on foot would not be considered in satisfactory condition if only the growth likely to interfere with overhead plant were removed. Brambles and other obstructive growth of like nature would require removal to permit patrolling and trouble clearance.

2.03 Low growing plants, such as huckleberry, laurel, azalea, sweet fern and many others, tend to prevent the growth of undesirable types of plants and are not a major obstacle to patrolling on foot. Sparing such growth, therefore, represents a saving in labor and spray materials, where such selective treatment is practical with the spraying methods being employed.

### 3. ACTION OF CHEMICALS

3.01 The chemicals used most frequently are of two types, (1) the growth regulating types commonly known as 2,4-D and 2,4,5-T and (2) those based on the weed killing properties of ammonium sulfamate. The commercial forms in which the former appear are as esters, amines or other salts of 2,4-dichlorophenoxyacetic acid and 2,4,5-trichlorophenoxyacetic acid. Of the various forms of 2,4-D and 2,4,5-T, these instructions are based on the use of "low-volatility" esters. Ammonium sulfamate is not volatile.

3.02 Because of the nature of their action within the plants, both types of chemicals are most effective as foliage sprays when applied to plants which are undergoing vigorous growth. This is usually in the spring of the year, just after the plants have come into full leaf.

3.03 To be effective, the chemicals must move into the woody tissues of the stems, trunk and roots. The leaves provide one path and are used for this purpose in foliage spraying. The chemical is also absorbed by the bark, crown and roots, which makes possible the basal and stump methods of treatment. The kill of the entire plant is brought about by movement of the chemical into the root system.

3.04 Insufficient dosage will produce only a temporary effect from which most plants will recover within a season. On the other hand, over-strength application in foliage spraying adds unnecessarily to cost and is otherwise undesirable because it may cause burning and early loss of foliage. In such cases, the leaves may not remain on the plant long enough for movement into the stems of sufficient chemical to cause a permanent effect, and the plants will recover. With bark applications, this risk is not present, and many times stronger concentrations of chemical can be used.

3.05 All plants do not react the same to the effect of the chemical, so that to obtain uniform results in mixed growth special attention must be given to the more resistant species. Extra care must be taken to see that they are covered thoroughly by whatever method is being used, and sometimes it is advisable to employ a different concentration of chemical.

The following is a list of species grouped in the general order of their response to the most effective treatment thus far developed, Group I being the most readily affected. Specific treatments for various difficult species are given in the accompanying sections.

### Group I—Susceptible

Ailanthus (Tree of Heaven)	Hackberry	Plum*
Alder	Hardhack	Poplar*
Apple, American	Hazel	
Crab	Hazelnut	Raspberry, Black
Ash, Mountain	Honeysuckle	Rose, Cherokee
Aspen	Hornbeam	Rose, Prairie
	Horsechestnut	
	Hydrangea, Wild	Sagebrush*
Birch*		Salt Bush
Blackberry	Ivy, Poison	Sassafras
Buckbrush		Scotch Broom
Buckeye	Juneberry	Service Berry
		Shadbush
Cactus, Cholla	Larch	Siberian Pea
Catalpa	Licorice	Silverberry
Cedar, Salt	Lilac	Skunkbush
Cherry*	Locust*	Snow Brush
Chestnut	Lote	Soapweed
Chew-stick Vine	Manzanita	Spicebush
Chinaberry	Maple, Ash Leaved	Sumac*
Chinquipin	Maple, Mountain	Sycamore
Coralberry	Maple, Silver	
Cottonwood	Matrimony Vine	Tamarisk
Cucumber Tree	Moonseed	Tea, New Jersey
Currant*	Mulberry, Red	Tobacco Tree
		Trumpet Vine
Devil's Darning	Oak, Chestnut	Tulip Tree
Needle	Oak, Poison	Tupelo
Dogbane	Oak, Red	Tung
	Oak, Scarlet	
Elder*	Oak, Water	Virginia Creeper
Elderberry	Oak, White	Virgin's Bower
Elm*	Ozier, Red	
		Wahoo
Fir	Paw Paw	Walnut*
	Pear, Prickly	Willow*
Gooseberry*	Pecan	Winterberry
Grape, Wild	Pin Cherry	Witchhazel
Gum*	Pine, Eastern	Wolfberry
	White	Wormwood
	Pine, Red	

\* All species.

**Group II—Intermediate**

Barberry*	Hemlock	Pine, Ponderosa
Brier, Common	Hickory	Pine, Short-leaf
Green		Pine, Virginia
Buttonbush	Ironwood	
	Juniper	Rabbit Brush
Chokeberry	Maple, Red	Redbud
	Maple, Striped	Rose, Wild
Dewberry	Maple, Sugar	
Dogwood,	Maple, Vine-leaf	Salmonberry
Flowering	Mesquite	Snowberry
		Spirea
Gaulberry	Oak, Black Jack	
	Oak, Bur	Thimbleberry
Hawthorn	Oak, Laurel	
Hercules Club,	Oak, Post	Yaupon
Aralia Spinosa	Osage Orange	Yucca

**Group III—Resistant**

Apple, Common	Cedar, Dry Land	Palmetto
Ash, Green	Cedar, Red	Persimmon
Ash, White		
Ash, Prickly	Holly	Rhododendron
Basswood		
Beech, American	Mahonia	Salal
Bittersweet,		Sourwood
Climbing	Oak, Scrub	Spruce

\* All species.

3.06 Plants of the same species growing in the same general area will vary in their response to treatment. Similarly, better over-all results may be obtained with a species in a given locality than with the same species in another locality. Some plants may die in one season, others of the same species may take two or more seasons to show final effects. There is no way to predict such results. This is one of the reasons why one or more follow-up treatments are required. For a particular locality, these variations in response may result in certain species falling into different groups from those of the above list. Lack of information regarding response to treatment has made necessary omission from the list of a number of common species of plants.

#### 4. FREQUENCY OF SPRAYING

4.01 Even under the most favorable conditions, it can not be expected that all undesirable growth will be eliminated from the right-of-way with one spray application. Two and sometimes three treatments will be required to place the right-of-way in a condition such that the job becomes simply one of preventing the growth of new plants. The reasons are these:

- (a) Differences in response among plants of the same or different species.
- (b) A certain number of plants are usually missed and others treated inadequately in the spraying operation.
- (c) On the initial treatment where the growth is dense, large, spreading plants hide smaller plants and shield them from the spray.
- (d) After the area is opened up by the first spray, seedlings will sprout and develop as the sunlight penetrates to the ground.

4.02 Depending on the results of the first treatment, the second may be required the following season. On the other hand, if a kill as high as 65 per cent or better is obtained from the initial treatment, the next spray might be deferred until the second year after the first spray. Because of the carry-over effect of the chemical, it may be found that some of the plants surviving the first spray have been injured and will not reappear the second season following. In general, when an area has been reduced to a sparse growth, it is approaching the point where any spraying to follow might be carried out by spot-spraying individual plants.

4.03 The following are definitions of terms as used in these practices:

**Kill** means the death of the complete plant, roots as well as the aboveground growth. Brush clumps in this condition can usually be kicked out of the ground.

**Sparse growth** means a woody plant growth of less than 1000 plants per acre. This is the equivalent of about 25 plants per 1000 square feet.

**Concentrate** means the undiluted chemical as supplied.

**Carrier** means the liquid to which the concentrate is added to obtain a solution suitable for spraying.

## 5. METHODS OF APPLICATION AND FIELD OF USE

5.01 The adaptability of the various spraying methods to specific conditions is discussed in detail in the sections devoted to particular treatments. A general description of the three most commonly used methods follows:

**Foliage Spray:** In foliage spraying, the chemical in relatively low concentration in water is applied in large volume with intent to cover all of the foliage and stems. As the foliage is the main path of entrance of chemical into the plant, this treatment can only be used while the plants are in leaf. This method is useful as a means of thinning out dense growth in preparation for further treatment.

**Basal Spray:** In basal spraying, the growth regulator type of chemical is applied in a much higher concentration only to the lower portions of the stems and to the crowns of the plants. Absorption of the chemical is through the bark. An oil carrier is used and application is generally from a knapsack tank using a narrow angle nozzle to limit the size of the spray pattern. Best results are obtained where the growth is sparse and the stems average  $3/4$  to 1 inch or larger in diameter.

Basal spraying may be carried on in any season of the year. It provides a means of treatment in locations where accessibility to power equipment is difficult or as a follow-up to a foliage spray. By using basal spraying during the dormant season, year around right-of-way maintenance is possible and the hazard of crop damage is avoided. Identification of plants for selective spraying is difficult, however, and without close examination it is sometimes hard to distinguish between live growth and plants already dead or dying. For this reason, dormant basal spraying is best undertaken only on sections not recently sprayed.

**Stump Treatment:** Highly concentrated solutions of chemical, if applied to stumps not later than 3 days after cutting, will be absorbed by the cut bark and largely reduce the tendency to resprout. Dry ammonium sulfamate can also be applied to cut surfaces. These treatments can be employed in any season of the year, either in connection with the usual cutting methods where new right-of-way is being cleared or where overgrown sections are being cut in preparation for later spraying. They can be applied to stumps of any size, although the results of treating stubble less than about three inches in diameter have not been found worth the effort and expense.

## 6. PRESPRAYING SURVEY

6.01 In order that the work of spraying can be properly organized, a preliminary survey of the right-of-way may be desirable. Information for later use in deciding on methods of application, concentrations, etc., may be noted as the route is covered, using pole numbers or marker numbers as points of reference.

6.02 Details of the route on which information would be helpful might include the following:

- (a) Accessibility to power equipment—location of intersecting roads or parallel roads close enough for the right-of-way to be reached with hose—entrances through private property—swamps, streams or other barriers.
- (b) Method of spraying—sections that can be driven, noting grades in the direction of the line and across the line—length of hose required—locations for spotting truck when using hose—knapsack work—sections to be left unsprayed.
- (c) Availability of water.
- (d) Growth conditions — average height — predominant species of woody plants—density.

## 7. CONDITIONS SUITABLE FOR SPRAYING

7.01 Practical results can be obtained by chemical treatment of brush and trees of any size. Although circumstances may on occasion justify foliage spraying of taller growth, the most practical range of height for this treatment is from 3 to 5 feet. Below this size, the leaf area is frequently inadequate, and heights above 5 feet present obstacles to spraying as well as requiring large volumes of material. Both knapsack work and hose handling are more difficult in brush over head height.

7.02 In roadside work, the appearance of standing dead brush of the upper range of spraying height is unsightly. Inasmuch as the more durable wood, such as locust, may remain standing for several seasons after being killed, such brush should first be cut and then sprayed when regrowth has reached the minimum height at which foliage spraying is effective. An alternate would be to cut only the larger plants, followed by stump treatment of the cuts and an over-all spray of the remaining brush.

7.03 In right-of-way work, when brush is sparse growing and not over about 25 per cent exceeds 5 feet in height, the entire area should be foliage sprayed, using the more highly concentrated basal spray on the taller growth.

Where taller brush runs to about 50 per cent of the total, the higher growth should be cut on a selective basis in the fall or winter in preparation for spraying the following summer. When brush 5 feet and over accounts for more than 50 per cent of the growth, the area should be cut throughout and sprayed when regrowth has reached the proper height. Cutting can be supplemented by stump treatment where the size of the remaining stubs justifies the work.

7.04 Good results from chemical treatment are dependent on the material remaining on the plant surfaces long enough for effective amounts to be absorbed. For this reason, in foliage spraying, if rain falls before the spray has completely dried, the affected area should be resprayed.

7.05 Low temperatures, while retarding the speed of action of the chemicals, do not seem to have any significant effect on the final results. Extremely high temperatures may contribute to poor kills.

## 8. RATING OF RESULTS

8.01 Since the action of the chemicals, particularly the growth regulators, is slow, the final results of spraying should not be judged too soon after application. With foliage or summer basal sprays, the initial effects are noticeable within a few days in the gradual wilting of the leaves and final browning. For best results, the leaves should stay on the plant until the usual time for dropping in the fall. With dormant sprays, the plants may leaf out normally in the spring. The growth may be distorted on emerging or may show no immediate effect, but later twist and turn color.

8.02 The movement of the chemical in the stems or trunk of a plant is through the live tissue just under the bark. The progress of the chemical through the plant can be traced by a change in the color of the wood fibers under the bark from the normal pale green or white to a brownish stain. Stripping a section of bark from young trees or shoots will disclose this movement. As the action progresses, longitudinal splitting of the stems or trunk may take place and finally fungus growth at the base of the plant may appear.

8.03 Treated plants should be allowed to remain standing for at least a year after treatment before judging results. By that time, young plants should pull easily out of the ground. Clumps of brush sprouting from old stumps should be dry and break off easily at the base. If they are still pliant, examination under the bark at the base will doubtless show failure of the chemical to reach that point.

## 9. PRECAUTIONS

9.01 The chemicals are not hazardous to operators, live stock or wild life in the amounts normally applied. Care should, however, be exercised to avoid prolonged contact of the skin with concentrated solutions. Gloves or clothing which have been wet with spray materials should be removed after work and washed before reuse.

9.02 The wilting foliage of wild cherry is poisonous to live stock, whether the wilting is caused by spraying or by cutting. Cherry growing in grazing areas should be cut close to the ground and the brush disposed of where stock can not reach it. Treat the remaining stumps or stubble to prevent resprouting.

9.03 Care must be exercised to avoid damage to property adjacent to the sprayed area. Even though low-volatility chemicals are used, finely divided spray particles of the growth regulating materials can damage vegetation if carried by the wind to adjoining land. Where sensitive vegetation of the types listed below is adjacent to the right-of-way, it is best not to spray during the growing season. If spraying can not be deferred, ammonium sulfamate can be used on the restricted area with less risk of damage.

Tomatoes	Peas and Other Legumes
Tobacco	Melons
Grapes	Fruit Trees
Cotton	Ornamentals
Alfalfa	Most Garden Flowers
Beans	

9.04 It must be kept in mind that the spray solutions used to control dormant brush can also have a harmful effect on near-by dormant shade trees and ornamentals. The damage can occur either through drift or by absorption of the chemical through the roots of the desirable growth. Where this hazard exists, do not use chemical treatment in the section involved.

9.05 Where the right-of-way crosses private property, it is important that permission for spraying, if not already included in the right-of-way agreement, be obtained from the owner or his agent before work is started.

9.06 For work along roads under the jurisdiction of county and state highway departments, consent to the use of chemicals should be obtained from the proper authorities before proceeding with the work.