# TVA

# Controlling Brush at TVA

## Part I

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BRUSH CONTROL is a major and expensive recurring problem connected with a transmission of electric energy in the Tennessee Valley region, because of the numerous species of brush and types of terrain, which vary from swamps and rolling upland to high plateaus and rugged mountains.

Average annual rainfall is more than 50 in., and the average annual temperature is above 60°. These factors contribute to luxuriant growth of vegetation.

TVA's power system includes approximately 13,000 miles of high-voltage transmission lines, which carry power throughout an area of 80,000 sq. miles.

A long-range brush control program, properly planned and with adequate supervision to completion, will gradually lengthen the cycle of costly brush control and abruptly reduce resprouting potential of brush. Successful programming depends on choosing the proper type of maintenance, selecting the proper chemical and the right method of application, scheduling the right time for maintenance, and evaluating results accurately. In order to do this, a thorough study is necessary of conditions on the rights-of-way, such as vegetative growth, height, density of brush, species present, and terrain. These are all important, since each is a determining factor in selecting methods, chemicals, crew, and budget requirements. After these conditions are observed and studied, a schedule is prepared for the proper type of maintenance.

### Types of Treatment: Foliage Spray—Ground

In TVA's brush control program, foliage spraying by ground crews consists of conventional spraying using esters, the automatic spray nozzle method, and conventional spraying with ammonium sulfamate (Ammate). Best results for this type of spraying are obtained when application is made immediately after leaves on brush have reached full growth. This condition usually exists about May 15, and spraying may be continued until about Aug. 15 if there is adequate moisture to keep the brush in vigorous growth.

*Conventional Foliage Spraying —Esters* The low-volatile esters of 2,4,5-T, containing 4 lbs., of acid equivalent per gal., are used and mixed at the rate of 3 gal., of chemicals to 97 gal., of water. The tank should be filled at least one-third with water and the chemical added; then it should be completely filled with water. The material should be thoroughly agitated before using. When the mixture has set overnight, or for several hours, it should be re-agitated before using.

Average volume of material per acre should be 100 gal. of mixture. Spray solution should be applied to the foliage and stems of brush (except pine and cedar) by a Hamilton handgun, moving the gun rapidly and wetting the brush to the dripping point. Pine and cedar require a complete wetting and should be thoroughly drenched. Pump pressure should not exceed 200 lbs.

Regular equipment includes a conventional spray truck with a 500-gal. tank and a 35-gpm John Bean piston-type pump, a 1-ton stake-body truck for hauling chemicals and employees, hose, and Hamilton spray guns. A spray crew consists of a foreman,

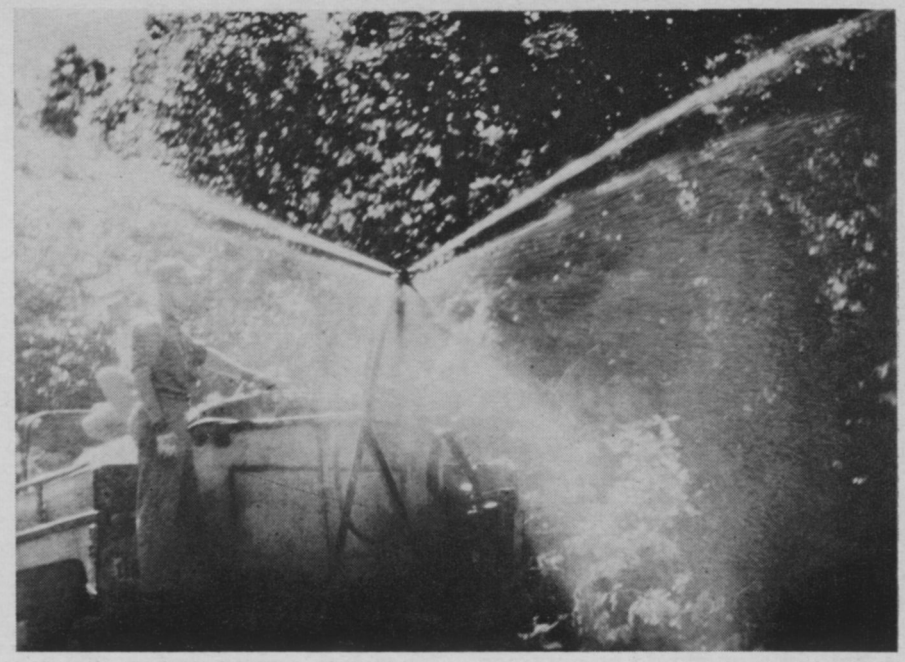
**Two workers do their spraying** for TVA the easy way . . . while in back of truck or jeep.

truckdriver, and two or three laborers.

This chemical is a selective material which is effective on most broadleaf plants and ordinarily does not affect grasses. It is normally used when necessary to pull hose for spraying in remote areas. It is more economical to use than Ammate.

This is a volatile material, and a number of plants are susceptible to it. Desirable plants off the rights-of-way may be injured or killed as a result of drift or vapor. Extreme care must be taken when spraying in the vicinity of susceptible crops, such as cotton, tobacco, tomatoes, grapes, legumes, potatoes, fruit trees, and ornamental shrubs.

*Foliage Spraying—Automatic Spray Nozzle (ASN)* The same chemicals and mixing procedures are used with this method as in the conventional foliage spray using esters. Average volume of material per acre should be 50 gal. of mixture.



**TVA field worker** stays on truck, operates spraying equipment directly from vehicle.

### Check Spray Pressure

Before actual spraying begins, equipment should be checked to see that it is properly set to maintain 20 lbs. of working pressure on the nozzle and 100 lbs. of working pressure to the manifold and handgun. In the event that sections of hose are stretched to spray small areas where the truck cannot be driven, pressure to the manifold and handgun may be increased; however, as soon as these areas are sprayed, pressure should be reduced. The truck should travel at a speed of 2 mph on the right-of-way. The truck should be driven in low and second gears and shifted to first gear to maintain a speed of 2 mph on steep, hard pulls. One round trip will be required on 75- and 100-ft. rights-of-way, allowing an overlap in the center of the 75-ft. right-of-way. On 50-ft. rights-of-way, one trip down the center of the right-of-way will be sufficient. The pump is not to be operated in excess of 700 rpm. It should be operated as near to 500 rpm as possible at all times. Clear, clean water should be used, since sand and other foreign matter will ruin nylon rollers and seals.

Regular equipment includes an automatic spray nozzle mounted on an IHC or Reo truck with Hypro pump operated by power take-off (PTO). A 1-ton stake-body truck for hauling chemicals and employees, a Tokheim hand pump, a ⅜-in. spray hose, Hamilton guns, and a knapsack sprayer. The crew consists of a foreman, a truckdriver, and one or two laborers.

One of the main advantages of this method is low cost. It is a rapid method of dealing with extensive areas of dense brush during the growing season.

Because this method is used during the growing season, sensitive crops such as cotton and tobacco can constitute a problem. In general, no spraying should be done within 500 ft. of cotton or 300 ft. of other susceptible crops and plants, such as tobacco, grapes, gardens, legumes, fruit trees, and ornamental plants. This method is limited to areas accessible to power vehicles.

*Conventional Foliage Spraying—Ammate* Ammate X and spreader-sticker acid are used. Standard mixture is one 60-lb. bag of Ammate to 100 gal. of water, plus 4 oz. of spreader-sticker acid. First, put approximately 200 gal. of water in the 500-gal. tank, with the agitator running; then pour each bag of chemical in slowly so that it is suspended or dissolved in the water. If this procedure is not followed, the crystals will clog the feeder lines and the feeder-line strainer. These mixtures require constant agitation, which should be continued until the mixture is of a smooth orange consistency before using. Agitation should continue while the mixture is being used.

Average volume per acre should not exceed 200 to 500 gal. of mixture, depending upon brush conditions, such as height and density. When this method is being used, all foliage should be wetted thoroughly to runoff, but not overdrenched. Nozzle pressure should be maintained at 200 to 250 lbs.

Regular equipment includes a conventional spray truck with a 500-gal. tank and John Bean pump, a 1-ton stake-body truck for hauling chemicals and employees, hose, and Hamilton spray guns. The crew consists of a foreman, a truckdriver, and two or three laborers.

Ammate is nonvolatile and may be used near susceptible plants. Care must be exercised to prevent the chemical from coming in direct contact with plants off the right-of-way.

This is a contact chemical and

affects plants it contacts as a result of direct spray application or drift. It is used near susceptible crops, where esters cannot be used. This material is corrosive, and care must be taken to prevent damage to equipment. Trucks used for spraying with Ammate should be thoroughly washed every two weeks and sprayed with Ennis fluid.

**Spraying With Helicopter**

Best results for helicopter spraying are obtained from sprays applied during the lush growth following full-leaf development, which is from about May 15 until July 15.

Low-volatile esters of 2,4,5-T are used. The mixing ratio is 20 gal. of chemicals to 80 gal. of water. Water should be obtained from city water systems and must be free of sand, rust scales, and other trash particles to prevent clogging of screens and nozzles. After the mixing tank has been filled, or while it is being filled, the material must be thoroughly agitated. Agitation should continue until a uniform mixture is obtained. Spray mixture should be agitated two or three minutes before each loading of the helicopter. Material left in the helicopter tank overnight should be thoroughly agitated with a boat paddle before application.

Average volume of material per acre should be 5 gal. of mixture. Daily helicopter spray period normally begins at daybreak, weather permitting, and stops when the wind velocity reaches 3 mph. Spraying is resumed late in the afternoon, if wind velocity decreases to 3 mph, and continues until dark. The helicopter is flown at 30 mph and should have adequate power to climb steep terrain, since spraying should be done uphill to obtain better control of the chemical mixture. Normally two passes are made to cover the full width of the right-of-way. Since rights-of-way are normally 50, 75, or 100 ft. in width, a varying swath width is necessary. This is accomplished by adding or removing nozzles on the spray boom.

Equipment used in servicing TVA's helicopters consists of two 2-ton trucks with no-spin differentials. One truck is equipped with a pump, meter, 1½-inch hose, and 1,100-gal. tank consisting of three compartments, with a mechanical paddle agitator. The other truck is equipped with hydraulic tail lift for loading chemical drums and a 300-gal. aviation gasoline tank. Radios are installed in the helicopter, supervisor's car, chemical-mixing truck, and a sedan delivery used by the mechanic. The crew consists of a supervisor, pilot, helicopter mechanic, and two truckdrivers.

One advantage for use of a helicopter in chemical application is the lower cost realized in areas where accessibility by ground crews is difficult, such as mountains and swamps. Another advantage is the comparative speed. A helicopter can spray 10 or more miles of 100-ft. rights-of-way in a day's operation. If brush is intermittent, it is possible to spray 30 to 50 miles a day. This speed also enables coverage of considerably greater acreage while plants are more receptive to the herbicide.

The major disadvantage of aerial spraying is crop damage, due to drift of small spray particles when wind is excessive: 3 mph or over. The operation requires skillful pilots, experienced in utility right-of-way spraying, and highly specialized equipment and supply units. This equipment is expensive and can be used only for short periods during the day. Also, work is seasonal. Therefore, helicopter spraying must be properly planned and initiated in order to utilize every minute of spray weather.

**Basal Spraying**

This method of spraying can be performed at any time of year. Normally, it is done after foliage work has been completed. In some instances, weeds, briers, and grasses may interfere with this method; work may have to be deferred until a killing frost.

Low-volatile esters of 2,4,5-T are also used in this type of spraying. Material is mixed by using 3 gal. of chemicals in 97 gal. of diesel oil or No. 2 fuel oil as a carrier. The mixture should be thoroughly agitated before application by running the pump with the spray gun open and circulating the mixture through the bypass and gun into the tank.

Average volume of material per acre should be 100 gal. of mixture, depending on stem count and species. Material should be applied under low pressure, not more than 50 psi. Chemical mixture is applied to the basal portion, or root crown, of each plant to a height of 12 in. above the ground line, including all exposed roots. Wet all foliage and stems on conifers (pine, cedar, etc.). The gun must be held close to the area where the mixture is directed. It is important to wet the complete circumference of the stem to the point of visible rundown at the ground line, since the mixture must penetrate the root collar zone to receive maximum results on brush in dormant stage.

Regular equipment consists of a Reo or IHC truck with Hypro pump operated by PTO, a 1-ton stake-body truck for hauling chemicals and employees, a Tokheim hand pump, ⅜-in. spray hose, Bete guns, knapsack sprayers, and protective clothing and shoes for crew members. The

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The Tennessee Valley, site of the government's vast power complex, has many marshy and mountainous areas, high plateaus, and numerous brush control problems. Handling this complicated maintenance endeavor well equips author John Aldred, TVA botanist, to detail for WTT readers his effective, systematic procedures.

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crew includes a foreman, a truckdriver, and three or four laborers.

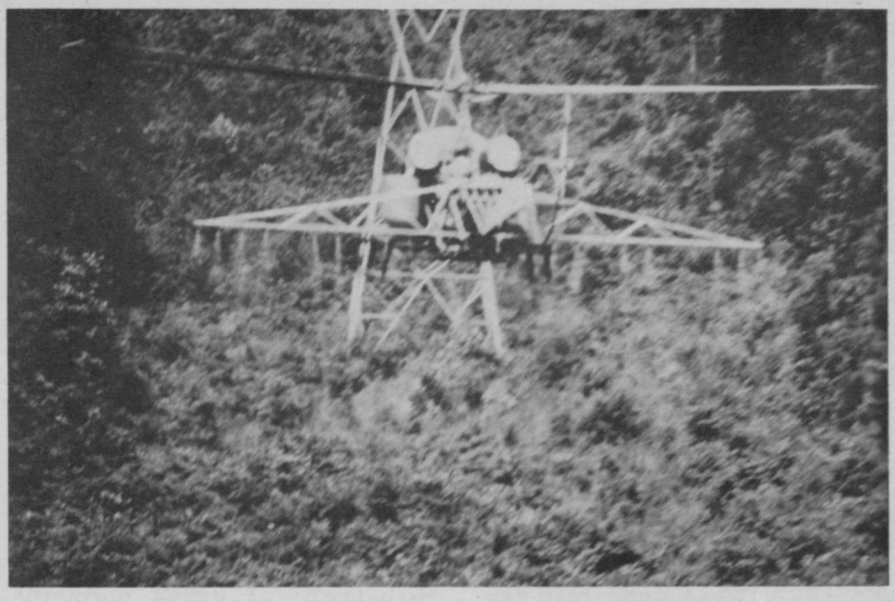
Since this type of application can be made in virtually any season, it permits utilization of labor and equipment over a longer period. It is used primarily as a re-treatment after one or more foliage applications, since it is effective on most species resistant to foliage spray, and it does a good cleanup job. It is also used in the nongrowing season to catch "skips" left by the ASN and helicopter because of susceptible crops. It can be applied in dormant seasons when results of the application will not give "brown-out" to existing foliage. The basal method is generally not hazardous, particularly when low-pressure application is made during the dormant season.

This basal method is not feasible for dealing with dense stands of brush. Sumac, sassafras, and locust should not be treated because of their rooting habits; however, they should be treated if they reach a height hazardous to operation of the line. This method kills original stems of these species; however, in most instances resprouting from the root system occurs, increasing stem population.

### Application of Pellets

Pellets can be applied at any time during the year; however, for best results, it should be done in late winter or early spring.

Dybar or Urab pellets are used, and three patterns may be used in applying these pellets: spot, broadcast, and grid. The spot method is more economical on scattered brush. It consists of standing erect and pitching 1 to 2 tbsp. of pellets on the ground at the base of each bush. Large clumps or trees require 3 to 4 tbsp. in spots around the base of the brush or tree. The broadcast method may be applied by hand or mechanical spreader, such as a cyclone seeder, at the rate of 40 to 60 lbs. per acre. If brush is dense, rates up to 100 lbs. may be required. The grid method for dense stands of brush is to pitch 1 to 2 tsp. on the ground every 3 ft. in a grid or checkerboard pattern. If the surface where pellets are being applied is sloping, it is essential that they be dropped on the upper side of brush. On fence rows near crops, apply pellets on the side of the crown of the fence row away from the crop field.



**One of TVA's helicopters** swoops low to give this brush a lethal dose of chemicals.

Standard equipment includes a truck for hauling chemicals and employees, a spreader for broadcast application, and a bag with shoulder straps or a plastic pail and tablespoon for individual or clump stem treatment. The crew consists of a foreman, a truckdriver, and two to four laborers.

This method is useful for brush control in areas hard to reach with spray equipment. It is also an economical method to clean up "skips" from foliage application and treatment of scattered brush.

Pellets should not be applied near valuable plants or trees, or on areas where their roots may extend. They should not be applied on brush standing in water. Because of economical factors involved, this method should be confined to small areas of brush where it cannot be more economically treated by some other type of maintenance.

### Mechanical Maintenance

Rebrushing by the mechanical method is necessary on rights-of-way where brush has been allowed to grow to such a size and density that spraying by ground crews would not be practical. Mechanical cutting of brush only renders temporary relief and must be repeated at frequent intervals. Basic disadvantage of cutting is that stem population is increased and makes each cutting more difficult and more expensive. Also, the established root system provides an excessive amount of moisture and food for vigorous growth of resprouts.

Numerous tools and equipment are used in mechanical methods; most commonly used are power saws with clearing attachments, rotary cutters, and Kaiser blades.

Mechanical cutting with power saws equipped with clearing attachments is the most economical method of cutting areas where there is both small and large brush. The crew should consist of a foreman, truckdriver, and four to six laborers.

The rotary cutter is a good tool for mechanical cutting if used properly. It can be maneuvered in brush stands, cutting up to 2 in. in diameter and leaving larger brush for power saws. However, there are limitations on maneuverability of this machine; its use should be confined to fairly smooth ground which is free of large rocks, etc.

Be sure to watch for the second and concluding segment of Aldred's TVA article in the July issue of *Weeds Trees and Turf*.