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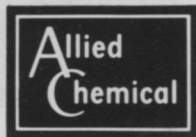
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TVA

Controlling Brush at TVA

Part I

By JOHN R. ALDRED

Botanist, Tennessee Valley Authority
Chattanooga, Tennessee

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.

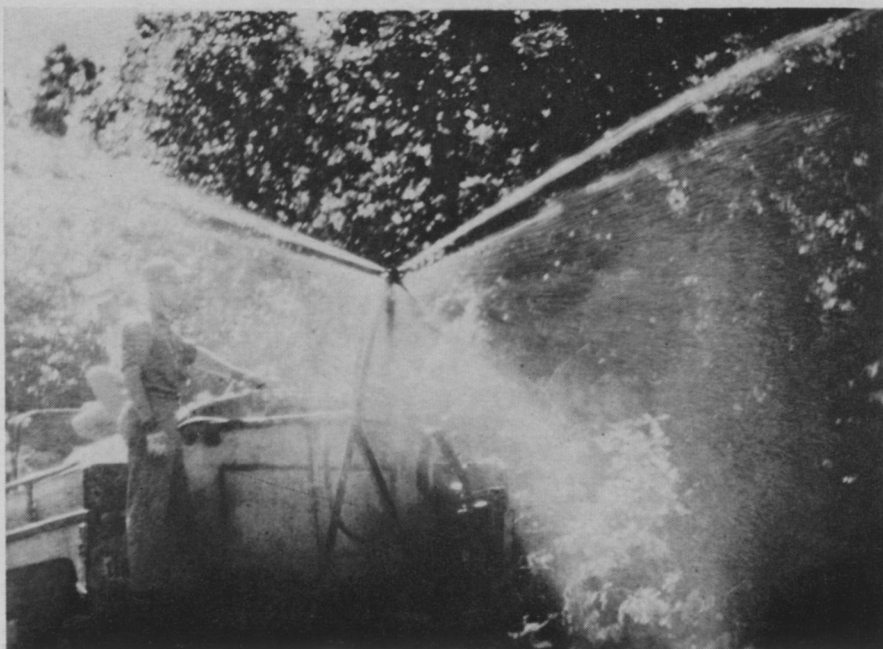
This chemical is a selective material which is effective on most broadleaf plants and ordinarily does not affect grasses. It is normally used when necessary to pull hose for spraying in remote areas. It is more economical to use than Ammate.

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.

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 for-



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

eign 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 $\frac{3}{8}$ -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, briars, 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, ¾-in. spray hose, Bete guns, knapsack sprayers, and protective clothing and shoes for crew members. The

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.

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

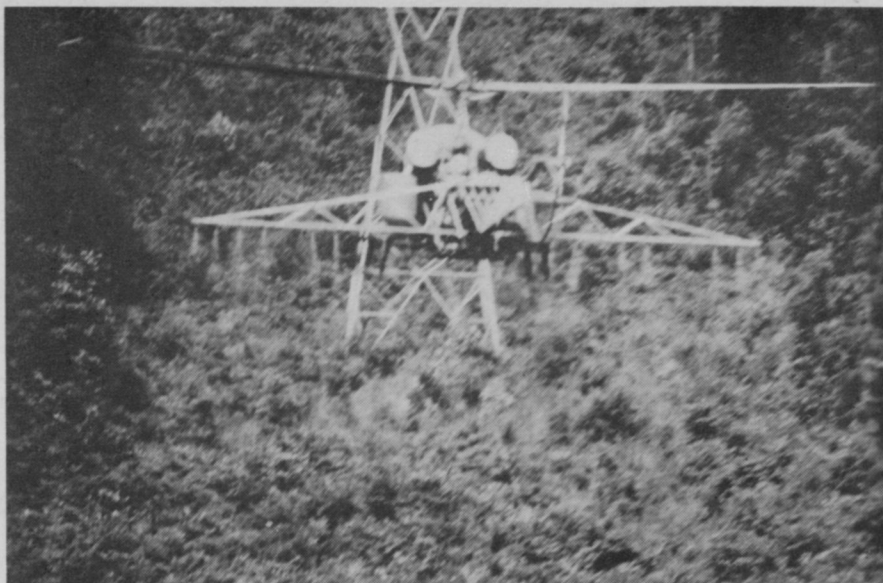
Since this type of application can be made in virtually any season, it permits utilization of labor and equipment over a longer period. It is used primarily as a re-treatment after one or more foliage applications, since it is effective on most species resistant to foliage spray, and it does a good cleanup 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



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

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.

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*.

How to Use the New

Turfgrass

COLORING

Compounds

GREEN GRASS may turn yellow or brown, for a variety of reasons: natural dormancy, drought, overuse, insect damage, chemical damage, mismanagement, or disease.

When grass browns out, it immediately loses its usefulness. Turf managers faced with any of the above situations may find turf colorants helpful.

This article describes what turf colorants in general are good for, what is involved in application, and the different qualities possessed by each.

At the outset, we should state that turf colorants are not turf management tools in the strict sense of the term. Colorants do not nourish grass, they do not protect grass against pests, and they do not correct soil conditions which often lead to unsightly brown-outs. They simply color lawns, or patches of turf, to make grass look better. Colorants should not be substituted for good cultural practices when true deficiencies are the cause of yellowing, but there is a definite place for artificial turf coloring.

Colorants can be of special value in the South and West.

Sub-tropical grass normally planted in these regions enters dormancy when cool weather sets in. The cultural practice used to make these lawns appear green is to overseed or "winter-

When grass turns brown in the fall, or earlier if attacked by diseases or insects, turf managers will find the new turf colorants useful. They'll open new avenues of profit for the lawn maintenance company, and help the golf course superintendent, etc., avoid complaints!

seed" with inexpensive cool season or temperate zone grasses.

Research with colorants has shown that application of a specially formulated emulsion paint, which coats the dormant grass blades, does no harm to grass plants, and makes the lawn green for the remainder of the season. The green color of most formulations now available persists until grass grows up from the bottom,

and painted blades are removed with a mower. Observers notice no significant difference in color of the properly painted portion of a grass blade and that portion showing new growth after the dormant period. Colored dormant turf must still be watered regularly.

In northern regions, where well-selected grasses do not enter winter dormancy, but thrive in winter, colorants may temporarily cover insect or disease damage, after proper chemical controls have been applied. During drought, grasses may yellow because of neglect, and after proper watering, may need to "green up" quickly for the sake of appearance. Colorants can be used here too, though manufacturers suggest that turf managers use a probe to test soil moisture on turf which has been treated in a drought area; it may look good, but if not watered roots will die. This advice applies to managers in the South and West, too.

Colorants may be used to cover up a mistake or an accident, such as fertilizer or chemical burn, or even dog urine stain. Such treat-



ment requires more skill and a good eye for color, because the applicator must match the natural green as much as possible, if a spot treatment is applied. Otherwise, total treatment is recommended.

Colorants can act as stopgap measures, used before cultural or chemical treatments, depending upon time of year. For instance, a homeowner may call for service to have a lawn treated for browned-out crabgrass in the early fall. Crabgrass dies out in the heat of late summer and leaves brown spots in turf when it goes.

An operator may use a pre-emergence crabgrass preventive which is best applied in the spring. In the meantime, artificial colorants can be used to cover dead crabgrass spots and give the lawn a good appearance until the following spring when it is treated.

Several manufacturers of colorants state that their products are used on football or baseball fields. Colorants give the turf a better appearance near the end of the season. This impresses spectators and color television audiences, since games appear on nationwide TV with increasing frequency.

A golf course which had a "rough season" may want to color grass for a special occasion. Again golf matches on color television make really green grass imperative.

What Are Colorants?

Most colorants consist of an emulsifiable paint pigment, similar to house paints, but with no toxic properties to animals or plants. Pigment mixed with water and sprayed on turf coats grass blades; no grass color beneath shows through because these paints are opaque.

Manufacturers claim tests show paints are fade-resistant, harmless to grass, and permanent on grass; that is, once dried, the green color will not resolubilize nor rub off.

One material is an exception, and it will be well to discuss it here. Auragreen* is a mixture of

*See end of article for list of manufacturers of compounds marked *.

hi...

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malachite green and crystal violet dyes and auramine fungicide. It may be used at a low rate for a temporary touchup of discolored turf. Its fungicidal properties are limited to control of incipient brown patch disease infestations. For brown patch control, it is used at a rate of ½ oz. per 1,000 sq. ft., dissolved in water. The manufacturer warns that the material will stain clothes, shoes, etc. until it dries on the grass. It also shows a "slight tendency to stain" if re-wetted.

Fungicidal properties of Auragreen are not long lasting, but color persists "up to several months," according to the manufacturer, depending upon the use, irrigation, and mowing of grass. The company suggests mowing be suspended as long as possible after application for most "mileage" of the color.

This material can be applied frequently with no danger of harm to turfgrasses. Although Auragreen is in a separate class of turf colorants, it bears study as a special-use material.

Turf paints are diluted in water at varying proportions: from 1 part colorant to 7 parts water, to 1 part colorant to 15 parts water. Dilution directions reflect "strength" of the paint formulation. Most manufacturers say 1 gal. of finished spray will cover about 500 sq. ft. adequately. Others may instruct users to spray twice or three times to get "desired" green intensity.

"Desired green intensity" is difficult to define because color is partly a matter of taste. What may be desirable to one person may seem a repugnant green color to another. Greenness of turf is partly dependent upon regular maintenance which grasses receive, so different lawns of the same grass may have a different shade of green. Also, no standard has been set so that one can say that bluegrass is "x" shade of green, and bermudagrass is "y" shade of green.

Cost of material, important to contract applicators, is reflected both in the dilutions for "desired green intensity" and number of

passes necessary for a "desired green." At this time, only a careful study of label recommendations and manufacturers' claims can indicate which material should be used. Companies offer trial samples, so that operators can decide by trial and error which material works best.

Matching green color of spray with green grass should be a concern only when colorants are used as touchup treatments. For an overall treatment of a browned-out lawn, color will be more uniform and taste will determine the proper or most-desirable shade. Manufacturers say to wait until southern lawns brown out completely before application of material so that color on turf will be uniform. For overall treatment on green grass, opaque paints will totally cover

all grass and impart uniform coloration, but the consideration here is the high variance of color with a neighbor's lawn or other adjacent turf.

Getting Ready For Green Spray

To prepare an area for coloring spray, one should mow the grass as short as is practicable or recommended, remove clippings, and rake lawn to remove any trash or debris. The shorter the grass, the less material is required to coat the leaf blades to the crown. Grass actually growing should not be clipped closer than customary, however, because food production capability of the roots might be impaired. No more than a third of the leaf blade of healthy grass should be removed at one time. This factor will not enter into the preparation of a dormant lawn since leaf blades are nonproductive. Experience will reveal how much material will treat 1,000 sq. ft. of grass at a certain height.

As we pointed out in the beginning, fall treatments of some athletic fields for the sake of appearance are sometimes requested. More coloring will be needed on such a playing field, because grass is usually left at maximum height.

Since paint pigments are relatively permanent, applicators must be careful not to spray adjacent concrete or wood. Some manufacturers instruct users to wet down surrounding concrete before applying color spray. Then if some paint drifts, or splashes onto concrete, it can be rinsed off quickly with water before it sets. Once dry on concrete, scrub brushes, steel wool and sand-rubbing are recommended to alleviate the "giveaway" green stain.

For the greatest safety, users are advised to mask off surrounding concrete drives, or curbs and foundation walls with paper or tarpaulins so that emergency scrubbing of these stainable surfaces will not be needed.

Clothing, too, may be affected by turf color sprays, since paint which gets on the applicator's clothing and shoes does not read-

(Continued on page 27)

Arborists Adopt National Trademark

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Equipment Parade at Callaway Gardens

By **FRED GALLE**

Director of Horticulture, Callaway Gardens, Pine Mountain, Georgia



Callaway Garden's "A Frame" tree mover is shown here transplanting large Burford Holly.

ESTABLISHMENT, development, and maintenance of a 2,500 acre garden requires use of many types of equipment. A great deal of horticultural work still must be done by hand, but, with the continual rising of labor costs, we combat this with better equipment and better utilization of equipment.

We have developed several pieces of equipment for our own use and have modified others to enable us to do a better job. We know it is important that all our foremen work together with our maintenance foreman to determine how we can best utilize this equipment and become more mechanized.

A good maintenance foreman is essential, and it is necessary to assure he has proper equipment to do the job; keep spare parts available, and have on hand a good supply of common nuts and bolts, along with replacement units of frequently needed items.

We find that a disc grinder is very important for sharpening tools, axes, and other equipment. We have paint sprayers for painting all our equipment. This keeps all our tools clean and ready to use. We maintain our own wheel balancers for trucks and other vehicles, and also a blade balancer for alignment of mower blades, thus reducing vibration of individual small motors. Also, our maintenance equipment includes a portable steam jenny, which is used during maintenance work and prior to painting.

Proper storage of various tools is important. We try to keep them ready to use at all times. We use racks for holding chain saws, tools, and implements.

Taking care of a 2,500-acre garden has made author Galle more cognizant than ever of the value of proper equipment and the necessity for efficient upkeep. Here he tells other vegetation maintenance professionals some of his "secrets."