Brush Control in the Georgia Piedmont[1]

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The only consistency in the use of chemicals for brush control in the Piedmont of Georgia is inconsistency. This fact, to the practical man, may make vain a discussion of practical applications of herbicides. But it is a fact which bears careful scrutiny in this part of the country, if the practicing range manager is to get the best results from plant control treatments. The work of Woods (1955) and Halls and Burton (1951) in the Coastal Plain, and Ray (1957) and Hiatt (1956) in the Interior Highlands, and of many other researchers is evidence that, in their respective provinces, inconsistent results need not be the case.

The rolling terrain north of the fall line in Georgia is characterized by criteria which, theoretically at least, may be responsible for erratic results from chemical applications. Since it is believed that plants must be physiologically active to absorb and translocate these chemicals, it follows that factors which inhibit active growth will serve to decrease lethal chances. Probably the chief factor is the sporadic rainfall pattern resulting in an average of more than four two-week droughts per year over the past 65 years of record keeping. In other areas, two weeks without rain would hardly be cause for a drought label; but the original subsoils of compact clay now exposed at the surface are relatively ineffective in rain water infiltration and storage for subsequent plant growth. This is especially the case since much of the rainfall occurs as short storms of considerable intensity.

Aspect, because of its influence on soil moisture, is particularly important in the growth of hardwoods. This has been pointed up by foresters in noting the encroachment and survival of deciduous trees on the more moist northern and eastern slopes, in contrast to their absence on drier south- and west-facing slopes. Aside from soil moisture, the low fertility and aeration levels of these soils are not conducive to plant growth.

The *integrated* factors of site—micro-climatic, physiographic, edaphic, and biotic—also lend their influence to the resistance or susceptibility of woody plants to brush control chemicals. It is the combination of these factors which bring about selection of the climax species. While oaks and hickories are climactic throughout most of the Georgia Piedmont, some areas, such as those chracterized by deep sands in old river beds, possibly carry these species only as temporary components. There, brush control applications are expected to be more satisfactory than where oaks and hickories are firmly and perpetually established. Other factors, such as size of trees, the time of day (Read, 1950), and the month of treatment, even within a particular season, may attribute to variance in results.

One major reason for *apparent* inconsistencies is the host of species which commercial formulations are expected to affect. At least 75 species of deciduous trees occur as brush in the lower Piedmont along with another 50 species of shrubs. All of these occur on abandoned lands which range men may wish to maintain in pasture. Naturally, metabolic rates and reaction to plant "hormones" will vary among them, resulting in wide differences in percentages of treated plants killed.

Of particular interest to us has been the inverse relationship of response to treatment with dosage rate. Some examples of such inconsistencies, when higher concentrations gave inferior results to lower concentrations, include the following:

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Chemical	Application	Result
Estasol (2, 4-D, isopropyl ester, 3.34 lbs. acid per gallon).	1 gallon: 320 gallons water @ 200 gallons per acre	Very good brush control 2 years later.
	1 gallon: 80 gallons water	No effect.
Dalapon (2,2-DP, sodium salt).	1 pound: 5 gallons water @ 200 gallons per acre	Good brush control 1 year later.
	2 pounds: 5 gallons water	Very poor results.
Kuron (2, 4, 5-TP, butyl ether ester, 4 lbs. acid per gallon).	1 gallon: 320 gallons water @ 200 gallons per acre	Good brush control 1 year later.
	1 gallon: 160 gallons water	No effect.

Why these relationships exist remains to be determined. In an effort to do so we have resorted to radioisotopes. Using radioactive carbon-14 in the 2, 4, 5-trichlorophenoxyacetic acid molecule, three important, but elementary, facts have thus far been established:

(1) Only a portion of the material applied to foliage is absorbed through the leaf cuticle. Supersaturation probably takes place, killing the absorbing tissues before all of the chemical can move from the leaf exterior.

(2) Most of this absorption seems to take place within 24 hours after application. The remainder may remain on foliage till autumn leaf fall or be washed off by rain.

(3) Finally, the various formulations appear to have widely divergent rates of absorption. The amine is superior to either acetone or ammonium salt compounds of 2, 4, 5-T.

These are but initial responses with isotope techniques in discovering why divergent results are obtained in silvicide applications. The use of this tool should pay rich dividends as we probe more deeply the cryptics of silvicide physiology.

Range men will be particularly interested in our results obtaining grass following brush control. 2, 4, 5-T in ACP's formulation 329 at high concentrations (1 gallon to 20 gallons water) applied in March appears excellent. The same company's formulation 609 (1 gallon to 80 gallons water) appears equally favorable when applied in early spring and midsummer (Figure 1).

Borate, at a rate of 5 tons per acre, gave good brush control and permitted grass establishment, but higher rates laid bare the soil (Figure 2). Borascu at both 5- and 10-ton rates gave good grass cover two years after application. Species eradicated in these trials included winged elm *(Ulmus alata)*, sweetgum *(Liquidambar styraciflua)*, blackhaw *(Viburnum rufidulum)*, blackgum *(Nyssa sylvatica)*, sourwood *(Oxydendrum arboreum)* and sumac *(Rhus* spp.). The oaks, except for post oak *(Quercus stellata)*, and hickories were noticeably absent on these plots.

Stockmen have lately been inquiring concerning the use of urea compounds for range brush control. We have failed to get a response with winter applications as great as 40 pounds per acre, but summer treatments at the same rate appeared satisfactory with bunch grass taking over during the second growing season. With CMU, a urea soil sterilant, Woods (1955) noted that by the end of the second growing season, wiregrass was nearly eradicated and replaced by other grasses. Invading grasses in the deep sands of West Florida where he experimented, were much taller and more vigorous than elsewhere.

A forester mentions kudzu to cattlemen only cautiously, and in passing. But when it gets out of hand, even the rancher may be interested in control methods. In the Piedmont, this information is important because it is reported that over a million acres of the province in South Carolina and Georgia have been detrimentally invaded by this vine and honeysuckle. Good first year kill is

FIGURE 1. Good grass cover is established following the use of ACP's formulations 329 and 609 on brush in the Georgia Piedmont Plateau.

obtained with either 2,4-D, 2,4,5-T, or amino-triazole; but the effect of 2,4,5-T appears within a few days, and about two weeks earlier than it does for the others. Annual treatments—or in some cases semiannual—are necessary to completely eliminate the vine. The chlorophyl-inhibiting characteristic of amino-triazole is not as pronounced on kudzu as has been reported for honeysuckle (Brender and Hodges, 1957).

In a nutshell, then, users of silvicides in the Georgia Piedmont must be made aware that applications may be costly risks and the chemical may not behave in practice as in formal experimentation. Good chemicals, and considerable information on their effects upon vegetation, are available; but positive predictions are not yet warranted.

FIGURE 2. Borate, at rates exceeding five tons per acre, sterilized the soil and thus prohibited grass invasion two years after treatment.

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