Alabama's Weed Spraying Experiment

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ALABAMA'S highway department had its usual war against weeds last summer, but this time we tried a new weapon —herbicide spraying. We have used some soil sterilants previously with success, but 1964 was the first time any large-scale use of chemical spraying for weed and brush control was attempted.

The Landscape Engineer wrote a very thorough set of specifications for the operation covering everything from materials to insurance. We were worried about damage suits from farmers who might have cotton or peanuts near the road and who might notice a strange convoluting, or curling of the leaves. So the specifications made sure that the contract applicator was responsible for any damage, and as a supplement to the specification, a table was made up for the inspector to keep, and it includes instructions for him to halt the spraying when the wind exceeds 8 to 12 mph. (A list of wind velocity descriptions from the Weather Department is on the form.) The inspector stays with the spray truck and fills out a new form for each half day, or oftener if conditions change. A psychological factor we had working for us was the sign on the back of the spray truck which said *Fertilizer*.

In order to be able to assess intelligently the results of the spraying, we needed to know what was growing along the roads before and after the operation. A survey was made of the areas to be sprayed which had been chosen by the various highway divisions. They were located in nearly every section of the state. Total mileage involved was 604, but because some of it required treating two shoulders, some the shoulders and the median, and some the median only, the total miles of 20-ft. strip was around 1600.

The survey before spraying consisted of making an actual weed count at 21 points along the highway concerned. At each point a strip 1 ft. wide and 20.5 ft. long was measured and the weeds within this area counted. For our purposes, a count of the six or eight major types of weeds in the area was sufficient, with the remaining minor weeds shown in "other." Grasses and clovers were shown as a percent of the total groundcover in the 20.5 ft. strip.

After 21 counts were made, they were compiled and the totals, being 1/100th of an acre, can be multiplied by 100 to show the theoretical count per acre. The 21 points for each compilation were chosen at random except when the character of the vegetation changed, then a count was made to reflect the change. The locations of the points were kept on the field notes so that the return survey or "after spraying count" was made on the same spot.

In addition to the effect of the spray, there are other factors which affect the end results: (1) *drought conditions*, which prevailed before and during the first four weeks of spraying; (2) *maturity* of the weeds when sprayed; (3) *mowing* of sprayed areas after spraying.

It is well known that the younger and more vigorous a weed is, the easier it is to kill with a herbicide. Consequently, those which were mature, or nearly so when we began spraying—like plantain, fleabane, and mild mint—and were, in addition, nearly dormant from drought, were hardly affected by the spray, in the amounts used. However, if we had sprayed

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Weedfree medians like this are goals of America's highway supervisors and contract applicators. This one is just outside of Birmingham, pictured after just one spraying.

Pensacola bahiagrass has taken root vigorously in this weed-free Alabama highway median strip south of Birmingham, where much of the state's weed control experimental work was done.

Blackened and dead horseweed and other weeds in the 20-foot strip alongside this Alabama highway show effectiveness of the state's weed control experiment carried out by the authors.

Alabama's Weed Spraying Equipment

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them four weeks earlier, the same spray might have killed them easily.

The spray used was 2,4-D, or 2, 4, 5-T in water, or both, with a surfactant, at 4 lbs. active ingredients to 100 gal. of water. The rate of spray was to be "in an amount sufficient to thoroughly wet, to the point of runoff, all exposed foliage surfaces." The amount needed was found to be not less than 25 gal. per acre (which spread 1 lb. of active ingredient per acre).

After the 23rd of June, when rains came to most of Alabama, the effect of the spray could be easily seen soon after the spraying operation. On the areas which were sprayed during the drought, the effect was not noticeable for two or three weeks.

The second spraying began August 10 and plants were growing vigorously from the frequent rains. Summer weeds including bitterweed, ragweed, and spurge were principal targets for this operation. The worst pests, crabgrass and Johnsongrass, were not affected by the spray; in fact, they were probably helped by the reduced competition. A second generation of dockweed and plantain was caught by this spray, but there are no doubt still plenty of seeds remaining to germinate later.

Table I. Weed count in 1/100 of an acre in unsprayed area as compared to 1/100 of an acre in adjoining sprayed area.*

Aug. 19—Unsprayed Area	
Ragweed	1155
Goldenrod	189
Nodding Spurge	84
Poison Ivy	126
Blackberry	147
Dallisgrass	20%
Common Bermuda	5%
Crabgrass	189

Sprayed (One Time)	
Blackberry	2
Buttonweed	51
Ragweed	14
Bindweed & Briar Vines	10
Crabgrass	460
Dallisgrass	10%
Common Bermuda	20%
Broomsedge	10%
Bahia	5%

*Grasses are represented in percent of area covered.

The effect of the spray on certain tall weeds such as wild (tall) lettuce *(Lactuca canadensis)* and blue vervain *(Verbena hastata)* was a disappointment to the maintenance people. The weeds were blackened and most of them were killed; but the strong stalk stood long after it was dead and made an unsightly appearance along the road. They had to be mowed along with those portions which had not been sprayed.

One of the purposes of spraying is to reduce the cost of roadside maintenance. To do that it should eliminate the need to mow at least one time. In our case, the spraying did not eliminate the need to mow. Each scheduled mowing was required in both sprayed and unsprayed areas.

At many spots along our highways, the kudzu or honeysuckle vines growing exuberantly on steep fills or backslopes are growing onto the shoulders of the road and even to the pavement. The spray was very helpful in controlling these vines, particularly with the second application. The first spray seemed to kill the leaves but not the vines; while the second evidently killed the plants within the 20-ft. strip. This is a great help to maintenance crews who are relieved of the difficult mowing or swing-blading in those situations.

On the other hand, one mowing crew foreman told me that the spray made the grass and weeds much tougher and harder to mow, and that his tractors used 5 gal. more gasoline per day when mowing behind the spray trucks.

A good control area was obtained on Highway US 82 between Montgomery and Tuscaloosa. The entire length of this road was to have been sprayed; however, a construction project was begun which eliminated a 3-mile-stretch of the road from both spraying and mowing. The weed count made in this area showed very clearly the difference in weed population between sprayed and unsprayed roadsides adjacent to each other, as shown in Table I.

Effects on Clover

The reseeding crimson clover, of which we have a great deal in Alabama, was mature before the spraying started on May 18. On the example of U.S. 231 south of Dothan, the crimson clover seed was being harvested the week before spraying began. The spray did not affect the germination of the seed later in the year, as is shown by the postspray counts on both July 13 and September 15 when crimson clover seedlings were observed in abundance.

The hop clover observed on May 18 at the same location was also mature at the time of spraying. No germination of hop was observed on the postspray counts.

Common lespedeza showing in most prespray counts, was killed by the spray.

Sericea lespedeza was killed by the spray. In most cases the Sericea within 20 ft. of the road has to be mowed anyway, and

very little drift occurred to damage the growth beyond 20 ft. Sericea seed will seldom germinate when it is not covered; therefore, it is doubtful if any Sericea will return to the spots where it was killed by the herbicide.

Other small clovers and legumes, such as black medic and white dutch were killed by the spray.

The records kept by the inspector who accompanied the spray truck show the material used, the rate of application, the wind, the location, and the plant conditions (vigorous or wilting).

These records were correlated to the "weed count" field notes to show why a good kill was obtained in some areas while in others it wasn't so good.

Table II shows the total count of weeds in 1/100 of an acre in 60 test areas; meaning that each figure, if multiplied by 100, would be the theoretical number of weeds in 60 acres located on the roadsides in 60 different areas of Alabama.

Plantain normally declines in midsummer, and then begins to show again in the fall. The figures above show that the spray decreased the number that could be expected on the third count. The horseweed and ragweed population was drastically reduced by the herbicide. Fleabane's demise was accelerated by the spray and no late invasion of the 20-ft. sprayed strip was noted — although a number of fall daisy fleabane was seen beyond the strip. Wild garlic was not much affected by the spray due to the timing of the operation. The spring crop was on the way out when the first spray was applied; the midsummer count showed none because they were dormant — then the fall count showed those which had sprung up since the second application.

Pepperweed control coincided with the normal growth cycle, so no conclusions are drawn.

Dockweed normally reappears in October. In this case the spray decreased the population of new dockweed as compared with the area beyond the 20-ft. strip.

Buttonweed (poor joe), bitterweed, and spurge are all weeds that appear in midsummer and flourish until fall. Good control of these three was obtained by the spray as the figures indicate.

The grasses were not affected by the application of 2,4-D or 2,4,5-T. Common and coastal bermuda, pensacola bahia, fescue, dallisgrass and broomsedge are the principal grasses while "other grasses" include wire grass, smut grass, millet, foxtail, tickle grass, wild oats and carpet grass. The average of all reports in Table III shows the percentage of desirable grasses in the 20-ft. strip on the shoulders or median of roads throughout Alabama.

Table III shows that the percentage of the bermudas and the bahia increased throughout the summer, and the fescue declined, both as expected. The broomsedge increased slowly, while the dallis is strongest in the middle of the summer. "Other grasses" included wild oats and other winter types at the first count—then decreased—then increased again as the tickle grass, smut grass, etc., became more prominent. The stands of coastal bermuda and bahia are generally weedfree so no conclusions can be drawn relating their increase to the weed spray. However, the common bermuda which is widespread and not usually in a pure stand, was definitely helped by the decreased competition of weeds after the first spray.

Conclusions

1. The spraying operation eliminated most of the annual weeds within the 20-ft. strip next to the roadway.

2. Damage to desirable clovers and legumes was confined to common lespidesa, *Kobe lespedesa, serecia lespedeza,* and white dutch clover. The specifications were purposely written to time the spraying so as to minimize the damage to the crimson, hop, and burr clovers.

3. Damage to crops did not occur, again due to the specifications, which spelled out conditions under which the inspector would halt operations.

4. No damage to desirable grasses occurred.

5. Not much economic advantage accrued from the spraying operation, because it did not eliminate the need for mowing.

6. A more lasting benefit from the spraying would have been realized if the entire roadway from right-of-way to right-of-way had been covered. As it is the weeds left beyond the 20-ft. sprayed strip will reseed the entire area within a short time.

7. Spraying of steep slopes near the road to control kudzu and other vines is very helpful and practical.

Table II: The Eleven Most Numerous Weeds

Species	Before Spraying	After 1st Spray	After 2nd Spray
Plantain	3616	608	491
Horseweed	2878	356	13
Ragweed	1771	665	123
Fleabane	2076	0	0
Wild Garlic	403	0	366
Dog Fennel	397	234	15
Pepperweed	302	15	0
Dockweed	302	8	41
Buttonweed	0	711	273
Bitterweed	0	331	56
Spurge	0	529	220

Table III: Desirable Grasses Remaining on Roadside

Species	Before Spraying	After 1st Spray	After 2nd Spray
Common Bermuda	9.96%	13.51%	14.64%
Coastal Bermuda	13.57%	13.66%	14.01%
Pensacola Bahia	13.11%	21.23%	22.78%
Fescue	16.37%	9.66%	8.17%
Broomsedge	3.47%	4.41%	5.21%
Dallisgrass	1.55%	6.91%	5.00%
Other Grasses	5.69%	3.15%	4.16%