

# CIRCULAR

Transportation Research Board, National Academy of Sciences, 2101 Constitution Avenue, N.W., Washington, DC 20418

## "ROADSIDE MAINTENANCE, DISCUSSION OF 1980 SURVEY: HERBICIDES IN ROADSIDE MAINTENANCE"

mode

1 highway transportation

subject areas

23 environmental design

40 maintenance

### INTRODUCTION

The Committee on Roadside Maintenance, A3C07, recognized a need to analyze the functional use of equipment and materials on roadsides throughout the United States. At the same time, the AASHTO Subcommittee on Maintenance had a similar goal. As a result, the Maintenance Aid Digest dated November 1980, circulated the information gleaned from a national survey. Mr. Bernard Williams, a member of the Roadside Maintenance Committee and Chairman of the Subcommittee on Research Identification and Review, received all of the raw data collected during this survey. He thoroughly analyzed the data. Mr. Williams' discussion of the 1980 Survey on Herbicides in Roadside Maintenance was presented at the January 1982 meeting and is now being published in circular format.

ROADSIDE MAINTENANCE, DISCUSSION OF 1980 SURVEY:  
HERBICIDES IN ROADSIDE MAINTENANCE

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A survey conducted in 1980 by AASHTO compiled data on roadside maintenance practice in 44 states and the District of Columbia. Data obtained on various operations pertinent to roadside vegetation management were tabulated and released. The median number of miles respondents reported responsibility for was 11,415, the median area consisted of 133,000 acres and the median budget was \$3,350,000. A 30 state sample used to examine roadside mowing showed the median number of acres in the maintenance responsibility to be 151,250 and the acres maintained by mowing to be 38,481.5. This tells us that 25.4% of the median maintenance responsibility was maintained by mowing. Thirty-nine states and the District of Columbia reported a decrease in mowing during the last 10 years. Twenty-five states indicated having experience with PGRs, plant growth regulators, on turf. Thirteen of these used PGRs in

their vegetation management program. PGRs are not widely used at this time. Eighty-two percent of all respondents used selective herbicides and 64% used non-selective herbicides. Of the 40 respondents that decreased mowing in the past 10 years, 27 have increased the use of herbicides. The median budget expenditure for herbicides, from a 35 state sample, was \$301,500. At this time the problems encountered by states using herbicides are not an obstacle to chemical vegetation management. Many states reported licensing or certification for pesticide applicators.

In 1980 the American Association of State Highway and Transportation Officials (AASHTO) conducted a nationwide survey on the use of herbicides in roadside management (1). The survey sought to relate herbicide utilization to the overall roadside maintenance program. A questionnaire, asking 14 basic questions with several secondary questions was sent to each state, the District of Columbia and Puerto Rico. Forty-four states and the District of Columbia responded. Information was obtained on roadside mowing, the use of PGRs, (plant growth regulators or growth retardants) on roadside grasses and on the role of herbicides in roadside maintenance. The purpose of this paper is to discuss the data obtained from this survey. The last question in the survey attempted to identify all pesticides used in right-of-way maintenance and sought information on each, including purpose of application, application rates and effectiveness. Pesticides and herbicides are discussed here only as they relate to roadside maintenance. A comprehensive discussion of the herbicides used in roadside management is provided by Larry Voorhees (2).

The size of the Landscape Maintenance Responsibility was the first topic the survey addressed. Respondents were asked to provide the number of miles in their system and the area volume in acres. They were also asked to provide the dollars budgeted for roadsides. In this report I wanted to compare the respondents' maintenance responsibilities and the

related budget amounts, therefore, information was required for each of the three items. Thirty-nine states provided this information and are reflected in Table 1. The median number of miles in this illustration is 11,415, the size of the median area is 133,000 acres and the median roadside budget is \$3,350,000. The median number of acres per mile in the maintenance responsibility is 11.65. The median per mile budget is \$293.47 and the median amount per acre is \$25.19. Considering that these amounts include right-of-way receiving low levels of maintenance as well as areas requiring a higher level of maintenance, or that are difficult to maintain, these figures appear reasonable.

On mowing, the questionnaire attempted to ascertain the size of the area mowed each year, how the quantity of mowing has changed in the last ten years and what part of the roadside budget was allocated to mowing. Forty-three states replied to the question asking the size of the area mowed each year. Of the 43, thirty-four gave the size of the area maintained by mowing and nine gave the volume of acres cut in a year, i.e. the number of acres mowed times the number of mowings. If one is interested in the volume of mowing done, acres X cuts, the state giving a number of acres mowed greater than the size of their responsibility, are showing this. The nine states reporting the gross volume of mowing (acres X cuts) show a high of 528,000 acres (Florida) and a low of 35,993 acres (Connecticut). The mean for the nine is 219,898 acres; the median is 201,747. The mean budget amount for mowing, in these states, is \$3,375,189 and the median is \$2,959,000. Keep in mind that we are looking at only nine states in this illustration. Where a respondent did not indicate the size of the maintenance responsibility, but gave a comparatively small number in reply to the number of acres mowed, I have assumed that this is the area maintained by mowing.

Thirty states provided total acreage for both the maintenance responsibility and the area maintained by mowing. Looking at these states we see the relationship of the area maintained by mowing to the total roadside maintenance responsibility. The median number of acres reported as the maintenance responsibility was 151,250. The median number of acres maintained by mowing in the thirty state example was 38,481.5. This tells us that 25.4% of the median maintenance responsibility was maintained by mowing. Also as the sample included 3/5 of all the states in the country, and a good cross section, the above figures could be considered valid for all states.

Further information gathered on mowing was in response to the question, "How has the quantity of mowing within your responsibility changed in the last 10 years?" Forty-four states replied to this question. Four states indicated that they have increased mowing and in each case this reflected an increase in the maintenance responsibility. Thirty-nine states and the District of Columbia reported that the quantity of mowing had decreased during the past 10 years. One state reported that there had been no change in the amount of mowing. In examining the explanations for decreased mowing (Table 2), we find many positive actions that could provide permanent, or at least long-term economies in roadside maintenance. Unfortunately, in the case of 17 respondents, the circumstances pertinent to the decrease in mowing were not articulated, and we cannot adequately report on these. However, we see later on that 27 of the 40 respondents indicating a decrease in mowing had increased the use of herbicides. One possibility, not mentioned by any respondents, that could be a concern to roadside managers, would be a deferment. As mowing was not reported

as being deferred, we cannot report on it. It is possible that in (d), from Table 2, the decreased funding caused a deferment. However, if the mowing practices had been re-thought, an alternative to past practice may have accommodated the reduction in funds.

Information was sought on the use of PGRs, plant growth regulators, and 25 states indicated having experience with these. Thirteen of these were using PGRs in their roadside program. Four were evaluating these materials, and eight had discontinued their use because they did not consider them cost effective or were otherwise dissatisfied. Eight of the thirteen states using PGRs reported the number of mowings eliminated by their use. Of the eight, four claim two to three as this value, Table 3. This suggested that substantial savings could be realized from the use of PGRs in roadside maintenance. However, when considering that only 29.5% of the responding states were using PGRs on more than 9% of the area maintained by mowing, it is apparent that PGRs are not yet impacting roadside maintenance on a large nationwide basis. Three primary reasons for this are illuminated by the survey. First of all, only 55% of all respondents to the questionnaire indicated having any experience with PGRs. The second reason, and this is not unique to PGRs, was the problems states reported having with pesticide application. This, of course, tends to compromise the success of any spray work. Finally, the expense of growth retardants, when optimum results are not absolutely certain, introduces a risk that many people may not care to work with. From the information provided by the survey and from what I know of PGRs, I believe a need for further research and development is indicated with these materials and their application. As discussed further on, spraying per se is not without its problems. As problems common to any spraying operation are resolved, the use of PGRs could appear more feasible.

The survey provided more data on herbicides than on PGRs and their role in maintenance was therefore more discernible. Eighty-two percent of all respondents reported that they used selective herbicides and 64% reported using non-selective herbicides. In all but one instance, users of the non-selective herbicides also used selective herbicides. Of the 40 respondents indicating a decrease in mowing, 27 indicated an increase in herbicide use during a 10 year period. I think there is a correlation here. Seven indicated no change in herbicide use and 8 reported a decrease in herbicide use. In 2 of the 8 cases fiscal restraints were offered as the reason for the decrease in herbicide use. The reasons offered for increased use of herbicides were a) to facilitate reductions in mowing and b) to cope with increased acreage responsibilities.

Thirty-seven states reported using selective herbicides. Thirty-five of these gave the number of acres sprayed annually, Table 4. Of the 35, the maximum acreage sprayed was 85,403 acres (Alabama), the minimum was 135 (Nevada) and the median 13,780 (Missouri). Two states (Louisiana and Mississippi) reported the area treated with selective herbicides as greater than the maintenance responsibility and, therefore, were not included in the median. In these cases, with a long growth period and pernicious weeds to control, replicate applications could be required. Twenty-nine states reported the area treated with non-selective herbicides. The maximum area receiving a non-selective treatment was 20,397 acres (Texas), the minimum was 30 (Michigan) and the median was 1,500 (New York). Budget information on the expenditure for herbicide treatments was provided by 35 states, not exactly the same as the previous group of 35. The maximum expenditure was \$2,700,000 (California) and the minimum \$43,570. The median

amount was \$301,500. The mean was \$597,502.

In the section of the report covering the various herbicides used, one can find the name of each herbicide, the target vegetation, purpose of application, rates, area treated, etc. The various objectives satisfied by using herbicides in roadside maintenance are identified in Table 5. Again I'd like to point out that the objective of this report is to discuss

**Table 1. 39 states roadside maintenance responsibility: summary of area, miles and budgets.**

	<u>Area (Acres)</u>	<u>Miles</u>	<u>Dollars</u>
Total	6,386,288	807,214	\$176,267,972
Maximum	1,000,000	180,000	22,000,000
Minimum	29,600	2,800	506,117
Mean	159,657	20,180	4,519,692
Median	133,000	11,415	3,350,000

  

	<u>Mean</u>	<u>Median</u>
Acres/Mile	7.91	11.65
Dollars/Mile	\$223.97	\$293.47
Dollars/Acre	28.31	25.19

**Table 2. Decreased mowing: objectives and/or methods.**

<u>Code</u>	<u>Objective or Method</u>	<u>No.</u>
a	Encourage development of native plant species.	3
b	Reduce quantity of mowing through increased weed control.	3
c	Reduce quantity of mowing by making fewer cuts.	9
d	Reduced mowing due to decreased funds.	3
e	Reduced mowing by reducing the size of mowed areas*.	12
f	No indication of intent or method.	17
g	b and e	2
h	c and e	5

\*One state reduced the size of the mowed areas and reported an increase in total responsibility because of added mileage.

**Table 3. Yearly plant growth regulator application versus mowing.**

<u>State</u>	<u>Cuttings Eliminated</u>	<u>Annual Savings/Acre</u>
California	2	\$64
Kentucky	1 or 2	\$42.81 behind guard rail \$ 8.50 - \$17.00 on other areas (27.78 average)
Maryland	2 or 3	\$ savings not reported
Michigan	1	\$ savings not reported
North Carolina	4	\$40
Oregon	5	\$35
Virginia	2-3	\$32
Washington	3-15	\$188.67 plus
Average	3.6	\$64.57

the survey in general and specific materials used are not covered here. As could be expected the most common purposes for using herbicides are selective weed control and the maintenance of vegetation around guiderail.

Tree and brush control with herbicides is also a widespread practice. Other objectives enumerated in Table 5 are protection of the pavement, landscape maintenance, drainage maintenance, aquatic weed control and maintenance of fire breaks, in that order. Herbicides are used in several ways to protect pavement. Some residual herbicides can be applied as a pre-paving treatment. This protects against weeds germinating under blacktop or weeds that might move laterally through the soil from outside the paved area. Similar residual or contact herbicides are applied along the edge of pavement to protect against vegetation encroachment and some herbicides are applied directly to weeds that have sprouted from joints or cracks in the pavement. The frequency, 23.6%, of herbicide used in landscape situations seems encouraging. Herbicide application among ornamentals requires judgment in pesticide selection as well as skill in application and proficiency in chemical vegetation management. Nonetheless, herbicide application on roadsides is not without problems, as is seen in the replies to question number ten, "What problems has your agency encountered in the use of pesticides in roadside maintenance?"

The answers fell into 11 categories including "none." Fourteen respondents reported no problems. Other respondents reported problems which are collectively represented by the ten designations on Table 6. The most frequent problems reported were drifting (9) and public opinion or special interest groups (8). In perusing the table, one has to wonder whether the problem with drift isn't a significant factor in several of the other problems, e.g. public opinion or claims and complaints. Similarly, equipment problems may be causing drift or other reported application problems. Funding was reported as a problem by two respondents. With sufficient funding and equipment, some application problems may be alleviated. Certainly when we consider the amount of spraying accomplished, the problems reported do not seem inordinate. In some cases the problems seem to present more of an inconvenience than a technical or program difficulty. In many cases the technical problems were described as occasional.

Information was sought on local, state or federal restrictions regarding pesticides used in roadside maintenance. Many states reported licensing or certification for pesticide applicators. Applicator certification is required under federal law for anyone applying restricted pesticides. The survey indicated however, that at least 16 of the respondents had certification in their states whether or not restricted pesticides were used.

**Table 4. Herbicide application and budget.**

<u>ITEM AND NO. RESPONDING</u>	<u>MAXIMUM</u>	<u>MINIMUM</u>	<u>MEAN</u>	<u>MEDIAN</u>
Area Treated/Selective Herbicides (35)	85,403	135	16,048	13,780
Area Treated/Non-Selective Herbicides (29)	20,397	30	4,279	1,500
Budget for Herbicides	\$2,700,000	\$43,570	\$597,502	\$301,500

\*Areas are reported in acres.

Table 5.	AREAS OR OBJECTIVES FOR TREATMENT	DRAINAGE AREAS	GUIDERAIL	LANDSCAPE	SELECTIVE WEEDS & TURF	FIRE BREAK	PAVEMENT	AQUATIC	TREE & BRUSH CONTROL
	Alabama				X		X		X
	Arizona		X		X		X		X
	Arkansas		X				X		
	California			X		X			
	Connecticut		X						
	Delaware		X	X	X		X		X
	Florida	X		X	X		X	X	X
	Idaho			X	X				X
	Illinois		X		X				
	Indiana		X		X				
	Iowa		X		X		X		
	Kansas				X				
	Kentucky		X		X				X
	Louisiana	X		X	X			X	X
	Maryland		X	X	X		X		
	Massachusetts	X	X						X
	Michigan		X	X	X				X
	Minnesota	X	X		X				X
	Mississippi		X	X					X
	Missouri		X						X
	Nebraska		X		X		X		X
	Nevada				X		X		X
	New Jersey		X		X				X
	New York	X	X		X				
	North Dakota		X						
	Ohio		X		X				
	Oklahoma		X		X				
	Oregon		X	X					X
	Pennsylvania		X		X				X
	South Carolina		X						
	South Dakota				X		X		
	Tennessee				X				X
	Texas				X		X		X
	Utah		X		X				
	Vermont		X						X
	Virginia				X				X
	Washington	X	X		X		X		X
	Wisconsin	X			X		X		X
	Wyoming				X				
		7	26	9	29	1	13	2	23

Table 6. Problems reported by states using herbicides.

<u>Problem</u>	<u>Occurrence</u>
Drifting	9
Public Opinion & Special Interest Groups	8
Application Other than Drift	4
Equipment	3
Restricted Areas	2
Claims, Complaints and Damage	5
Off-Target Injury	2
Funding	2
Personnel	2
Regulations	1
No Problems Reported	14

In concluding I'd like to point out that the AASHTO report from November 1980 attempted to make the results of the survey available promptly. Several minor errors occurred due to the large volume of information to be analyzed and presented in a short period. While preparing this report I was able to have the MAD-25 (1) figures verified and make appropriate adjustments. For this reason and because many of the figures used in this report are derived from samples, rather than from totals in the Maintenance Aid Digest, the numerical values presented may vary between this report and the November 1980 release on the use of herbicides in roadside maintenance.

## References

1. The Use of Herbicides in Roadside Maintenance. Maintenance Aid Digest, AASHTO Committee on Maintenance, MAD-25, November 1980.
2. L.D. Voorhees. The Role of Chemicals in Management of Roadside Vegetation. Environmental Sciences Division, Oak Ridge National Laboratory, Oak Ridge, Tennessee.

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