

A Vegetation Management Program for Alabama Highway Roadsides

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ABSTRACT

The Alabama Highway Department is engaged in the management of approximately 105,000 acres of roadside. Diverse ecology and temperate climate promote species diversity. Turf is composed of tall fescue, Pensacola bahiagrass, and bermudagrass. Weeds and brush caused up to five costly mechanical mowings a year. To alleviate short-term and costly mechanical controls a chemical-mechanical management approach was adopted. All of the 105,000 acres are mowed at least once and sprayed approximately two times. Broadcast herbicide treatments using single dormant applications of sulfometuron where bermudagrass is present and later site-specific applications of monosodium methanearsonate (MSMA), 2,4-D amine, diuron, and dicamba alone or in combination have been effective in controlling broadleaf and grassy weeds and in promoting bermudagrass release. This release program is the result of research in cooperation with Auburn University and has promoted 35,000 acres of monostand bermudagrass. Nonselective weed control on paving and structures is accomplished with applications of diuron, glyphosate, hexazinone, and sulfometuron as site-specific treatments alone or in tank-mix combination. Brush and woody species are controlled with 2,4-D amine dicamba combinations or glyphosate or fosamine. Application techniques have been updated to current state-of-the-art equipment. Intensive training, applicator certification, and literature and policy developments have increased the performance and effectiveness of personnel. Environmental safety and aesthetic end results are highly emphasized. These developments have been demonstrated to have tangible economic benefit by reallocating work loads and reducing mowing, resulting in projected savings of \$1,500,000 per year.

As managers of the highway landscape, landscape engineers are increasingly confronted with complex and challenging issues. They are burdened and yet encouraged in this challenge by raised consciousness on environmental issues, economic- and resource-oriented maintenance activities, and ever-changing technology.

PHILOSOPHY

Some background of Alabama's program should preface any further discussion, which, for the most part, will be related to chemical vegetation management. General factors that have influenced the present roadside philosophy in Alabama include

1. Methods and materials employed in erosion control;
2. Interstate highway construction, which, by its nature, necessitated studies and standards for species selection for trees, shrubs, turf, and other vegetation; bifurcations and scenic corridors; and also mowing limits;
3. A state maintenance management system instituted in 1973; and
4. Budget limitations and related economic factors followed by the inclusion of a statewide herbicide program in 1977.

BACKGROUND AND HISTORY

Alabama is a temperate state with a mean average temperature of 64°F and a mean average rainfall of 56 in. Soil types found in the state are predominantly coastal plains, piedmont plateau, prairie, limestone valley-uplands, and Appalachian plateau, so a diverse cross section of adapted and natural vegetation is present.

Historically and currently the state has used slash and loblolly seedling pine plantings and other forest plantings for slope-erosion control, and, to a lesser degree, adaptive hardwoods such as yellow poplar, oak, sycamore, willow, redbud, dogwood, maple, and sweetgum. Grasses include tall fescue, common and hybrid bermudagrass, and Pensacola bahiagrass. Legumes include reseeded crimson clover, Kobe lespedeza, crown vetch, and several others. Geographically, the extreme northern portion of the state is still largely planted in tall fescue; one-fourth to one-fifth of the southern portion of the state is planted in Pensacola bahiagrass--common bermudagrass combination turf. The remainder of the state is a mixture of Pensacola bahiagrass; common bermudagrass is the predominant species due to a highly successful release program.

Until the early 1970s, the Alabama Highway Department relied on extensive mowing and hand labor for control of vegetation along its roadsides. The economic crunch, along with the allure of such non-labor-resource-intensive control measures as herbicide treatments (until that time roadsides were mowed up to 4 to 5 times a year); mowing limit adjustments (increased natural succession areas); as well as pressures from kudzu, johnsongrass, and other noxious

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weed infestations, caused the department to take a new direction and philosophy toward vegetation management, which led to the current program.

ALABAMA'S CURRENT PROGRAM

The state of Alabama has 11,085 road miles of state and federal highways, of which, 866 road miles are Interstate highway. This mileage represents an approximate total of 105,000 acres of maintainable roadside. From a roadside maintenance point of view, the state currently budgets approximately two mowings or 48,280 acres on Interstate class roads and approximately one mowing or 100,870 acres on all other road classes. Broadcast herbicide treatment is accomplished at a total of 230,700 acres, or approximately two times the total maintainable acres.

Mowing is accomplished, if needed, in the late spring and early summer after wildflowers and clovers have seeded. Subsequent to a preemergent herbicide application, some mowing is preempted or delayed until fall.

Roadside vegetation 18 in. high in areas designated for mowing precipitates a mowing. Mowers are set to a minimum of 6 in. Current mowing limits are delineated as follows:

1. Undivided highways with 100-ft or less of right-of-way (ROW). In flat areas, mowing should be accomplished from pavement edge to right-of-way line.

2. Undivided highways with more than 100 ft of right-of-way and multilane divided highways. In flat areas, mowing should be accomplished 35 to 50 ft from the edge of the pavement or a greater distance where required to maintain a safe sight distance or to maintain a clean area around traffic signs beyond the normal limits. This mowing should follow the natural contours of the ground and should include all areas in which drainage is to be maintained.

3. Medians less than 80 ft wide should be entirely mowed, except for landscaped areas and plants set for purposes of screening headlight glare.

4. Median widths 80 ft or greater are to be mowed 35 to 50 ft from the edge of the pavement and in accordance with other roadside mowing standards (e.g., up to areas delineated for natural succession).

5. In developed urban areas next to residences or businesses, in rural areas next to cultivated farmland or scenic views, and at road intersections where sight distance is required, mowing should be accomplished from edge of pavement to the right-of-way line.

6. Areas within the ramps of diamond interchanges should be entirely mowed. The standard mowing width of 35 to 50 ft should be used for areas from outside of the ramps to the right-of-way line. Other interchanges are to be mowed in accordance with standard mowing limits.

7. On fill sections where guardrail exists, mowing should be accomplished a maximum of 15 ft, or one mower swath, beyond the guardrail if it can be done safely. Herbicides and chemicals will reduce the need for trimming under and around the guardrail.

8. On fill sections with slopes steeper than 3:1, without guardrail, mowing should be accomplished a maximum of 15 ft down the front slope from the shoulder edge.

9. On cut sections that have a slope deeper than 3:1, mowing should be accomplished from the edge of the pavement to a minimum of 10 ft up the back slope.

10. On all back slopes where *Sericea lespedeza* is planted, mowing should be accomplished a minimum of 10 ft.

Today Alabama's chemical vegetation management program centers on an aggressive bermudagrass release program using a dormant-season herbicide treatment. Other control areas are kudzu and brush control, crack and joint treatments, paved shoulder treatments, guardrail, posts and bridge structure treatments, and spot noxious weed control. The current herbicide program is outlined by season as follows:

I. January and February

- A. Winter weed control in bermudagrass turf. (Recommended for roadsides with full bermudagrass coverage established at least 18 months. Do not shut off at guardrails.)

1. Oust® (sulfometuron) @ 0.38 to 1.12 oz active ingredient (ai)/acre

II. March and April

- A. Spot spray guardrails, posts, bridge abutments. (Do not use these treatments where the likelihood of erosion is present.)

1. Diuron 80 W @ 4 lb ai/acre, or
2. Roundup® (glyphosate) @ 3 lb ai/100 gal water (not for guardrail).

- B. Longitudinal joints

1. Velpar® L (hexazinone) @ 6 lb ai/acre
2. Roundup® (glyphosate) @ 1.5 lb ai/acre, plus Oust® (sulfometuron) @ 3 oz ai/acre. (Use in 50 gal or less/acre carrier.)

III. Late May through September after mowing or dormant treatment

- A. Broadcast treatment

1. High-volume sprayers

- a. Monosodium methanearsonate (MSMA) @ 2.25 to 3 lb ai/acre

- b. Diuron 4L or diuron 80 W @ 1.2 to 1.6 lb ai/acre

- c. 2,4-D amine @ 1.5 to 2 lb ai/acre

- d. Banvel® 720 (1.9 ai 2,4-D amine + 1.0 lb ai dicamba/acre) @ 0.71 lb ai 2,4-D amine + 0.38 lb ai dicamba/acre to 0.95 lb ai 2,4-D amine + 0.5 lb ai dicamba/acre

- e. Combination treatments

- MSMA @ 2.25 lb ai/acre + 2,4-D amine @ 1.5 lb ai/acre, or

- MSMA @ 2.25 lb ai/acre + diuron 4L @ 1.2 lb ai/acre, or

- MSMA @ 2.25 lb ai/acre + diuron 80 W @ 1.2 lb ai/acre, or

- MSMA @ 2.25 lb ai/acre + 2,4-D amine @ 0.71 lb ai/acre + dicamba @ 0.38 ai/acre

2. Low-volume sprayers

- MSMA @ 1.5 lb ai to 2.25 lb ai/acre

- B. Spot treatment of paved shoulders and longitudinal cracks

1. Velpar® L (hexazinone) @ 4 to 5 lb ai/acre

2. Roundup® (glyphosate) @ 3 lb ai/acre (for greater than 50 gal/acre volume), Roundup® (glyphosate) @ 1.5 lb ai/acre, plus 1 qt 90 percent ai nonionic surfactant/acre (for 50 gal or less application/acre)

- C. Spot brush, kudzu, and structure (handgun)

1. Banvel® 720 (1.9 lb ai 2,4-D amine + 1.0 ai lb dicamba/gal) @ 1.9 lb ai 2,4-D amine + 1.0 ai dicamba/100 gal mix

2. Roundup® (glyphosate) 6 lb ai/100 gal mix
- D. Spot selective weed control (handgun)
 1. MSMA @ 3.75 lb ai/100 gal mix
 2. Banvel® 720 2,4-D amine @ 0.95 lb ai + dicamba @ 0.5 lb ai/100 gal mix
 3. 2,4-D amine @ 3 lb ai/100 gal mix
- IV. September, October, and Dormant Season
 - A. Foliar brush treatment
 1. Banvel® 720 @ 1.9 lb ai 2,4-D amine + 1.0 lb ai dicamba/acre
 2. Krenite® S (fosamine) @ 8 lb ai/100 gal mix (handgun)
 - B. Fresh cut stump treatment
 1. Banvel® CST (dicamba @ 1.0 lb ai/gal) undiluted on fresh cut stumps
 2. Banvel® 720 (1.9 lb ai 2,4-D amine + 1.0 lb ai dicamba/gal) diluted 50:50 with water on fresh cut stumps.

WARM-SEASON RELEASE

As a direct result of research in cooperation with Auburn University, the Alabama Highway Department has implemented a dormant and warm-growing-season grass release program.

As a result of this program, the department has progressed from essentially no acreages of monostand common bermudagrass to current acreages of 35,000 plus acres of this more desirable roadside species, as indicated by February-March broadcast herbicide treatments (see Figure 1).

Note that discussion of herbicides in this paper is not a recommendation for their use. If herbicides are handled, applied, or disposed of improperly, they can harm humans, domestic animals, desirable plants, pollinating insects, fish, and other wildlife, as well as contaminate water supplies. Herbicides should be used only when needed and should be handled with care. The directions should be carefully followed and all precautions on the container label should be heeded.

All herbicide solutions applied to Alabama highway roadsides contain a polyvinyl polymer drift control additive.

A nonionic surfactant is added wherever label instructions call for its inclusion in the mix or where additional herbicide activity is desired.

APPLICATION TECHNIQUES

In 1977 the Alabama Highway Department used high-pressure, high-volume handgun applicators as well as low-volume span-sprayers developed by Ring-Around

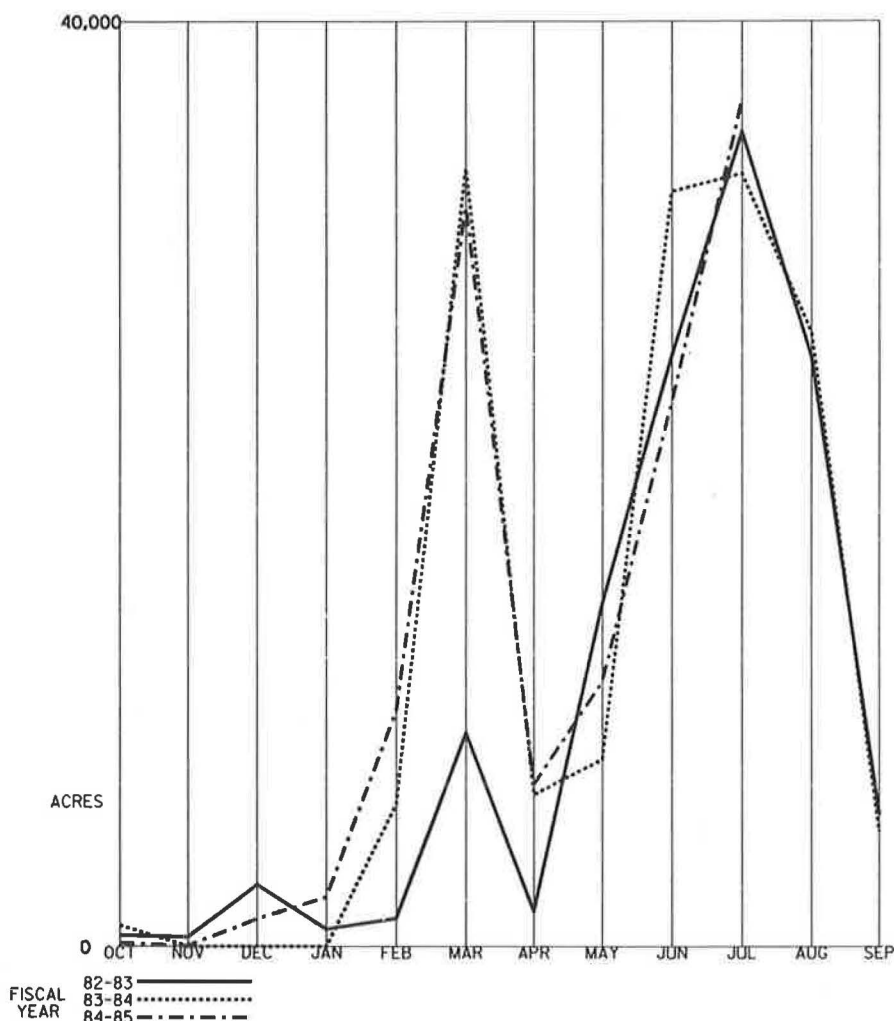


FIGURE 1 Comparison of broadcast herbicide treatment from FY 1982-1983 to FY 1984-1985.

Products. These applicators afforded a then up-to-date method of applying 2,4-D and MSMA, the principal building blocks of the vegetation management program. At that time, considerable problems were encountered with off-target damage when using 2,4-D in agricultural areas due to spray droplet size and adjacency to spray operations.

Today the Alabama Highway Department uses 28 high-volume boomless type trucks, some equipped with microprocessor computer injection as well as Dickey-John radar pressure-volume-speed controllers to ensure a more accurate application.

Tractor sprayers, equipped with Dickey-John controllers and conventional agricultural boom spray apparatus, are also used for off-road applications. High-volume handgun application is used for brush control and spot-weed control applications.

PROBLEMS

Although the use of Oust® (sulfometuron methyl) has figured heavily into the bermudagrass release program as a dormant-season treatment, its use has not been without problems. Several off-target movement claims and application on areas without proper bermudagrass cover has caused the department to use lower rates, move application dates back, and place heavier constraints on equipment and roadside composition requirements. These measures have been effective in alleviating this problem.

The department must constantly be aware of damage claims; at present, this problem has virtually been eliminated by (a) increasing spray droplet size (boomless type truck), (b) including drift-control agents in all spray mixes, (c) better educating the public, and (d) providing prompt and courteous relations and investigating complaints thoroughly. A close advisory relationship is maintained with the Alabama Department of Agriculture and Industries, which regulates pesticides and pesticide application

and also investigates any alleged misapplication of products.

Environmental groups have opposed the program or have approached the department in an adversarial role. Their concerns are addressed by a firm statement of the facts and an explanation of the tangible benefits of the program.

TRAINING

The department trains more than 200 personnel yearly in the use of herbicides and about program requirements. The training takes place at nine locations throughout the state and lasts 6 to 8 hours. A yearly Roadside Vegetation Management Seminar is sponsored jointly by industry and the Alabama Highway Department.

Certification is stressed for every division and all district personnel associated with the program; currently 75 people statewide are certified. A comprehensive Roadside Manual as an improvement over current literature has been completed and has been used as a training and practice aid in implementing the policies and procedures of the vegetation management program.

RESEARCH AND SUPPORT

Auburn University, primarily the Department of Agronomy, is relied on heavily for continuing federal and jointly funded research projects, as well as extensive in-house research.

The vegetation management program affords the Alabama Highway Department the opportunity to evaluate new materials and equipment as they become available for testing and thus to develop information for decision making before being bombarded by vendors with high-pressure sales campaigns. This approach of screening new products in small-scale replicated

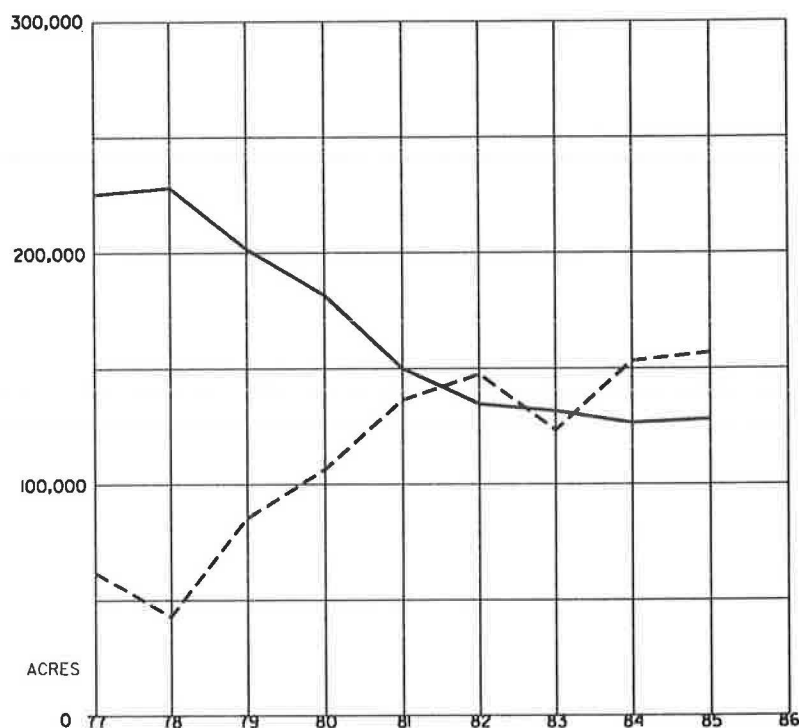


FIGURE 2 A comparison of mowing and broadcast herbicide treatment from FY 1976-1977 through FY 1984-1985.

studies as early in the development process as possible has allowed the department to avoid large-scale testing and statewide demonstrations of new products or techniques that have caused embarrassing situations in the past. This policy of using only well-researched procedures and products in the vegetation management program has been of great help in developing public confidence in the department's ability to manage roadside vegetation in an economical and environmentally safe manner.

ECONOMICS AND PROGRAM EVALUATION

The overall accomplishment of integrating mowing and chemical treatments into vegetation management can be seen from Figure 2 and Table 1.

A breakdown of fiscal year 1983-1984 roadside

maintenance activities shows a savings of \$6.48 per acre by using a broadcast herbicide treatment (see Tables 2 and 3). Comparing the cost for spraying the 153,227 acres with the cost for mowing, an immediate saving of \$992,910.95 is realized. Furthermore, if an additional mowing was assumed to be eliminated (it can be reasonably assumed), the overall savings would be \$1,647,390.96. The inclusion of the winter weed control program has stabilized mowing costs somewhat, and even more savings could be extrapolated from that factor. In addition, by comparing Figures 1 and 3, a definite trend toward reallocation of workload distribution can be seen, which has had a positive effect and influence over other routine maintenance activities in that the labor force is not overwhelmed at what has historically been a very busy time of year for mechanical and chemical vegetation management.

TABLE 1 Mowing and Herbicide Costs and Accomplishment By Acre from Fiscal Year 1975-1976 Through Fiscal Year 1984-1985

	Mowing		Spraying	
	Acres	Cost/Acre (\$)	Acres	Cost/Acre (\$)
1984-1985	128,075	17.72	156,750	9.89
1983-1984	126,475	16.84	153,228	10.46
1982-1983	131,688	12.37	123,311	11.24
1981-1982	134,707	16.87	147,490	12.09
1980-1981	150,005	17.96	136,420	14.82
1979-1980	181,693	13.43	106,472	12.78
1978-1979	201,747	13.48	85,403	9.72
1977-1978	228,061	12.11	42,796	22.05
1976-1977	225,328	11.42	61,831	11.63
1975-1976	251,992	10.60	48,000 (estimated)	18.00 (estimated)

Note: Inventory = 103,493 acres.

TABLE 2 Alabama Highway Department Roadside Maintenance Activities, 1983-1984

Activity	Accomplishment	Unit Cost (\$)
All roads combined		
625 mowing	126,475 acres	16.84
626 herbicide (broadcast)	153,227 acres	10.46
627 brush and tree cutting	90,542 man-hours	9.70
629 spot litter pick up	51,266 man-hours	10.81
630 full litter pick up	3,615 passenger miles	46.98
631 spot herbicide	799,624 gal	0.51
634 other roadside maintenance	35,560 man-hours	17.53
Interstate		
625 mowing	40,315 acres	15.97
626 herbicide (broadcast)	21,344 acres	8.33
627 brush and tree cutting	22,089 man-hours	18.89
629 spot litter pick up	16,622 man-hours	10.04
630 full litter pick up	1,998 passenger miles	38.84
631 spot herbicide	183,206 gal	0.55
634 other roadside maintenance	10,568 man-hours	18.77
Other state roads		
625 mowing	86,160 acres	17.24
626 herbicide (broadcast)	131,883 acres	10.80
627 brush and tree cutting	68,453 man-hours	10.12
629 spot litter pick up	34,644 man-hours	11.18
630 full litter pick up	1,617 passenger miles	57.05
631 spot herbicide	616,417 gal	0.49
634 other roadside maintenance	24,992 man-hours	17.01

TABLE 3 Alabama Highway Department Roadside Maintenance Activities for 1983-1984, Breakdown by Percent

Activity	Labor (%)	Equipment (%)	Material (%)	Miscellaneous (%)	Total Cost (\$)
625 mowing	38.75	60	1	0.25	2,130,119
626 herbicide	12.60	15	72	0.40	2,603,980

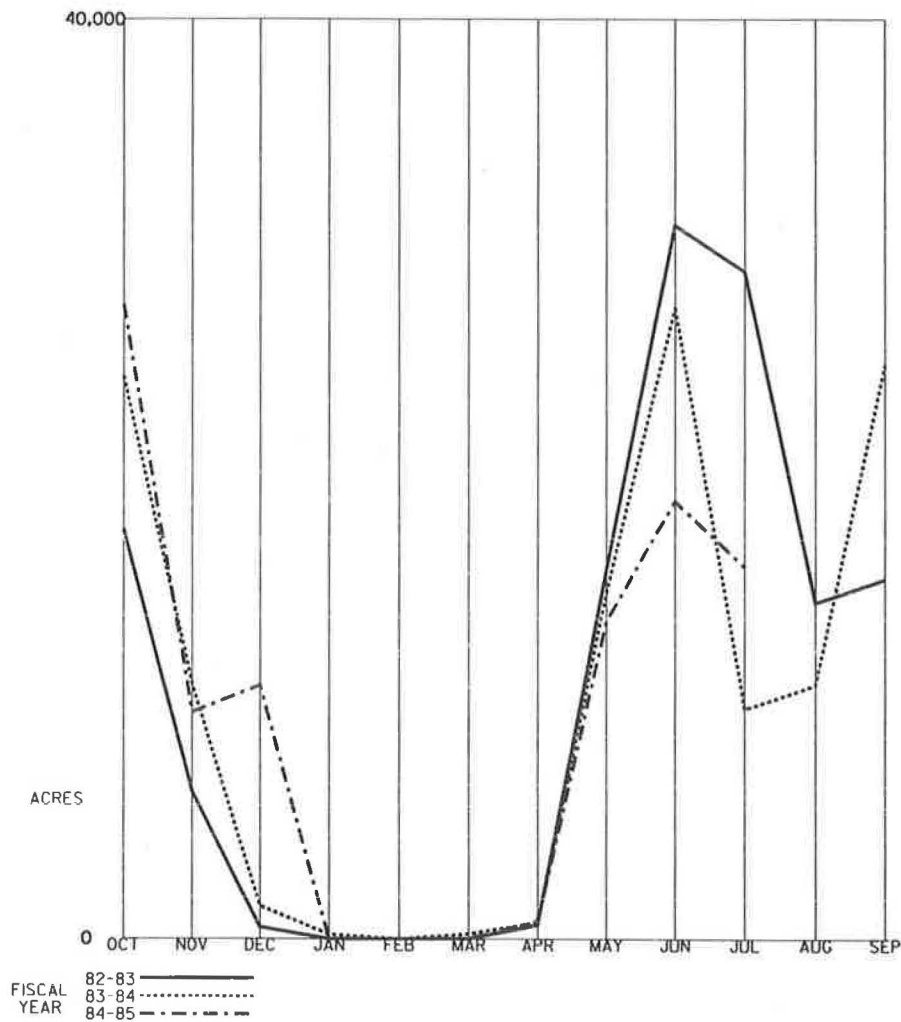


FIGURE 3 Comparison of mowing from FY 1982-1983 to FY 1984-1985.

CONCLUSION

The integration of properly timed and well-planned mowing and herbicide application as elements of an overall vegetation management plan has provided the following tangible benefits to Alabama highway road-sides:

1. Release of bermudagrass, a desirable low-growing turf species that is functionally safer, aesthetically pleasing, and economical to maintain;
2. A lower total dollar expenditure for roadside maintenance at a higher level of service;
3. Workload reallocation, making for more balanced activity accomplishment;
4. More lasting elimination or control of undesirable species;
5. Ultimately a safer and more pleasant highway

system owing to the elimination of certain weed pests while maintaining an environmentally and economically sound vegetation management program; and

6. Development of noncritical roadside maintenance, allowing for selective clearing, natural succession, and scenic woodland areas.

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