fescue grasses are growing. Asulox will not normally hurt fescue.

We attempt to control Kudzu along our roadsides and will enter into agreements with private property owners to treat roadsides adjacent to their property if they will agree to treat their own. We have used Krenite with good success as an early fall treatment along with Roundup or the 2,4-D-MCPP-Dicamba mixture as a spring-summer treatment.

Multiflora rose has been designated as a pest in North Carolina. We have used either Roundup, Banvel, or Krenite in an effort to control this pest. All three appear to be effective.

The use of herbicides and growth regulators, as listed here, seems absolutely necessary to provide the North Carolina Department of Transportation with the tools to control vegetation along our roadsides and maintain the aesthetics of our highway system. We are very proud of our strides in recent years in the use of chemical products to control roadside vegetation, and we are proud that some parties have indicated that our program is as progressive as any that can be found in the United States.

FLORIDA'S ROADSIDE VEGETATION MANAGEMENT PROGRAM

Bill G. Morris and J.A. Lewis

Florida's Department of Transportation has long recognized the benefits to be derived from a sound vegetation management program. Florida has a combination of rural and urban conditions with nearly 12 000 miles of state-maintained roadway spread over an area of 60 000 miles^2. The state is irregular in shape and is fronted by the Atlantic Ocean and the Gulf of Mexico. This geographic area, coupled with varied terrain, rainfall, temperature, and growing seasons, results in a variety of vegetation management programs.

Management of our roadsides begins at the desgin phase. We maintain a close working relationship with the department's design staff and support ongoing vegetation research that is performed in-house and with the university system where repetitious vegetation problems are best solved.

Generally roadside maintenance is categorized as either maintained or nonmaintained. Maintained areas receive routine and as-needed applications of fertilizer, mowing, and herbicides. Nonmaintained limits are allowed to regenerate and/or are supplemented with native tree species. Period fertility is accomplished by using a high-analysis (24-6-8) 50 percent water insoluble nitrogen source. Although this program contributes to a more dense, stable turf, it does not contribute to additional mowing requirements. Various size mowers are used on roadside applications. Frequencies vary depending on location and attending land use.

The department has developed a comprehensive manual on chemical weed and grass control that includes details of herbicide materials, plant identification, calibration programs, special considerations, equipment, and so forth. It provides detail and specifies desired treatment limits, nozzle configurations, and related application pressures and speeds.

A five-day classroom and field training program is held for applicators, and they must exhibit technical competency for certification. We have attempted to minimize the number of materials used in the program and evaluate them on a cost-effective basis. 2,4-D, 2,4-D-Dicamba, Banvel 720, Dalapon, Hexazionone (Velpar), Glyphosate (Roundup), Diquat (Ortho), and Oryzalin (Surflan) are the mainstays of our current programs. These programs consist of selective weeding, brush and grass control, abatement, aquatic, drainage ditch, and ornamental work. A daily herbicide spray report is maintained by crews. The report provides for the recording of essential information and allows for program performance evaluation.

From an economic standpoint, Florida is seriously questioning mowing needs. A no-mow test area was established in 1977. This resulted in the recognition that a dense and uniform established weed-free bahia or Bermuda turf is acceptable in appearance, therefore, making it possible to virtually stop mowing in certain areas without serious consequence.

It was recognized at the beginning that for the projects to be successful, a well-established turf condition relatively free of competitive tall grasses and broadleaf weeds would be required. This was verified with the discontinuance of mowing. Control of broadleaf weeds has been successful with the use of 2,4-D and 2,4-D-Dicamba; however, control of the tall competitive grasses such as Johnson, vasey, quinea, smut, para, and napier is requiring an alternate program.

At the beginning of this program, no acceptable product or application techniques were available to selectively remove the competitive grasses from the desired bahias and/or Bermudas. We have since experimented with low-rate overspray programs by using Hexazinone (Velpar) and Asulam (Asulox or Johnix). Each of these provided favorable results for particular plant control but neither material has effectively removed all of the undesired grasses.

Our latest approach to the control of these grasses has been the Rope-Wick concept and using the herbicide Glyphosate. The unique factor in this procedure is that the material is applied only to the taller, undesired grasses by using the rope-wicks resulting in essentially no material waste. Control of the undesired grasses coming in contact with the wick is satisfactory.

With the information gathered to date, certain modifications to our management practices are being considered. These include the expansion of the rope-wick concept coupled with a reduction in mowing and expanded selective broadcast programs.

USE OF CHEMICAL TOOLS IN MANAGING VEGETATION ALONG TEXAS ROADSIDES

Tom Allen

The vegetation management program of Texas has been designed to maintain the integrity of the asphalt surface, prevent or reduce soil erosion, provide safety for the traveling public, achieve maintenance efficiency, and provide beauty. The use of chemicals was demonstrated as the most efficient and economical method of controlling undesirable vegetation. Herbicides are the major chemical tool used along roadways; however, insecticides and plant growth regulators may become important as our knowledge increases.

The chemical vegetation management program was divided as follows.

1. Complete vegetation control (bare ground). The use of a residual herbicide at the proper rate will provide complete vegetation control unless resistant species are present. The number of these species must be considered. This type of vegetation management may be desirable in areas where it can be

economically maintained or where plant growth decreases maintenance efficiency or creates a fire hazard. Water soluble Hexazinone will control most of the forbs and grasses along Texas roadsides and is noncaustic and low in mammallian toxicity. For best results, this material should be applied early in the spring, and no application should be made near desirable vegetation.

2. Selective plant removal or weeding can be accomplished by using a chemical applied either as a pre- or post-emergent application. Glyphosate is used for Johnsongrass control and it is miscible with water, noncaustic, and low in mammallian toxicity. However, it is highly corrosive to galvanized containers. A Hexazinone treatment in late summer or fall at a low application rate will effectively control field bindweeds; however, it is not recommended because of the chemical's ability to maintain a bare ground for a period of 8-12 months. In general, field bindweed is controlled in the same manner as Johnsongrass.

3. Woody plant control or brush control. A number of woody plant species are serious problems as they produce stipular spines that can cause flat tires or injury to individuals. These species include mesquite, huisache, blackbrush, twisted acacia, guajuillo, and cat claw acacia. At present, there are a number of experiments in progress at various locations, and the most promising herbicides appear to be Hexazinone and tebuthiuron. No foliar-applied herbicides have produced acceptable results on these species.

4. Bermuda grass release is a term for the chemical treatment of an area to damage or kill all of the vegetation with the exception of Bermuda grass. There are two methods of applications recommended. First, an overspray of glyphosate is used that would kill the taller growing species and possibly up to 20 percent of the Bermuda grass. This treatment is recommended in areas where driving a tractor may be hazardous. The second method is to use a tractor-drawn rope-wick applicator with glyphosate that treats the higher growing vegetation only with a contact material.

5. Chemical mowing by using the rope-wick applicator over areas where Bermuda grass is absent is effective when the height of the rope-wick is above the desirable vegetation.

6. Treatments around ornamental planting are accomplished by using glyphosate plus Oryzalin. As a treatment around the base of the planting, care must be taken not to apply the chemical to the green portion of the ornamental planting.

7. Prepavement treatment with pramitol under the asphaltic surface has successfully controlled vegetation growth for a period of up to 4 years.

8. Plant growth regulators or retardants are used to slow down the growth of plants to reduce the frequency of mowing. This program is still in the research stage.