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

(Continued on page 30)

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.

A New Nematode In Turf-grass

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IN 1959, A NEMATODE resembling the root-knot nematodes, *Meloidogyne* species, was encountered several times in Florida attacking roots of st. augustinegrass. Only slight swellings of the grass roots occurred where the nematodes were attached. The parasites were usually completely embedded within root tissues although they were sometimes found with the body completely outside the root with only the neck and head penetrating the root. Large populations of this nematode in grass roots and in surrounding soil were associated with circular or irregularly shaped patches of dead and dying grass.

Detailed examination of these nematodes indicated that while they were closely related, they were not identical with root-knot nematodes. The adult female nematodes are white and less than 4/100 of an inch in diameter, or considerably smaller than the head of a pin. Similar to root-knot, the females extrude many eggs in a gelatinous mass from the posterior end of the body to the outside of the plant root. The nematode has been given the scientific name *Hypsoperine graminis.*

A nematode identified as being a root-knot species was encountered several years ago on zoysiagrass and more recently on bermudagrass in Maryland. Recent comparisons of this nematode, however, with the one from st. augustinegrass in Florida indicate that they are identical or closely related. The new pathogen has been detected in several zoysia lawns in the Washington, D. C. suburbs in nearby Maryland during the past year. It now appears that this nematode is present in several southeastern states of the United States and California. There is now considerable concern that the nematode may become an important pathogen of certain lawn grasses.

Limited host range investigations indicate that the nematode can reproduce on several bermuda and zoysia grasses, Pensacola bahiagrass, st. augustinegrass, and crabgrass. Certain bermuda and zoysia grass strains appear to be resistant. No dicotyledonous plants tested or corn supported the parasite. Additional host range tests are needed to fully determine its spectrum of host plants. Also, host ranges of populations from various parts of the country need to be compared to determine if physiological races exist; this would be important from the standpoint of control through developing or selecting plant varieties resistant to this nematode.

One Nematicide Promising

Only two chemical nematicides have been tested in attempts to control the nematode on established turf. 1,2-Dibromo-3-chloropropane failed to control the pathogen on st. augustinegrass in tests in Florida and on zoysiagrass in tests in Maryland. In limited tests in Maryland, an experimental organic phosphate nematicide (Bayer 25141) showed very good promise of giving adequate control from one application per growing season. The nematicide is not yet available commercially.

Knowledge of the biology and distribution of this nematode are still quite meager. Despite the fact that the nematode appears to be a pathogen of potential importance on certain turfgrasses, there are already indications that feasible and adequate control methods will soon become available.

Patches of dead bermudagrass caused by *H. graminis* in experimental fertilizer trial plots. Photograph courtesy of C. W. Laughlin.

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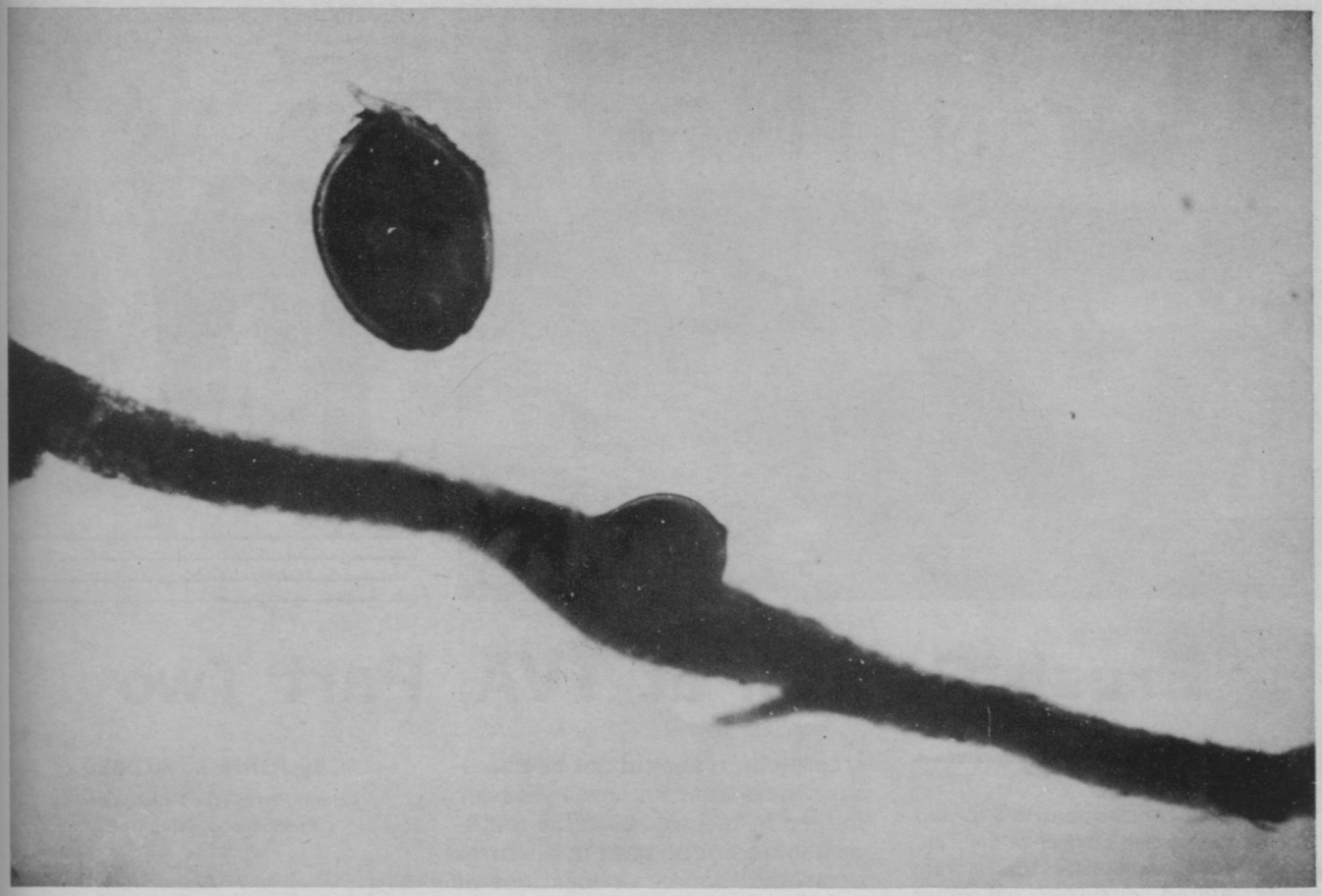
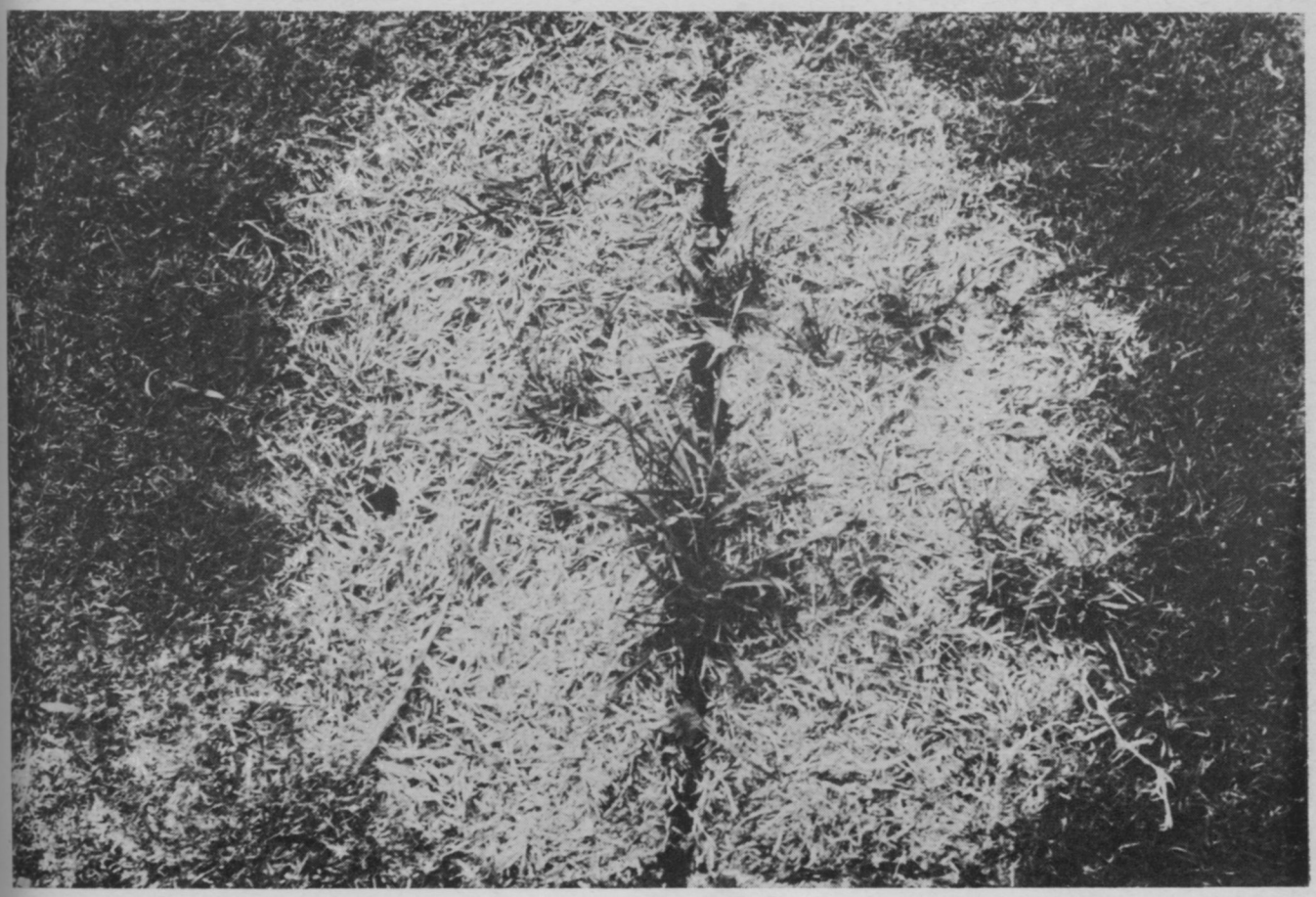


Less than 4/100 inch in diameter in actual size, the nematode *H. graminis* is pictured here, greatly magnified, as a female (top) and female attached to zoysiagrass root.

Patch of dead bermudagrass below was caused by *H. graminis*. Areas like this, containing a few live plants, are characteristic of nematode damage to turf. Photo by C. W. Laughlin.



Around steam plants, such as these, TVA workers prefer to use soil sterilants to effect weed control.

TVA

Brush Control at TVA, Part Two

By JOHN R. ALDRED
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THIS is the conclusion of a two-part article on brush control at the Tennessee Valley Authority. Last month, author Aldred discussed helicopter and basal spraying, application of pellets, and mechanical maintenance. Ed.

Pole Degrassing

Pole degrassing is considered a necessity on some of TVA's lines or sections of lines where past history indicates that the areas are burned annually and are so-called "hot spots." Two methods used in pole degrassing are manual "scalping" and chemical treatment.

The former is accomplished by scalping vegetation within a radius of 6 ft. around wooden poles with garden-type hoes. This method gives fire protection for one season and must be repeated annually; however, it should be used in pasture areas.

The chemical method is much more economical. For chemical degrassing, apply 2 lbs. of Chlorea granular or Ureabor to a radius of 6 ft. around the wooden pole, using a hand seeder. One treatment should normally render a sterile condition for about two years. After the second treatment, it should not be necessary to re-treat for three years or longer in most cases. This method should not be used in pastures or around houses or locations of this type; nor should it be used in areas where fire hazards do not exist.

How To Remove Trees

Mechanical cutting of dangerous trees is performed extensively and is effective. The one-man power saw is the most effective and economical tool used. This method, like mechanical clearing of rights-of-way, has its place; when more economical methods and techniques are adaptable, they should be used. All trees that could hit the line should be mechanically cut.

Various chemical methods may be used for removal of dangerous trees, and are more economical in some areas. Chemical methods should never be used in residential areas. If there are a number of trees in an area along main highways, the mechanical method should be used. Conifers, such as pine and cedar, should be cut. The two most common methods of chemical application are "frilling" and using a tree injector.

Generally, the most economical method of controlling dangerous trees is by application of a low concentration of 2,4,5-T esters (3%) in diesel oil to a frill, or overlapping axe cuts, encircling the tree at a height of not more than 12 in. above the ground line. Mix thoroughly 1½ gal. of 2,4,5-T esters in 48½ gal. of diesel oil in a used 55-gal. chemical drum. A knapsack sprayer should be used to wet exposed wood areas in the frill thoroughly at approximately 1 qt. to each 12-in. diameter tree, allowing the chemical to overflow freely from the frill and wet the bark and root crown below. The crew for this method consists of a foreman and two laborers, using a jeep for transportation. One laborer carries the axe and does the frilling of the tree, while the other man carries the knapsack sprayer.

For the tree injector method mix 2 qts. 2,4,5-T esters in 4½ gal. diesel oil or kerosene for a total mixture of 5 gal. Shake the container vigorously for one to two minutes in order to obtain a thorough mix. The tree injector is filled by pouring the mix into the cylinder of the injector at the top. Material is applied by jabbing the blade through the bark

near the base of the tree, forming a pocket and tripping the trigger; allow material to fill pocket before removing injector. These jabs should be placed approximately 2 in. apart.

Initial Stump Treatment

As a result of rising costs of labor, transportation, and materials, TVA was searching for some way to reduce unit cost and the total right-of-way budget. While reviewing the right-of-way program, it was found that many tracts of land (farms) were cleared several months before line construction was completed and the line energized. This interval resulted in a medium-to-dense stand of brush ranging from 6 to 20 ft. in height on the right-of-way at the time the line was energized, and a foliage treatment was required during the first summer the line was in service. Initial stump treatment on newly cleared rights-of-way was begun on an experimental basis in 1954 and resulted in a kill of 81% at a cost of $57 per acre of brush. In 1957, TVA established a stump treatment program, which has resulted in treating 12,517 acres of brush at an average cost of $65 an acre.

Chemicals consist of the 2,4,5-T esters and 97 gal. of diesel oil, applied at an average rate of 100 gal. of mixture per acre of brush.

The crew consists of a foreman, a truckdriver, and five laborers. Transportation consists of a 1-ton stake-body truck with no-spin differential and dual wheels to haul chemicals and a 6x6 IHC or Reo 1,000-gal. tank truck equipped with a Hypro pump operated from a PTO. A manifold is installed at the rear of the truck about 7 ft. from the ground to provide an individual hose attachment for each spray gun. This manifold eliminates use of wyes and extra hose lengths, and it also prevents delays due to hose failures and malfunction of guns. They use Bete spray guns attached to a $\frac{3}{8}$-in., lightweight neoprene hose. Protective clothing, consisting of neoprene overalls, overshoes, and neoprene-coated cotton gloves, are provided for these workers.

For initial stump treatment, TVA crew members apply specially formulated chemicals with equipment like that shown in this photograph.

The truck is driven down the center of the right-of-way with men walking behind and spraying small sections of the right-of-way. Where the truck cannot be driven, as is the case on a small percentage of our rights-of-way, hose is laid out or knapsack sprayers are used. All small growth is wetted thoroughly to the ground line. Stumps up to 12 in. in diameter are wetted to the ground line, including the cut surface. When stumps are 12 in. or larger in diameter, they are wetted thoroughly down the side to the ground line, including all exposed roots. The cut surface on larger stumps need not be sprayed except for a distance of 4 in. in from the edge of the stump. Spraying pressure should not be more than 50 psi to save material and to prevent splattering material on areas which should not be sprayed. Low pressure will also help eliminate drift to susceptible plants off the right-of-way.

In the early days of the stump treatment program, some people believed this method had to be used within 72 hours after trees were cut, while it was the opinion of others that it could be deferred two weeks. However,

Danger trees are removed from TVA grounds by using a tree injector which is filled with chemicals to remove unwanted, hazardous trees.

Soil sterilants are applied around steam and hydro plants by a mechanical spreader such as the one that is here operated by TVA crewmen.

TVA has treated stumps at various periods ranging up to a year later, treating all visible stumps and sprouts after the growing season. Results have been highly satisfactory, regardless of the length of time since the brush was cut. Rights-of-way treated by this method have not required re-treatment for at least three years. Work can be performed any time of year, even when the temperature is below freezing, except when ground is covered by snow or sleet. At present, stump treatment is scheduled when right-of-way crews are not engaged in foliage work; however, it is preferred that work be done shortly after the right-of-way has been cleared and before roads and fences are repaired after construction work.

TVA's Weed Control

In June 1959, TVA initiated a chemical weed and brush control program at 28 hydro plants and eight major steam plants. Steam plants have an average of 25 miles of railroad and approximately 20 acres of area which require weed and brush control, including switchyards, transformer yards, fences, and riprap on intake and discharge channels. Hydro plants have an average of four acres that require control.

In order to have an effective soil sterilization program, areas must be surveyed to determine plant growth, species, and density. Annual rainfall, temperature, and soil conditions are also important. We have found that Chlorea granular or Ureabor used at 1½- and 2-lb. rates per 100 sq. ft. are more effective and longer lasting than other soil sterilants. Numerous other chemicals are used in small quantities for treatment of specific problem areas. In projecting a long-range program, it appears that spot treatment will be required each year after initial treatment, using Chlorea granular, Ureabor, or similar material, with the major part of treated areas requiring a re-treatment every two years at a reduced rate of chemicals.

During the last few years, TVA has increasingly relied more heavily on herbicide chemicals for control of woody growth along transmission line rights-of-way. In order to maintain these rights-of-way in the most efficient manner and at the lowest cost, TVA conducts a year-round research program. This program includes studying and experimenting with various chemical formulations, application rates and techniques, equipment, and other conditions to determine methods and procedures for improving the program. It keeps currently informed on research and development of chemicals and equipment by chemical formulators, research institutions, manufacturers, and other utilities. In cooperation with various formulators and other research institutions, TVA establishes field test plots using various chemicals, formulations, and rates to determine their effectiveness on various species of brush. Various types of equipment are also tried on an experimental basis to determine their adaptability to the right-of-way program.

Considerable research has been done with invert or thickening materials, using both air and ground equipment; however, this has not been adopted into our program for large-scale use, since it is more expensive than standard spray mixtures. At present, one of the main concerns of the program is a study of resistant species now remaining on the rights-of-way.

Public Relations

TVA has derived considerable benefit from careful and regulated use of chemicals to control brush on rights-of-way. In con-

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Acres Maintained and Cost Per Acre

The following tabulation is a summary of the right-of-way maintenance work performed since fiscal year 1956

	Helicopter		ASN		Conventional		Basal		Mechanical	
F.Y.	Acres	Acre Cost	Acres	Acre Cost	Acres	Acre Cost	Acres	Acre Cost	Acres	Acre Cost
1956	—	—	—	—	9,894	$78	1,885	$62	2,005	$62
1957	—	—	—	—	7,232	94	1,663	96	1,179	61
1958	—	—	171	*	6,106	95	3,481	85	1,611	59
1959	3,199	$23	6,603	$26	3,038	94	1,153	63	727	67
1960	7,558	19	6,891	24	2,452	55	1,976	63	459	58
1961	10,968	13	5,727	28	2,492	58	1,854	70	612	66
1962	10,079	10	5,575	25	2,708	59	1,287	71	1,265	49
1963	8,126	11	5,266	27	2,337	50	3,096	64	881	46

*Work performed on experimental basis.

How to put the finishing touch on any insect control program

DON'T RUN a needless risk. Complete your program by making sure that empty insecticide containers won't cause problems.

The picture above shows how easily a tractor wheel crushes an empty 5-gallon pail. Puncturing, burying, or burning are other positive ways to deal with containers or packages.

By eliminating the possibility of misuse of a pesticide container you protect yourself, your family, workers and livestock.

The destruction of empty containers—or disposal by other recognized methods—is one of the essential parts of any pesticide program.

To ensure safety and effectiveness throughout your program follow these simple steps: (1) read the label on any pesticide carefully, before you start, (2) follow the directions and precautions exactly, (3) make sure your application goes only on the crop to be protected; drift to neighboring cropland or streams is bad business, (4) never clean or flush out your equipment near a stream, and (5) complete the job by crushing and burying all small empty containers.

To dispose of drums: return them to the formulator, sell them to a cooperage equipped to decontaminate them, or destroy them according to procedures recommended by the U.S.D.A.

Play it safe and you do a great deal to ensure the efficient and profitable performance of any pesticide.

NATIONAL AGRICULTURAL CHEMICALS ASSOCIATION

Current Trends in Sod Production

By BEN WARREN
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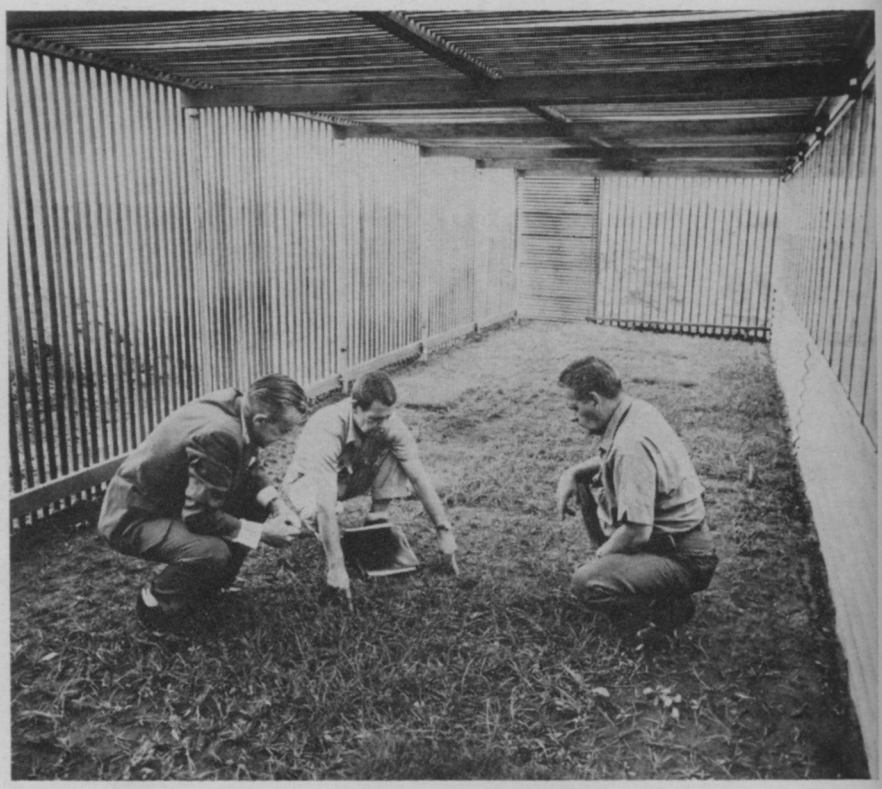
AMERICA'S cultivated sod industry has seen at least two milestones which have been major stimulants to its growth. The development of the powered sod cutters in the late 40's and the introduction of Merion bluegrass in the early 50's contributed tremendously to the expansion of sod growing. Staying ahead of today's business may help to develop other milestones and to correctly evaluate proposed changes as steps forward or backward.

While such changes in the past have arisen without pressure from our industry, more and more such changes should be industry stimulated. Constant evaluation of growing and handling techniques should reveal many places for improvement. With the size the industry is achieving, we should be increasingly successful in encouraging equipment manufacturers to develop machinery designed for our needs.

The labor-consuming job of rolling sod seems to be coming closer to a solution. The entire



Progressive sod producers like Ben Warren (center) perform extensive research on their sod farms. The structure above enables Warren personnel to test new shade-growing Kentucky bluegrass under various sunlight intensities. Looking on above are Robert Warren (right) and marketing advisor W. P. Pettit. Building is in Palos Park, Illinois.

WTT's Sod Industry Section to Be Monthly Feature

HERE IS the first of a new monthly feature of *Weeds Trees and Turf* devoted exclusively to production and marketing of cultivated turfgrass sod in America.

This section is being initiated because of the growing importance of sod farming, and because there is presently no regular coverage of problems unique to sod growers available in other media.

While the section will be of particular value and interest to sod growers themselves, other *WTT* readers will also find these articles helpful. Those who sell or install sod, those who are called on to treat lawns grown from sod, and those who buy sod for installation will find the articles in SIS of note.

Many months in preparation, SIS is the result of extensive surveys of state agricultural departments and turf agronomists, trade associations, turfgrass producers, and others. During the months when data on sod production were being gathered by *WTT's* market research staff, other personnel were assembling comprehensive articles from some of the best minds in the industry today.

In the coming months, this section will deal in detail with such topics as new methods of harvesting sod; advantages of automatic irrigation; new concepts of transporting sod from farm to market; labor management on the sod farm; and other such subjects.

In addition to these feature articles, SIS will contain a number of news and product stories, along with advertising pertaining specifically to sod production.

The editors feel this new portion of *WTT* is a necessary addition because of editorial policies, which have dictated that *WTT* become the single authoritative national monthly covering all three phases of nonfarm vegetation maintenance and control.