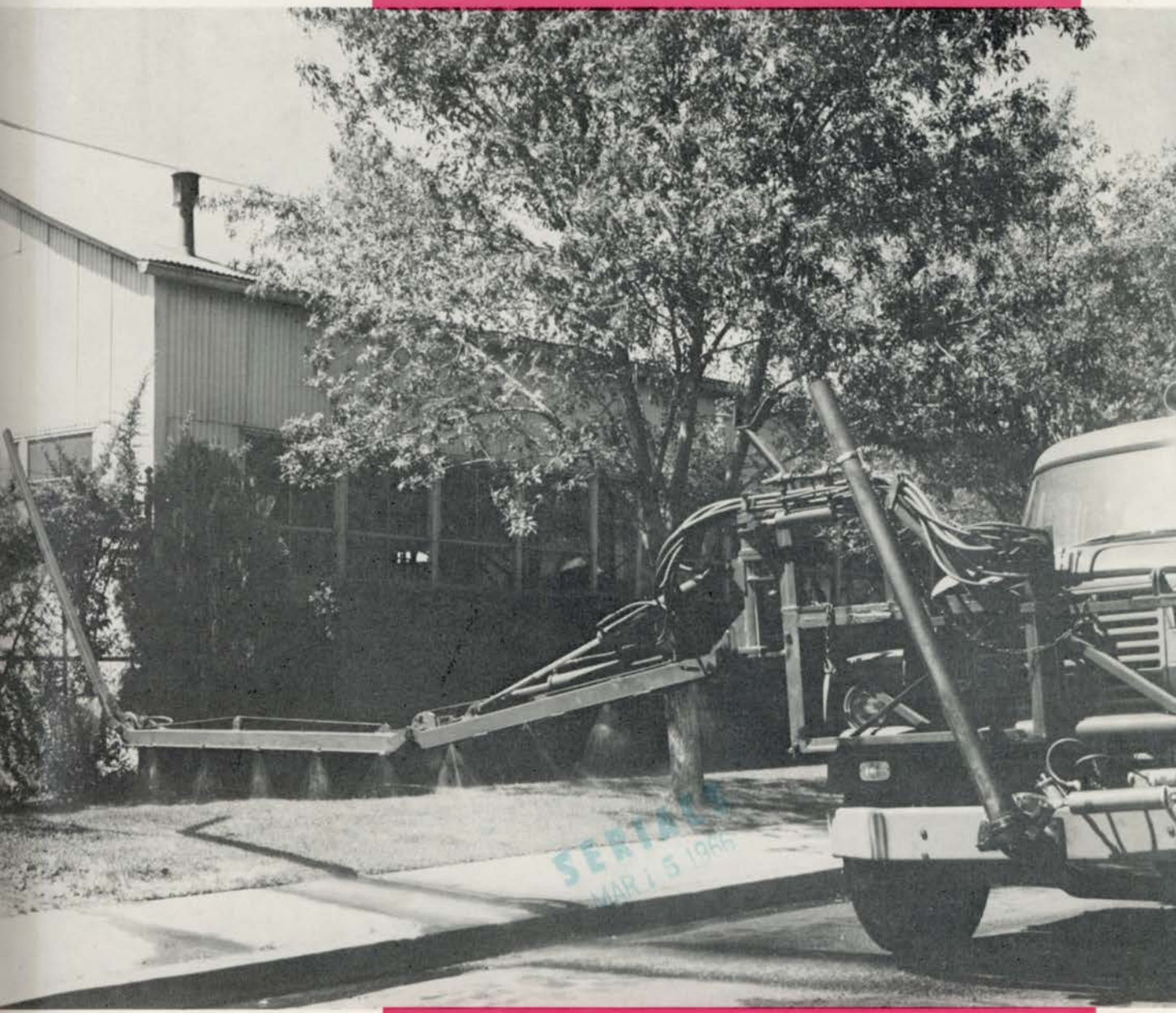
WEEDS TREES and TURF

FORMERLY WEEDS AND TURF

March 1966



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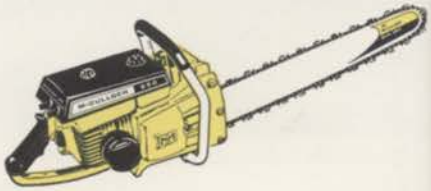

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(continued from front) coarse droplets under a hood close to the ground. The spray pattern leaves no area larger than a dime uncovered... has standard 36-inch swath. Special 18-inch applicator disc attachment available to give full 72-inch swath. ■ You can't make mistakes with the Meter-Miser because complex metering and calibration is eliminated. Simply half fill the 5 gallon tank with water, add pre-measured container of Amchem Meter-Miser herbicide (choose the right one for each job) and finish filling tank with water and spray. One tankful covers 4,840 square feet.

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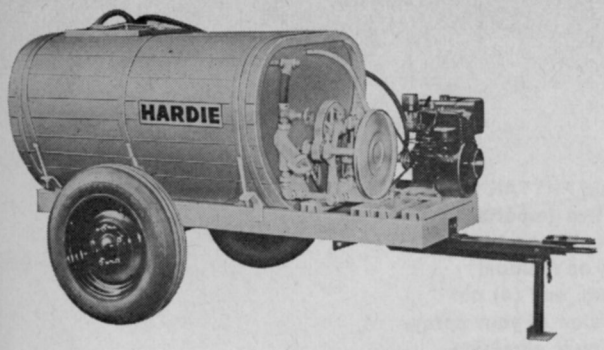

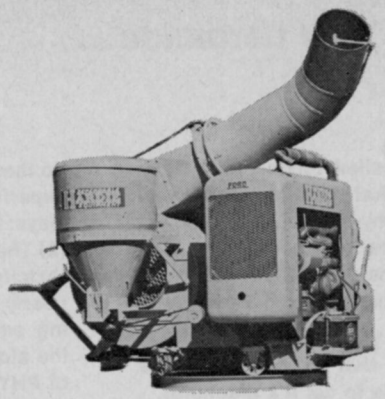

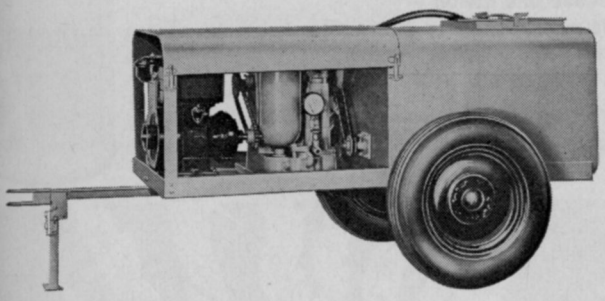

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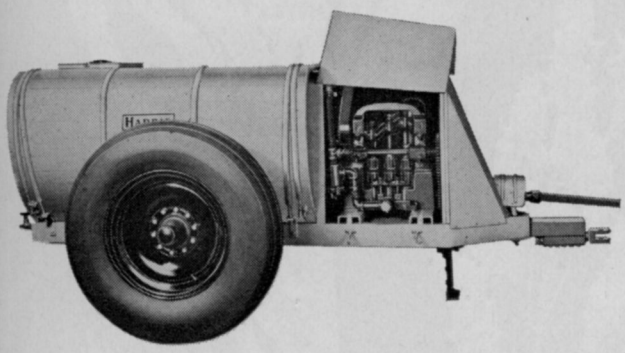

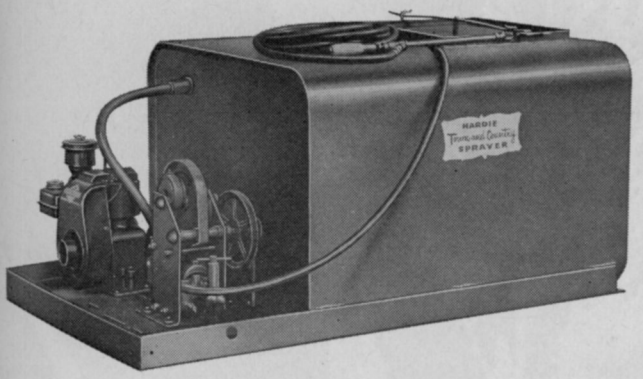

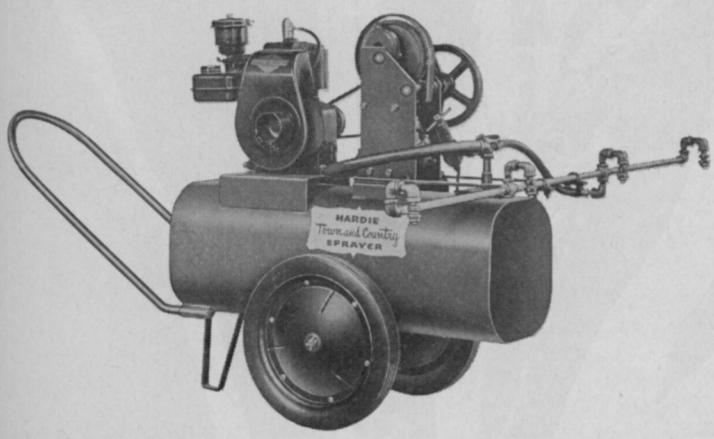

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WEEDS TREES and TURF

FORMERLY WEEDS AND TURF

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Synthetic Turf and Bare Feet

We've been reading in a number of places how man is demonstrating his capacity for improving on nature by scientifically developing substitutions. One of the latest innovations appears to be synthetic turf.

Naturally, we had more than just a passing interest in such materials that simulate the appearance of grass but claim to lack its "flaws," so we sent for some samples.

After examining the little swatches mailed to us, we've come to the conclusion turfmen have nothing to worry about. As my outdoor-loving wife said, "Who'd ever want to walk around in their bare feet on that!"

Granted, the new lawnlike carpeting may enable designers to put the green stuff (although it comes in a number of colors!) into places where turfgrass wouldn't grow anyway, such installations cannot be used in places where man has come to expect the sweet scents of clipped lawn and pungent wet earth, and the miracle of green growing things in their annual cycle of birth and rebirth.

We wondered about a number of angles. No company sent us prices on their turf carpeting, even though we had asked for them. Surely these synthetic ground covers need care, but it is claimed their advantages include mildew, moth, weed, rot, dirt, stain, flame, and stretch *resistance*. Wonder how one keeps them clean, or where the detergent wash water goes when it drains?

Are these grass substitutes strong enough to withstand duffers on a golf green or constant footwear, especially from cleated shoes? It was easy to pull out "tufts of grass" on one of the samples we received, and no matter how hard our yardman tried, he couldn't replace it with a sprig of grass or a planting of seed. How do these easy-to-keep plastic grasses reflect the hot summer sun? Would they feel like the seat of your convertible when its parked with the top down?

Mind you, we're not against progress, and undoubtedly today's entries into the synthetic grass market will improve both in feel and durability, but we're confident manmade turf will have to come a long way before there's even the slightest threat to the future of cultivated sod and those who maintain grass so man can enjoy the greenness of life itself when he steps away from the synthetic tools of his business environment, to relax in nature's great out of doors, to stretch out on the lawn beneath his favorite tree, or experience the refreshing thrill of walking on a dew-covered grass in his bare feet.

Ever see plastic fruit? Looks tempting, but 'tis not very nourishing nor satisfying to the taste.

WEEDS TREES AND TURF is the national monthly magazine of urban/industrial vegetation maintenance, including turf management, weed and brush control, and tree care. Readers include "contract applicators," arborists, nurserymen, and supervisory personnel with highway departments, railways, utilities, golf courses, and similar areas where vegetation must be enhanced or controlled. While the editors welcome contributions by qualified freelance writers, unsolicited manuscripts, unaccompanied by stamped, self-addressed envelopes, cannot be returned.

Liquid vs. Solid Fertilizers

By DR. JAMES A. SILVA
Soil Scientist
College of Tropical Agriculture
University of Hawaii, Honolulu

FERTILIZER materials which are in solution, moved and stored in tanks, and transferred through pipes by pumps or gravity are called "liquid fertilizers." Anhydrous ammonia is one example of a liquid fertilizer which is held under pressure. But aqua ammonia, a solution of anhydrous ammonia in water, is a liquid fertilizer which is not held under pressure. Nutrients supplied by liquid fertilizers must be water soluble so they are readily available to plants as long as they remain in solution.

To compare liquid fertilizers with solid forms, first of all, consider the various liquid fertilizers used to supply nitrogen (N), phosphorus (P), and potassium (K).

Ammonia Lost from Liquid

Anhydrous ammonia is ammonia gas kept under extreme pressure so that it is a liquid. This fertilizer, which contains 82% N, must be handled and applied with special high-pressure equipment.

Another widely used liquid nitrogen fertilizer is aqua ammonia; it is simply anhydrous ammonia dissolved in water. This fertilizer contains 15 to 25% N and is not held under pressure, and is much easier and safer to handle and apply than anhydrous ammonia.

Ammonium nitrate, and various ammonium phosphates, are sometimes added to aqua ammonia to obtain a higher ratio of N in liquid mixtures. These materials also are used alone to supply N, or both N and P. Nitrogen often is supplied as urea (a synthetic organic nitrogen carrier) and also by various natural organic nitrogen carriers such as fish emulsions.

One of the difficulties experienced with anhydrous and aqua ammonia is the loss of ammonia by volatilization. This is detected by the smell of ammonia after the fertilizer is applied. When applied to acid soils, ammonia losses may be as high as 15%. On alkaline soils, volatilization losses can exceed 50%. Thus, to minimize loss, it is necessary to inject these materials below the soil surface. Application of anhydrous and aqua ammonia in irrigation water also greatly reduces volatile losses.

The other liquid forms of nitrogen mentioned usually do not volatilize when applied properly. Some of the inorganic forms of nitrogen can "burn" leaves when applied in high concentrations directly on plants. Organic sources of N, on the other hand, are less likely to burn leaves and are preferred for foliar applications.

Phosphorus Popular In Compound Form

Phosphorus is supplied in liquid form as phosphoric acid (H_3PO_4), and also as various ammonium and potassium phosphates. Phosphoric acid, which contains about 24% P is very corrosive and must be handled in stainless steel or rubber-lined containers.

Where soils are very alkaline, phosphoric acid is applied directly to the soil. In most areas, however, phosphoric acid is neutralized by adding aqua ammonia before application. These mixtures are much less corrosive than phosphoric acid, and ordinary steel containers can be used to handle them. Phosphorus found in liquid phosphorus fertilizer is completely water soluble which makes it readily available to plants.

Potassium Chloride: Most Common K Carrier

Muriate of potassium (KCL), or potassium chloride, probably is the most common carrier of potassium used in the liquid form. It is a solution of solid KCL in water. Sulfate of potash and potassium phosphate also are used as liquid carriers. Potassium solutions are very corrosive and proper care of equiment used to handle these solutions must be practiced. However, the addition of aqua ammonia to the KCL solution reduces its corrosive powers considerably.

Various mixtures of N, P, K, and their compounds are used to make liquid fertilizers at different N, P, and K ratios; for example, 15-2-4 and 6-5-10. These mixed fertilizers cannot contain more than about 20% total N, P, and K (by weight), because it is not possible to dissolve more in a given volume of water.

Oxide Statement Confuses

The expression of plant nutrients in the elemental form, P and K, rather than the oxide form, P_2O_5 and K_2O, is being done for greater clarity and simplicity. Although phosphorous and potassium have been expressed as oxides for many years, considerable confusion often occurs in discussing and reporting fertlizer trials, for example. Use of the oxide statement is actually incorrect, since these nutrients

are not in the P_2O_5 and K_2O form in fertilizers. These are some of the reasons national soil and agronomic societies recommend the use of the elemental form to denote plant nutrients. It is very simple to convert from one form to the other by multiplying by appropriate factors shown in Table 1.

Liquid vs. Solid Fertilizer

Now that some of the liquid fertilizers have been discussed, let us see how they compare with solid fertilizers.

Liquid fertilizers have several advantages over solid forms, and some are listed below.

1. Convenience in handling; i.e. by pumps and gravity.
2. Easy to obtain uniform mixtures and applications.
3. Easy to place in bands or rows.
4. May be applied with irrigation water.
5. Phosphorus availability increases.

Liquid fertilizers characteristically also have several disadvantages when compared with solids. For example:

1. Liquids corrode metal containers and other equipment.
2. Possibly, nitrogen is lost by volatilization of ammonia in some carriers.
3. Phosphorus is "fixed" in certain soils.
4. Total plant food in solution is limited to about 20%.
5. Larger quantities of liquids must be applied with some carriers to obtain equivalent amounts of plant food supplied by solid forms.

Crop Response Compares Forms

The response of crops to nutrients applied in the two forms is probably the most important comparison. Many experiments have been conducted to compare the yield response from liquid and solid forms of fertilizer. Generally, when properly used, equal response is obtained with anhydrous ammonia and nitrogen solutions as with the same amounts of actual N applied in the solid form.

The sugar industry in Hawaii conducted an extensive series of experiments comparing liquid aqua ammonia and solid ammonium sulfate. No difference in yields of cane or sugar was found.

These results, as well as the fact that aqua ammonia was cheaper than ammonium sulfate, encouraged the industry to shift from solid ammonium sulfate to liquid aqua ammonia.

Coastal bermudagrass yield response to liquid fertilizers was

Table 1. Oxide-elemental Conversion Methods.

Percent or Pounds		Multiply by factor		Converted to Percent or Pounds
Conversion from oxide to element				
P_2O_5	×	0.44	=	P
K_2O	×	0.83	=	K
Conversion from element to oxide				
P	×	2.29	=	P_2O_5
K	×	1.20	=	K_2O

Adapted from: Crops and Soils. 1962. 14:(6):5-7.

Table 2. Yield of Wheat Forage as Influenced by Source of P.
(Norfolk sand loam, Alabama, 1957.*)

Source**	Form	(lbs./A) Dry Forage
None	—	1321
Concentrated superphosphate	solid	1923
Ammonium metaphosphate	solid	1925
Ammonium metaphosphate	liquid	1965
Diammonium phosphate	solid	1920
Diammonium phosphate	liquid	2047
Ammonium superphosphoric acid	liquid	1837
	LSD (.05)	453

*Adapted from: Lathwell, D. J., Cope, J. T. Jr., Webb, J. R. 1960 Agronomy Journal 52:251-254.
**P applied at 9 lb. (20 lb. P_2O_5)/A banded in the row.

Table 3. Comparison of Liquid and Solid Fertilizers for Coastal Bermudagrass
(Cecil sandy loam, Athens, Georgia, 1962.*)

Treatment	Pounds per acre N-P-K	Forage yield /A (Oven-dry) Total of 4 clippings
1. Liquid 14-3-6	100-22-42	2871
2. Solid 16-3-7	100-22-42	3494
3. Liquid 14-3-6	200-44-84	5161
4. Solid 16-3-7	200-44-84	7073
5. Liquid N sep. Liquid H_3PO_4 and KCl sep.	200-44-84	6025
6. Liquid N & H_3PO_4 mixed KCl sep.	200-44-84	6673

*Adapted from: Morris, H. D. 1964. Georgia Agr. Res. Ga. Agr. Exp. Sta. 5:16. (Fertilizer ratios in the original article were in terms of P_2O_5 and K_2O.)

Table 4. Comparison of Liquid and Solid Forms of N for the Application of 50 lb. N per Acre of Turf.

Form of Fertilizer	Liquid	Solid
Source of N	NH_4NO_3	$(NH_4)_2SO_4$
%N in concentrated material	17	21
Dilution of material for application	1:60	none
%N in applied material	0.4	21
Amount of conc. material for 50 lb. N/A	26 gal.	238 lb.
Amount of diluted material applied /A	1,560 gal.	238 lb.
Weight of material applied /A	12,500 lb.	238 lb.

compared to that from solid fertilizers in Georgia. Some data are presented in Table 3. A comparison of treatments 1 and 2, and treatments 3 and 4, shows that liquid fertilizers gave lower yields than solids; this difference being greater at the higher rate of application. The author of that article states that yield difference may be due to plant poisoning by the liquid fertilizer, since foliage on plots that received liquid fertilizer, in any form, was injured. Injurious effects disappear about two weeks after application. The liquid nitrogen used was composed of one-half urea and one-half ammonium nitrate. Concentration of the fertilizer solution was not given, but it appears that the concentration was too high because leaves were burned.

A comparison of treatment 5 with 6 shows a 648-lb. difference in yield in favor of treatment 6. The only difference between these two treatments is that liquid nitrogen in treatment 6 was applied separately, followed by H_3PO_4. The liquid in treatment 8 was mixed with the H_3PO_4 before application, and they were applied together. The author suggests this increased yield is due either to a reduction in loss of nitrogen from urea in the nitrogen solution, a decrease in the phytotoxicity of the materials from mixing, or a combination of these factors. These data emphasize the fact that application of liquid fertilizers in too high concentration can seriously damage grass.

Equal crop response, therefore, has been obtained from the proper application of either liquid or solid forms when the same amount of actual N, P, and K has been applied.

Should You Use Liquid or Solid?

Since liquid and solid fertilizers give the same yield response, which form should be used? In order to answer this question, one must evaluate several factors concerning these two forms of fertilizer. Two of the most important factors are relative cost per unit of plant nutrient and application costs of the two materials. Also considered must be the relative concentrations of nutrients in the final volume of applied material.

Data in Table 4 illustrate some calculations which should be made during the evaluation of the two forms. A liquid nitrogen fertilizer containing 17% N, such as ammonium nitrate (NH_4NO_3), is compared with a solid nitrogen fertilizer containing 21% N, ammonium sulfate ($(NH_4)_2SO_4$). The liquid material weighs about 11.5 lbs. per gallon and is supplied in 30-gal. drums, while the solid material comes in 80- or 100-lb. bags. Manufacturers recommend

(Continued on page 16)

Book Review

Management of Artificial Lakes and Ponds

by George W. Bennett, Reinhold Publishing Corp., 430 Park Ave., N. Y., N. Y. 10022, 1962, 283 pp. $8.00.

Management of Artificial Lakes and Ponds deals with a complex subject. But the author displays an intimate knowledge of limnology, ecology, botany, zoology, ichthyology, conservation, and control, which enables him to sift practical information from a voluminous bibliography of technical material. He includes in his text adequate theory and a maximum of useful advice for those interested in water management.

Contents vary from the history of fish culture, through a discussion of kinds of excavated water bodies as possible habitats for game fish, to a consideration of fish as a productive crop, their reproduction and mortality.

The most important chapter for readers of this magazine is called "Theories and Techniques of Management." Included in this section are subjects of rough fish control and aquatic weed control. Both are dealt with from a management standpoint.

Information on weed and water relationships is invaluable to controllers who seek to make the best possible use of water without nuisance weeds. *Management* is not a handbook for removal of aquatic weeds from standing water, even though it contains a chart of recommended materials and rates to control various weeds. It is designed for the lake manager, whose duty ranges widely, but it is equally useful to the aquatic weed controller seeking new markets for his service. If aquatic weed controllers expect to cultivate business from commercial, municipal, or state recreational establishments, they will have to be familiar with the ideas, and needs of lake, pond, or aquatic game managers. This book helps to supply that familiarity.

Management is easy to read. Author Bennett's style reflects many years of association with people who knew less about limnology and ecology than he, and who wanted to learn. His book conveys concepts in an understandable way: "Prospective homeowners who contemplate purchase of lots for permanent homes on small lakes should insist on a sewage (septic) system which will carry all effluents away from the lake. Effluents from tile fields enter the lake, and because they carry phosphates and nitrates, they act as fertilizers which stimulate aquatic vegetation and create nuisances."

Bennett is a writer with humor: "One type of *Spirogyra* (algae) is notoriously slippery, and once I saw a bather slip and sit down at the top of a steep spirogyra-covered lake spillway and slide entirely to the bottom before he could stop . . . Needless to say, he repeated the act until the algae as well as the seat of his bathing suit was practically gone."

Judging from the scant number of books on this subject, *Management of Artificial Lakes and Ponds* is welcome, and just in time, if not a decade overdue.

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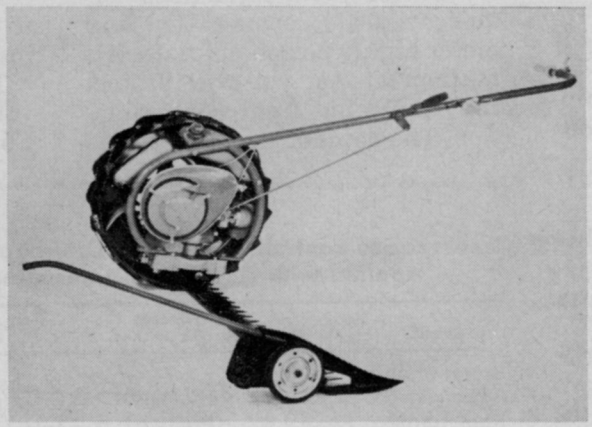

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New Injection System for **Killing or Curing Trees**

By MICHAEL NEWTON
Assistant Professor of Forest Science
Oregon State University, Corvallis

CONVENTIONAL equipment used to control undesirable trees is often bulky, wasteful of chemical, and awkward to use on multiple stems or many-forked trunks. A new injection instrument, the Hypo-Hatchet, has given consistent plant control results on a variety of hardwoods and conifers. Unlike most injectors and hand spray equipment, it can be operated without serious problems.

Impact Injects Dose

This new, lightweight hatchet is a precision instrument. It weighs about 3 lbs. and operates automatically upon impact. No chemical is released until the blade has penetrated its target. A check valve system eliminates drip from chemical outlet holes in the hatchet blade, and the chemical reservoir is lightweight plastic, carried or worn anywhere that is comfortable for the user. A self-priming, positive-dislacement pump supplies a consistent chemical flow, even if the reservoir is worn below the hatchet usage level. Under steady use, one full reservoir, about 2½ lbs., should last roughly one-half a day at injection rates of 0.5 ml. per cut. Any dosage volume up to 1 ml. may be calibrated, and production models will deliver more.

Hatchet injector blade is wedged into the vascular system of a tree for treatment. Only small, predetermined chemical doses are injected at each impact.

New Hypo-Hatchet injects tree curing or killing chemicals through small holes just above the sharpened edge of its blade. Liquid is fed from the flexible tubing through the hatchet handle and is closely metered by a check valve system.

Many injected compounds are effective and have limited foliage toxicity (see Table). Additional combinations of chemicals for the treatment of more species will be found.

Hatchet Used for Systemics

Use of the Hypo-Hatchet is not limited to tree killing. Control of insects with systemics requires a sealed system that will meter highly poisonous materials with precision, yet will protect the applicator from contamination. The hatchet is ideally suited for insecticides now in use. Antibiotics for tree disease control, such as Actidione in blister rust control, may be applied more efficiently with this system than with current methods. However, formulations of healers or killers first must be matched for compatibility with the vascular system of the treated tree or plant species.

This system should find wide usage in many aspects of vegetation management. Benefits will be labor savings for tree thinning, forest and tree stand improvement, rights-of-way conifer control and other uses, combined with its versatility for systemic insect and disease control.

The Hypo-Hatchet is being developed by the Ansul Chemical Co. in Marinette, Wisconsin.

Chemical reservoir is worn at waste level and a pump supplies a constant even flow of liquid to the hatchet's check valve system. This worker is injecting a modern chemical which minimizes sprouting.

Tree species controlled with undiluted compounds. All treatments were applied with 0.5 ml. injections spaced at various distances.

Species	Herbicide (0.5 ml.)	Cut Spacing (inches)	Trade Name (remarks)
Sugar maple	2,4-D amine	3	Weedar 64
	Picloram + 2,4-D	6	Tordon 101
Red maple	Picloram + 2,4-D	3	Tordon 101
Prunus spp. (cherries)	2,4-D amine	9	Dow formula 40
	Picloram + 2,4-D	9	Tordon 101
	Cacodylic acid	9	Ansar 160
Bigleaf maple	Picloram	6	Tordon 22K
	Potassium silvex	6	Kurosal SL
Red alder	2,4-D amine	3	Dow formula 40
	Dicamba	6	Banvel-D
Douglas fir	Cacodylic acid	9	Ansar 160
	Picloram + 2,4-D	9	Tordon 101 (Root graft problems)
	Picloram	9	Tordon 22K (Root graft problems)
Sitka spruce	Picloram + 2,4-D	6	Tordon 101
Western hemlock	Cacodylic acid	6	Ansar 160
	Picloram + 2,4-D	6	Tordon 101
Grand fir	Picloram + 2,4-D	6	Tordon 101
	Cacodylic acid	6	Ansar 160
Eastern white pine	2,4-D amine	6	Weedar 64

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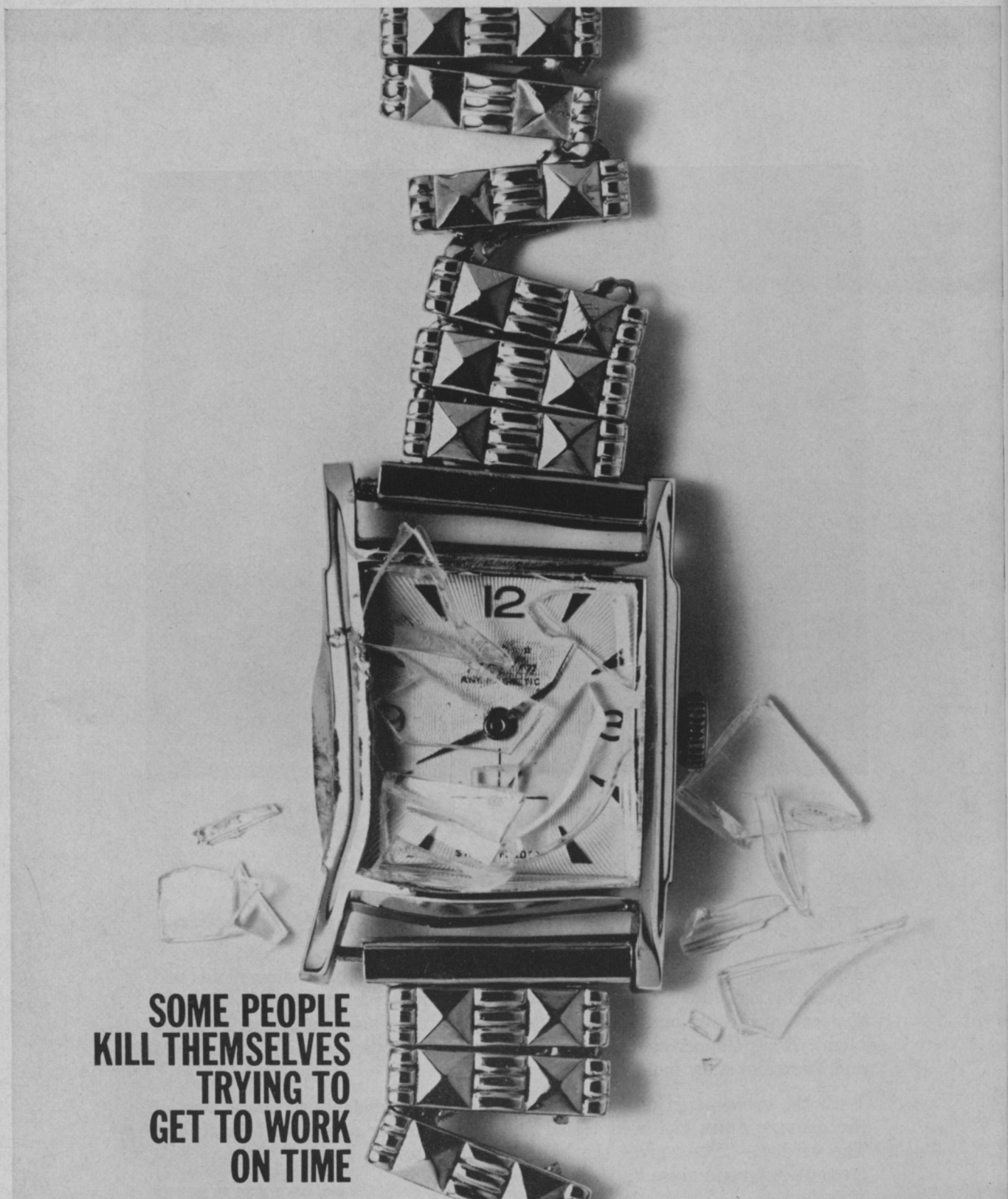

SOME PEOPLE KILL THEMSELVES TRYING TO GET TO WORK ON TIME

Getting your employees to and from work alive is a full-time job. *Yours.* And it's not just a matter of public welfare, either. Off-the-job traffic accidents cost American industry millions of dollars in lost time, training and production every year. Last year alone, more than twenty thousand workers were killed in off-job motor vehicle accidents. And more than 750,000 were injured. Motor vehicle accidents claimed more than 1½ times as many lives as on-the-job accidents. Can you do something about it? You really can't afford not to. Write now, to the National Safety Council for information on what you and your company can do. Address your letter to the Director of Public Information, National Safety Council, 425 N. Michigan Avenue, Chicago, Illinois 60611. *Published to save lives in cooperation with The Advertising Council and the National Safety Council.*

Hydraulic boom with three 8 ft. sections, that can be operated independently of each other, are part of this truck used by California highway department.

How We Control Vegetation at the California Division of Highways

By DAN CASSIDY

Landscape Specialist, California Division of Highways, Sacramento

IT IS THE POLICY of the Maintenance Department of the Division of Highways to replace as much as possible the blading, discing, and mowing, with the less expensive chemical methods. Low rates of chemicals are being used to eliminate fire hazardous grasses and to leave within the sprayed areas those plants that do not cause a fire hazard or problem to the maintenance of the highway or to the surrounding farmers or home owners. Plants such as Turkey mullen, Baccharis, Alfalfa where no seed crops are being grown, and many other low growing plants may be left within these areas.

Objective: Fire Prevention

In the past, the chemical spraying was limited to a 4 foot strip placed to prevent fires from spreading from the right of way. The present chemical control is now started from the edge of the pavement outward to prevent fires from starting. An added benefit of the spraying has been a reduction in the noxious weed population. A reduction in the amount of mowing needed has reduced the cost of roadside care and eliminated the duff caused by repeated mowings. This dry material is believed to be responsible for many roadside fires. Certain weeds have been a host for insects that damage surrounding farmers' crops and spray rates may be adjusted in these areas in the annual spray program to eliminate such weeds. Some of these insects have been the beet leafhopper in the Imperial Valley and aphids in the Salinas Valley.

This spray program is planned to be done annually and is started in the late summer or fall of each year. We feel this annual program is the safest possible method of controlling vegetation. We use a basic spray rate of 4 lbs. of Simazine in 100 gals. of water per acre. Addition of Amino-Triazole is sometimes necessary when spraying is done later in the year after the annual grasses have germinated. In landscaped areas, low rates of soil-acting herbicides are being used after the plants are established, ones that have been in the ground one year. Materials such as Simazine at 1 to 2 lbs. active per acre in 100 gals. of water may be sprayed directly over the plantings with no damage to existing plants. Some other materials being used in landscape plantings are Dymid or Enide and Casaron. In areas where spraying of vegetation control chemicals would be objectionable, such as areas with very erodible soil, diamonium phosphate has been sprayed on the mature annual vegetation. This has been moderately suc-

Two 60-gal. stainless steel tanks, mounted behind 2000 gal. water tank, are shown in this rear view of, all-purpose vegetation maintenance spray rig described in this article.

This article is based on a paper given at the 18th Annual California Weed Conference in San Jose, Jan. 18-20, 1966.

cessful but there is need for a better method of making this material stick to annual grasses through the entire fire season, because light rain or heavy winds can dissipate this material.

Testing Growth Inhibitors

Growth inhibitors are being tried under varying climatic conditions. As yet no material or method has been found to control annual fire hazardous vegetation at a height that would make it unnecessary to mow. Some satisfactory results have been obtained on inhibiting the growth of shrubs that formerly were pruned often, such as those around headlight screens in narrow median divider strips, or shrubs in planter boxes on freeway islands that must be kept low for sight distance. These plants can be sprayed rather quickly in comparison to the time it takes to prune and haul the brush, to say nothing of the hazard caused to the traveling public and the men doing the work.

We believe that one of the greatest needs is for effective growth inhibitors, or better methods to apply these growth regulators that can be used at different times of year and will not cause noticeable damage to the plant.

The past year has seen increased use of contact sprays on freeway ground cover plantings. These materials are being used to edge ice plant and ivy, doing away with a very expensive method of cutting with mechanical edgers and the problems of hauling and disposal after cutting.

Built Versatile Spray Rig

A number of different types of spray rigs are used by the spray crews in different areas of California. Several years ago the Division of Highways Equipment Department took a commercially available hydraulic boom and adapted it for use on the front of the spray truck so the equipment operator could work from the cab and both he and the driver could see the spray operation. This boom has three 8 ft. sections that can be operated independently of each other to follow the contour of the ground or be moved out of the way of obstructions. Nozzles in each section may be independently or collectively operated. During the past year a further improvement in spray equipment has been made by the Equipment Department. A 2000 gal. tank was mounted on a truck frame with two 60 gal. stainless steel tanks mounted behind the large tank. Two separate chemicals may be mixed in a heavily concentrated form in each of these tanks; a proportioner pump will measure and mix the material from either or both 60 gal. tanks at any rate per acre that is desired. The 2000 gal. tank needs to carry only water, so the unit may be taken off vegetation spraying and be used for watering planted trees and shrubs without the need of cleaning out tanks or the danger of some chemical being left in the unit after cleaning which might damage plantings.

Different areas of the state of California, variable climatic conditions and diversified land use adjoining the highways and freeways, call for different methods of vegetation control. We feel we have been progressive in trying new chemicals and developing new equipment for this program.

Liquid vs. Solid Fertilizers

(from page 10)

that 1 quart of the concentrated liquid fertilizer be diluted to 15 gals. with water (1:60 dilution) and applied to 500 sq. ft. of turf, approximately 0.01 acres. Nitrogen concentration in this diluted solution is about 0.4%, and when applied at the recommended rate it will supply about 50 lbs. of N per acre.

It will require about 26 gals. of the concentrated liquid to supply 50 lbs. of N per acre of turf. When this is diluted 60 times, volume will be 1,560 gals. which weigh nearly 12,500 lbs. In contrast, ammonium sulfate, which does not require dilution, will supply 50 lbs. of N in 238 lbs. of material.

When liquid fertilizers are applied by broadcast methods to turf or foliage, considerable dilution must be made to prevent plant injury. This dilution results in a marked decrease in the amount of nutrient contained in a unit of the diluted solution and makes large-volume application necessary.

An alternative procedure would be to inject it in a more concentrated form below the ground surface to minimize burning. However, this can be an undesirable practice for turf. Another solution to the problem is to apply concentrated liquid forms into the irrigation water when sprinkling and avoid hauling the large quantity of water. Various metering devices can be obtained for this purpose.

The fact that a large quantity of diluted material is necessary when using liquid fertilizers on turf does not mean that liquid forms are more costly than solids. Ease of handling liquids by pumps or gravity, and their application in irrigation water, may keep cost of using liquid fertilizers relatively low. However, each operator must decide this on the basis of what handling and application costs are for his set of conditions and with his facilities. The cost of the *entire* operation must be considered when the decision is made.

Liquid and solid fertilizers, when properly applied, have been equally effective in producing crop response when compared on a per-pound-of-plant-food basis. In the use of each form, there are certain advantages and disadvantages, and these must be considered. Under certain conditions, the increased ease of handling liquids by pumps or gravity and application in irrigation water or by other means may make liquid fertilizers most economical. Hence, cost to handle and apply the two forms must be considered as well as the cost per unit of plant food in the two forms of fertilizer.

Selective Weed Control Advancing, Mullison Tells 19th Southern Weed Conference in Jacksonville

Changing concepts in weed control was the theme at the 19th Annual Southern Weed Conference, Hotel Robert Meyer, Jacksonville, Fla., where nearly 1,000 representatives of colleges, industry, and government gathered Jan. 18-20. The three-day conference included nearly 20 talks on practical weed control methods for lawns, public and private grounds and rights-of-way, streams and ponds, rangelands, and forests.

Selective Herbicides Coming

"Tomorrow's weed controller will use the prescription approach," Dr. Wendell R. Mullison, of The Dow Chemical Co., Midland, Mich., viewed as the keynote speaker. "Herbicide X," he said, "will have greater biological activity and selectivity from the point of physiological tolerances. Herbicide persistence and decomposition will be controlled. We want the material to last exactly as long as it's needed, then disappear. New products will be safer to use, safe to man, animals, wildlife, and our environment in general.

"In addition to the Herbicide X, a selective seedicide may be developed, and certainly the related properties of desirable nematocidal and soil fungicidal action are being investigated."

Prior to 1940, Mullison recounted, only about 14 chemical weed killers were known, most of them inorganic compounds. Today, there are more than 125 well-known herbicides.

"The increased availability of a variety of materials," he added, "makes possible another concept in weed control, and I call this the 'prescription approach.' As our knowledge of weeds and herbicides grows, there will be not only more combinations available for the operator to mix in his tank, designed to solve specific problems, but there will also be more than one active ingredient in many commercial formulations."

Mullison explained that because of a higher level of education and the increasing labor shortage, the future weed controller will be much quicker to adopt new weed killers and novel application methods.

Chemical Mixes Kill Herbs

Recapping the modern trends for combination herbicide products, T. J. Hernandez, E. I. duPont de Nemours & Co., Wilmington, Del., said, "Bromacil or diuron weed killers are often used in combination with other weed killers. Some of these are chlorates, TCA, weed oils, and hormone-type weed killers. Bromacil or diuron combined with these materials makes use of the different vegetation control properties of each compound and therefore provides more efficient weed control."

Reviewing a few of the standard combinations used in the weed control industry, Hernandez outlined the dosages and mixtures available. "A combination of 3 to 8 lbs. of bromacil or 10 to 20 lbs. of diuron with 120 to 150 lbs. of chlorate-borate or chlorate-chloride mixtures has been used extensively by railroads and other industrial concerns. Chlorates in this combination provide good contact action. Also, they are highly soluble and readily move down into the root zone of deeply rooted plants. Bromacil and diuron prevent seedling regrowth by remaining near the surface. Higher rates are used for initial treatments and lower rates after perennials are eliminated.

"Bromacil or diuron applied at similar rates combined with 80 to 120 lbs. of TCA per acre have been very effective where bermudagrass is prevalent. TCA in the mixtures gives both contact and systemic toxic action.

"When hard-to-kill broadleaf weeds or vines are present, hormone-type weeed killers, 2,4-D or 2,4,5-T, with bromacil or diuron will improve overall control. Amine formulations are preferred because they are easier to mix and are less hazardous to adjacent desirable vegetation."

Hernandez stated that weed oils in combination with bromacil or diuron have been successfully used in the northern areas of the country to provide rapid top kill and residual control of annual weeds. "This combination has not been readily accepted in the southern areas of the country. There, oils contribute little to the control of hard-to-kill perennial grasses, such

New Southern Weed Conference officers elected to reign in 1966 are (from left): President-elect, Robert A. Mann, Tennessee Valley Authority, Chattanooga, Tenn.; Donald E. Davis, new President from Auburn University, Auburn, Ala.; Site Selection Chairman, James L. Taylor, Thompson-Hayward Chemical Co., Gainesville, Fla., and Secretary-Treasurer, H. H. Funderburk, Auburn University, Auburn, Ala.

as johnsongrass, bermudagrass, nutgrass, vasey, and dallisgrass."

Rain Affects Herbicides

Discussing the influence of rainfall on herbicides, Dr. Anson R. Cooke, Biological Research Director, Amchem Products, Inc., Ambler, Pa., pointed out that rainfall can influence the performance of certain preemergence herbicides.

"How much rainfall is necessary to activate a preemergence herbicide? How much rain must fall before the herbicide is leached from the zone of germinating weed seeds? How much rain does it take to move the herbicide to where the crop seed is germinating, with resulting injury to the crop?" Cooke attempted to answer these three questions by setting up a controlled study concentrated into a single growing season.

"From our tests," he announced, "conducted with artificial rain, we found that by substituting common, soluble formulations with less soluble derivatives of the same products, weed control often remained constantly high. This happened even when initial rainfall varied from 0.5 to 2 inches. The more soluble forms, on the other hand, often gave poorer weed control when carried too deeply by a single heavy rain of an inch or more."

Dr. Wendell R. Mullison, Dow Chemical Co., Midland, Mich., said, "Tomorrow's weed controller will use the prescription approach," adding trends will be toward more selective and predictable herbicides to give modern control.

With such knowledge, Cooke concluded, it may soon be possible to formulate preemergence herbicides on a more-or-less custom basis depending on the average normal rainfall for a given area. In an area with normally high rainfall, for example, a rather insoluble form of herbicide might be provided, while a more soluble form of the same weed killer might be furnished areas of normally low rainfall.

Weeds Crumble Asphalt

William J. Bowmer, of the Range Science Department, Texas A & M University, College Station, told attentive conferees that plants growing up through asphalt cause it to crumble and make repairs necessary. Bowmer announced that a pilot project is underway to study herbicides in asphalt by the Texas Transportation Institute at the university.

"In preliminary tests," Bowmer explained, "seven herbicides were selected and applied in three different methods: applied to open areas and left uncovered, applied to open soil and covered with an asphalt cap, and mixed with the asphalt before it was laid down. Results indicate that some oil-soluble herbicides may be effective when applied directly in asphalt, although the other methods show some promise." He added, past experience has shown that herbicides applied to the base material should be distributed through approximately the top ¼ inch to be most effective. However, a great deal more work needs to be done with herbicides in asphalt before recommendations can be made, he said.

'gatorweed Controls Tested

"The most effective control for floating mats of alligatorweed in Louisiana tests was obtained with 4½ lbs. of 2,4-D and 15 lbs. of diglycolic acid applied in 300 gals. of water per acre," Dr. J. A. Foret, Professor of Horticulture, University of Southwestern Louisiana, Lafayette, reported. Dr. Foret explained the testing of control methods for alligatorweed in Louisiana conducted by himself, Dr. S. L. Solymosy, and Dr. F. W. zurBurg, both Southwestern Louisiana U. staffers.

"One of our main weed troubles stems from the Chagres

River that flows at an average of 2,000 cu. ft. per second," J. S. Hearne, Chief of the Dredging Division of the Panama Canal Co., announced. "The river brings with it many thousands of all kinds of aquatic growths: waterhyacinth, waterlettuce, elodea, coontail, cabomba, many cords of driftwood, and grasses, to name a few.

Booms Used to Catch Drift

"Driftwood is caught by a huge boom across the river which funnels the drift into a lagoon where it is removed by a large rake. Much of the drift passes over or under the boom and must be gathered up by workboat crews," Hearne said while explaining methods used to keep the Panama Canal clear of aquatic plants.

"As far back as 1913, the waterhyacinth was a primary cause of trouble, and even today it has not been eradicated," Hearne explained. "In areas where there is a continuous stream flow entering the Canal channel and Gatun Lake, spraying is not the answer. The use of log booms, which are on all the streams emptying anywhere near the Canal channel, is one reason we have been able to keep water hyacinth under such good control," he added. "The booms have failed to resolve the problems of submersed weeds, because they slide under the floating booms and move with the currents to infest other areas." Hearne noted that elodea and coontail were controlled with outstanding success by using copper sulfate applied by hand or mechanical sprayers.

New experiments are being conducted with the assumption that each area in the Canal Zone will have its special set of characteristics. Underwater earth samples will be taken from the bottoms of various areas and placed in test containers to observe weed regrowth. Raw copper is one product being studied that may deter regrowth for long periods. One handicap, Hearne said, is that only a limited number of chemicals will be allowed in Gatun Lake because that water is used for drinking, swimming, cooking, and fishing.

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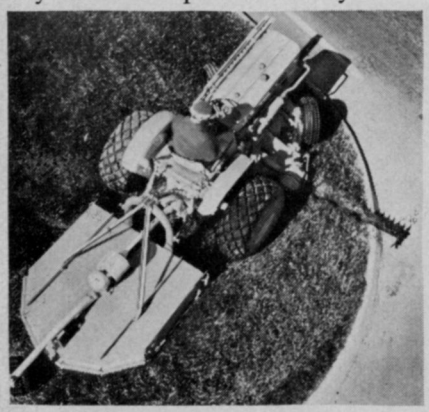

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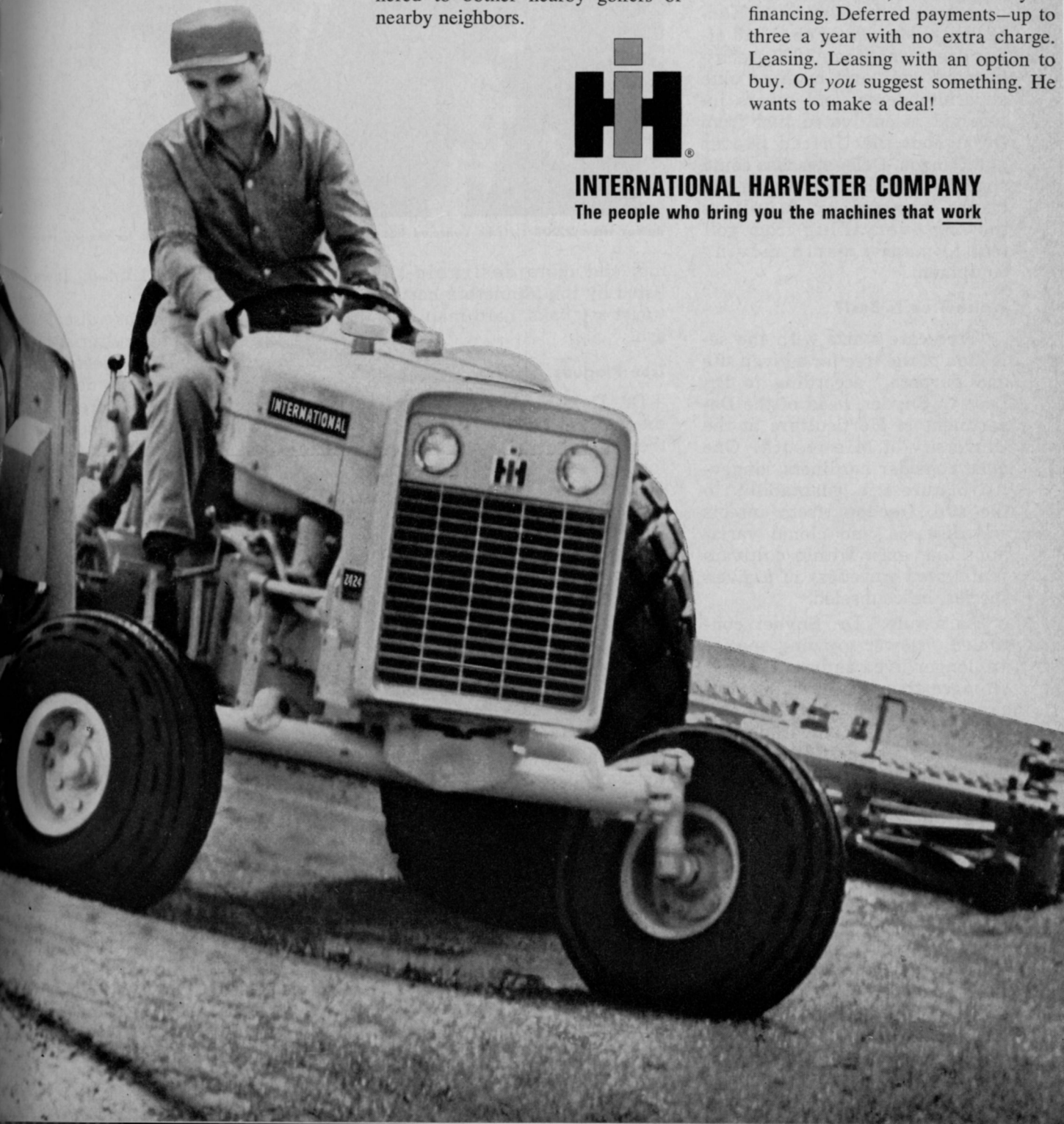

Turfmen Must Be Treemen, Too, Delegates Shown At 37th Int'l Turfgrass Conference in Kansas City

The increasing complexity of golf course greens management means superintendents must not only be knowledgeable in all phases of turf care and weed control, but be experts in tree maintenance as well. This was especially evident last month at the 37th International Turfgrass Conference and Show staged by the Golf Course Superintendents of America Association in Kansas City, Mo. The Feb. 13-18 affair drew more than 2,000 greenskeepers, golf and country club superintendents, and others interested in cultivated turf from throughout the United States and Canada. Delegates also could shop among the more than 115 booths manned by suppliers showing everything from golf tees to massive earth moving equipment.

Better than 2,200 turfmen swarmed into Kansas City's Municipal auditorium for the '66 show.

Which Tree Is Best?

"Tree care starts with the selection of the tree for a given site and purpose," according to Dr. Leon C. Snyder, head of the Department of Horticulture at the University of Minnesota. One must consider hardiness, longevity, mature size, adaptability to the site, freedom from insects and diseases, and clonal variations that exist within cultivars (cultivated varieties) of a given species, he counseled.

"As a rule," Dr. Snyder continued, "slower growing species are longer lived and structurally stronger than fast-growing species. Bolleana Poplar, Populus alba 'Bolleana,' Lombardy Poplar, and Populus italica nigra, Silver Maple, Acer saccharinum and Robusta Poplar, and Populus x robusta, are recognized as being fast growing, but relatively short lived. The Silver Maple," he admitted, "is actually not short lived but its usefulness as an ornamental tree is certainly limited. As this species reaches maturity, it is subject to breakage by winds and ice storms."

The more hardy, slower growing, and more desirable trees listed by the Minnesota horticulturist are oaks, hard maples and ash.

Tree Plagues

Dr. Dale M. Norris, Jr., from the University of Wisconsin, told the group of cures he's found for some of the diseases which plague trees.

Oak wilt, caused by the fungus, *Ceratocystis fagacearum*, can be "stopped in its tracks," according to Dr. Norris, by a thorough program of rootgraft breakage between adjacent oaks. "This prevents the spread of the lethal fungus from tree to tree down the fairway through interconnected roots.

"You may simply trench a few-inch wide ditch down about 30 inches in the soil along a line midway between oaks that are 50 ft. or less apart. You can also inject a soil-sterilizing chemical, such as Vapam, into holes drilled in a similar line between the trees and kill a portion of the roots and thus prevent fungus spread," he said.

Elm phloem necrosis is a second tree killer in many central and more southern states, such as Ohio, Indiana, Illinois, Iowa, Nebraska, etc.

"This lethal virus disease," the Wisconsin horticulturist explained, "has never been adequately studied, but we do know that it spreads readily from elm to elm through root connections. Thus, rootgraft breakage is a must in any control program. In addition, a sucking insect, a leafhopper, extracts the virus from leaves of diseased elms and effectively inoculates it into the foliage of healthy elms. This insect flies, or is carried by the wind, for miles. Spraying with insecticides, such as DDT, on the foliage of healthy elms in the late spring is our only control measure against leafhopper spread of the virus," Norris suggested. Diseased trees must be quickly removed and destroyed, he said.

Effect of Light and Heat on Turf

Every physiological process occurring in plants is affected by temperature, and only light can supply the energy used by green plants, so turfmen must understand the varying interrelations between these two important

(Continued on page 34)

Quit brooding over the winter campaign, Nap. Get a good start with NITROFORM®

Like Napoleon, turf and ornamentals had a rough winter. Heavy snows and sudden cold waves took the toll of weak plants. And with the spring, turf traffic becomes heavy.

A spring feeding with Nitroform restores turf damaged during the winter, and takes advantage of the peak growing cycle of warm-season grasses. This spring feeding also allows turfgrass to spread out with a good growing start ahead of the weeds. Spring feeding with Nitroform strengthens any plant and builds residual nitrogen.

Nitroform®, Hercules Powder Company's ureaform plant food, contains a whopping 38% nitrogen, but releases it slowly as the plant needs it. Nitroform is easy to handle and store, is odorless and nonburning, and is available in two forms: Blue Chip® for dry application, and Powder Blue* for liquid application. Also, the granular form is used in balanced fertilizers that carry the "Blue Chip" tag.

Nitroform is used on turf, trees, ornamentals, and any plants that require sustained nitrogen feeding.

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Azak® pre-emergence herbicide stops crabgrass before it gets started. Applied to established turf before warm weather and moisture awaken the crabgrass seeds, Azak prevents seed germination and initial growth. Nonleaching, one application lasts through the germination period. Another economy turf managers like is that a 12.5-lb. bag of wettable powder covers one acre, or 43,560 sq. ft. Azak is also available in granular form, which can be mixed with fertilizers and other pesticides.

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STH66-2

Nozzle Wear, DED Are Topics at Illinois Custom Spray Operator's Training School

More than 30 papers were presented to midwestern spraymen who gathered at Urbana, Ill. for the 18th Illinois Custom Spray Operator's Training School, Jan. 26-27. Reports were given by university weed control researchers, and municipal and Ill. Natural History Survey workers. New techniques were described for agronomic weed control, and equipment maintenance was a major concern.

Spray Pattern, Output Change with Nozzle Wear

"The abrasive action of sprays causes wear on nozzle tips," E. L. Knake, Associate Professor of Weed Extension, University of Illinois, Urbana, told the spray operators. He explained that changes in the volume sprayed, or distribution pattern caused by abrasion, may damage adjacent plants, cause residue problems, and increase application costs.

Knake described tests conducted to determine the amount of wear and the efficiency of new and used spray nozzles. In the laboratory, he said, new and used nozzles were tested by using pure tap water in a device operated at 30 lbs. per sq. inch (PSI). Water from each nozzle was collected in beakers, measured, and recorded in terms of milliliters per minute. Spray distribution patterns were also determined.

"Since wear on the nozzle tip changes the spray distribution pattern," Knake concluded, "nozzle tips should be replaced periodically. Our test results indicate that brass nozzle tips should be replaced after each tip has been used for approximately 100 acres, to maintain the desired spray pattern.

"Since output from brass nozzles increases rapidly with wear, it is important to regularly calibrate spray equipment. Our study along with others show a possible 10% increase in output after 250 gallons of spray have passed through a nozzle tip.

"The output of the new brass nozzle tips that were checked was quite consistent, and their distribution pattern was satisfactory. However, periodic replacement should be considered a wise investment, since the distribution pattern of both liquid and wettable-powder formulations change considerably with

U. of Ill. extension entomologist H. B. Petty (right) previews program of the 18th Annual Custom Spray Operators School held recently on the university's campus. From the left are Ken Caldwell, Creston, Iowa, custom spray operator; Dr. J. B. Claar, director of U. of I. Co-operative Extension Service; entomologist Jim Paullus, Rochelle, associated with the Del Monte Co., and Petty.

wear." Stainless steel tips may be used to good advantage, he pointed out. They cost more, about $1.50 compared with 50¢ for brass tips, but they are more resistant to wear and would not need to be replaced as often as brass tips.

DED Stopped in Route

"Dutch elm disease, one of the most destructive diseases of trees in the United States, kills thousands of elms annually," J. C. Carter, Head, Illinois Natural History Survey, Plant Pathology and Botany Section, reported to the attentive spraymen. "In the Champaign-Urbana, Ill. area, it has killed over 78% of the elms since 1951.

"Healthy elms," he explained, "within 25 feet of diseased elms frequently become infected by transmission of the DED fungus through grafted roots. This transmission of the fungus can be prevented by injecting Vapam into the soil. One part Vapam to 3 parts water is placed in holes 15 inches deep and 6 inches apart in a band between the diseased and healthy trees. One-half cup of the Vapam solution is placed in each hole. In the treated zone, Vapam kills roots, and therefore the DED fungus can not pass from tree to tree through their roots."

The Illinois Natural History Survey recommends methoxychlor for the control of elm bark beetles which carry the elm disease fungus. It suggests a 12% solution of insecticide if applied with a mistblower, or a 2% solution if sprayed with a hydraulic sprayer. Also, sanitary measures for the removal and destruction of all elm material in which elm bark beetles can colonize are recommended.

Grasslands Book Revised

The 707-page book, "Forages: The Science of Grassland Agriculture," contains material on all aspects of grasslands production. Completely revised, it is now available from the Iowa State University Press, Ames, Iowa. Price is $8.50 per copy. The work has won international recognition for its educational value.

Weeds, Diseases, Sod Industry, Grass Varieties, Play Major Role at Rocky Mountain Turfgrass Conference

Weeds, diseases, the sod industry, and grass varieties were pegged for special attention during the Rocky Mountain Regional Turfgrass Conference held at Colorado State University, Fort Collins, Jan. 26-27.

Leadoff speaker to address more than 150 persons interested in producing, selling, installing, and maintaining turf was P. Eugene Heikes, CSU extension weed specialist. He pointed out that major weed problems in the Rocky Mountain area are dandelion, broadleaf plantain, Japanese clover, ground ivy, hairy crabgrass, bentgrass, quackgrass, and a number of coarse-bladed grasses.

"Hairy crabgrass, although an annual weed, can take over a lawn due to the difference in growth habits between it and bluegrass," Heikes explained. "It grows most rapidly in the heat of summer when bluegrass is dormant and slow growing."

"Bentgrass is fine, if all the lawn is of the same variety. It can stand close mowing and hard usage. But bent, mixed in a bluegrass lawn, is undesirable. Its different color and growth habits give the lawn a patchy appearance," Heikes concluded.

Crabgrass research findings were reviewed by John W. May, plant pathologist at CSU. May said that 63 materials were tested. These included new experimental materials as well as the old "standbys." Of the materials tested on common Kentucky bluegrass, May said, Zytron, Trifluralin, Dacthal, Bandane, Azak, 296-B, and Betasan produced best results last year under Colorado conditions.

May cautioned that Colorado had an unusually cool, wet, late spring which may have been responsible for poorer performance of some of the materials in the test.

Harebell Can Be Controlled

Hard-to-kill weeds in turfgrass was Homer Hepworth's topic. He revealed that Colorado's creeping harebell could be controlled with a 1½-lb.-per-acre application of Banvel-D. This treatment gave 95% top kill of harebell and 100% control of dandelion, knotweed, and kochia. At 2 lbs./A, the herbicide effected a 100% top kill of all three weeds.

Hepworth, who is plant pathologist with CSU, noted that bentgrass could be killed with excessive rates of nitrogen and the soil could be replanted with bluegrass soon after treatment. A 24% nitrogen aqueous ammonia solution or 20 lbs. of ammonium sulfate per 1,000 square feet was used to kill the bentgrass.

Colorado's booming sod industry, with a predicted 1966 sales potential of $6,500,000, was thoroughly examined and discussed by a panel of experts. Dr. Jess Fults of the university's plant pathology department said, "The business is so new that most people don't know what quality is. There is a place for pasture or meadow sod in farm conservation work, but cultivated sod is a landscaping tool and deserves higher quality."

Use of good-quality seed, establishing the sod in areas relatively free of turf diseases and not heavily infested with deep-rooted perennial weeds, is preferred. The trend, Fults said, is for sod growers to use one species of grass and not a mixture.

J. Russell Wilkins of Green Valley Turf Co., Littleton, outlined production methods used by his company. This covered all phases from germination to sod harvest. He explained use of fertilizers, automatic sprinkling systems, and other tricks of the trade developed on his sod farm. He uses both liquid and dry fertilizers, and finds that best growth results from light seeding. He plants 50 lbs. of seed to the acre and finds that grass fills in and develops a better root system.

Charles Drage, extension hor-

With Colorado's sod industry booming to a predicted $6,500,000 in 1966, this panel offered up-to-date information for better sod production. From the left, they are Charles Drage, Dr. Jess Fults, both of Colorado State University; J. Russell Wilkins, Green Valley Turf Co., Littleton; Melvin C. Rich, Richlawn Turf Farm, Littleton; and Frank C. Stewart, president of the Rocky Mountain Turfgrass Association.

Weeds in turf . . . seemingly endless problem with turfmen everywhere . . . was the topic of these three Colorado State University specialists during recent Rocky Mountain Regional Turfgrass Conference. From left: Homer M. Hepworth, plant pathologist; Eugene Heikes, extension weed specialist; and John W. May, experimental station plant pathologist. They reviewed current research and recommended weed control practices.

ticulturist with CSU, detailed recommended practices for soil preparation where sod is to be laid. Adding phosphate to the soil for root development and also a little nitrogen will give sod much aid in becoming established. Most of the nitrogen should be applied from the top.

"Also, this area needs modifications to the soil in addition to nutrients," Drage added. "If the soil is alkaline, use some agricultural sulphur and try to improve the physical properties of the soil as well, at this time."

Most panel members recommended a 1-inch cut to harvest sod. All agreed thin sod takes hold faster so that the nurseryman is selling sod not soil.

Frank C. Stewart, Littleton, president of the Rocky Mountain Turfgrass Assn., said selling sod by telling customers they will save water may be misleading. "You can save some water but not all of it. You have installed one inch of root system. Six to seven inches of the roots have been left behind. Advise the customer to treat sod as he would new seed."

Melvin C. Rich of Richlawn Turf Farm, Littleton, suggested "Keep instructions simple for the homeowner. Tell him to do twice as much watering—maybe he'll do half of it."

The intricate subject of installation and bidding sod jobs was the topic of Ben Warren, Warren Turf Farms, Chicago, Ill. He outlined three varying types of sod jobs: the fine turf area for putting, bowling or tennis greens; the home or small industrial lawn; and the large industrial or highway sodding contract.

"Specifications on fine turf may be provided by a golf course architect — but then, you may have to provide your own specs. In bidding these jobs, consider that you will have to give the utmost attention to soil preparation, grading, and laying. The job must be near perfect, and no matter how well it is done, it won't be good enough," he said.

Misunderstandings are main problems of fine turf jobs. Make it understood where your job ends. If maintenance is included, you'll have considerable work. Check water availability and test the existing irrigation or sprinkling system before sod is installed, Warren warned. Subsoil, thoroughly prepared, is just as successful for sod base as topsoil that must be hauled to the site.

Specifications cover all highway bidding, Warren said. Sometimes specifications are written

(Continued on page 32)

Bidding and installation of sod is a serious business, particularly with highway projects and large industrial areas, Ben Warren, of Warren Turf Farms, Chicago, Ill., told the conference.

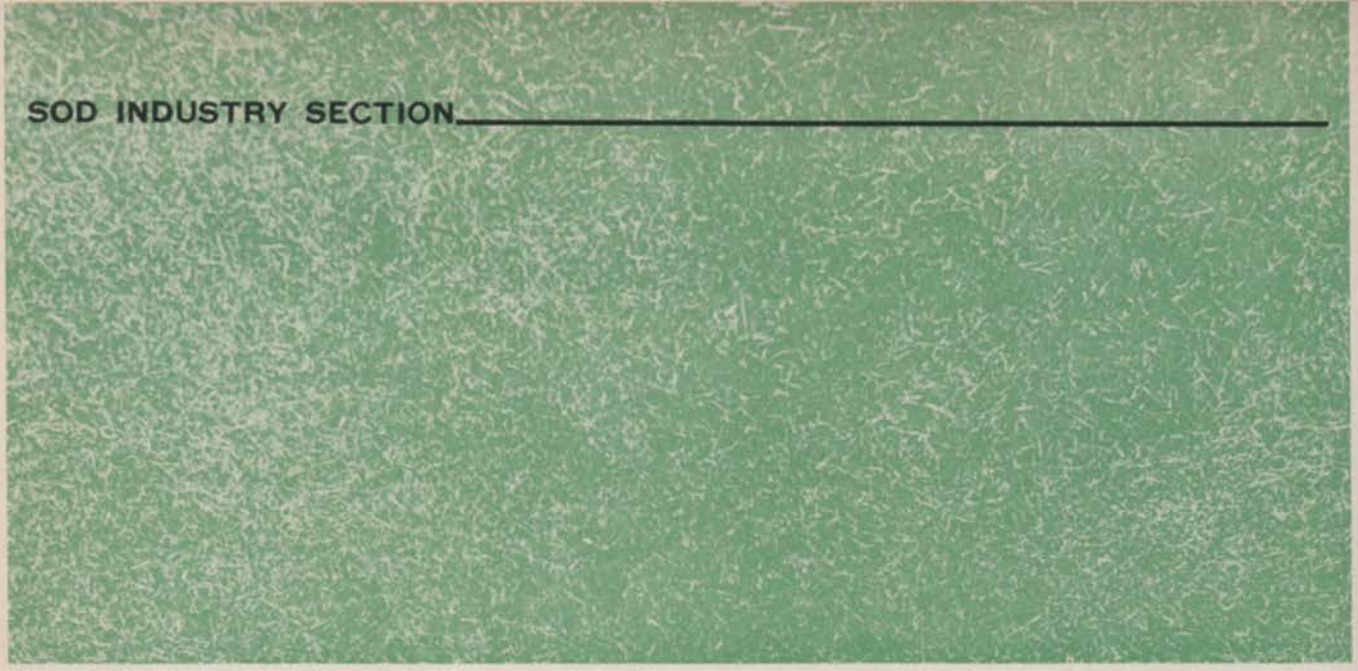


Figure 1. A mature sod of Merion Kentucky bluegrass ready for lifting. This represents the end result of following the practices and principles of establishing a uniform stand of turfgrasses and provided with proper maintenance. Portion of this field qualified for New Jersey certified sod.

How to Establish a Uniform Stand for Turfgrass Sod

By DR. HENRY W. INDYK
Extension Specialist in Turf Management
Rutgers University, New Brunswick, New Jersey

PRODUCTION, marketing, and utilization of sod as a vegetative means of quickly establishing lawn and other turfgrass areas is intimately associated with a high quality product. Sod quality is the net result of a combination of factors involving basic principles and practices of sod production. The degree to which they are incorporated into sod production will greatly influence or determine the quality of the marketable product.

An important criterion for measuring sod quality is the uniformity of stand of the desired turfgrass or mixture of turfgrasses. Successful establishment of a uniform stand, and its proper management after establishment, will produce a uniform and dense carpet of green leaves above the soil. More importantly, a well developed, extensive rhizome and root system will be produced below the soil when the turfgrass is fully and uniformly developed. (Figure 1)

Thin or bare areas can be corrected with proper overseeding techniques when recognized during the early development stages of a newly seeded sod field. However, such deficiencies in a mature sod present a problem at harvest time. These thin or bare areas complicate as well as delay "lifting" of sod. In addition, it becomes very wasteful because of the necessity of discarding sod pieces (such as illustrated in Figure 2) containing bare or thin areas. It is particularly wasteful when considered from the standpoint that such areas may comprise only 1% or less of an otherwise high-quality strip or roll of sod.

Realizing the importance of uniformity of stand of turfgrasses in relation to sod quality, sod growers should be overconscious of the principles and practices of sod production which aid

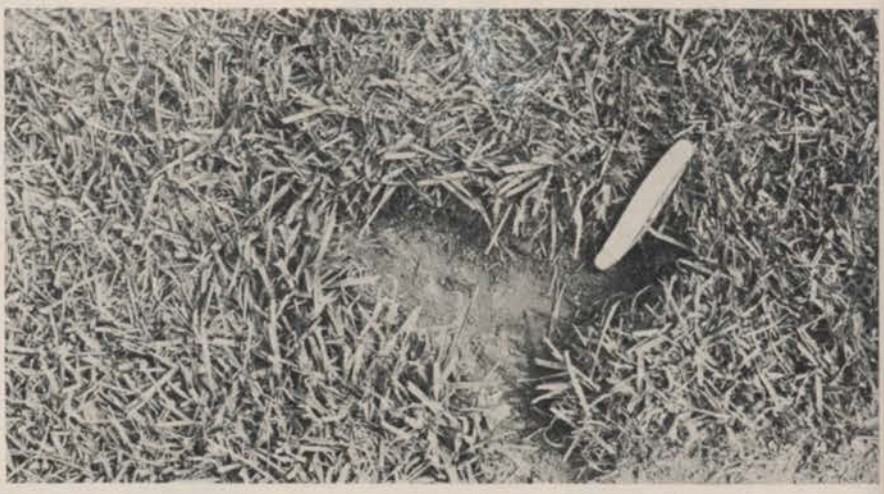


Figure 2. Lack of a uniform stand of the desired turfgrass has resulted in this type of condition in an otherwise high quality strip of harvested sod.

Here's how easy it is to get long-lasting control of nematodes and soil insects that ruin turf

- A single spray of Nemagon® Soil Fumigant kills root-choking nematodes all season.
- A single application of dieldrin insecticide controls root-pruning insects for years.

THE FACTS that follow quickly explain the essential value of controlling soil pests with Nemagon and dieldrin; their flexibility and ease of use; why the root protection they provide far outweighs the cost of treatment.

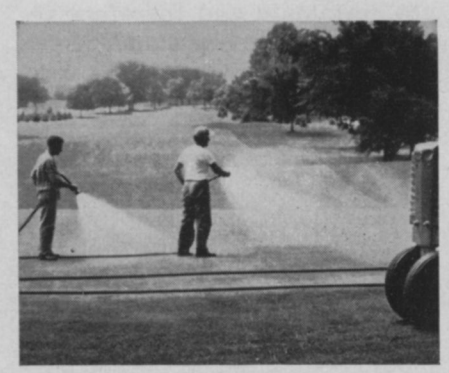
Nematode control with Nemagon

Nemagon works as a pre-planting application or on established turf. It fumigates the root zone to kill the nematodes (microscopic worms, not insects) that can infest soil in fantastic numbers. All damaging species are controlled and reinfestation will normally not occur for a year or more.

Without the root knots and lesions caused by nematodes, water and soil

A Nemagon spray knocks out nematodes fast, and thoroughly. Turf isn't disturbed. And nearby plants won't be injured.

nutrients can pass freely through roots. Turf can respond fully to fertilizer and irrigation. Risk of stunting, poor appearance and dead patches is eliminated. So is the risk of a reseeding or



Protecting a golf green with Nemagon eliminates any chance of unsuspected nematode infestation causing costly damage and disrupting play.

resodding.

Nemagon is easily drenched into soil following a spray application. There's no need for special equipment and grass isn't disturbed. Easy-to-follow directions are printed on every package.

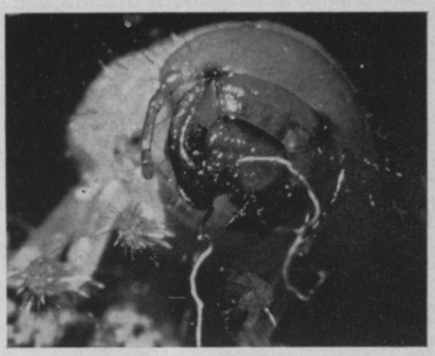
Soil insect control with dieldrin

Dieldrin controls all species of grubs, including the larvae of Japanese and June beetles. It can be used ahead of time to prevent damage from ever starting. Or you can apply dieldrin to stop an infestation when discolored turf indicates that soil insects are pruning roots and limiting the crop's access to fertilizer and water.

Dieldrin can be applied any time after soil warms up. Effectiveness usually lasts 3 to 5 years. Control is so thorough that grub-eating moles and rodents can't find food in the treated area and leave.

Dieldrin can be put on in fertilizer, or in granular form. Liquid concentrates and wettable powders are available for spray use and drenching.

Full details on using dieldrin for



This root-chewing white grub can kill turf or make it look sick. So can a host of other grubs and soil insects. Dieldrin stops them all.

control of soil or surface insects are on every package label.

Nemagon and dieldrin are both available as branded products of well-known manufacturers and sold where you normally buy insecticides, and other turf maintenance products.

For more information, write Shell Chemical Company, Agricultural Chemicals Division, 110 West 51st St., New York, New York 10020.

Follow label directions carefully when using any pesticide.

Shell Chemical Company
Agricultural Chemicals Division

SHELL

in getting a uniform stand. Let us consider factors which contribute to a uniform stand of turfgrass in the production of a high quality sod.

Weeds: Key to Land Selection

Observation of weed growth in an area before seeding will be time well spent in determining the suitability of a particular field for sod production. Avoid seeding fields which are known to be infested with difficult-to-control weeds such as quackgrass, bermudagrass, johnsongrass, nutgrass or other pernicious perennial weeds. Weed problems of this nature can not be resolved by selective control procedures in an established sod field. The best approach to control of weed infestations of this type is complete eradication before seeding.

Fields infested with difficult-to-control weeds can be made suitable with the proper use of chemicals, in combination with cultural practices. Chemicals are available which can be used as soil sterilants or others which are nonselective or specific for perennial grasses. Clean cultivation or clean fallow are helpful cultural practices. Use of cultural practices in preparation for sod production is advisable for two or more years before seeding any fields which have not been cultivated for the preceding five or more years.

Soil Preparation Affects Quality of Turf Stand

Proper soil preparation requires more patient and painstaking techniques than are normally required for other agricultural crops. Carelessly prepared fields may affect not only the stand of turfgrass obtained, but also its future management. Soil preparation involves proper provision for physical and chemical conditions.

Physical conditioning begins with mechanical preparation which may involve subsoiling, plowing, rototilling, discing, harrowing, and culti-packing. The objective or end result of using such implements is the preparation of a level, finely granulated but not pulverized seedbed that is smooth and firm. Utmost care should be taken to provide as level a seedbed as possible. An uneven seedbed affects seeding operations from the standpoint of variable depths of planting.

Seed planted too deeply will not germinate and therefore result in an uneven stand. As a general rule, the larger the seed size, the more tolerant it is to deeper planting. For example, a seed such as red fescue which is approximately 8 times as large as Kentucky bluegrass would tolerate deeper planting than the bluegrass. Conversely, a seed as small as bentgrass (about ¼ the size of Kentucky bluegrass) should be planted on the soil surface. When the soil surface is not even, it is very difficult to control depth of planting. The net result is a variable or uneven stand of turfgrass because of the variance in seed depth.

Furthermore, lifting sod from areas which are pocketed with undulations becomes very difficult. In situations when the normally used tillage implements are inadequate for preparing a level even seedbed, land levelers can be used to advantage.

Incorporation of organic materials in the form of green manure cover crops, well in advance of the anticipated time of planting, can improve very light or heavy-textured soils. Dense plantings of such crops as corn, sorghum or soybeans make suitable cover crops.

Seedbeds should be prepared well in advance of the seeding date with periodic, shallow tillage. This is an opportunity to destroy several crops of weeds before planting.

Chemical preparation involves adjustment of soil pH to approximately 6.5 (slightly acidic) with adequate amounts of lime. The amount of lime required will depend upon the degree of acidity as well as the soil type. A soil test is the best way to determine the amount of lime required for a particular soil.

Adequate Fertilization A Must

Adequate fertilization is necessary to get new turfgrass seedlings off to a vigorous start. A 1:1:1 (N:P:K) ratio of fertilizer applied at the rate to provide about 100 lbs. of actual nitrogen/acre is satisfactory for most situations. If soil test information is available which indicates very low levels of phosphorus and/or potash, a 1:2:2 or 1:2:1 fertilizer at equivalent rate of nitrogen (100 lbs./A.) to the 1:1:1 would be more appropriate. In situations where the phosphorus and potash are above average, a 2:1:1 fertilizer ratio (100:50:50 lbs./A.) or straight nitrogen material, applied at rates equivalent to the nitrogen rate suggested in the 1:1:1 ratio, would be adequate.

In some situations grubs and

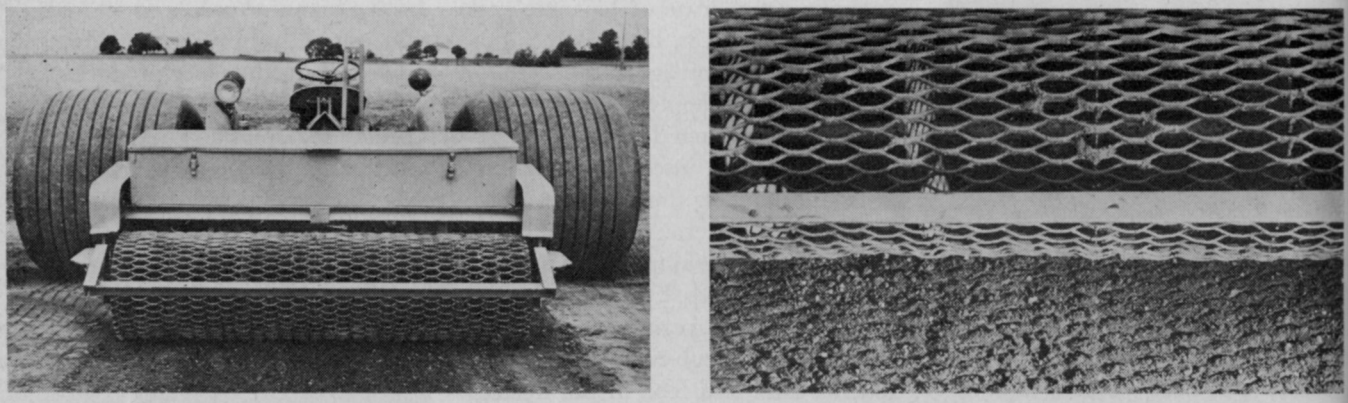


Figure 3. View of one type of seeder in popular use, together with a close-up view of the soil conditions after seeding.

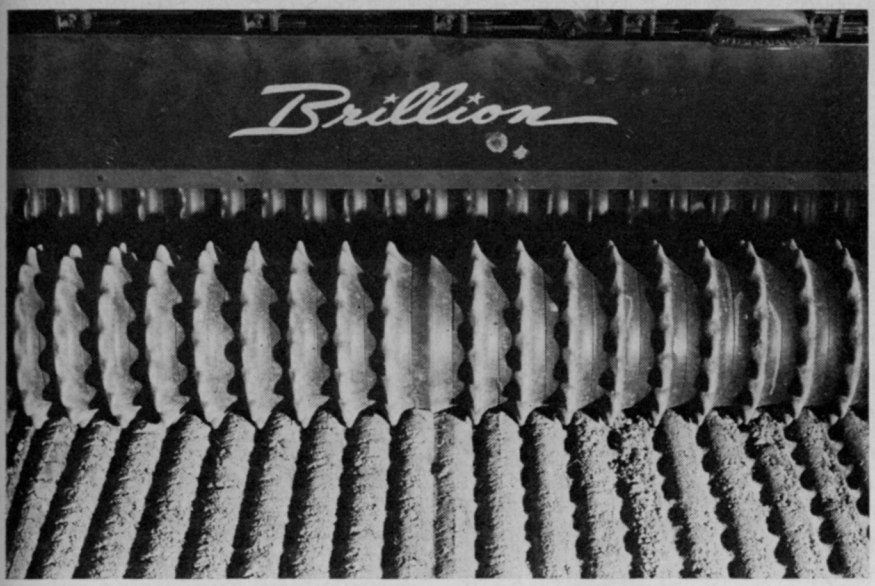


Figure 4. Another type of seeder in popular use showing close-up of soil pattern after seeding made by this machine.

other soil-borne insects may produce serious damage to the stand of turfgrass. Application of appropriate insecticides while preparing seedbeds will provide assurance against grubs. At present, the New Jersey Department of Agriculture requires soil insecticide treatment for interstate shipment of sod. Insecticides such as chlordane, dieldrin, aldrin, and heptachlor can provide long-lasting protection.

All soil improving materials broadcast evenly and completely on the soil surface should be thoroughly incorporated to a 6- to 8-inch depth. This will provide favorable conditions for extensive and deep root development.

Use Seed Label As Quality Guide

Select certified or registered seed of improved turfgrass varieties adapted for the location in which the sod will be produced and marketed. The seed label contains a wealth of information on the ingredients of a particular container of seed. It should be used as a guide to determine the quality of the seed selected.

Difficult-to-control weed problems may be introduced very easily into an area through poor quality seed. *Poa annua* and bentgrass are examples. Certified seed gives a considerable measure of assurance of high quality, but under present certification standards the weed problem is not entirely eliminated.

Fortunately, sources of seed are available which provide the added assurance of freedom from *Poa annua* and bentgrass. There are special lots of certified seed known to be free from *Poa annua* and bentgrass. Sod producers should request not only certified seed, but they should shop for certified seed free of these contaminants. Under present certification standards, up to 5% (by weight) of other crop seed can be included without label listings. A 5% contamination of *Poa annua* or bentgrass can pose very serious problems because of the large number of these tiny seeds involved.

Best Planting Season

Most successful plantings are made from late spring to early fall. During this period, temperature and soil moisture conditions are most favorable for the germination and establishment of an even turfgrass stand. Furthermore, competition caused by weeds is minimal or greatly reduced. Spring seedings can be successful, but establishment at that time is more difficult because it will be necessary to devote more attention to reduce weed competition and provide adequate soil moisture for survival of the new, spring seedlings. Commonly, late summer to early fall seedings will be ready for harvesting at the same time or even sooner than grass planted in the spring of the same growing season.

Light to medium seeding rates are suggested for best development of a vigorous rhizome and root system. The actual rate per acre will vary with the particular species of turfgrasses being seeded. In the case of Merion Kentucky bluegrass, which is popularly grown for sod, a desirable rate is 30 to 50 lbs. of seed per acre. Rates of 100 lbs. or more per acre are used primarily to shorten the time between seeding and harvest. Heavy seeding rates provide a more dense top growth sooner than the lighter rates. Rhizome and root systems from light sowing rates will not be as well developed as from heavy seeding rates. In the absence of a well-developed rhizome and root system, it is necessary to cut deeper into the soil to give harvested sod added strength.

The depth of seeding which a turfgrass can tolerate is closely associated with seed size. Certain seeds contain a pigment that is sensitive to light and controls germination. Stimulation of this pigment by light will either prevent or induce germination. Light is necessary to induce sprouting in Kentucky bluegrass, and if it is planted too deeply, sufficient light is not present to bring about the necessary reaction. Generally, depth of seeding should be within the top ⅛ to ¼ inch of soil. It is very difficult to regulate depth of seeding on poorly prepared seedbeds, and poor stands or bare spots will result where seed is planted too deeply.

Seeding equipment in good working condition, and operated properly, is an absolute necessity in order to obtain proper, even distribution of seed as well as planting depth. Two types of seeders in popular use today and the appearance of the seedbed after seeding are illustrated in Figures 3 and 4. Conscientious operation of such equipment is necessary to avoid blank areas between the seeded swaths. Operation at speeds faster than those recommended by the manufacturer is not compatible with

the internal mechanisms engineered for even distribution of seed.

Moist Soil Hastens Germination

Maintaining a moist soil condition helps reduce the time necessary for germination and obtain a more uniform stand. Any supplemental irrigation should be a constant program of light, frequent sprinkling with as fine a droplet as possible. Daily sprinkling would be desirable but prohibitive from the standpoint of portable irrigation systems.

Mulching with a weed-free, salt hay or grain straw can be very helpful by yielding quicker germination as well as a uniform stand. The need for watering becomes greatly reduced because the moisture retained by a mulch is held at the soil surface. From an economical standpoint, large scale mulching may not be economical.

Successful establishment of a turfgrass or mixture of turfgrasses does not, in itself, insure uniformity of stand. Once established, it must be developed and protected with a maintenance program. Close and constant attention must be devoted to fertilization, mowing, irrigation, and also weed, insect, and disease control. Each of these factors influences turfgrass stand uniformity which is a significant criterion in determination of sod quality.

Rocky Mountain Conference

(from page 27)

with no flexibility. This can be costly to the contractor. Establish a clear understanding on all phases of work, soil preparation, final grading, and other requirements. Highway sod is laid faster, depending on thickness which can be unreasonably thick. Water requirements are another concern; you may have to haul it. It is very important to consider every possible cost item when bidding on highway sod work.

Weed Control in Turf

One of the big factors in chemical weed control failures is poor

timing. An understanding of plant growth habits is essential, Eugene Heikes said when attention was directed to weed control. Keeping ahead of weeds is the key to success of a good lawn, and is the hardest job. Most weeds can be controlled with chemicals, except for coarse grasses, Heikes continued, but chemicals should be supplemented with good management practices.

It takes 4 to 6 years of testing after a new variety of grass is developed to determine its disease resistance, Dr. Jack Altman, plant pathologist, said in discussing turf diseases. Studies by the U. S. Department of Agriculture show that single strains of bluegrass, such as Newport and Merion, make a better appearing lawn in the first 3 to 4 years. However, after 4 years the common Kentucky bluegrass has the best appearance when disease problems develop in the single strain.

Merion bluegrass still appears to produce the best quality lawn in Colorado, Jack May reported. He reviewed findings of a study with 20 grass varieties at Fort Collins.

"But we may not have the whole story yet, in view of USDA findings," May cautioned. "The CSU plots have been established since 1962 to study effects of herbicides in different varieties." In describing favorable characteristics of several desirable grasses, May reported Merion bluegrass to be the best quality turf which can stand shorter mowing, offers strong competition against weeds, and has a dark color. It is susceptible to rust, but rust is not a major problem in the Rocky Mountain region.

Ryan "Mole" Goes Underground

"Mole," a new, inexpensive tube-laying device, chews through ground as deep as 7 inches but does not disturb the surface turf as it installs flexible or semi-flexible tubes, pipes or cables, according to its manufacturer, Ryan Equipment Co. "Mole's" uses are said to include fast, one-man installation of underground sprinkling systems, gas lines for yard lights and other purposes and telephone and electrical cables.

"Mole" consists of a vertical cutter blade with a bullet-like terminal to which tubing, piping or cable up to 1¼ inches in diameter is chain-attached. The Sod Cutter then pulls the tubing beneath the surface and through the ground at speeds up to 100 feet per minute. A slit in the turf which soon disappears is the only visible evidence of the installation. Radii as tight as 2 feet are possible.

Complete information about "Mole" is available from Ryan Equipment Co., 2055 White Bear Ave., St. Paul, Minn. 55109.

"Mole" leaves only a narrow slit in the turf as proof of its work. The slit quickly disappears, though, and there is no trace that Ryan's "Mole" has installed underground pipes, cables or tubes.

Meeting Dates

Western Weed Control Conference, Westward Ho Hotel, Phoenix, Ariz., Mar. 15-17.

36th Annual Michigan Turfgrass Conference, Kellogg Center, Michigan State University, East Lansing, Mar. 16-17.

Conference on Community Development, on campus, University of Iowa, Ames, Mar. 18-19.

Wisconsin Turfgrass Conference, Wisconsin Center, Madison, March 22-23.

Wisconsin Park & Recreation Assn. Annual Meeting, Hotel Eau Claire, Eau Claire, March 23-25.

West Virginia Weed Control Assn., First Annual Conference, Daniel Boone Hotel, Charleston, March 30-31.

Northern California Turfgrass Council, 2nd Annual Turfgrass Exposition, Santa Clara County Fairgrounds, San Jose, March 31-April 1.

New Jersey Society of Certified Tree Experts, Meeting, Andrew Wilson Co., Springfield, April 18.

New Jersey Society of Certified Tree Experts, Annual Dinner, Rock Spring Corral Inn, West Orange, April 12.

5th Annual Florida Turf-Grass Trade Show, Plantation Field Research Laboratory, Ft. Lauderdale, April 28-29.

Florida Nurserymen and Growers Assn., Convention, Sheraton's British Colonial Hotel, Nassau, May 12-14.

18th Annual Nurseryman's Refresher Course, Cal-Poly College, San Luis Obispo, Calif., June 7-8.

International Shade Tree Conference, Western Chapter, Annual Meeting, Miramar Hotel, Santa Barbara, Calif., June 20-23.

New Jersey Society of Certified Tree Experts, Meeting, Essex County Highway Dept., Verona, June 20.

American Association of Nurserymen, 91st Annual Convention, Palmer House, Chicago, Ill., July 16-20.

Midwest Turf Field Days, Purdue University, West Lafayette, Ind., Aug. 15-16.

Texas Assn. of Nurserymen, Annual Convention, Nursery and Garden Supply Show, Dallas Memorial Auditorium, Dallas, Aug. 21-24.

Penna. Grassland Council, Materials Handling Field Day, John Rodgers (Plum Bottom) Farm, Belleville, Aug. 26.

Hawaiian Turfgrass Management Conference, University of Hawaii, Honolulu, Aug. 25-26.

International Shade Tree Conference, 42nd Annual Convention, Sheraton-Cleveland Hotel, Cleveland, Ohio, Aug. 28-Sept. 2.

Turfmen Must Be Treemen, Too
(from page 22)

elements to provide the best environment for their grasses. This was the reason for having Professor R. E. Schmidt, from the Department of Agronomy at Virginia Polytechnic Institute, address another GCSAA educational session.

There are turfgrasses which grow best under high temperatures (so-called warm season grasses) and those which grow best at lower temperatures (cool season grasses).

"It has been known for some time that grasses adapted to the cool region have a lower minimum and optimum growth temperature than those adapted to the warm region. For the most part, optimum temperature for root growth is lower than for herbage growth of both warm and cool season grasses," Schmidt revealed.

"Natural grass adaptation is based on the extremes of the environment," he continued. "With proper management these extremes may be minimized so that grass will tolerate, at least for a time, unadapted conditions. For example, raising the bentgrass clipping height during the summer will provide more insulation and thereby lower the soil temperature to improve turf quality."

Crabgrass Controls

Most turfmen are vitally interested in crabgrass control, so delegates were especially attentive when Dr. Jess L. Fults, chief botanist at the Colorado Agricultural Experiment Station in Ft. Collins, listed some of the controls he has found effective.

Among the pre-emergence crabgrass killers, he mentioned chlordane, lead arsenate and other inorganic arsenic compounds, calcium cyanimid, allyl alcohol, Dowfume, and Vapam.

"It has been generally assumed that when pre-emergence crabgrass herbicides are applied at 'reasonable herbicide rates', either to established turf or to a prepared seedbed prior to seeding perennial grasses, there is no significant long-lasting residue," Dr. Fults explained. "The general assumption seems to be that the 'microbial activity' in the soil has the capacity to break down almost any applied chemical into 'inactive' products, as far as their effects on the growth of perennial turfgrass is concerned. Our long time observations and measurements in the case of two commonly used pre-emergence crabgrass herbicides (chlordane and certain inorganic type arsenicals) would indicate that this assumption is open to serious question."

New GCSAA executive team for the coming year are all smiles over success of conference and show last month in Kansas City. These top three officers stopped for the camera just after their election. In the middle is GCSAA president Edward Roberts, Jr., of Chatham, N.J. On his left is the new vice president, Walter R. Boysen, Oakland, Calif., and at the right is John J. Spodnik from LeRoy, Ohio, who was reelected secretary-treasurer.

Actidione for Rust

Dr. M. P. Britton, of the University of Illinois in Urbana, told a group of 31 sod growers during their own divisional meeting that his experiments have shown Actidione RZ to be the most effective chemical tool to combat rust fungus. It usually takes two to three applications, at seven-day intervals, to wipe out the disease which attacks the base of Merion bluegrass, he said.

Companion speaker on the commercial cultivated turf seminar was Dr. Ray Keen of Kansas State University, Manhattan, who spoke on grasses for the crabgrass belt. The area in which this nuisance grass predominates stretches from Wichita to Washington and is from 300 to 500 miles wide, he said. In desperation, he admitted, most growers regularly switch between bluegrass and bermudagrass on a routine basis, jumping back and forth from one to the other when climatic and temperature conditions "wear out" the species that's in at the time. Keen admitted none of the 46 test plots in his seven-acre experimental turf area has provided the satisfactory, hardy grass turfmen and their customers are looking for in the "crabgrass belt."

Next year's satellite sod section is also to be held in conjunction with the golf superintendents' show, but there is a possibility the group may rotate future meetings to join with other associations. Dr. Britton reported some growers felt they should associate with such groups as those centering on agronomy, landscape architecture, and highway beautification, to acquaint these fields more effectively with what the cultivated sod industry has to offer.

Dr. Henry W. Indyk, at Rutgers University in New Brunswick, is heading up program arrangements for the sod group's meeting in Washington next February during the GCSAA conference.

Convention site for '67 is the Washington Hilton Hotel in Washington, D. C. with the dates set at Feb. 5-10. In 1968, the association will meet in San Francisco for its mammoth trade show and educational conference.

"Methods of Soil Analysis" Published by Agronomy Soc.

A hardbound, 1,572 page, 2-part monograph, entitled "Methods of Soil Analysis," was recently published by the American Society of Agronomy (ASA) in a joint effort with the American Society for Testing and Materials (ASTM).

With more than 200 figures and 50 tables, both principle and practice are explained in the text.

Part 1, entitled "Physical and Mineralogical Properties, Including Statistics of Measurement and Sampling," is composed of 51 chapters and 770 pages. Six sections deal with statistics of measurement and sampling, and 37 sections cover the measurement of physical properties of soils (15 on water, two on gases, five on thermal properties, and 15 on soil mechanics and properties of soil particles and aggregates). Eight sections on mineralogical properties discuss both pretreatments and methods of analysis, and include data on such mineral analysis techniques as the petrographic, microscope, thermal analysis, and infrared spectrometry.

The second volume, "Chemical and Microbiological Properties," has 62 chapters and 802 pages. Its sections on chemical analysis are divided into five on applications of modern techniques such as spectrography, photometry, spectrophotometry, and polarography; five on ion exchange properties, one on soluble salts, 28 on the analysis for total elements and for 22 separate elements, one on carbonate, six on organic matter, and 16 on microbiological properties. The sections on microbiology include microbial populations, types, and physiology, plus algae, protozoa, nematodes, and mites.

The work can be ordered as a set or individually from American Society of Agronomy, 677 So. Segoe Rd., Madison, Wis.

Price in the United States to ASA members is $30.00 per set, or $17.50 per single part. For active or graduate student members of ASA and active voting members of ASTM, a personal copy is $25.00 per set, $15.00 per single part. (For USA orders not prepaid add $1.00 per set or single volume.)

All countries outside the USA add $1.00 per set or single part to above prepaid prices. All orders from outside USA must be prepaid in USA dollars.

Roxy Mower Model UM21-3W has been approved for all Wheel Horse Standard Chassis Tractors, including 1966 models, Roxy-Bonner announces. The three gang mount cuts a 58 inch swath and reportedly keeps wheel tracks to a minimum. Other models of the mower are available for various lawn and garden tractors. Drags cutting 60 to 96 inches, and 50%-heavier drags for 72 to 132 inch swaths are also produced. Roxy-Bonner, Inc., 2000 Pioneer Road, Huntingdon Valley, Pa. 19006 has details.

Literature *you'll want*

Here are the latest government, university, and industrial publications of interest to contract applicators. Some can be obtained free of charge, while others are nominally priced. When ordering, include title and catalog number, if any. Sources follow booklet titles.

Dutch Elm Disease. Publication No. 130, 1965, Extension Bulletin Room, University Station, Brookings, S. Dakota 57007.

The Zoysia Grasses, by J. C. Lowery. Circular No. 620, 6 p., Auburn University Extension Service, Auburn, Alabama.

Deer-Resistant Plants for Ornamental Use. Leaflet No. 167, 1965, Agricultural Publications, 207 University Hall, University of California, Berkeley, Calif.

Principles of Selective Weed Control. Publication No. C 505, 1965, Agricultural Publications, 207 University Hall, University of California, Berkeley, Calif.

YARROW

(Achillea millefolium)

Yarrow (7) is widespread throughout North America and is found in most parts of the world. It is seen commonly in meadows, along fence rows, and in waste places growing on thin topsoil where more desirable plants do not survive. In the U. S., it is known also as milfoil, bloodwort, and thousand-leaf. Seldom does it grow in cultivated fields.

This species is perennial and reproduces by underground rootstocks (4) and seeds (5). Branching underground, the taproot system sends out lateral runners. Each runner may produce several stems from its crown at ground level. Livestock seem to avoid the plant; it has an offensive odor and a bitter taste. Historically, it was used by Achilles to cure his wounds, hence the generic name *Achillea*.

Stems, branched at the top, grow from 1 to 2 feet tall. They grow erect and are covered with many grayish-green hairs.

Leaves are finely divided and fern-like (6). They are covered with soft, fuzzy hair. Leaves near the base of the plant are longer than those near the stem tips. They range from 1 to 10 inches long and sprout alternately from the stem.

Flower heads can be seen easily from a distance. Each head is composed of 5 to 10 white ray (3) flowers (2) and yellow disk flowers (1). These flowers form a flat-topped cluster at the top of the branched stems. The clusters range from 1 to 4 inches in diameter. In the South, yarrow blooms in June, and in more northern sites it flowers in September. Typically, but not frequently, pink flowers are produced.

More than 200 white or gray seeds may be produced by one head of clustered flowers. The tiny, oblong seeds are flattened and slightly curved.

Yarrow is little affected by 2,4-D or hormone chemicals, and large scale control may be difficult. In lawns, repeated applications of 2,4-D will control this weed, and its tough rootstocks can be pulled when lawns are wet and soft. Silvex or dicamba give some control when applied at 1 to 1½ lbs. per acre.

Prepared in cooperation with Crops Research Division, Agricultural Research Service, United States Department of Agriculture, Beltsville, Maryland.

(DRAWING FROM NORTH CENTRAL REGIONAL PUBLICATION NO. 36, USDA EXTENSION SERVICE)

MSU Invites Turfmen to 36th Annual Conference

Simultaneous sessions will be conducted during the first day of the 36th Annual Michigan Turfgrass Conference to better serve the needs of two specialized fields of turf endeavor: sport turf management and the sod industry, it is reported by Dr. Milo B. Tesar, chairman of the conference. The conference, to be held at Michigan State University's Kellogg Center for Continuing Education, will take place March 16-17, East Lansing.

An introductory talk, "The Role of MSU in the Turf Industry," by Dr. Sylvan J. Wittwer, and reports by MSU turfgrass research men will be followed by the annual business meeting of the Michigan Turfgrass Foundation. President Ernie Wohlfeil will preside. The meeting is open to guests of members.

Dr. Harold A. Henneman, MSU Dept. of Crop Sciences, will reveal plans for a new turf short course program at MSU.

Turfmen will be entertained during the annual luncheon by Dr. Maynard Miller, of The National Geographic Society. He will lecture on a recent Mt. Kennedy Yukon expedition.

In two afternoon sessions, turfmen will attend either the Sports Turf or the Sod Industry section meetings. Specialists in both these fields are prepared to present new developments of interest to the golf course superintendent or the sod grower.

While golf course managers gain information on meeting the golf cart problem and, how to prepare a course for tournament play, sod producers will receive information on sod production and certification in New Jersey, and use of muck soils for sod production, among many other subjects.

The final day's meeting will be conducted on a general theme providing important information on all phases of turf production and maintenance. This will include research reports on soil warming from Purdue University and results of turf research projects at Rutgers University.

Classifieds

When answering ads where box number only is given, please address as follows: Box number, c/o Weeds Trees and Turf, 1900 Euclid Avenue, Cleveland, Ohio 44115.

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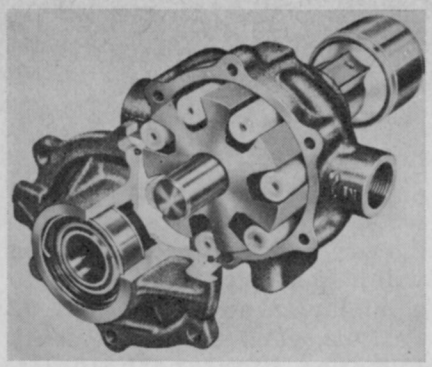
TREE AND LAWN SPRAY SERVICE. Hartford, Conn. Complete, high volume, profitable, established business. Excellent equipment. Owners have other interests. Write Box 18, Weeds Trees and Turf magazine.

Hypro Has 7-Roller Sprayer

Hypro's Series 7700 sprayer pumps are designed to handle wettable powder suspensions, company spokesmen announce. The 7-roller pumps have scoopless rotors and special wide roller slots which reportedly prevent powder suspensions, slurries, and similar liquids from clogging the roller.

The ball-bearing construction pump comes in cast-iron or Ni-Resist housings and delivers up to 15 gpm at 550 rpm, Hypro adds. Mounting adapters for direct tractor PTO are available. Contact Hypro Engineering, Inc., 700 39th Ave. N.E., Minneapolis, Minn. 55421 for details.



New scoopless rotors with re-designed wide roller slots prevent powder suspensions, slurries and similar liquids from clogging the roller, Hypro, Inc. reports.

Weeds Trees and Turf

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Massachusetts Requires Seed Test; Honest Packaging

"All seed intended to be sold for seeding purposes in Massachusetts must be tested and properly labeled," reminds William N. Rice, director of the State Seed Laboratory, University of Massachusetts. "False or misleading statements or pictures that imply the seed is better than it is will be considered violations of the state seed law," Rice said.

Typical statements considered misleading are "all-purpose," "unconditionally guaranteed," "engineered for you," or "no finer seed for your money." A picture of a beautiful lawn on a package containing coarse or hay grass seed is misleading and unlawful.

The State Seed Laboratory in Amherst, as part of a campaign to encourage proper and truthful labeling of seeds, will examine labels and printed materials on all seed packages and will analyze contents to see if they meet the requirements of the law. Grass seed labels must show germination percentage and the date of test. The purity percentage must be stated for all field crops or lawn seeds.

Seeds for testing should be identified properly, packed in strong envelopes, wrapped securely and sent to the Massachusetts Seed Laboratory, University of Massachusetts, Amherst. Fee schedule, a summary of the seed law, and current seed inspection bulletin are also available from the laboratory.

Prompt Care Avoids Cankers

Prompt treatment of tree wounds caused by storms, lawnmower bumps, or construction will help keep canker diseases to a minimum, according to R. E. Partyka, Ohio State University Extension plant pathologist. Cankers, a local disease caused by several fungi, originate when specific organisms enter trees through wounds in the bark.

Cankers are often recognized by water-soaked areas that are darker than the surrounding healthy bark. Edge of the diseased area cracks and as woody tissue grows under the cracks, it becomes infected and dies. Concentric rings of dead tissue accumulate eventually and when this canker completely surrounds a trunk or branch, the portion above dies.

If cankers are not too large, they can be cut out and the exposed wood treated with a tree-wound dressing. Large cankers may necessitate removal of an entire branch. Good fertility level in the soil promotes vigorous growth of the trees and helps reduce cankering. Cankers are found on birch, elm, linden, black walnut, chestnut, crab apple, dogwood, hemlock, maple, mountain ash, oak, poplar, redbud, spruce, sycamore, and willow trees.

A hydraulic tiller, said to be the first in the compact tractor field, has been added by the J. I. Case Co. to its line of implements available with its garden tractor. Named the Case Hydrastatic-Drive Tiller, it provides a smooth, powerful rotor action to work the toughest soils, the company says. Only one pump is required to drive the tractor and the tiller. Control valve for the tiller actually controls the ground speed of the tractor. This gives operator finger-tip control of rotor speed to work soil to desired texture. Tiller has 40-inch cutting width. Six 14-inch diameter tines work soil to 9-inch depth. Rotor is reversible. For complete details on this equipment write J. I. Case Co., Racine, Wis.

WTT Mailbox

Last month *Weeds Trees and Turf* was among the 600 who attended the National Academy of Science's Public Symposium on the Scientific Aspects of Pest Control in Washington, D. C. All major pesticide firms were represented, along with top-level government and university authorities on pesticidal chemistry and toxicity, and those developing new control techniques. We talked with Dr. Warren Shaw, and the new President of the Northeastern Weed Control Conference, Dr. Richard Ilnicki, and scores of others, but were disappointed not to see more representatives of other trade groups in the vegetation maintenance and control field. To date, official talk about alleged pesticide toxicity and residue hazards has been focused primarily on the agricultural and structural segments of the pest control field, but decisions affecting these areas have a direct relationship to what weed, tree, and turf men will be permitted to do in the future. It won't be too long before applicators in the urban/industrial vegetation control and maintenance complex will also be regulated by legislation which has, for the most part, omitted specific reference to them. Some 36 experts addressed the conference, held in the State Department Auditorium, and there seems to be a changing attitude on the part of many who now feel there really isn't the kind of hazard from pesticide residues so many have claimed as an eventuality, a la Rachael Carson. While the advantages of pesticides far outweigh any claimed ill effects, proper use of them is absolutely necessary, just as it is when taking a drug, or driving an automobile, for that matter. This was the theme that ran through the symposium. Wish more of our industry had been there.

* * *

With all due respect *to one of our good advertisers, we do believe the "what shall we call it" department of Smith-Douglass outdid itself recently when it came up with a name for its new extruded turf food. It's to be known as TLC. And, dear reader, do you know what these initials stand for? TLC is an abbreviation for "Tender Loving Care"! The turf food is bright pink, cylindrically shaped, and packed in polyethylene bags. A 20-lb bag is said to be enough to feed 5,000 sq. feet of turf . . . with tender loving care, of course.*

* * *

Bright Future. According to the Stanford Research Institute Report on Pest Control, which is going the executive rounds these days, clearance of brush and weeds along rights-of-way costs more than $97 million annually, and railroads spend a total of $30 million. This market may increase, SRI says, at a faster rate than other segments of the overall pest control market.

Geigy now offers you five industrial herbicides.

All five Geigy industrial herbicides deliver long-lasting residual control of annual and perennial weeds. With once-a-year application, too. Yet, each one has special features to solve specific problems. As a group, they'll handle just about any weed problem you encounter. On level land, or slopes. In and along paths, drives, lots, and roads. Around buildings, signs, markers, fences, and poles. Everywhere weeds are not wanted.

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SIMAZINE 80W. Wettable powder. For spray application before weeds emerge.

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This entire area was seeded with bluegrass and crabgrass. Left-hand side was sprayed with "Tupersan" the same day it was seeded. Note absence of crabgrass in treated area seven days after treating.

The same area twenty-one days after seeding and treating. "Tupersan" made the difference. Note crabgrass growth in the untreated area at right, and how "Tupersan" controlled crabgrass in treated area at left.

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