

WEEDS TREES & TURF

JUNE 1976



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WEEDS TREES & TURF®

June 1975, Vol. 14, No. 6

10 Practical Ideas for Bluegrass Health — Fusarium blight disease has become a major problem in the Northeast especially on bluegrasses. But several superintendents throughout this area have achieved successful control through timely applications of fungicide.

16 THE SEED LABEL — The turfgrass seed label appears to be simple and straight-forward. But it implies many things and fails to clarify others. Anyone encountering frequent plantings should be familiar enough with the label to analyze all possible unseen consequences.

18 Measuring the Nutritive Values of Gypsum — Increasing turfgrass root activity has long been a goal of most growers. Dr. Guy Terwari, U.S. Gypsum Co., claims gypsum not only enhances root proliferation and penetration but also provides a source of calcium and sulfur.

22 Aquatic Plant Management — It's no secret that this country has an extensive aquatic weed problem. Botanist William Rushing feels we should think in terms of long range management of the aquatic system and not just immediate control of one facet. Rushing suggests an arsenal of aquatic plant management tools — biological, mechanical, chemical and others.

26 The White Amur Controversy — The search for biological control organisms for aquatic plants is on the increase. Probably the most heatedly-debated bio-control agent is the white amur. Alva Burkhalter takes a state-by-state look at amur research — past, present and proposed.

40 Sewage Sod Saves Time — Henry Decker, Buckeye Bluegrass Farms, has discovered a sod production short cut using sewage sludge or other waste material as a growing medium. Decker claims he can cut growing time, shipping weight and labor costs.

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THE COVER — Adequate roadside maintenance can only be achieved with well-maintained equipment. With this in mind, WEEDS TREES AND TURF's July, August and September issues will contain feature articles on repair, maintenance, and proper handling of new and old equipment.

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Editorial

Later this year the 5th anniversary of the Occupational Safety and Health Act of 1970 becomes history. All is not sweetness and light, but the crucial period of government harassment relating to the Act is behind the industry.

This isn't to say the Act is to be taken lightly. Rather, the enforcement approach has changed greatly. Today, the OSHA arm of government is talking voluntary compliance. A businessman, large or small, in some areas may request a trained OSHA consultant to visit his workplace, explain which OSHA standards apply, and point out where violations exist.

Under no circumstances — according to John H. Stender, assistant secretary of labor for OSHA in a recent speech — will records of the visit be used to trigger an OSHA inspection. This program is a co-operative venture with states which accept the program and funding is to be shared equally by the state and the federal agency.

The inspection or consulting program is a part of the voluntary compliance route now being pushed by OSHA. Stender reports that OSHA is putting together a variety of booklets, checklists,

and companion literature on standards to help employers, especially small employers. The idea is that they understand OSHA, develop their own safety and health programs, and conduct self-inspections of their own businesses.

Stender believes that self-inspection is an important and logical part of voluntary compliance. Employers, he says, know their own workplaces best and should be the first to know what the hazards are.

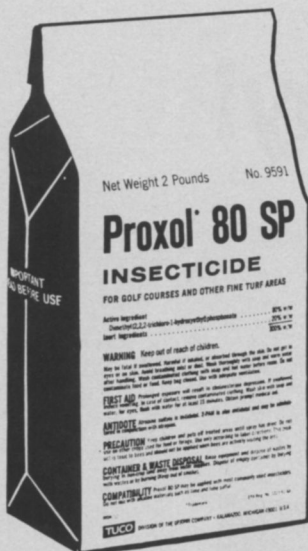
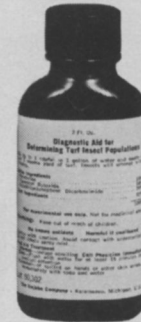
He further restates the position of OSHA as a regulatory agency, but recognizes that an effective enforcement program must be backed by an equally effective program of voluntary compliance. OSHA, he points out, cannot police five million workplaces which cover 60 million employees. This is why, he says, that the thrust of the agency has been directed toward reshaping a program directed at helping employers comply voluntarily.

In citing plus points for the agency, Stender said that work-related fatalities and illnesses dropped 7 percent between 1972 and '73. Work related deaths for all industries (including some not covered by OSHA) were down in 1974 by 5 percent.

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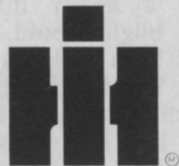
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INTERNATIONAL HARVESTER

Fusarium Blight Control

Practical Ideas for Bluegrass Health

PRACTICAL APPROACHES and experience in the control of Fusarium blight disease are being reported in the Northeast in an area where this disease has become a major problem, especially on blue grasses such as Merion. The experience includes several years of trials on Pennsylvania golf courses that have been hit hard by a disease which thrives in summer when temperatures are constantly above 70 degrees.

Golf course superintendents have faced difficult disease problems with Merion, despite the fact that it generally holds up better than bent grass and does not need as much water or fertilizer. Also Merion can be cut at 1" — not ½" as on bent grass. But in spite of these maintenance advantages and the enthusiasm of golfers for Merion, the appearance of Fusarium blight several years ago threatened a number of well-known courses where Merion Blue was the dominant grass. The disease has customarily appeared about half a dozen years after the turf was well established, and control seemed to be elusive.

Now, it's clear the disease can be stopped. Several superintendents of leading golf courses in southeastern Pennsylvania have achieved practical control in '73 and '74. They expect to continue their control programs for the coming season, as well. The programs are based on timely applications of fungicide. Following are the experiences of three.

Moselem Springs Success

Bare spots from mid-June on was the Fusarium blight challenge faced several years ago by superin-

tendent Byron Knoll at Moselem Springs Golf Club at Fleetwood, Pa. Wilting grass turned brown on all of the fairways and small one-foot spots quickly coalesced into patches measuring six to eight feet in diameter. The disease first appeared on the course in 1970 and was rampant two years later. In June, 1973, Dr. Herbert Cole and his staff from Penn State and Knoll established a key series of 30 trials on a fairway close to the clubhouse. Their aim was to measure the control potential of alternate materials and to demonstrate what could be done to keep a fairway in good condition with disease-control compounds that would involve added maintenance cost — yet insure better turf.

"We used a show-and-tell technique to demonstrate how a fungicide can control disease," says Knoll. "It was easy for our membership to see how Fusarium blight was stopped. The disease marched right up to the edge of the plots. We certainly developed a lot of interest in the control program."

Moselem Springs had been developed with a 70 to 90 percent stand of Merion and with increasingly heavy disease pressure it provided almost a classic example in disease control. Cole's trials included application of nine materials in mid-June, 1973, with a second application being made in early July. The rate used was 8 ounces per 1000 square feet, each time. The principal conclusion in these trials was that a heavy infection of Fusarium blight could indeed be controlled by a high rate of "Tersan" 1991. This fungicide proved the most effective treatment in the plots that were laid out across the fairway.

"The eight-ounce rate seemed like a 'massive dose' of material," says Knoll. "But it did not kill the grass, and it did control Fusarium. And that's why we expanded our control efforts in 1974. We also found we were getting control of other diseases."

Last year Knoll used a boom sprayer to cover about 25 acres of turf on Moselem Springs fairways. The first application was made June 20, when the weather was cool and dry. Weather continued cool, and rain was seasonal — 2" fell in a span of several days. In mid-July small areas of Fusarium developed, apparently where the boom treatment had missed. These were spot treated — and results were immediate. A second general application on the fairways was made July 24 at the eight-ounce rate during a period of high humidity and high temperatures. Rains and irrigation of the course moved the material down into the critical root zone. About three weeks later, when disease spots turned up on some fairways, the turf was spiked and four ounces of the fungicide and five ounces of wetting agent were sprayed.

Superintendent Knoll sums up his disease control program at Moselem Springs: "A late season evaluation showed we were getting good control, except for minor Roseum breakthroughs and for boom misses in our 1974 treatments. We're planning a repeat program for 1975. We have learned a lot about how to control Fusarium — and we certainly had better fairways to go into winter in 1974 than we have known for the last ten years. Our preventive disease control program represented only about



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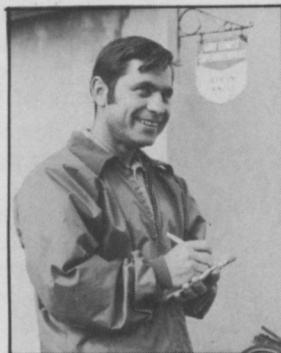
1. Disease conference brings together Byron Knoll of Moselem Springs Golf Club and Neil Wenning (right), technical representative for a major chemical firm, as they check for Fusarium blight on treated area.

2. Continuing checks are vital in disease prevention programs. Knoll is on his course every day looking for subtle changes in health of grass. **3.** Careful tests and accurate record keeping are essential in developing a successful disease control program says Knoll. **4.** Disease problem on Waynesborough fairway shows how Fusarium blight looks at initial stages. Small patches spread rapidly when disease pressure is heavy.

5. Fungicide boom application at Moselem Springs shows how material is evenly applied for maximum disease control.



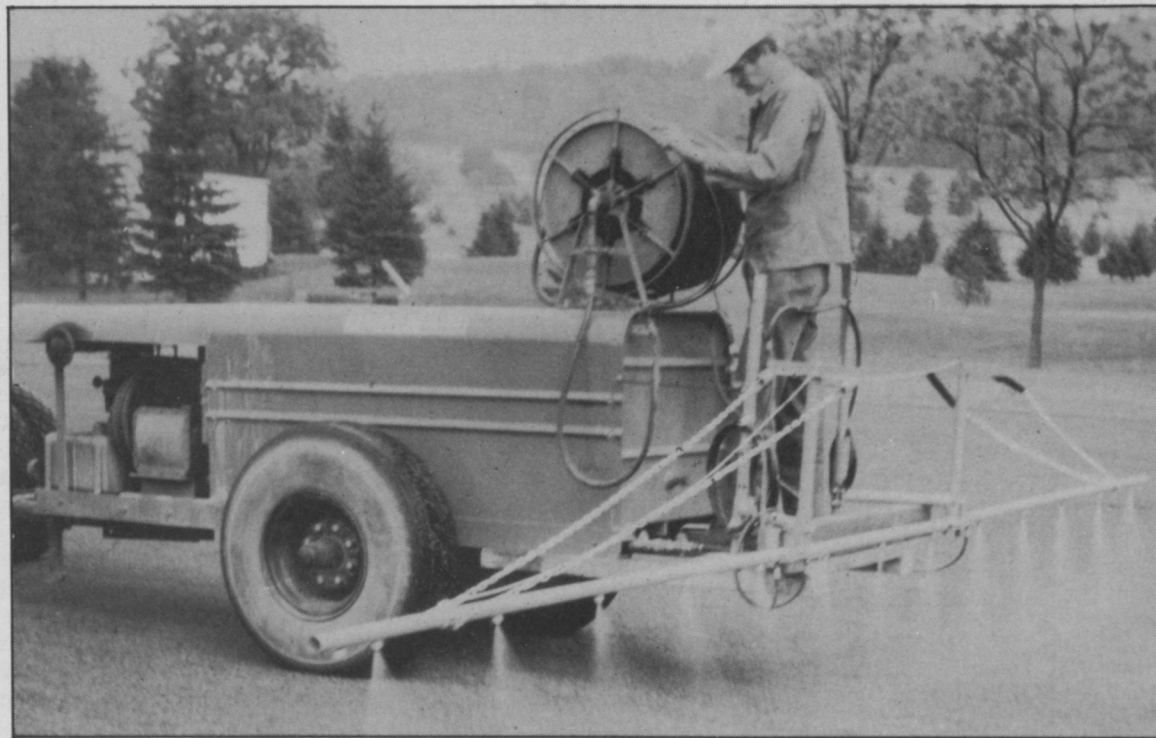
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3



4



5

five percent of our maintenance budget. It was a sound investment for this particular growing season."

Spot Treatments at Heidelberg

At the Heidelberg Country Club, Superintendent Harry Carlson has built his preventive program for Fusarium blight control around spot treatments. The Heidelberg Club in Bernville, Pa., has been developed with Merion blue grass on the fairways and Penn Cross bent grass on tees and greens. Carlson has been familiar with Merion for many years. His maintenance program features an annual renovation period beginning after Labor Day, with each nine holes of the Heidelberg course being closed in turn for five days for thatch removal, fertilizing, top dressing and other work.

"We get heavy play in October and November," notes Carlson. "We have a sizeable membership, plus various outings — and the course is open seven days a week. We have found that the annual renovation period is vital to keeping the turf in top shape."

Fusarium blight has turned up as a relatively new problem, according to Carlson, who recalls its initial appearance in the late 1960's. He has not been shooting for complete control. At Heidelberg he has been following a program of spot treat-

ments with "Tersan" 1991 that follow several applications of "Tersan" LSR in the spring and are combined with heavy watering. This minimizes disease appearance and pressure. Carlson applies an inch of water every week — which, of course, is supplemented by rain.

"We spot treat areas with the fungicide where we have disease," says Carlson. "And we have been able to keep Fusarium pretty much under control, so golfers can almost always play summer rules. We recognize that as our course gets older (it was built in 1967) we may have to step up our disease control program."

New ideas in disease control are not likely to be overlooked at Heidelberg, even including rearranging the order or sequence of mowing of holes on the course to help minimize disease infection. In 1974, Carlson applied the fungicide in mid-June and again in early July. In 1975, he anticipates a third application to be scheduled in late July to avoid breakouts of the disease.

"We apply our chemicals with a 21-foot boom sprayer, and we do all our spraying in the morning when the dew is on the grass," says Carlson. "Our applicator is a farmer who does some crop spraying, too. Know-how is very important if you are going to keep disease under control."

Every year is somewhat different in Carlson's experience. The confidence he has gained in timing of disease control sprays will be useful in dealing with weather variations in his area in the future.

Three Years at Waynesborough

Work with Fusarium blight control started at the Waynesborough Country Club in Paoli, Pa., in 1971, when superintendent John Segui tested the fungicide at 2½ ounces per 1000 square feet. The rate was too low. The following year he boosted his rate to 6 ounces and gained limited control with applications being made in early July and in mid-August. Then in 1973, he added a third treatment in one area and observed good control of the disease in treated areas.

"We got our best control with three treatments last season," says Segui "in areas where we had treated in 1973 as well. Two years of successive treatments obviously produce better results. It was quite

striking on a fairway that had a 20-foot untreated strip with disease carrying over from 1973."

The turf disease first appeared at the Waynesborough Club in 1970. Segui, whose experience dated from 1959 at other clubs, knew he had a problem — and in 1972 he set up a criss-cross block pattern for his fairway trials, so he could observe results at varying rates of application. The tests showed that "Tersan" 1991 provided the longest control.

"The initial treatment in 1973 stopped the disease cold," recalls Segui. "You could see the edge of our treatment clearly outlined. That's what helped convince our Greens Committee to move ahead with a larger program."

The 1974 program was featured by boom applications early and late in July and again in August, with spray patterns being criss-crossed on alternate applications to insure maximum control. Fusarium blight was checked everywhere, except on the two fairways with the heaviest disease infestation; here there were some signs of disease in early September. Progress of the program has been followed closely not only by superintendent Segui but also by all seven members of the Greens Committee, who began to ask that the fairways be widened when they realized that summer rules would be practical through the season. When the fairways were widened by close trimming of the grass, Segui noticed that Fusarium blight was in the rough, so he initiated the practice of hanging half of the boom in the rough during spray treatments. The disease had never been spotted when the grass had been taller.

"We'll be continuing our control efforts this coming season. I'm looking for improved results as we become more effective with our timing of applications."

Practical experience added to the recognized disease control potential of the fungicide will go a long way toward keeping Fusarium blight under control. That's the lesson at Moselem Springs, at Heidelberg, and at Waynesborough Country Clubs. Input from Dr. Herb Cole, Jr., plant pathologist at Penn State has been essential in all cases — the course experience of knowledgeable superintendents has been equally important in obtaining good control of a tough disease.



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Government News Business

EPA's Office of Research and Development (ORD) is undergoing major reorganization. The revised ORD will consist of four offices: Office of Monitoring and Technical Support; Office of Energy, Minerals and Industry; Office of Air, Land, and Water Use; and Office of Health and Ecological Effects. Each office will be headed by a Deputy Assistant Administrator. The program will be implemented by the 15 ORD laboratories. ORD previously had 24 field laboratories administered by four National Environmental Research Centers. "This new organizational structure streamlines and simplifies program planning and program implementation," said Dr. Wilson K. Talley, assistant administrator for research and development. "One of the key benefits of this realignment...is the shifting of more detailed program management activities to the field and the resultant freeing of headquarters staff to improve coordination both within EPA and with groups external to the agency." The new organization plans to be in full operation by July 1, 1975.

Agrico Chemical Company plans to construct a new ammonia plant at its Verdigris, Oklahoma, fertilizer complex. Construction of the new 425,000 tons-a-year plant is scheduled to start this year and should be in operation in 1977.

A triple damage patent infringement suit against Garden Pro, Inc., a Brownsville, Texas, garden care equipment manufacturer, has been filed by Weed Eaters, Inc. The suit asks triple monetary damages on profits made by Garden Pro as a result of alleged patent infringement and requests the court to provide injunctive relief by preventing Garden Pro from manufacturing and marketing its "Spin Trim" product.

U. S. Department of Labor will hold public hearing beginning June 23 on a proposed standard that would protect workers against excessive workplace noise exposures. OSHA announced the proposed standard on October 24, 1974, requesting public comments no later than December 9, 1974. To accomodate public requests for additional time, the deadlines were later extended to January 22 and then to March 21. Requests to appear at the hearing, to begin June 23, in the Department Auditorium, Constitutional Avenue between 12th and 14th Streets, NW, Washington, D. C., should be submitted to J. Arnoldus, OSHA Committee Management Office, Room 200-MNWA, 1726 M Street, NW, Washington, D. C. 20210.

President Gerald R. Ford recently issued a statement establishing his Administration's intention toward a metric conversion program in the United States. It reads as follows:

"It is important that the United States develop a national plan to direct the voluntary conversion to the metric system as the standard of measurement. Accordingly, my Administration will soon submit the 'Metric Conversion Act of 1975', which will establish a United States Metric Board to plan and coordinate the predominant but not exclusive substitution of metric measurement units for customary measurement units in education, trade, commerce, and all other sectors of the economy. The legislation is designed to encourage efficiency and minimize overall costs.

"The (American) National Metric Council and other similar groups have done much to smooth the way to metric conversion. Such continued efforts will be very important to its final realization."

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THE SEED LABEL

By JAMES CONVERSE, Proturf Division, O.M. Scott & Sons

IN CONSIDERING expenditures for turf there is often less concern about the purchase of seed than any other cost. Whether planting new areas, or overseeding, it is well to be completely informed about the seed we place in the ground. Unfortunately, the seed label is taken at face value and appears to be simple and straight-forward. But, it implies many things and fails to clarify others. Anyone who encounters frequent planting situations should be familiar enough with the label to analyze all possible unseen consequences.

The most imposing figures on any label are the percentages of each seed variety. But, we must constantly remind ourselves that a label reading 50% Kentucky bluegrass and 50% Highland bentgrass is not going to grow into 50% Kentucky bluegrass and 50% Highland. The label merely states that 50% of the **weight** of a package is Kentucky bluegrass and the remaining 50% is Highland bent. For it takes 9,072,000 seeds of Highland bent to make a pound and only 2,177,280 seeds of Kentucky bluegrass. Thus, this package which seems to be an apparent 50-50 mixture actually amounts to 81% Highland bentgrass and 19% Kentucky bluegrass.

To begin with, a mixture of 80% Kentucky bluegrass and 20% Highland bent is not compatible, but even if the buyer were aware he might consider the bent to be in modest, insignificant proportion. In reality this man will plant 1,814,400 bentgrass seeds and 1,714,824 Kentucky bluegrass seeds. The great variation in seed count per pound graphically illustrates why we must look beyond the percentages on the seed label. Percentages merely indi-

cate the weight of each variety in the container. What we must learn, or have easy reference to, is the number of seeds in a pound of each variety.

There are other figures on the seed label which appear insignificant, but require full understanding. For instance, **purity** is an indication of quantity and not the quality of a given variety. Even though seeds are pure, not all are capable of germination and growth.

Another seed label term is **germination**. This is the percentage of pure seed that is capable of beginning growth within a prescribed period of time. Unfortunately, not all seeds have the same strength, the same rate of growth, or the same survival rate. So, the percentage of germination merely indicates seeds that will start growth and not necessarily those that will end up as turf. To determine how many pure seeds will germinate, multiply the percentage of purity by the germination percentage. Example: the label says the purity of Kentucky bluegrass is 90%, the germination 80%. By multiplying the two we find that only 72% of the lot will be pure, live seeds. When we consider the mortality rate from various factors, the percentage of possible growing plants is again decreased.

Other terms that may appear on the seed label are **crop**, **weeds**, **noxious weeds** and **inert**. Each has a meaning, or significance, that will directly affect the quality of the final package. In most instances the percentages that represent these terms appear so trivial as to lack importance. But, they do play a major part in determining the final quality of mature turf.

(continued on page 45)

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Minerals and Management

Measuring the Nutritive Values of Gypsum

By DR. GUY TERWARI, U.S. Gypsum Co., Des Plaines, Ill.

"TURF" is a common word throughout Europe and U.S.A., and its origin lies in the Sanskrit word "darbhus" which means a tuft of grass. In general terms "turf" refers to a piece of the outermost layer of soil with the living matted vegetation. Historically, the concept of open yard, now generally known as lawn, originated in China as early as the 12th Century. Later, Victorian England imported this practice into the British Isles. Turf grass, like any other living organisms, is sensitive to the various environmental stresses, and responds to a good and sound management program including the provision of essential plant nutrients to enable it to carry out its vital metabolic processes.

Properties of Gypsum

Gypsum is a naturally occurring mineral in the earth's crust. From a chemical standpoint, gypsum ($\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$) is calcium sulfate combined with two molecules of water.

In most of the naturally occurring deposits, it is found in combination with anhydrite (CaSO_4). Anhydrite is, primarily, calcium sulfate devoid of water molecules. Gypsum, in its pure form comprises 20.9% combined water, 46.6% sulfur trioxide and 32.5% lime as calcium oxide (CaO).

Although not very soluble in water, gypsum is 150 times more soluble than calcium carbonate. It is the most soluble mineral form of calcium. Solubility of gypsum, when applied to soil, depends on several factors, including the amount of available soil moisture and the extent of the contact between the gypsum and the soil particles.

Traditionally, gypsum has been used on plants in a fine powdered form. Gypsum, in this form, is highly soluble in soil solution. However, only gravity-type spreaders can be used to apply this material to large areas as its light and dusty nature is not suited to centrifugal or

whirly-bird type spreaders. Coarse grind gypsum (20 percent passing 100 mesh) is somewhat superior to the powdered form in bulk handling and field spreading characteristics.

A new form of gypsum has recently been developed by United States Gypsum Company. It combines some of the major physical and chemical characteristics which are considered essential in relation to the use of gypsum in agriculture. It has a particle size range of 6x30 mesh, and is compatible for bulk-blending with other fertilizer materials. It can be bulk-blended and bulk-spread with conventional fertilizer spreaders. It has tailored solubility under normal field conditions as it becomes available to plants at a controlled rate. Controlled solubility makes it longer-lasting and prevents it from being prematurely leached out of the soils before plants are able to utilize it. It is non-segregating to a large extent and is non-caustic. Granular gypsum can also serve as carriers for micro-nutrients, pesticides and herbicides.

Gypsum, A Soil Conditioner

Soil is the medium for plant growth. Physical and chemical properties of soils profoundly affect plant growth and development as the plants depend upon soils for nutrients and water under a favorable soil physical environment. Soil structure and soil consistency are the main factors influencing the soil physical environment.

Soil structure refers to the arrangement of soil particles. A good soil structure is synonymous with the abundance of water stable aggregates or granules. A soil having a good soil structure is subject to minimum surface crusting, minimum soil erosion, and allows water and air to circulate through the soil system. A good soil structure can be

promoted by the flocculation (forming large chunks) of the dispersed soil particles.

Various factors may cause soil structural degradation. Most important among these are the concentration of sodium ions, excessive cultivation, compaction, flooding, poor drainage, high clay content, low organic matter, etc.

Gypsum has long been used as a soil conditioner, and its primary role, in this regard, is related mainly to its flocculating action on the clay particles. From physico-chemical standpoint, clays are negatively charged particles. These particles, like any negatively charged particles attract positively charged ions, such as calcium, magnesium, potassium, sodium, ammonium and others. Sodium ions, when present in soils, in excess of 10-20 percent of the total cations, adversely affect the soil physical property. The detrimental effect of sodium ions is related to soil swelling, reduction in soil pore space and in increased hydration.

When gypsum is applied to such soils, the calcium ions from the dissolved gypsum replace the sodium ions on the soil particles and bring about the flocculation of the soil particles. Another mechanism by which the calcium ions influence the soil physical condition is to flocculate the clay particles in association with the oriented water molecules.

When the soils become dry, the particles are pulled together and, in the presence of calcium ions, this action causes flocculation of the dry particles.

Various synthetic soil conditioners, such as polyacrylamide bitumen emulsions, polyvinyl alcohols, polyvinyl acetates and others have also been tried as soil conditioning agents. The mode of action of these substances involves the formation of linkages between the soil

(continued)

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GYPSUM (continued)

particles which, in turn, is caused by the primary absorption. The synthetic soil conditioners are, however, expensive and thus economically prohibitive for large scale uses. Moreover, they lack nutritional values. Gypsum, on the other hand, is a much less costly product and is also an important source of two major plant nutrients, sulfur and calcium.

Gypsum, a Source of Calcium

Gypsum supplies calcium which is one of the major essential elements for plant growth and development. Calcium is required for maintaining the cellular protoplasmic organization, and is also responsible for the formation of calcium pectate which acts as a cementing agent for the cell walls. Calcium deficiency in plants is generally characterized by the failure of the terminal buds and the apical tips of the roots to develop. It influences the protein synthesis by its ability to regulate the uptake of nitrate nitrogen. Calcium affects the activity of certain enzyme systems. Calcium ions are involved in the movement of ions into the root cells by synthesizing and maintaining the root membranes.

A Source of Sulfur

Sulfur, like nitrogen, is a major essential element and acts as an agent of low energy bonding in the protein synthesis. Sulfur also influences the process involved in the hardening of protoplasm in cold or drought condition. Sulfur is similar to phosphorous in activities related to energy transfer within the plant system. Sulfur is needed for the synthesis of sulfur containing important amino acids; cystine, cysteine and methionine. It also acts as an activating agent for certain proteolytic enzymes, and is a constituent part of some vitamins, co-enzyme A and of glutathione. It is also found in oils of plants belonging to mustard and onion families.

Plants suffering from sulfur deficiencies are known to accumulate nitrates as well as amides. Plants take up sulfur in the form of SO_4 ions.

Time and Rate of Application

Rate of application depends upon a number of factors, such as the soil type, soil fertility status, organic matter content and the nature of the plant species.

Time of application would depend upon the objective and the management techniques employed in the establishment and maintenance of turf. When new turf is being established, the ideal thing to do would be to apply a generous amount of gypsum at the time of land preparation. For maintenance purposes, gypsum should be applied at any time of the year, but late fall and spring application would be more effective. Gypsum can also be applied in mixture with other lawn fertilizers.

From the foregoing, it is evident that the gypsum application can be a very productive tool in the establishment and maintenance of good turf. Its primary role is related to the improvement in soil physical property leading to improved soil structural condition, improved soil drainage, improved air and water circulation, increased water holding capacity and greater root penetration.

Plant roots need adequate quantities of oxygen to carry out their important metabolic processes. Greater root proliferation and greater root penetration also allows the plants to explore large volume of soil for plant nutrients and water. Enhanced root activity provides a greater amount of organic matter essential for a good soil structural condition.



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THE MAGNITUDE and nature of the problem of troublesome aquatic plants in the United States is extensively documented and generally well known. There is no need to repeat this information; if no problem existed we would have no real reason to be here.

This presentation is a summation of my personal views and it is not to be construed as the official stand of the Waterways Experiment Station of the Corps of Engineers.

My purpose is to suggest that the problem is so large and so complex that there is no single solution to it, and that instead of a panacea, we need an arsenal. It has seemed to me that many of the people concerned with aquatic plant management,

But I believe it to be equally true that someone must attend to the whole mosaic, so that the tessera of special products may be fitted together. In effect, I am proposing the development of an integrated system for managing aquatic plants.

I prefer to think in terms of "aquatic plant management" rather than "aquatic weed control." It has become obvious that "the problem" is concerned with *managing* a complex system and not just *controlling* one facet of it. The term "management" is also more compatible with the thinking behind the new name for this Society. What we must have is a logical, but possibly rather complex, methodology by which the entire aquatic ecosystem

The Situation

In past years when aquatic plants were just beginning to be problems in the nation's waterways, people responsible for their control thought in terms of total eradication. It has taken some years and considerable frustration to realize that any aquatic plant that is successful enough to become a national problem is here to stay. Why is this so? Because they almost all have very large ecological amplitudes, i.e. they flourish in a wide variety of situations. The water hyacinth, for example, grows in the tropics, subtropics, and temperate zones. It grows along exposed lake banks, under cypress trees, in shallow ditches, in large open reservoirs, in narrow canals and broad streams, in small shallow depressions with very little water, and, indeed, in wet soil where there is no standing water. It grows in coastal lagoons with saline water, in open sewers, and in pristine brooks, and on and on *ad infinitum*. I have even seen them grow in distilled water for a surprising length of time.

There are at least two major implications here. One is that the plants are now an integral part of

(continued)

A Long Range Look At AQUATIC PLANT MANAGEMENT

By WILLIAM N. RUSHING*

both research and operational types, have been guilty of tunnel vision; they have selected a small part of the puzzle, declared it to be *the* essential part, and worked on it without regard to its relation to the big picture. To be sure, it is essential that scientific specialization continues.

is managed for the benefit of nature and a highly complex and changing society. The system will almost surely be multifaceted, consisting of an entire arsenal of techniques and hardware, any combination of which can be called upon for attacking a given problem.

*The author, botanist with the United States Army Engineer Waterways Experiment Station, Vicksburg, Miss., presented this article at the Hyacinth Control Society convention, July, 1974.



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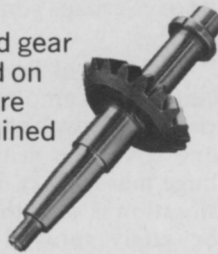
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the aquatic ecosystem and play an essential role in it. The fact that the plants now play an essential role in the biosystems suggests that in many places, we would not *want* to eradicate them, even if we could. Indeed, whether a plant is "good" or "bad" is entirely a matter of who is doing the defining. One land owner may like water hyacinths around his boat dock and another may not — in one case they are good and the other bad. Introduction of the human factor complicates the situation drastically. Each individual and group tends to see the aquatic plants in terms of its own viewpoint. The result is that landowners, environmental groups, fishermen, water skiers, the EPA, and so on, express the problem and the acceptable solution in different ways.

The second implication is that methods to control growth and proliferation must enable us to reach effectively into every nook and cranny of the aquatic world; into broad lakes, swift streams, drainage ditches, navigation canals, cypress swamps, reed marshes, and so on. Further, we must be able to reach into these places and kill or suppress the target plant, but *only* the target plant. A technique that kills water hyacinths in a drainage canal, but that also kills the soybeans in the fields alongside, is clearly unacceptable.

The situation, then, is a complex of factors about aquatic plants and about the nature of the problems they pose to society. From this, it is clear that an aquatic plant management capability must be one that can be applied with precision and selectivity. Each situation will dictate how precise and how selective each operation must be.

The Problem

The situation discussed above demonstrates that an effective aquatic plant management system must meet three general requirements.

First, the control method must be fitted to the situation. At first glance this often seems to be easy, but in practice, many subtleties intrude. For example, Blue Lake, Mississippi, is choked with alligatorweed, so let us introduce the Agasicles beetle to suppress the plants. But it turns out that there is a difficulty. The lake is surrounded by cotton fields, and the insecticides used

to suppress the bollworm and boll-weevil also eliminate the Agasicles. The cotton farmers are not going to lose their crop to save a few funny bugs on alligatorweed in a lake they mostly wish wasn't there to begin with. So let us spray the alligatorweed with a herbicide — but let's make sure that it doesn't drift over into the cotton fields — a practical impossibility. What is left? Perhaps a slow-release herbicide in the water. Perhaps mechanical harvesting. Perhaps a fungus that is immune to insecticides, but is specific to alligatorweed. Perhaps some combination of these.

In parts of Louisiana water hyacinths grow among the cypress trees, choke narrow and tortuous bayous, and cover the nearby open lakes in huge masses. Let us assume that the situation is such that herbicides may be safely sprayed on them. A rig mounted on an airboat is effective in open lakes and bayous, but how do we get the herbicide to the plants amid the closely spaced trees? Clearly another kind of operational platform is required. The point is that the control method must fit the geographical, ecological, and social situation, and it is utterly unrealistic to assume that one weapon will deal with all possible eventualities.

The second general requirement is that the control methods must be economical. To be sure, there is obviously a direct relation between the criticality of the problem and the amount of money that may be spent to eliminate the problem. Nevertheless, the lower the cost, the happier we all will be. Thus, a technically effective method may be ineffective in practice because no one is willing to foot the bill.

The scientific community is often guilty of forgetting the sordid fact that somebody has to pay for each operation. But we all sometimes forget that economics is not based on the same considerations in all places. Thus it is that a candidate control method may be tried in one situation and rejected because it is too costly. The method is then all too often automatically removed from consideration for other situations. And that may be a mistake. In the next county is a lake used for recreation; the people concerned with it might well be willing to pay a high price for a control method that would keep the water free without

deleterious or undesirable side effects. But the method used in, for example, Lake Loiza, Puerto Rico, is rejected because it is "too expensive." We have thrown the baby out with the bath water.

The point is the cost is relative. Thus, it may be concluded that our arsenal of weapons can include systems that range widely in cost of operation.

The third general requirement is that control methods must be timely. A method, however effective at killing aquatic plants, that cannot be cranked up until after a boat in Jacksonville harbor has been swept from its mooring by a flood of water hyacinths is not really acceptable.

The argument here is that an effective and economical aquatic plant management system must incorporate procedures for applying the various plant-killing or plant-growth suppression methods at the optimum time and place. All too often the plant control agencies do not learn of the existence of a problem until a telephone call from a frantic citizen apprises them that the bridge to his house is about to be swept away by legions of water hyacinths. At this point in time, the population explosion has already occurred, so the control agency is faced with the prospect of dealing with the worst possible situation.

The nagging fact is that those legions were once upon a time only a handful of juvenile plants. If they could have been attacked at that time, the population explosion would not have occurred, and the crisis would never have arisen. And all of this might have been achieved by a couple of hours of effort and a few grams of herbicide, or a few gallons of fuel to run a mechanical harvester, or whatever. The difficulty is that there is no effective method of finding potential centers of population explosions or of monitoring the growth of populations. The result is that our control agencies are forced to await the onslaughts of the mature armies, instead of strangling the babies in their cradles. The latter would clearly be cheaper.

The point is that we need an effective intelligence service, so that our available arsenal of control methods can be deployed with maximum effort.

(continued on page 36)

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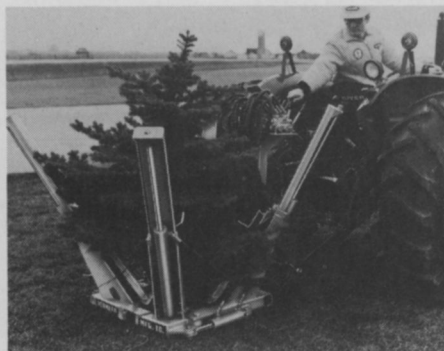


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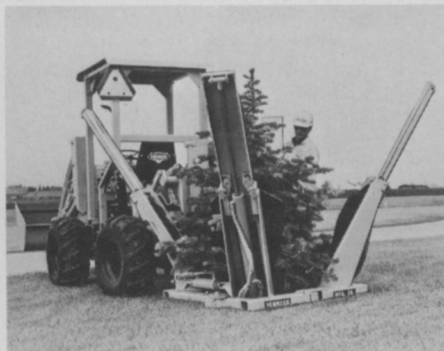
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Alva Burkhalter Updates

The White Amur Controversy

RESEARCHERS are making a concerted effort to find biological control organisms for noxious aquatic plants. The three primary control groups being studied are insects, diseases, and fish. Perhaps the most controversial group of biological control agents is the fish, of which the white amur has received the most criticism.

The white amur is a member of the family Cyprinidae — the minnow or carp family — and is indigenous to the great rivers forming the boundary between northern China and southern Russia. Once it grows to three or more centimeters, the amur is almost exclusively a herbivore and offers promise for controlling aquatic higher plants. Investigated as a potential biological control agent for submerged aquatic weeds, the fish has an outstanding history.

The amur was first introduced in the U.S. in 1963 at the Bureau of Sport Fishery and Wildlife's Fish Farmer Experiment Station at Stuttgart, Ark. Research was initiated at the station and at Auburn University in Alabama. In the late 1960's, the Arkansas Game and Fish Commission started using the white amur in an operational aquatic weed control program. This action initiated the controversy that exists today. There was an immediate uproar from the other states who banned the amur from introduction until more was known about its environmental impact in the U.S. The white amur is now being studied intensively in a number of these states, many of which feel it has a tremendous future in aquatic plant control.

In preparing this manuscript, my initial step was to phone other state representatives actively involved in white amur research. I asked two general questions: What were their past and present programs with the fish? What future investigations were planned? I will take each state contacted and briefly summarize the responses.

ARKANSAS — Since much of the controversy started with the Arkansas Game and Fish Commission's endorsement of the white



The author, Dr. Alva P. Burkhalter, is coordinator, Aquatic Plant Research and Control, Florida's Department of Natural Resources, and immediate past president of the Hyacinth Control Society, Inc.

amur, I feel it would be appropriate to start with the State of Arkansas. Bill Bailey, fisheries biologist with the Commission, has been engaged in work with the white amur since shortly after its arrival. He studied the fish in closed systems until the late 1960's, then Arkansas began releasing amur into public waters. The fish has since become the primary means of aquatic plant control. In addition, Arkansas also has investigated artificial propagation of the amur, its effect on selected native sport fish and its commercial and sporting potential.

Virtually all public lakes with submerged weed problems in Arkansas have been stocked with this biocontrol agent. This has involved more than 100 public lakes, totaling more than 50,000 surface acres and 380,000 white amur. The exact number of private ponds and lakes that have been stocked is unknown.

The initial controversy arose from the fact that many of the stocked lakes are in the Mississippi River watershed which comprises a

drainage area equivalent to almost three-quarters of the U.S. The white amur currently is distributed from the lower Mississippi in Louisiana to the Missouri River into Nebraska, including the Ohio, Tennessee, and numerous other rivers connecting with Mississippi drainage. This strongly suggests presence of the amur in the waters of three-quarters of the U.S.

To date, no one has confirmed natural reproduction. All fish captured thus far can be traced to known age groups accidentally escaped from Arkansas. Most captured fish have weighed several pounds and no fingerlings or fry have been recorded. One paradox of this situation is that many states are still arguing over releasing this fish into their waters. Since the amur now has access to the vast area between the Appalachian and Rocky Mountains via the Mississippi River, it seems this argument makes as much sense as "hip boots on a boar hog." For at least three-quarters of the U.S., this argument is ludicrous.

I asked Bailey if the Arkansas Game and Fish Commission felt it had made the correct decision in releasing the white amur. I received an unequivocal "YES" to that question. They have attained good weed control, recorded no adverse effects on sport fisheries and feel they will continue to have one of the finest waterfowl-hunting states in the country. Even though fish have escaped into the Mississippi River, Arkansas feels that there is no imminent danger. If the amur reproduces naturally in the Mississippi watershed, Arkansas feels it will be controlled by its own demand of a highly selective spawning site or by natural predation.

Bailey made an interesting statement in one of his reports: "The stocking of white amur in weed control concentrations has produced definite long-range, detrimental effects on one species — the white amur itself." In other words, white amur used at proper rates appear only to be detrimental to themselves since they tend to lose weight even to the point of starvation when



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Turn the page for reasons why Banvel herbicidal effectiveness becomes the key to cutting the cost of vegetation control. . . .

Why and how Banvel® industrial herbicide formulations in your vegetation control program make excellent economic sense....

Q. We've sprayed picloram for two or three cycles and got rid of many brush species, but the tough brush gets bigger and tougher. Our problem is to control a mixture of oak, ash, hickory, poplar, sassafras, cedar . . . well, you name it. What formulation do you suggest in a long-term selective brush control program along our transmission line right-of-way?

A. Basal applications of Banvel®-510, one pound dicamba and two pounds 2,4,5-T per gallon, has proved effective

and economical for the control of both hardwood and evergreen species, including root-suckering trees such as sassafras, chokecherry, aspen, sumac, and locust.

As with picloram, Banvel-510 herbicide is applied by hydraulic spray, using a mix of two gallons of Banvel-510 in 98 gallons of oil, at the rate of approximately 100 gallons of spray mixture per acre of brush.

Spray the basal parts of the brush and tree trunk from the ground line up to a height of 1-1/2 to 2 feet. Spray until runoff, with special emphasis on covering the root crown.

Treatment may be made at any time during the year.

As a foliage spray with water, use Banvel®-320 or Banvel®-710 at the rate of one gallon in 99 gallons of water and spray the entire plant to runoff.



Q. Our experience indicates that picloram is a long-residual material, and our company is greatly concerned about this. How does Banvel dicamba compare in this regard?

A. The half-life of picloram is in excess of 100 days. The half-life of Banvel dicamba is 25 days. Once Banvel dicamba gets into the plant system, it works over a period of two or three years in disrupting the plant's cellular structure. In the soil, Banvel dicamba that is **not** absorbed by the root sys-

tem of the plant dissipates quickly. It breaks down into harmless compounds in the process of biodegradation.

Soil moisture, organic matter content and temperature greatly influence Banvel dicamba degradation, but metabolism by soil micro-organisms is the major factor in degradation.

Q. Can we tank mix Banvel dicamba with 2,4-D and 2,4,5-T?

A. You certainly may. Banvel herbicides have Federal label registration for tank-mix combinations with the phenoxyes for both water- and oil-

soluble formulations. Also by tank-mixing with 2,4-D and 2,4,5-T, you can double the acres you can spray.

Q. Some parts of our right-of-way are cattle-grazed. We find that picloram is not registered for use in grazing land. What about using Banvel herbicide here?

A. Banvel dicamba herbicide has Federal registration for use on pasture

grasses. Established tolerance in grass is 40 ppm and in milk, 0.05 ppm. There is no withholding period for meat animals on Banvel dicamba when used alone on treated areas, with this exception: do not graze meat animals on treated areas within 30 days of slaughter. Also, do not graze dairy animals on treated areas within 60 days after application at high application rates;

up to 90 days delay is required before harvesting hay.

No tolerances have been established with 2,4-D or 2,4,5-T in or on grass. 2,4-D, 2,4,5-T and picloram are federally registered for use on pasture grasses. However, picloram has EPA registration for use in Texas.

Q. What about Banvel 4-W.S. herbicide toxicity?

A. Banvel® 4-W.S. herbicide was developed and tested during the period when extensive toxicological and residue requirements were necessary to obtain Federal registration. It has met

every requirement of the USDA, the FDA and the EPA in this regard, and obtained label clearance for industrial brush control in 1968. Be sure to observe grazing and harvesting restrictions shown on the label.

Although Banvel 4-W.S. is several times more active on brush than the phenoxy compounds, it is approxi-

mately five to ten times less toxic than 2,4-D or 2,4,5-T. The LD₅₀ in rats for dicamba acid is 2900 mg/kg. 2,4-D is 300-470 mg/kg, and 2,4,5-T is 390-640 mg/kg.

Q. Much of our right-of-way is overgrown with a varied mixture of brush and weeds. What chemical should we use in a foliar spray?

A. If there is a mixture of species—conifers, softwoods, hardwoods, vines—you need a formulation that controls the broadest spectrum. Use Banvel-320, containing one pound dicamba, one pound 2,4-D and one pound 2,4,5-T per gallon. Or use Banvel-710, containing one pound dicamba

and two pounds 2,4,5-T per gallon. Banvel dicamba alone controls most species, including softwoods that phenoxyes do not control. Moreover, Banvel dicamba permits grasses to flourish.

Q. I have willows taking over my ditch banks. Picloram and 2,4,5-T are not registered for ditch bank use. What chemical can I use to get rid of these trees and a lot of other brush and weeds?

A. Banvel 4-W.S. dicamba gives excellent control of willows and their destructive, water-seeking roots, and is registered for ditch bank brush control. It also destroys broadleaf weeds and extensively rooted vines. Because it is a selective weedkiller, at proper

dosages it will not harm grasses, so you can avoid erosion along banks of irrigation or drainage ditches. Banvel dicamba, alone or in combination with 2,4-D, is registered for vegetation control along ditch banks.

Q. Last year we had difficulty getting an adequate supply of Banvel dicamba and phenoxy in premixes, or in any form. What is the supply situation this coming year?

A. Banvel dicamba and phenoxy should be in adequate supply, in spite of demand that has doubled each year for the past three years for use on several crops and on grazing lands throughout the United States. Recently, Velsicol completed a new manufacturing plant that has more

than doubled the production of Banvel dicamba.

At present, our supplies of 2,4-D and 2,4,5-T acid are limited. You can, however, profitably stretch the 2,4-D or 2,4,5-T materials you are able to find with the various Banvel dicamba tank mixes.

Q. Can I use Banvel dicamba to sterilize certain areas?

A. Banvel dicamba is not a soil sterilant, and should be used at label dosage rates for brush and broadleaf weed control. Banvel 4-W.S. herbicide is selective, allowing grasses to grow

for soil cover and to prevent erosion. If you wish to sterilize the soil, your contract applicator can advise you, or call Velsicol on the Banvel "Hot Line."

Q. How does Banvel 4-W.S. herbicide kill brush? Why is it more effective than the phenoxy compounds?

2,4-D and 2,4,5-T, but also controls many species not controlled by phenoxy chemicals, such as evergreen species and suckering hardwood species. There are no other herbicides in commercial use that outperform Banvel 4-W.S. for control of brush and vines.

Because Banvel 4-W.S. dicamba translocates, it gives a more complete kill, even though the entire plant is not sprayed. Other herbicides may merely suppress. Therefore, Banvel 4-W.S. is more effective on the toughest weeds, trees and vines that have the deepest or most extensive root system. Translocation of Banvel 4-W.S. herbicide through the plant system eventually gets to the roots.

A. Phenoxy compounds enter the plant through the leaves and bark, while Banvel 4-W.S. herbicide enters the plant through the roots as well as the leaves and bark. It is several times more active biologically than the phenoxy herbicides. Its different mode of action and greater mobility within the plant give a higher degree of brush and vine control with Banvel 4-W.S. dicamba alone or with Banvel dicamba plus phenoxy mixtures than with phenoxyes used alone.

Banvel 4-W.S. dicamba not only controls those brush species controlled by



Q. I put out Banvel-510 herbicide in September as a basal application, according to your label directions. Brush browned out very well, but in June the next year, some trees started to leaf out. Does this indicate partial failure?

application. Translocation takes time. Chemicals that give immediate, first-year brownout do not necessarily give third-year kill, so that you have to spray more often. Full benefit of Banvel-510 herbicide, its ultimate effect, is in the third year.

Banvel 4-W.S. dicamba by itself, applied to brush, is slow in giving brownout. With some species brownout is never achieved, as leaves curl and fall without turning brown. With the addition of 2,4,5-T brownout is faster, occurring within two to four weeks after

application. The addition of Accutrol® adjuvant will increase penetration and absorption of the chemical.

Some species take longer to die than others. For a few, it will be 18 to 24 months from time of application.

In short, this means that you spray on a three- to five-year cycle . . . you seldom have to go in again sooner than three years.

A. It's true that elm and certain other species often leaf out during the first growing season. However, Banvel-510 herbicide usually gives complete kill in the second growing season after the

Q. My management has made a decision not to use 2,4,5-T for brush control. Do you have a product I can use that does not contain 2,4,5-T as a basal application to control brush?

A. Yes, for sure. Banvel®-520 herbicide, containing one pound dicamba and two pounds 2,4-D per gallon, controls a broad spectrum of brush. Why don't you give this formulation a good test? But, if you feel that it is not doing

the job as expected, call Velsicol on the Banvel "Hot Line" free of charge. On certain species, Banvel-520 herbicide proves effective but works more slowly than Banvel-510 herbicide.

Q. We use some pellets in our vegetation control program for brush and vines. Does Velsicol manufacture a Banvel dicamba pellet?

A. Yes, Velsicol sells Banvel® XP pellets, containing ten percent dicamba in clay. It is applied by hand or mechanical applicator, scattered uniformly on the ground under the tree, within six

inches of the trunk. Banvel XP dicamba leaches to the roots where it is taken up and translocated throughout the tree, destroying growth tissue as it goes.

Q. I've been using 2,4,5-T on poplar, sumac, chokecherry, locust, sassafras, aspen, and persimmon with good kill the first year. But right now, about two years after, these areas are thick with root sprouts. Would this happen if I used the right Banvel dicamba plus phenoxy formulation?

A. Not at all likely. Banvel herbicide combined with a phenoxy kills dormant buds and gets absorbed by the roots of these trees as well as through the leaves and bark, to put a sure end to root suckering. As long as you get good coverage around the crown of the plant, you will get good brush control. Banvel-510, containing 2,4,5-T, is

recommended, unless you have an environmental restriction against 2,4,5-T. If so, then you may be able to use Banvel-520, containing 2,4-D. Lower in cost than Banvel-510, Banvel-520 does not control quite as broad a spectrum of brush species, especially maple.

Q. Environmentally, how does Banvel dicamba compare with other brush control chemicals?

A. The table shows a comparison of Banvel dicamba with other brush control chemicals.

ENVIRONMENTAL COMPARISON OF BRUSH AND WEED CONTROL CHEMICALS

	BANVEL	2,4-D	2,4,5-T	TORDON
Chemical Toxicity (acid) oral LD ₅₀ over 2500 mg/kg	Yes	No	No	Yes
EPA Federal Label Approval on Pasture and Rangeland	Yes	Yes	Yes	*
Waiting Period Between Treatment and Grazing:**				
Beef Cattle	No	No	No	*
Dairy Cattle	Yes	Yes	Yes	No
Federal Residue Tolerances Established on:				
Pasture Grass	Yes	No	No	*
Crops	Yes	No	No	No
Milk	Yes	No	No	No
Soil Persistence Half-Life	25 days	4 days	20 days	100+ days
Ditch Bank Application (registered label)	Yes	Yes	No	No
Controls Both Hardwood and Softwood Species	Yes	No	No	Yes

*EPA registration for use in Texas.

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the submerged weeds are eliminated.

There are several large commercial fish farms in Arkansas currently producing and selling white amur for weed control. The fish farmers are advertising in magazines such as *Progressive Farmer*, *The Commercial Fish Farmer*, and many others. Their advertisements get wide distribution as do their commercial sales. There is no federal legislation that prohibits these dealers from selling fish to persons in any other state — only legislation within the various states it may enter. Therefore, the only way a state can stop the entry of the fish is to confiscate it upon entry.

Many of the small cyprinid minnows commonly sold as bait closely resemble the white amur. Unless examined by a well-trained person, the amurs would likely pass as just another shipment of bait minnows. Therefore, legally or illegally, the fish is already in nearly every state — particularly those which encourage farm pond practices.

Be it blessing or curse, Arkansas' stocking and sale of the white amur has forced many states to backtrack and initiate research programs. Regardless of their position on the fish, most states now have it in their natural waters.

ALABAMA — Since Auburn University obtained amur concurrently with Arkansas, they probably have conducted as much scientific investigation as anyone, particularly towards farm pond use. Many fishery scientists at Auburn have been working on white amur studies for eight years. They have studied its artificial propagation, dietary preference, feeding habits, effects on water quality and effects on native sport fishes.

Most of Auburn's fisheries personnel feel there is tremendous potential for the use of white amur as a control tool in farm ponds. They have found the amur, if properly used, will provide good aquatic plant control with no adverse effect on the sport fisheries.

Probably the most damaging scientific evidence against the use of the amur was reported by Dr. John Lawrence, fisheries scientist at Auburn. When stocked at excessive rates in fertilized ponds void of vegetation or lightly vegetated, amur may interfere with bluegill

recruitment. Lawrence feels that this does not damage the potential use of the fish in farm ponds, but rather the fish should not be used at random stocking rates.

A very precarious situation exists in Alabama. Although Alabama's Game and Fish Commission officially has taken no action for or against the fish, it nevertheless is being sold commercially within the state and probably is being used in farm ponds as extensively as in Arkansas. In fact, the fish is being sold in many bait shops and some commercial dealers even advertise in farm and ranch magazines.

FLORIDA — Since Florida has the most severe aquatic plant problem in the U.S., much of the present day controversy over the white amur is centered around this state.

White amur were brought into Florida in the late 1960's. Initial studies with the amur started as a joint effort between the University of Florida and the U.S. Department of Agriculture Laboratory under the direction of Dr. David Sutton and Robert Blackburn. Early work evaluated plant preferences and changes in water quality in aquaria and small plastic pools. Under a permit from the Game and Fresh Water Fish Commission and funding by the Florida Department of Natural Resources, Sutton initiated further studies in 1970.

Currently, the white amur is stocked in approximately 10 to 12 locations in the state. All are closed systems ranging from 5 to 250 acres. Plans are being promulgated to stock additional lakes, some of which will exceed 1,000 acres.

To date, most of the research conducted in Florida supports the ability of the amur as a weed control agent. No past studies have confirmed any undesirable effects on sport fish, water quality or other parameters of the aquatic environment. The crux of the controversy in Florida is not whether the fish does or does not have potential as a weed control agent — the controversy centers around the possibility of the fish naturally reproducing in the river systems of the state in sufficient quantities to pose a threat to fisheries and waterfowl populations. Proponents of the white amur, such as myself and my staff, feel there is little scientific evidence to warrant this extreme fear and cau-



The Honorable William E. Fulford (right), Florida House of Representatives, Orlando District No. 40, examines a white amur. Florida, with the most severe aquatic plant problem in the United States, has the most to gain with the use of the amur as aquatic weed controllers.

tion. Opponents of the fish, primarily the Florida Game and Fresh Water Fish Commission and several environmental groups, feel that all programs should proceed with extreme caution until more information is obtained on the potential reproduction of the fish in Florida's rivers. If the fish is ever given a clean bill of health, Florida, more than any other state in the Union, stands to benefit from its use.

Florida has a severe submerged weed problem, particularly with a species of plant commonly called Florida elodea or hydrilla (*Hydrilla verticillata*).

Introduced from the Malaysia-Indonesia area in 1959, it has spread rapidly and now infests over 100,000

(continued)

acres of water. Although millions of dollars are spent annually on its control, hydrilla rapidly is invading new areas of Florida and spreading to other states. It now is established in Georgia, Louisiana, Texas, Iowa, Oklahoma and several other states.

Currently, hydrilla is being controlled chemically at an average cost of 150 to 300 dollars per acre. Studies show that this soft-bodied plant can be controlled easily and economically by the white amur; preliminary costs range from 15 to 25 dollars per acre and would constitute a persistent treatment.

Regardless of the controversy, amur are still being moved and sold commercially to people in the state. The Florida Game and Fresh Water Fish Commission at last count documented approximately 32 cases of illegal stocking of white amur. I seriously doubt if this represents even one-tenth of the actual illegal stockings.

Hopefully, answers to many questions will be forthcoming in future years. Studies currently are underway in Florida to determine impact of the amur on sport fish, water quality, benthic organisms, vegetation and other parameters.

LOUISIANA — To update Louisiana's position and work with the white amur, I called Louie Richardson, supervisor of aquatic

plant control research for the Louisiana Wildlife and Fisheries Commission.

Louisiana initially took a "hands off" position on the white amur after the initial release by Arkansas. Later, Dr. Dana Sanders at Northwestern Louisiana State University, under permit from the Louisiana Wildlife and Fisheries Commission, began studies on the white amur/common carp hybrid. For all practical purposes, a hybrid would be sterile. If it retained parental characteristics of the white amur, the hybrid could be used without fear of reproduction. The presence of white amur in the natural waters of Louisiana and loss of some desirable parental amur characteristics has prompted Louisiana to discontinue hybrid investigations and concentrate efforts exclusively on the amur.

Some white amur escapes from Arkansas were first recorded in the Louisiana portion of the Mississippi River. Louisiana has confirmed the commercial and sporting catches from the Mississippi and its tributaries of more than 50 white amur ranging from nine to 40 pounds. Although there have been 50 confirmed captures, Richardson suspects this represents only a small portion of what has actually been taken. He additionally informed me that a commercial market is beginning to establish in Louisiana, and the amur is referred to as the shiner buffalo. In fact, local people ask for the shiner buffalo by name at market places.

An environmental impact study is being conducted by university fishery scientists within Louisiana and the Louisiana Wildlife and Fisheries Commission biologists. During the current year, six 30- to 250-acre lakes are to be stocked. Research considerations include the effect of the white amur on aquatic vegetation, water, quality, sport fisheries, benthic organisms and other parameters of the aquatic ecosystem. They also are examining the effects of the white amur on crawfish since the state supports a large crawfish industry.

In summary, Louisiana's policy on white amur research is one of "proceed with caution," but they do feel the fish has potential for use as a biological control tool.

GEORGIA — Georgia began investigations with the white amur

several years ago. Dr. Al Fox, Co-operative Fishery Unit, University of Georgia, has investigated the weed control potential of the white amur together with the impact of the white amur on sport fish, water quality, algae production, and benthic organisms. Basically, his results have been encouraging. The amur has exhibited good weed control and has not exhibited detrimental effects on sport fish, even at high stocking rates with sparse vegetation.

I talked with Leon Kirkland, chief of the Fisheries Division, Georgia Department of Natural Resources, who informed me that they currently are conducting a single study on the white amur. Kim Primer, fisheries biologist in Calhoun, Georgia, is investigating the amur in hatchery pond management for control of *Pithophora*, a species of filamentous algae. Primer reported very good *Pithophora* control which enhanced sport fish, primarily striped bass and catfish, recovery. He also noted that the amur can be aggravating to fish recovery because they are very active (particularly when seined) and thrash violently in the net occasionally causing harm to the recovery species. However, Primer felt the better recovery obtained as a result of the weed control made up for this small inconvenience.

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Primer said 123 five-pound amur were stocked in a 16-acre *Pithophora*-infested catfish pond open to public fishing. Within a year, the amur had grown from five to 14 pounds, the *Pithophora* was controlled and two white amur were caught by fishermen. He reported that no additional research was planned except for minor investigations in some southern hatcheries.

IOWA — A newcomer into white amur research is the State of Iowa. The person currently conducting investigations is Larry Mitzner, fisheries biologist with the Iowa Conservation Commission. In 1973, the Commission stocked Red Hall Lake, a 73-acre impoundment in southern Iowa, and plan to evaluate the effectiveness of the amur in controlling undesirable aquatic vegetation and its effect on sport fish population. To date, Mitzner has been pleased with the degree of vegetation control obtained and the absence of significant water quality changes. I would evaluate Iowa's attitude as optimistic, but again with

a cautious approach towards research.

ILLINOIS — Dr. Bill Lewis, University of Southern Illinois, has been using the amur for weed control for several years in many of the hatchery ponds at the fisheries research center where catfish, bluegill, bass and several other species are reared. Lewis is highly satisfied with the weed control ability of the amur, its palatability, and its compatibility with catfish and centrarchids. Additionally, he said white amur have been recovered from the Illinois reaches of the Mississippi River.

NORTH DAKOTA — I had a very interesting conversation with Dale Henager of the North Dakota Game and Fish Commission. In August, 1973, 5,000 three-inch fingerlings were stocked in a 500-acre closed-basin lake which has an excellent population of northern pike. Gut analysis of pike taken from the lake after stocking revealed that many small amur were being consumed by the pike. However, no amur have been recovered

in rotenone or pike gut samples taken after the first overwintering which suggests few if any residual amur. According to Henager, northern pike probably are highly predaceous on small white amur and the amur may not be able to tolerate North Dakota winters.

Although the white amur does tolerate winter conditions equivalent to North Dakota in its native range, it does so primarily in large river systems. The North Dakota lake was a non-flowing type and probably has much colder winter temperatures than the Amur River. Henger said the final demise of the amur was probably the severe North Dakota winters, but pike predation also played a significant role.

Additionally, he said that 800 to 900 fry were stocked in a small spring-fed pond. Although this pond contained very few predator species, there were no amur recaptured after one winter. Therefore, no further research is planned in North Dakota since the winters probably

(continued on page 35)

SAFETY

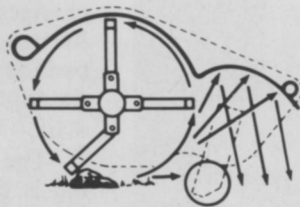


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Toro Chief Optimistic Toward Mower Safety Recommendations

David T. McLaughlin, President of The Toro Company, recently said he was optimistic that the final form of the mandatory mower standards, currently being developed by Consumers Union (CU) for the Consumer Product Safety Commission, (CPSC) would give the public maximum protection without imperiling the future of the power mower industry.

He pointed out that the Consumers Union committee working on this complex problem still has nearly one month before the standards are to be presented to the Consumer Product Safety Commission. "While the industry has done a highly commendable job in developing voluntary standards, there are a few areas where further performance safeguards could lessen accident frequency. It is important,

however, to realize that approximately 95 percent of all lawnmower accidents are caused by user carelessness. Standards to protect the consumer must be related on a cost/benefit basis so that the public does not pay excessively for the protection it receives.

"I am certain that members of the general public and of the mower industry will have an ample opportunity to make known their views before the Commission takes final action. I am hopeful that the Commission will look at this rationally and not repeat the mistakes evident today in the automotive industry."

McLaughlin said the impact of the CU standards would undoubtedly be less critical for Toro than for many others in the industry. "We did not wait for the government to mandate safety for

Toro customers," he explained. "Toro, over the past quarter of a century, has invested heavily in research for its on-going development of a safer rotary mower. As a result, we have introduced a host of innovative test procedures and safety features, a number of which the CU committee has recommended for adoption."

The chief executive said he hoped both Consumers Union and the CPSC would give full consideration to a Stanford Research Institute study released recently by the Outdoor Power Equipment Institute, the industry association which commissioned it. According to SRI, the latest CU draft standards could force more than one-third of the power mower manufacturers out of business.

Hyacinth Society To

The Hyacinth Control Society will meet for the last time July 6-9, 1975 before that organization changes their name to Aquatic Plant Management Society. L. V. Guerra, president, said the new name is more descriptive of their work, aims and activities.

The society's 15th annual meeting is planned for the Hilton Palacio Del Rio, San Antonio, Texas.

There is an international flavor to the up-coming meeting with many papers coming from foreign countries and a post-convention trip to Mexico City. A newcomer to the meeting is Dr. Pedro Mercado, representing Mexico's Fish and Wildlife agencies. His topic is "The Control of Aquatic Plants in the Central and Southern Zones of Mexico." Other speakers include John B. Ritch, director, Registration Division of the Environmental Protection Agency, presenting a paper entitled "The Progress in Pesticide Registration for Aquatic Weed Control."

Many papers are being pre-



Lew Hammer (center), president of the Associated Landscape Contractors of America, was an honored guest at the National Landscape Contractors/Garden Centers of America Clinic recently staged in Louisville. The clinic, open to all landscape professionals, landscape firms and garden center retailers, attempts to give participants a hard-hitting program aimed at top and middle management problems. Pictured with Hammer are Tom Gilmore (right), immediate past president of the National Landscape Association and Don Johnson, current NLA president.

Eastern Gypsy Moth Study Traces Six-Year Infestation

The Connecticut Agricultural Experiment Station has published a bulletin that describes the rise and fall of the gypsy moth and elm spanworm in Connecticut during the last six years.

The gypsy moth is still a problem in some parts of the state — particularly in eastern and northern Connecticut — but the elm spanworm was killed off a few years ago by a parasite discovered by station entomologists.

John Anderson, chief entomologist at the station and senior author of the bulletin, said it appears that "the general spread of these insects during 1969 to 1974 resulted from winds tending to blow more frequently from the south and west."

The data show "outbreaks of gypsy moth are now persisting for longer periods of time, and that the main directions of dispersal are to the north and east," he said.

"Thus it appears that future infestations in southern or western areas of Connecticut may spread across the state and even into adja-

cent states as the infestations have done during the early 1970's," said Anderson.

The bulletin contains a town-by-town record of the severity of defoliation experienced in 165 towns during the last six years. Only four towns escaped noticeable defoliation during that time.

Anderson also discusses the effects of aerial spraying programs carried out in 12 towns during the years from 1969 to 1971. He concluded in several cases that insect populations would have collapsed without aerial spraying.

The tables used for the defoliation data employ a location-identifying system called the Geo-Code which was developed by co-author Sydney W. Gould. Gould and Anderson feel that the Geo-Code could be used to assemble uniformly organized records of damage caused by any disease organism or insect.

The bulletin is available from Publications, The Connecticut Agricultural Experiment Station, Box 1106, New Haven, Conn. 06504.

Potentials of Foliar Nutrition Subject of Cornell Research

The Horticultural Research Institute recently approved funds to conduct research on foliar nutrition of environmental plants for improved production and maintenance efficiency, reduced nutrient runoff and ground water pollution, and fertilizer conservation.

The work, to be done under the direction of Dr. H. B. Tukey, Jr., Department of Floriculture and Ornamental Horticulture, Cornell University, Ithaca, N.Y., will evaluate the effectiveness of foliar applications to meet the nutritional needs of horticultural plants, both in the commercial production industry and in the maintenance of plants in nonagricultural situations, such as residences and parks.

According to Tukey, mineral nutrients and other substances can be absorbed by the foliage of plants more rapidly and efficiently than those applied to the roots.

"Foliar nutrition offers considerable potential as a more effi-

(continued)

Meet In San Antonio

sented on the biological control aspect of noxious aquatic plants. Papers on the use of plant pathogens for problem plant control are also being presented. Dr. Kerry Steward will present his study on "Factors Affecting Subaqueous Release of Herbicides from Various Invert Formulations." New Research on the white amur will also be presented by several authors including Mondell Beach of Florida's Department of Natural Resources.

The relatively new field of infrared photography for aquatic plant monitoring will be presented by at least two authors presently conducting research in this area. Problems associated with *Melaleuca* introduction into the Everglades will also be explored.

Social activities will include a Texas-style barbecue, tours for the ladies, hospitality hours, annual banquet and dance and the post-convention tour.

For more information, contact L. V. Guerra, President, Hyacinth Control Society, 134 Braniff, San Antonio, Texas 78216.

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There's a strong new entry in the Kentucky bluegrass lawn field, selected for its attractive appearance, low growth profile and good overall turf performance, including an ability to grow in moderate shade. A selection from Rutgers University, Glade has excellent turf quality, and has demonstrated good resistance to important lawngrass diseases including stripe smut, leaf rust, and powdery mildew. Glade mixes especially well with other elite bluegrasses and fine

fescues. Glade persists in areas of moderate shade where many other bluegrasses weaken because of too little sun. Nationally tested as P-29, it is one of the fastest germinating and establishing bluegrasses; quickly produces a heavy close-knit rhizome and root system, and a very attractive, leafy, persistent turf. Ask for new Glade for use in full sun or in mixtures with fine fescue for shade at your local wholesale seed distributor.

Another fine product of Jacklin Seed Company

cient method of meeting the nutrient needs of plants," said Tukey, "including nursery and greenhouse plants, commercial vegetables and fruits, certain agronomic crops, turf-grass in sod production and landscape plantings around homes and in parks, and forest trees in both seedling nurseries and forest plantings."

In addition, foliar nutrition may be an important aid in reducing nutrient runoff and subsequent groundwater pollution from agricultural land in plant production and maintenance. This practice may reduce the quantities of fertilizers used in the production of some environmental plants, which is particularly important now because of the worldwide shortage of fertilizer and the high economic and energy cost of fertilizer manufacture.

The proposed research will delve into the feasibility of foliar applied nutrients to provide nutrient requirements in plants in combination with root absorption. Research is expected to begin at Cornell University immediately.

Industry Seminar Includes Parts and Inventory Control

Forty-seven persons including two women, have been awarded certificates by The Toro Company at the completion of its training seminars in parts management and inventory control.

The classes, believed to be the first of their kind in the outdoor power equipment industry, demonstrated the increasing importance Toro gives to the sale of replacement parts for its maintenance equipment for lawn and turf care.

According to R. F. Eldred, general manager of Toro's Parts Division, the seminars were designed initially to increase the professionalism of parts managers, especially in forecasting and record-keeping, and thereby improve customer satisfaction and distributor profits. The present economic climate, which encourages repair rather than replacement of equipment, has made such training doubly necessary, he said.

Encouraged by the success of the first round of classes, Toro will hold future seminars in alternate years,

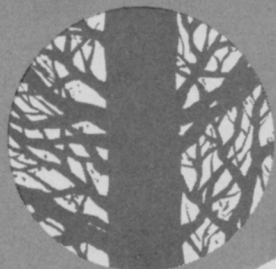
Eldred said. Between seminars, he plans to send divisional staff members out into the field to give on-the-spot training.

Proposed Plant to Produce Daconil, Bravo Fungicide

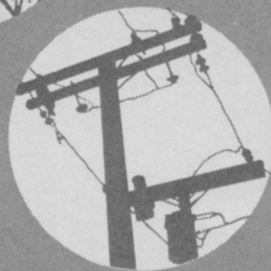
A new fungicide plant for Diamond Shamrock is slated for operation in late 1976, announced W. H. Bricker, president of Diamond Shamrock Corporation at the company's annual shareholders meeting.

The plant will produce Bravo® and Daconil 2787® fungicides, and is needed to supply growing demand in existing markets as well as new markets overseas, Bricker said. When completed, the new facility is expected to nearly double Diamond Shamrock's fungicide supplies in the United States.

Construction is scheduled to begin in early 1976 at Greens Bayou, Texas. It will be located adjacent to a "sister" fungicide plant which was in full production last year. The Company maintains other fungicide production facilities in Ashtabula, Ohio and Japan.



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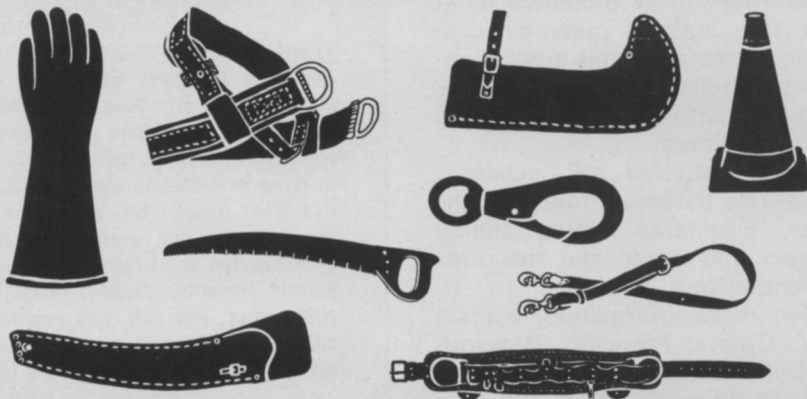
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Tree branching texture, crotch development and overall form are among the features inspected at the Ohio Research and Development Center shade tree evaluation plot.

Ohio Shade Tree Day Set for July 9

The background and status of the Ohio Shade Tree Evaluation Project will be one highlight of a combined program of the Ohio Shade Tree Symposium and the summer meeting of the Ohio Chapter of the International Shade Tree Conference, July 9, at the Ohio Agricultural Research and Development Center (OARDC), Wooster, Ohio.

The project was developed as a comparative evaluation of new tree selections in the north central states. The first phase of the study involves a planting of species in an OARDC plot. Plantings have been made annually since 1965. Currently, there are 128 species and cultivars represented in the 842 trees in the plot.

The second phase of the project involves evaluation of existing plantings of 53 different species in Toledo, Wooster, Columbus, Cincinnati and Cleveland. At each of the 99 separate sites, five replications of a tree type are being evaluated.

Dr. L. C. Chadwick, Professor emeritus of horticulture, will open the Symposium with a status report on both phases of the project. The program will also feature Richard Boers, commissioner of forestry, Toledo, Ohio, in a discussion of urban arboriculture; new plant introductions will be covered by Dr. Frank S. Santamour, Jr., supervisory research geneticist, U.S. National Arboretum; Charles L. Wilson, OARDC plant pathologist, will update Dutch Elm disease research; David Nielson, OARDC entomologist, will talk about shade tree insect control; and Dr. O. D. Diller, professor emeritus of forestry, will discuss establishment of community shade tree commissions.

Registration for the event begins at 9 a.m. in the OARDC auditorium with the program starting at 9:25.



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Toro Turf Products Extends Parts Warranty to One Year

The Toro Company has extended its warranty coverage on all of its institutional turf products to one full year, according to James R. Maloney, service manager.

The new policy covers the costs of both parts and labor for the repair or replacement of defective materials, including engines, transmissions and other components not manufactured by Toro.

The coverage, extended from 90 days, implements a new phase in Toro's program to assure after-sale satisfaction.

Toro has also adopted new procedures for equipment set-up and delivery. Distributors are supplied with a check list for each turf unit to make certain it is assembled properly and functioning well before acceptance by the purchaser.

Distributors are being urged to explain to each customer everything done to ensure top performance, and to provide instruction to turf maintenance personnel on proper operation, adjustment and maintenance procedures.



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"Golf course development has saved nearly two million acres of open space in areas where it is needed most," said Geoffrey Cornish, president of the American Society of Golf Course Architects (ASGCA). "In some overcrowded urban areas, golf courses are among the last large green belts, the final sanctuary for many species of wildlife and plant life."

A resident of Amherst, Mass., Cornish has designed more than 150 golf courses around the world. The 75-member professional association he heads is made up of the leading course designers in North America.

While golf course development on all fronts — municipal, private and real estate — has presently slowed with the economy, Cornish predicts that nearly another million acres of open space will be saved during the next 10 years by golf course developers.

"While many are waiting for a healthier economic climate, many people interested in new courses are now involved in feasibility studies and preliminary plans which indicates golf course construction may spurt later this year or early next year," he said.

Golf courses and other green belts act as big air conditioners, with trees, grass and shrubbery producing oxygen, trapping airborne pollutants, and absorbing unpleasant odors and noises.

The ASGCA president said the average 18-hole golf course can provide the oxygen requirements for a town of 7,000 people. Trees help cool and cleanse the air in summer, and reduce wind velocity and heat loss in winter. The soil absorbs moisture and replenishes water tables. The average 150-acre golf course, for example, effortlessly absorbs 12 million gallons of water during a three-inch rainfall.

Those interested in obtaining information on how to go about planning a golf course project may contact the American Society of Golf Course Architects, 221 N. La Salle St., Chicago, Ill. 60601.

WEEDS TREES and TURF

WHITE AMUR (from page 29)

are too severe for white amur survival.

PUERTO RICO — Bill Rushing, Corps of Engineers, Waterways Experiment Station, Vicksburg, Miss., informed me that the Corps and the Commonwealth of Puerto Rico are planning white amur research in Puerto Rico. Amur were stocked primarily for weed control evaluations in small ponds ranging from one to 15 acres on the Del Rado Beach property. The Commonwealth is planning to stock several large freshwater reservoirs which supply water to major cities and are plagued by submerged weeds.

TENNESSEE — Tennessee recently initiated investigation of the white amur in small ponds at the Oak Ridge Laboratory under the direction of Dr. Larry Wilson. Wilson will investigate plant preference and effectiveness of the white amur as a weed control agent and he will evaluate the impact of the white amur on native farm pond fishes and the sporting potential of the white amur.

Bill Campbell, Tennessee Game and Fish Commission, said white amur have been taken from Real Foot Lake and are probably from Arkansas stockings. Real Foot is in the northwestern part of the state and connects via canal to the Mississippi River. He feels the amur definitely is now in the Tennessee River watershed.

Leon Bates, biologist with the Tennessee Valley Authority (TVA), said the TVA stocked a small farm pond in Alabama to evaluate the aquatic weed control potential of the white amur. The pond was approximately an acre and was stocked with five three-pound amur. The fish did an excellent job in controlling weeds, and grew to approximately 26 pounds in two and one-half years. The amur did such an effective job that the farmer was very hesitant to allow TVA to recover the fish and insisted that the recovered fish be replaced.

Bates also said several Alabama ponds which occur along the Tennessee River are stocked with the white amur. Since these ponds were flooded by the Tennessee River this year, white amur now must be widespread in the Tennessee River watershed.

MISSOURI — Dr. Jim Whitley,

Missouri Conservation, Division of the Game and Fish Department, is very concerned about white amur movement from Arkansas to Missouri. Since Missouri borders Arkansas, he feels the introduction of white amur in Arkansas leaves Missouri little choice concerning the amur. This has resulted in a heated contention between states over the potential use of the white amur. Whitley is concerned that the white amur may meander into some of the Ozark streams which contain native aquatic plants upon which he feels the associated fish production is dependent.

Whitley has investigated the feeding habits of small amur to determine if and under what conditions white amur will feed on organisms other than plants. He has reported that small amur will feed on *Gammarus* spp., a small crustacean commonly known as scud, and that one-tenth pound white amur consumed fry of bluegills and guppies in aquaria void of vegetation.

Dr. William Pfliger, an associate of Whitley's, is working with commercial fishermen to establish the distribution of the white amur in the U.S., especially in the Mississippi watershed. He is also trying to determine if the amur has reproduced naturally in the Mississippi drainage.

According to Whitley, several nine- to 15-pound amur have been taken in the Missouri River. Whitley said Dr. Richard Anderson, Cooperative Fishery Unit, is conducting water quality and algae production studies on the white amur in aquaria.

CALIFORNIA — Dr. Pete Frank, U.S. Department of Agriculture at the University of California, is project leader on the white amur

work, the main thrust of which is to produce a sterile amur. Instead of going the route of hybrid production, various chemical means of inducing sterility are being investigated. White amur are also being evaluated for weed-control potential and effects on sport fish, particularly bluegill. These studies are being conducted in small one-tenth acre ponds.

The California Game and Fish Commission has banned importation of the amur and is not receptive to research except under highly controlled conditions. Frank feels the Commission will not allow expanded white amur studies in natural situations until sterile fish are produced.

SUMMARY — Although virtually all states have banned importation of the white amur, many states are beginning to actively investigate its potential as a biological control agent for aquatic weeds. This is particularly true of the southeastern states which experience the most severe aquatic weed problems. Above the roar of the controversy, the true facts of the white amur are beginning to surface. I feel more encouraged with each additional bit of gathered information in hopes that we soon may be able to determine the final fate of this fish and its proper place in weed control. Each state, however, seems determined to conduct its own studies on the basic considerations, namely impact and feeding.

With better cooperation and communication within and among the states, we could resolve the mysteries and myths of the notorious white amur and get to the real crux of the matter — the truth. There is nothing so tragic as one with eyes and ears who does not hear or see. □

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Bill Rushing's concept of aquatic plant management involves a whole arsenal of control methods including (above) chemical application from an airboat, (top, right) mechanical harvesting and (bottom right) biological controls such as the herbivorous white amur.

AQUATIC (from page 24)

The Solution

This, of course, is a misnomer. Clearly, there is at this time no way of spelling out the details of an effective and economical aquatic plant management system. It is, however, possible to describe its general characteristics in qualitative terms. It is my hope that, by so doing, we will identify gaps in the research programs that are being conducted, and at the same time provide a general framework into which existing work may be fitted. The effectiveness of too many potentially useful control methods is still too uncertain, so, at this time, we should not set priorities.

First, we need an arsenal of control methods. There are two segments to this need. Of primary importance is the need for the largest possible number of ways of affecting the plants themselves. Some obvious possibilities include:

Controlled-release herbicides —

These look especially promising for situations in which water exchange is slow, such as in many canals and lakes.

Growth regulators—These offer the possibility of suppressing the formation of stolons on water hyacinths, for example.

Mechanical plant removal — All mechanical methods have proven to be very expensive, but there is mounting evidence that the costs could be dramatically reduced by careful engineering. And it should not be forgotten that there may be special situations in which only mechanical removal will be acceptable.

Biological agents — Much attention has been and is being devoted to these methods. But one wonders if enough imagination has been applied. Would it be possible to develop strains of fungi, bacteria, or viruses that would have useful properties, for example? Note that I did not say "find" them; I am proposing that we might be able to create them. Recent work on the development of the sterile mono-sex white amur hybrid is a case in point.

Radiation — While the experiments so far conducted suggest that the CO₂ laser is relatively ineffective, it should be remembered that only one wavelength has actually been tried. Perhaps among the infin-



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ity of others is a combination that will unzip the DNA molecule. The Navy has recently developed a method for creating very short-duration electromagnetic pulses of the order of 10 megawatts; one wonders what the effect on the highly complex molecules included in the plant's metabolic cycle might be.

As discussed earlier, a plant control method is useless if it cannot be brought to the plants. At the moment, our arsenal of platforms consists mainly of three kinds of vehicles: conventional boats, airboats, and helicopters. Each has advantages and disadvantages, and there are places where none can reach. In view of this, there may well be a place for air-cushion vehicles and Archimedes screw vehicles.

There is certainly a place for improved spray methods that are more effective, uniform, and controllable than some of the fire-hose methods that are often used today.

This raises the flag of economics. A lot of money is spent and will be spent on aquatic plant con-

trol. This suggests that there is a market for devices specifically engineered for aquatic plant control use. So let us devote more dedicated engineering effort to such mundane things as the configuration of spray nozzles, hull designs for boats, and so on.

Further, the comprehensive management system must include an information-gathering capability, so that the deployment of control resources can be optimized. Three things seem to be worthy of consideration:

Remote sensing — Could we develop a capability, perhaps using earth satellites or regularly scheduled high-altitude aircraft flights, for detecting aquatic plant populations at an early state of development — perhaps using automated identification techniques to keep down costs and improve response time?

Monitoring instruments — Could we place sensing instruments in critical places, and telemeter their responses to an operations center?

Growth prediction — Could we

develop mathematical prediction methods that would tell us where and when a potentially dangerous population of aquatic plants will appear? We surely could, if we spent some effort on understanding the basic physiological processes of our target plants.

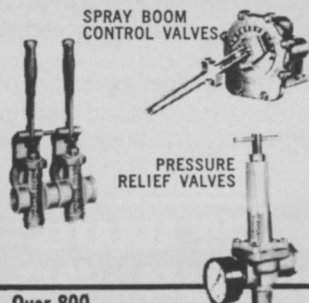
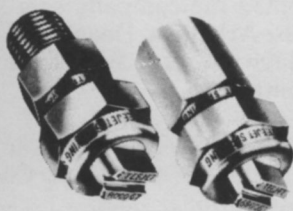
Finally, the management system must include a public information capability, so that the public can be informed both as to the nature and magnitude of the problems, and also as to the specific steps being taken to counter them.

Conclusion

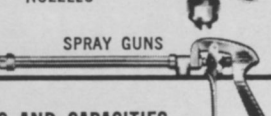
I have only touched the surface of the multitude of areas we need to consider in the development of a long-range capability for operational management of aquatic plants. The crux of the whole matter is that the *entire* situation must be considered. When we consider the problem as a system, I think that we must conclude that we must develop a multifaceted arsenal of techniques and materials for aquatic plant management. □

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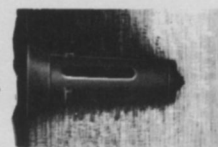


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* * *

Fred J. Zalokar, appointed vice president, finance, of Agrico International, a subsidiary of The Williams Companies. **Winthrop A. Wyman**, appointed vice president, transportation, Agrico International.

* * *

Norman W. Harris III, named vice president-planning and control of The Toro Company. **Kendrick B. Melrose**, appointed Toro's group vice president, recreational products. **Gary Holland**, promoted to the newly-created position of group director of planning for Toro. **Mary Elliott**, promoted to the new post of corporate director-administrative services.

* * *

G. R. (Dick) Gordon, named district sales manager for Cushman-Ryan turf care equipment for eastern Canada and the northeastern United States.

* * *

Ralph Deaver, joined Thompson-Hayward Chemical Co. as an agricultural sales representative in western Tennessee and northern Mississippi. **Dennis H. Ford**, joined the company as a sales representative in north-east Arkansas. **Donald B. Emenegger**, joined Thompson-Hayward as a field research and development representative.

* * *

Hans Bombeck, joined the Minerals & Chemicals Div., Engelhard Minerals & Chemicals Corp., as director of international sales.

* * *

Kenneth DeVun, joined the production planning dept. of Ciba-Geigy's Agricultural Div. as a planning specialist.

* * *

Robert C. Tyo, elected president and chief executive officer of Disston, Inc., a manufacturer of hand and industrial cutting tools and cordless electric lawn and garden tools.

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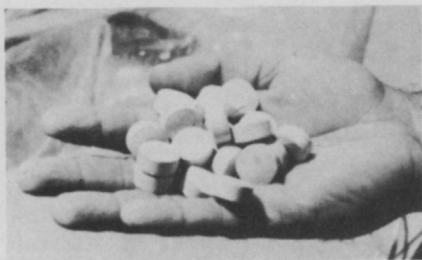


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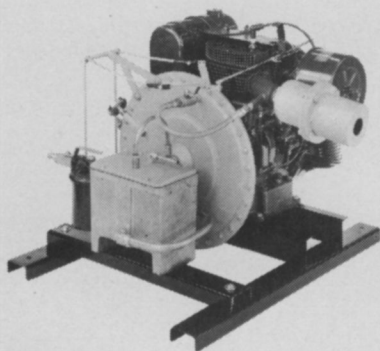
WEEDS TREES and TURF

New Products



ALGAE CONTROL: A new approach to algae control is now available from Great Lakes Biochemical Co., Inc. Slow Release Algimycin PLL-C, a pelleted copper-based formulation, is said to save time and labor and require no mixing, special equipment or trailing bags. Application can be made with a hand scoop. PLL-C pellets will stay in place on the bottom and slowly release the algae control chemicals while water currents create natural distribution. Even when water is drawn for irrigation, pellets will remain active in treating the pond and lake water as well as water which may be added. Pellets are available in 50 lb. bags and are broadcast at a rate of 10 to 20 lbs. per acre-foot of water. This product has been registered by the EPA and various state authorities. The use of PLL-C pellets is said to take about 25 percent of the time required by the conventional methods and is particularly effective in the control of hard-to-get-at Chara and Nitella as well as most other algae.

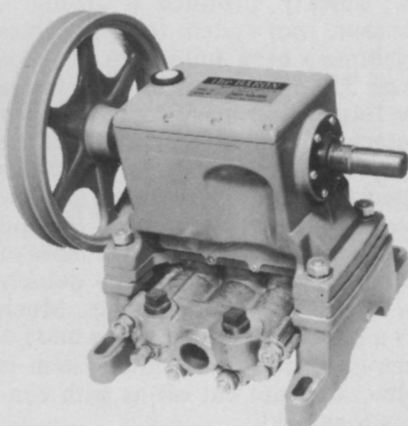
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FOGGER: London Fog Co. now manufactures heavy-duty truck-mounted foggers for fogging recreational areas, industrial property and other large areas. The foggers all have piston engine powered turbo fog system. This two-stage fog-producing system produces low temperature fog by mechanical, viscous friction-induced heat from a turbo rotor mounted directly on the engine crankcase. Second stage is produced by brief exposure to engine's hot air blast. Model 500 features 16 hp Kohler four-cycle in-

dustrial type engine with self-starter, alternator and simplified remote control. Model 100 has same features, but doubled fog output with 37 hp Wisconsin engine. Model 250 is a lighter-weight unit powered by a 12 hp manual start Kohler engine.

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PUMP: Model 50 high-pressure Baron pump from Britt-Tech Corp. has a capacity range from seven gpm at 800 psi to nine gpm at 700 psi. Dimensions of Model 50 are 7 3/4 in. long x 12 1/4 in. wide x 10 1/8 in. high; weight, 63 pounds. Model 50 has all the standard Baron features including corrosive-resistant components with stainless steel plungers and V-type seals that are acid and solvent resistant. Design features include the near absence of pulsations, an extremely low sound level and easy seal replacement. The pump is designed to keep pumped liquid out of oil bath crankcase.

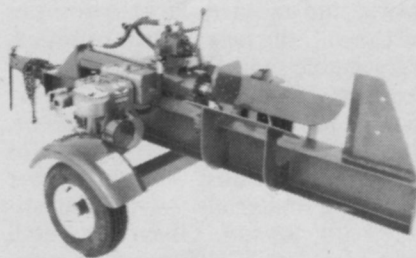
Circle 703 on free information card.



MOWER: Excel Industries has introduced Hustler Model 272A, a 72-inch mower with 20 hp engine, dual path in-

line hydro transmission and adjustable suspension seat. New model retains independent control to each wheel but eliminates transfer gear case. Power is transmitted direct to high torque hydraulic drive motors at the wheels. By reversing one wheel while moving the other forward, operator can reportedly turn machine around in its own length and trim in tight places. According to manufacturer, one man with a Hustler can replace several persons operating smaller units. Hustler is also said to conserve energy in open areas by replacing larger, more expensive tractors. Operator safety features include: a positive interlock ignition, parking brake, electric clutch and highway safety yellow paint. New 20 hp Kohler engine is protected by a heavy-duty, two-stage air cleaner, oil filter and hour meter. Available attachments include: rotary snow blower, broom, cab with heater, dozer blade and 60-inch flail cutter.

Circle 704 on free information card.



WOODSPLITTER: Hy-Draulic Products has designed several new log splitters, including the MS-400 Mini-Splitter. Features of the splitter include: eight horsepower air-cooled engine; heavy-duty ram cylinder; a splitting cycle of 12 seconds; rugged tubular steel frame; a seven-gallon hydraulic oil reservoir; and a splitting length of up to 20 inches.

Circle 705 on free information card.

HYDRO-WET: After four years of field testing, Kalo Laboratories is introducing a new soil and turf wetting agent, Hydro-Wet, designed to aid water penetration in compacted hydrophobic or sloping soils. Hydro-Wet is said to release compaction layers allowing turf to better absorb water and to reduce erosion on slopes because it makes slopes wettable thus keeping water where it is needed, instead of having it flow into low areas. Hydro-Wet is designed to be used in combination with liquid fertilizers and pesticides. Hydro-Wet will reportedly help get these compounds directly to the roots where they are needed. The product is available in one and five gallon metal containers.

Circle 706 on free information card.

Sewage Sod System Saves Time

By DR. HENRY F. DECKER

The author is president of Buckeye Bluegrass Farms and the developer of the new sod producing system. Decker was a botany professor at Ohio Wesleyan University for ten years, has had practical experience in sod farm management and has served as a consultant to O. M. Scott & Sons and several lawn care companies.

A NEW, quicker and reportedly less costly system for growing sod has been developed from experiments over the past five years at Buckeye Bluegrass Farms, Inc., Ostrander, Ohio.

Compared to the conventional method of growing and harvesting sod, which often takes a year or more, and requires large quantities of topsoil, the new system produces harvestable sod in a few weeks, reduces shipping weight by 30 percent or more and requires less labor. Sewage sludge, composted leaves or garbage, stack dust — any number of waste materials — are substituted for topsoil. Given the retail cost of sod at \$2,500 per acre minimum (central Ohio), the process makes it possible for an industry with a waste problem to dispose of it economically.

The variations in the process are enormous, depending largely on the type of waste material utilized. And while its execution is slightly more exacting than growing conventional sod, the system consists simply of placing a suitably rendered growing mixture over a root impenetrable barrier, such as polyethylene sheeting, and allowing the extensive, primary rooting of the grass to knit and bind the sod. Pregerminated seed is recommended and the irrigation of the growing mixture is more critical in the initial stages.

In the conventional method of growing sod the primary roots of the grass are cut off by the sod cutting machine in which case the knitting and binding of the grasses is a function of their tillering, rhizomes, and stolons. The slowness of these growth processes account for the

relatively lengthy period of time necessary to grow a conventional sod so that it will stay intact when harvested.

The new system capitalizes on the tremendous capacity for grasses to quickly produce a primary, fibrous, root system (a single grass plant has been known to produce over 350 miles of roots in 17 weeks or less). All primary rooting is kept intact, being unable to penetrate the plastic sheeting; hence the sod binds quickly and can be rolled up in a few weeks. The undersurface of the sod is a rather impressive, white mass of primary roots which can quickly bind the sod to its new site. Much is a rather impressive, white mass of new sod since its rooting system is intact and not cut off as with conventional sod.

Conventional sod often takes several weeks to regenerate a new root system and hence to become

knitted to the new laying surface. It must be kept moist during this period often requiring great quantities of water.

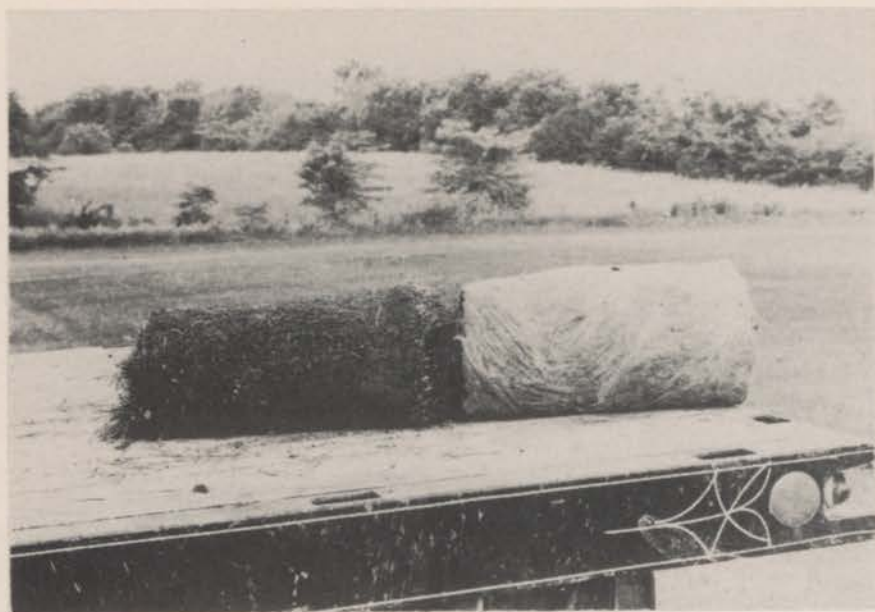
A simple method of harvesting and laying the new sod is in rolls four feet wide using a slightly modified, inexpensive, three point boom apparatus off the back of a tractor with suitable hydraulic capacity. Both the harvesting or the laying of the sod requires only two men.

Various plastic or plant fiber nettings such as those used in experiments at the University of Delaware or polyureaformaldehyde foams as used in England and in experiments by the Environmental Protection Agency in Delaware, Ohio, were found either unnecessary, too costly, or only incidental to the success of the system.

Several other advantages in the new system are readily apparent: one is that since the sterility of the



Normally, the plastic barrier is left on the soil to be used again, but here it is pulled up for demonstration purposes. The plastic can be rolled with the sod for protection during long shipments. Notice the primary rooting. This sod had been growing only about eight weeks.



Buckeye Bluegrass Farms' "Nu-Sod" on the right vs. conventional sod on the left. According to Buckeye's President Henry F. Decker, Nu-Sod is only about half as heavy as conventional sod, and will establish more quickly because of the intact root system.

growing mixture can be controlled, use of herbicides and other pesticides necessary in the production of conventional sod are reduced; another is that since its weight can be contrived, larger quantities of the new sod can be harvested, shipped, and laid at one time such that labor is reduced to a minimum; furthermore since the new sod consists of

young plantlets the advantage of juvenile resistance is incorporated into the system. They young grass is relatively free of disease and as a result has more eye appeal than conventional sod.

In addition the new system makes it possible to virtually harvest the sod all year around in temperate climates. There is also some indication that using black plastic for the root impenetrable barrier may significantly lengthen the yearly growing period. In any case several crops per year per acre can be expected, whereas in conventional sodding a year or more are sometimes necessary to produce a crop which is sufficiently knitted to harvest. The advantage of producing several crops per year per acre on land which by the nature of the industry has to be close to metropolitan areas is obvious.

Studies at Ohio State University also indicate that given certain modifications, the system may also be applicable to growing other types of ground covers — such as an ivy, or *Euonymus* sod, or even one of crown vetch for roadside stabilization.

Patent protection covering the technique is pending. The intention of the developers is to license the process with supporting data and to provide assistance to anyone interested in trying it in return for a nominal fee to support additional research in grass botany. □

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Wilmington, Delaware 19899

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JUNE 1975



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Meeting Dates

Turfgrass Field Days and Trade Show, Virginia Polytechnic Institute and State University, Blacksburg, Va., June 18-19.

Michigan Turfgrass Field Day, Crop Science Field Lab, Michigan State University, E. Lansing, Mich., June 24.

The Hyacinth Control Society, Inc., 1975 meeting, Hilton Palacio Del Rio Hotel, San Antonio, Tex., July 6-9.

Shade Tree Day, Ohio Agricultural Research and Development Center, Wooster, Ohio, July 9.

American Sod Producers Association, summer convention and demonstrations, Crown Center, Kansas City, Mo., July 17-18.

American Association of Nurserymen, centennial convention, The Palmer House, Chicago, Ill., July 19-23.

Horticulture Research Institute, New Horizons Day '75, The Palmer House, Chicago, Ill., July 23.

Penn Allied Nursery Trade Show, Hershey Motor Lodge and Convention Center, Hershey, Pa., July 29-31.

TVA Fertilizer Conference, Executive Inn, Louisville, Ky., July 29-31.

New York State Turfgrass Field Day, Warren's Turf Nursery, New Hampton, N.Y., July 30.

Turfgrass Field Day, The Ohio State University, turfgrass research plots, Columbus, Ohio, July 31.

Southern Nurserymen's Association, annual convention, Atlanta, Ga., Aug. 3-5.

Landscape Maintenance Symposium, Union Building, Michigan State University, E. Lansing, Mich., Aug. 4-5.

Rutgers 1975 Turfgrass Research Field Day, College Farm Road, New Brunswick, N.J., Aug. 5.

Illinois Landscape Contractors Association, Summer Field Day, Burr Oak Nursery, Round Lake, Ill., Aug. 6.

Garden Industry of America Market, Las Vegas Convention Hall, Las Vegas, Nev., Aug. 8-12.

Canadian Parks and Recreation Association, annual conference, Quebec City, Aug. 10-14.

International Shade Tree Conference, 51st annual meeting, Heritage Hotel, Detroit, Mich., Aug. 10-14.

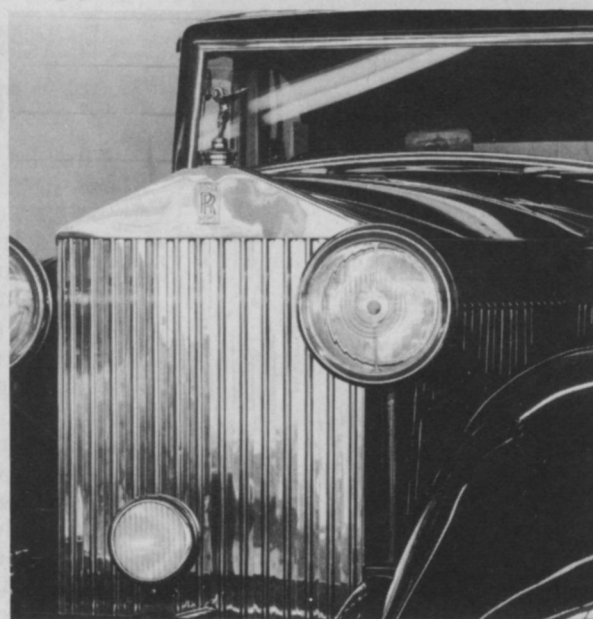
Rhode Island Golf Course Superintendents, annual turfgrass field day, University of Rhode Island, Kingston, R.I., Aug. 20.

Illinois Turfgrass Foundation, Golf Day, Indian Lakes Country Club, Bloomingdale, Ill., Aug. 25.

Irrigation Seminar, sponsored by the Northern California Turfgrass Council, Asilomar Conference Grounds, Pacific Grove, Calif., Sept. 5-7.

Turf and Landscape Day, Ohio Agricultural Research and Development Center, Wooster, Ohio, Sept. 9.

JUNE 1975



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JACKLIN PRODUCES:

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MUNICIPAL SPRAYING NEWS

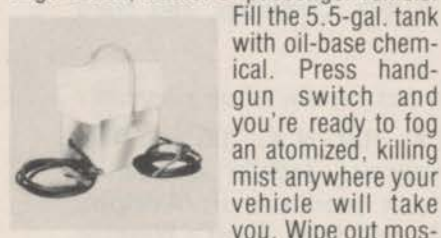


Century's powerful Mist Blower/Sprayer is 4 sprayers in 1. Blower rotates through a 210° arc. 3-point mounted unit equipped with 25-gal. "Poly" tank. Includes sturdy, trigger-type, brass 2-ft. hand-gun with 25 foot hose. Also has brackets for boom or jet spraying. Delivers 150-mph mist with swath up to 150 feet.

Becomes a hand-gun sprayer just by turning a valve, adjustable from fine mist to driving stream. Useful in parks, camping/recreation areas, lagoons and swamps, around buildings and storage areas. Can kill weeds in ditches hard to reach with conventional sprayers.



Hook this New 50-lb. Portable Fogger to the 12-volt battery of your pickup or larger truck, tractor or passenger vehicle.



Fill the 5.5-gal. tank with oil-base chemical. Press hand-gun switch and you're ready to fog an atomized, killing mist anywhere your vehicle will take you. Wipe out mosquitoes, flies and weeds. Works well even in sub-zero weather. Has 15-ft. durable, hi-pressure hose; 3/4-hp. motor, 1200-psi. pump pressure.

Write for further details on sprayers, portable heaters and washers, and central cleaning system.

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Researchers Seek Halt To Nitrate Contamination

Cornell University researchers in Ithaca, N.Y., are attempting to halt the buildup of groundwater nitrates in the eastern part of Long Island in a major effort to avoid contamination of drinking water.

They are taking a critical look at nitrogen fertilization of potatoes and of turfgrasses on sod farms, home lawns, golf courses, parks and other lawn areas.

Their goal is to develop alternative fertilizer recommendations that will reduce nitrate leaching to acceptable levels without hurting crop yields and turfgrass quality.

Supported by a \$200,000 grant from the Suffolk County Department of Environmental Control, the study was spurred by recent findings that nitrate levels above 10 parts per million (which exceed the public health standard for drinking water) were observed in a number of wells in eastern Suffolk County.

Professor Jim L. Ozbun at the New York State College of Agriculture and Life Sciences, Cornell, who is directing the study, said the most likely sources of nitrate in groundwater are fertilized farm fields, domestic sewage from septic tanks and cesspools, and residential, institutional and recreational areas where turfgrasses are maintained.

Kenneth Rykboost, research associate with the College's Long Island Vegetable Research Farm in Riverhead, N.Y., is serving as coordinator of the project. Other researchers in the project are Professor John E. Kaufmann, turfgrass specialist; Professor David R. Boulding, agronomist; Professor Gilbert Levine, agricultural engineer; and Professor Stewart L. Dallyn and Senior Research Associate Anne Schippers, both vegetable crop specialists. Several graduate students are also participating in the project.

Before launching the project last summer, the Cornell researchers had conducted for several years a series of preliminary studies of the fertilizer practices for potato production.

The results have indicated that growers may be able to obtain satisfactory yields with less nitrogen than now used, although no conclusive

recommendations can be made at this stage, Ozbun said.

To improve the efficiency of nitrogen use, the Cornell researchers are concentrating on methods and timing of application. Chemical inhibitors that slow the transformation of nitrogen into leachable nitrate will be tested.

Kaufmann, who is responsible for turfgrass research in the project, is evaluating 40 different varieties of turfgrasses at the Riverhead research farm to see how they perform under low rates of nitrogen application.

Kaufmann pointed out that golf courses in the area generally apply from 170 to 260 pounds of nitrogen per acre (four to six pounds per 1,000 square feet). The rate for home lawns may be as high as 350 pounds per acre (eight pounds per 1,000 square feet).

"Those who apply six to eight pounds of nitrogen per 1,000 square feet of lawn are using more nitrogen than necessary," Kaufmann said.

The Cornell researchers are preparing to set up a series of demonstration plots on selected farms and golf courses this year for farmers and non-farm people in the area.



Kapco bags it!

NITROFORM*
organic nitrogen



The organic nitrogen that saves you labor, equipment use, and time... because it's so long-lasting. Try it.

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LABEL (from page 16)

For instance, **crop** is an agricultural term and literally means any seed that may be grown as an agricultural crop. Crop could be composed of bentgrass seed, horse-radish, buckwheat or anything grown for crop value. If the crop in any package exceeds 5 percent by weight then it must be listed by name. However, if the crop in a particular lot of seed happened to be bentgrass, only two percent would total 181,000 seeds per each pound.

Weeds are listed as the percent by weight of all seeds in a package which have not been included as pure seed or crop. This is generally only a fraction of a percentage, but depending on the size of the seed may be of great significance. For instance, 0.1% Chickweed could amount to 560,000 plants in a 10,000 square feet area.

Noxious weeds vary from state to state and are listed as such because of their difficulty to control in agricultural practices. Thus, sheep sorrel which might be a plague to agriculture could be listed, while a real turf pest such as **Poa annual** might never be mentioned. So, noxious weeds are primarily harmful to farm crops and not to turf. However, there are exceptions.

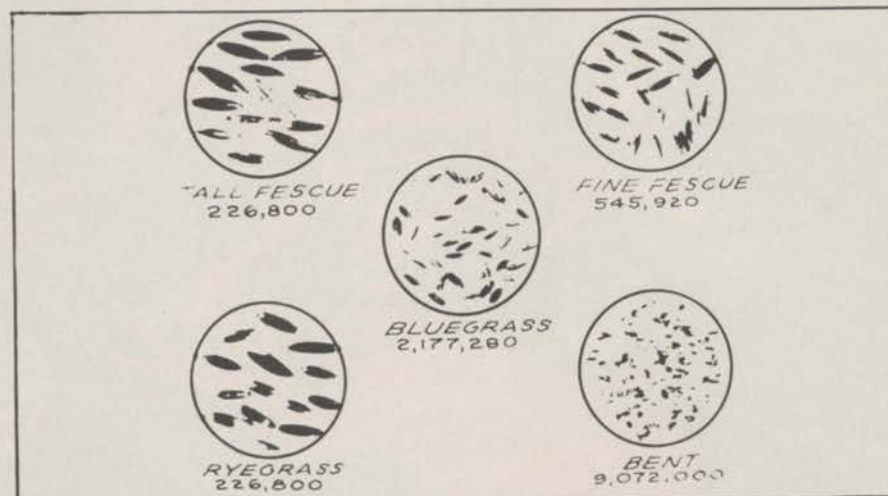
Inert is the percent by weight of all material in the package that will not grow. It may be chaff, sawdust, corn cobs or any similar material that will give the package added size but not added weight. When the package lacks weight, sand can be added. These practices may imply dishonesty but they are entirely within legal limits.

The laws that guide seed labels are antiquated, misleading and deceptive. Fortunately, concerned companies have the integrity to sell seed with quality and merit. Unfortunately, some companies will sell inferior seed just to reap a few dollars more profit. For the seed buyer, it then becomes necessary to learn all that he can about seed labels. He must learn to recognize the areas of weakness and make certain that he plants exactly what he intended to purchase.

In reading a seed label we generally get the feeling that the seed was subjected to a thorough and absolute true test. But, in reality, the law states that only a one-gram sample

\$3.95		NET WEIGHT 1 lb.	SPREADER SETTING	
SEEDING RATE			Golf Brand	Scotts
New Lawns	1 lb. per 300 Sq. Ft.		#7	#11
Established Lawns	1 lb. per 500 Sq. Ft.		#6	#10
MIXTURE ANALYSIS—GOLF BRAND				
PREMIUM LAWN SEED				
CONTENTS		PERCENT	GERM.	
FINE TEXTURED GRASSES:				
Proto Kentucky Bluegrass		42.57		82%
Fylking Kentucky Bluegrass		30.70		80%
Newport Kentucky Bluegrass		25.54		80%
COARSE KINDS: None Claimed				
OTHER INGREDIENTS:				
Crop Seed .16%		Inert Matter .98%	Weeds .05%	

Unfortunately, the words on a seed label reveal and conceal many facts about the seed mixture. How would you rate the seed from the above label?



The importance of a seed count cannot be over-emphasized when analyzing a seed label.

is required for testing regardless of whether the total lot is 5 pounds or 5,000 pounds. This is not to say that the test on this sample is not accurate — it is. However, if we visualize taking one tiny gram out of 5,000 pounds, it seems fair to predict that we may have missed many things. In this one gram we are supposed to determine pure seed, crop, and weeds for the entire lot of 5,000 pounds.

State and Federal agencies have recognized this discrepancy and insist that 25 grams be examined for certain noxious weeds. The weakness of this test is that it covers only "certain" noxious weeds that are listed, while unlisted weeds are ignored. Crop is also ignored simply because it is not a part of the test.

If there is an opportunity to purchase large amounts of seed at bargain prices, it is almost essential that the buyer insist on complete analysis and not just certification. It may be the best opportunity to destroy unwanted vegetation of the future.



Lawn King bags it!

NITROFORM*
organic nitrogen



The concentrated organic that takes up less storage space. Pathogen-free and odorless, too.

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Bob Johnson of Illinois Lawn Equipment Company, Orland Park, Illinois, didn't think anything could outperform the Jacobsen Commercial 60.

Then he saw the new Commercial 72. It does everything the other mower does. But the Commercial 72 does it faster. Because it cuts a superwide 72-inch swath.

A heftier 19.8 horsepower engine gives the Commercial 72 all it needs to sail through rough turf. Or the fine-finish areas.

And all that power means the Commercial 72 can also mulch leaves. Or plow moderate amounts of snow with the optional blade.

But rugged as it is, this little brute handles easily. A low center of gravity

gives built-in stability. And hydrostatic transmission means the operator simply pushes a pedal with his toe to go forward. Or with his heel to back up.

The operator won't waste time with frequent fueling stops either. The gas tank has a big 10-gallon capacity.

The good old reliable Commercial 60 is fast.


The good new reliable Commercial 72 is even faster.

All of us Jacobsen Distributors are ready now to show you how it gets more done in less time.

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Before we sell it, we buy it.

For the name of the distributor near you write: Jacobsen Turf Distributor Directory, 1721 Packard Avenue, Racine, Wisconsin 53403.



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of dollar spot and
large brown patch,
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Sure, you want your course to look its best.

To keep it green, healthy and disease-free, spray TERSAN 1991 on tees, fairways and greens. Sprayed only every 10 to 14 days, it causes less inconvenience for players and reduces labor costs.

Used correctly, TERSAN 1991 stops dollar spot and large brown patch before they can damage your turf.

Should pythium be a problem in established turf or at overseeding, apply TERSAN SP.

With the Du Pont TERSAN 1-2-3 Program, you'll be on top of turf diseases all season long.

The TERSAN 1-2-3 Program gives you effective, economical and complete disease control. For details, contact your golf course supplier today.

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follow labeling instructions
and warnings carefully.*

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When answering ads where box number only is given, please address as follows: Box number, c/o Weeds Trees and Turf, 9800 Detroit Ave., Cleveland, Ohio 44102.

Rates: All classifications 50¢ per word. Box number, \$1. All classified ads must be received by Publisher the 10th of the month preceding publication date and be accompanied by cash or money order covering full payment.

FOR SALE

ARPS stump cutter teeth, top quality and best price in U.S.A., D. J. Andrews, Inc., 17 Silver St., Rochester, New York 14611. Call 716 235-1230.

FLEXIBLE TINE Pasture Harrows, herd grass seeders, woods stump cutters, tractor mount rotary mowers, portable welders, flat-bed, horse stock trailers. Appaloosa horses. Wayne R. Wyant, Inc., New Bethlehem, Pa. 16242. Phone 814 275-2115.

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1972 FLECO 26" tree shear, \$4500.00. Jim Green, Ohio Chipper & Equipment Company, Div. of Osborne Brothers Tree Service, Mentor, Ohio 216 951-4355.

FOR SALE: Used Ryan 18" auto-cutoff sod cutter with sulky. May be seen at Oak Harbor, Ohio. Phone 419 893-2311 or 308 697-4686.

FOR SALE — 301T Rotomist, less than 300 hours, excellent, new bearings, shroud, tires, battery packings, warranty. \$5,500.00. Call 315 685-3756

FOR SALE: 2 used aerial baskets — 50 ft. working height, 2 Asplundh brush chippers. Bean sprayer, 35 G.P.M. Vermeer stump cutter 1560. Parkway Tree Service, Milwaukee, Wisconsin. Phone 414 257-1555.

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SOD QUALITY Seeds Merion, Fylking, Delta, Park, Newport, Nugget, Adelphi, Cheri, Glade and Baron bluegrasses also fine fescues. Manhattan rye grass. Custom mixing available. Michigan State Seed Co., Grand Lodge, Michigan 48837. Phone 517 627-2164.

HELP WANTED

DISTRIBUTORS for D. J. Andrews, Inc. stump cutter teeth, pockets and bolts. Best wholesale and retail price in U.S.A. Add to this exclusive area, local advertising at our expense, etc., and you have our story. D. J. Andrews, Inc., 17 Silver St., Rochester, N.Y. 14611. Call 716 235-1230, or 716 436-1515.

REPUTABLE FORMULATOR — distributor of turf supplies to golf courses, sod growers, dealers, requires person with sales experience, managerial ability. Top level position. New York, Penna., Ohio area. 5 figure salary, bonus, extras. Resume to Box 132, Weeds Trees and Turf, 9800 Detroit Ave., Cleveland, Ohio 44102.

HELP WANTED

MAN TO BE WORKING Assistant manager for sod farm in southern Mississippi. Must have experience with warm season grasses and all phases of sod production. Contact Pearl River Turf, Inc., Box 217, McNeill, Mississippi 39457. Phone 601 798-8209.

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EQUIPMENT SERVICE AND PARTS — New England and New York State. Authorized servicing of aerial lifts and chippers by factory trained personnel. Specializing in Asplundh and Skyworker. Two convenient locations plus complete road service. Service contracts available. Call C.U.E.S., Inc., 603 889-4071 or 203 634-3146.

PUGET SOUND TREE SERVICE, INC., 1111 No. 98th St., Seattle, Washington 98103, Stump Chipper Teeth and pockets for the Northwest. Phone 206 523-2240.

STEEP GRADE MOWING specialists. Earth dams or steep embankments. If it is too steep for ordinary equipment, we can handle it. GLC Corp., P.O. Box 442, Columbus, Indiana 47201. Phone 812 379-2770.

WATER WELL LOCATING by scientific instrument. Accurate Water Location, Inc., Route 375, Poughkeepsie, New York. Phone 914 462-0560.

EDUCATION-BOOKS

AUTOMATIC IRRIGATION COURSE Sprinkler heads, remote control valves, controllers, vacuum breakers, precipitation rates, etc. all variations covered. System design, installation, operation, maintenance. Send for free course out-line. Larson Company, P.O. Box 4453, Santa Barbara, Ca. 93103.

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WANTED: Young man with funds would like to purchase landscaping business or related business. Write David Gray, Jonestown, Pa. 17038.

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WEEDS TREES & TURF EQUIPMENT RALLY



Three months of heavy emphasis on equipment in the green industry. The July, August and September issues of **WEEDS TREES and TURF** will carry more features, more data, more photographs on equipment than ever before. Rolling stock, engines, tree care and sod equipment, golf cars and course maintenance equipment, tractors, trucks and hand tools. Watch for the biggest green industry equipment rally ever held.

Trimnings

A sycamore tree grown from a seed carried to the moon has been planted at Washington Square as part of the nation's bicentennial observance. The tree was grown from one of the collection of tree seeds carried to the moon in 1971 by Astronaut Stuart Roosa aboard Apollo 14. The tree seeds were carried on the Apollo flight so the effects of prolonged weightlessness on seed germination and seedling growth might be determined. When the seeds were returned to earth, the Forest Service germinated them in its research installation in Gulfport, Miss., and Placerville, Calif.

This year Jacobsen Manufacturing Company celebrates 25 years of continuous product service training. Jacobsen began in 1950 formulating a nationwide training program which involved three sets of training teams — one set each for the East Coast, Middle West and West Coast. In 1962, they opened a factory service school in Racine, Wisconsin. Two years later, the school was expanded to 4,000 square feet in one area and remodeled to include the latest in audio and visual training aids.

There are 185 new "imagined" products for parks and school playgrounds in the 1975 catalog of Game Time, Inc., a wholly-owned subsidiary of The Toro Company. "Imagineering" is Game Time's formula for mixing the excitement of imaginative play with these advantages of excellent engineering: safety, durability and low maintenance. The new entries, a record number for Game Time, include a line of therapeutic play equipment designed to meet the needs of special children, a greatly expanded line for pre-school children, a new modular concept in wood playground products, and a playground spectacular — Circurama. The therapeutic play equipment was designed to help the disadvantaged child in five general categories: balance, motor coordination, skill learning, creative play and physical challenge with security. The 102-page catalog, with four-color photographs on every page, divides Game Time equipment into 20 separate sections. All of the playground

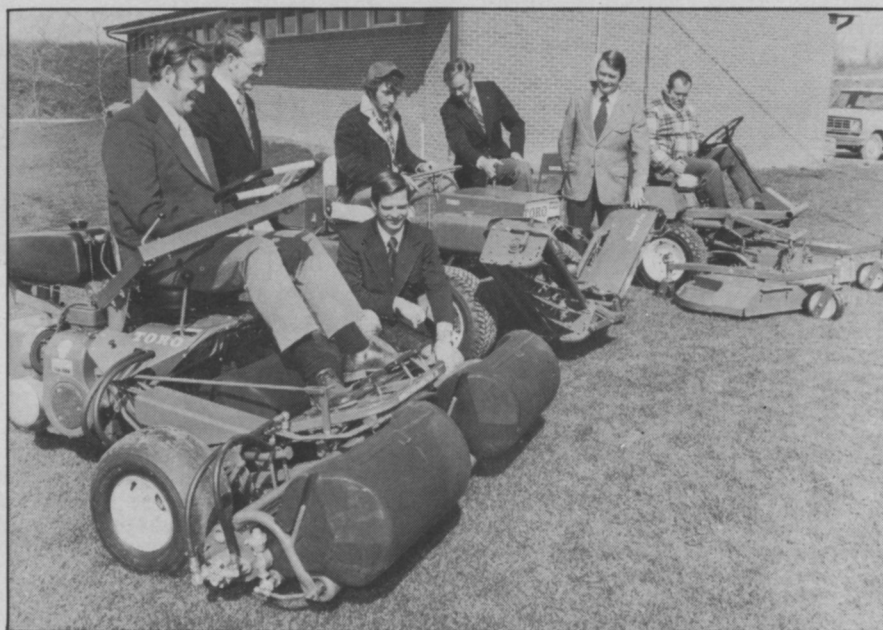
equipment is certified by the Nationwide Consumer Testing Institute, Inc., to comply with the proposed safety standards developed for recreational equipment in use in public parks and playgrounds. Copies of the catalog may be obtained from any Game Time representative or by writing Game Time, 6874 Washington Ave., S., Eden Prairie, Minn. 55343.

The American Society of Golf Course Architects, has published its 1975 membership list, which includes a map with the location of the various designers. President Geoffrey S. Cornish reported that the Society's membership includes leading architects from Canada, Mexico, and the United States. There are 57 regular members, 18 associate members, and two foreign corresponding members. Those planning to build a new course or remodel an older one may obtain a copy of the current membership list by writing the American Society of Golf Course Architects, 221 N. La Salle St., Chicago, Ill. 60601.

Occidental Chemical Company has officially combined both its Eastern and Western operations for a marketing-training-distributing effort to make Monsanto's new

"Round-Up" available where needed most in all non-crop areas. Oxychem is an industrial chemicals marketer as well as an agricultural fertilizer and chemical mining and manufacturing company, and has an active distribution network set up to handle "Round-Up" on a nationwide basis. The new herbicide from Monsanto research is well suited for industrial usage, especially wherever tough weeds or grasses are a problem.

A new study, published in a recent Council of California Growers Newsletter, reported no illness among field workers harvesting vegetable crops in Imperial County during January and February. Some 300 workers were examined by a team from the University of California Medical School. Their level of enzyme cholinesterase was compared with that of urban dwellers. All of the field workers had been harvesting crops treated with organo-phosphate compounds. Exposure to organo-phosphates reportedly lowers the cholinesterase level. However, the examinations revealed no decrease in the enzyme level among the field workers. And levels were the same for field workers and the urban dwellers who had no contact with the treated crop.



Richmond Power Equipment Co., Richmond, Virginia, recently made available to the Virginia Tech Turfgrass Research Center at Blacksburg, power equipment valued at over \$12,000. Shown with the new equipment are from left: Dave Hancock, Richmond Power Equipment Co.; R. E. Schmidt, associate professor of agronomy at Tech; A. J. Powell, Tech Extension turfgrass specialist; F. M. Shepherd, turfgrass technician; P. H. Massey Jr., associate dean of agriculture; T. B. Hutcheson, head of the department of agronomy; and Tommy Davis, supervisor, Tech turfgrass research center.

PRO 4

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Jean Paul Lauzon has been growing sod for 27 years and is considered by many to be Canada's best.

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