JUNE, 1970

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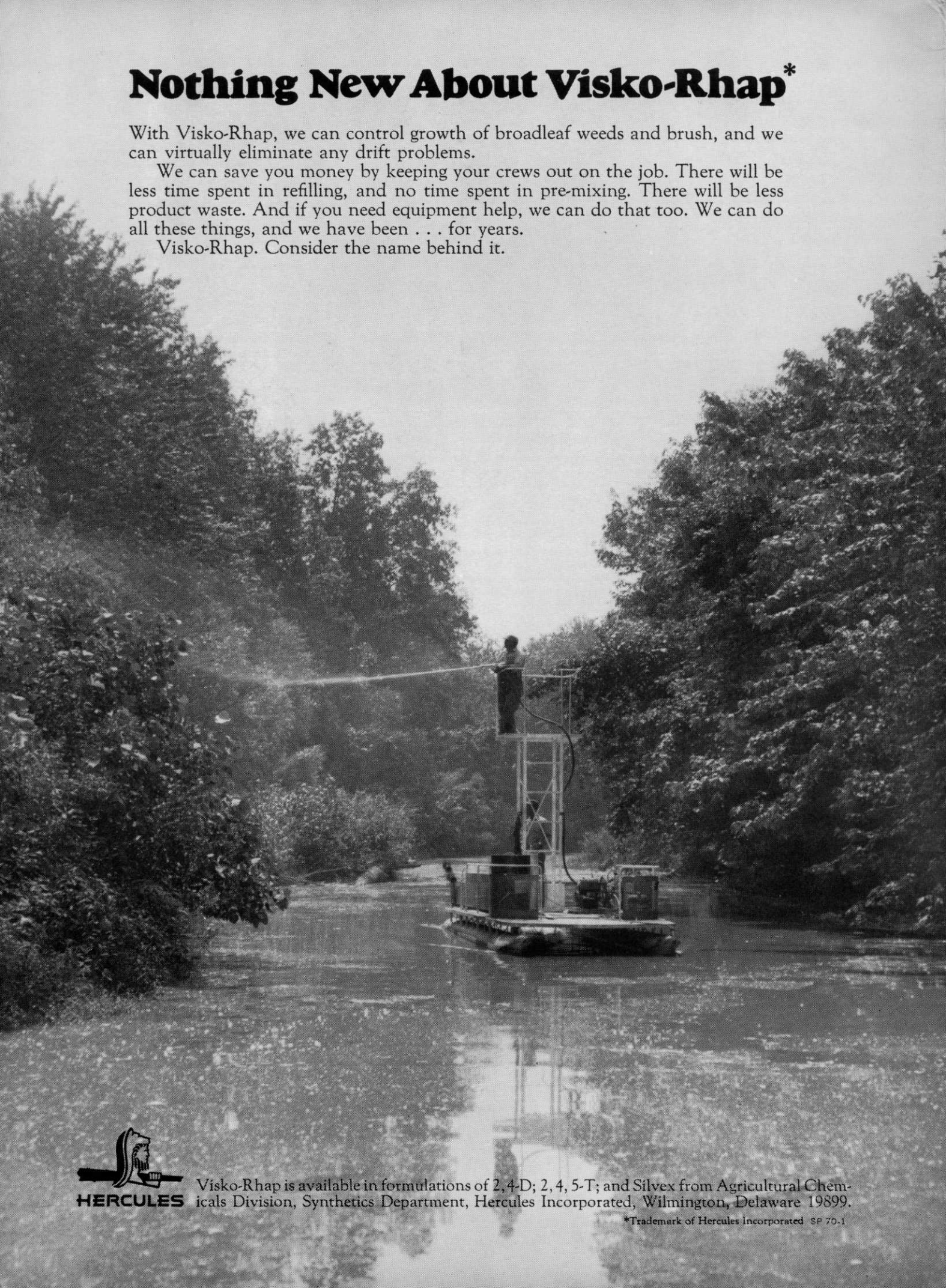

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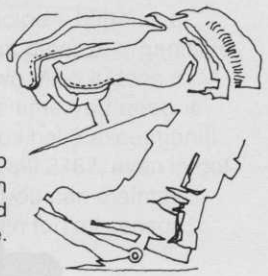

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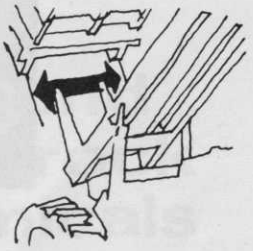

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1. Dacthal kills crabgrass and other undesirable weeds and grasses before they come up.

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3. Daconil 2787, the ONE fungicide, controls a broad spectrum of turf disease organisms. Try these three great ways to take trouble out of turf.

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THE system of weed and disease control.

For More Details Circle (113) on Reply Card

Inaccuracies in 2,4,5-T Article

There are two brief articles about 2,4,5-T in your March, 1970, issue which contain inaccurate statements. I am writing in the hope you will correct them. On page 52, one finds an article entitled "Incriminating 2,4,5-T Test Is Invalid." A reading of this article reveals the headline is much too definite, and that further tests are needed to decide whether the toxic effects on laboratory animals are due to the 2,4,5-T or to an impurity of the dioxin type. A more correct headline would thus read "Incriminating 2,4,5-T test requires reevaluation."

The editor's note at the bottom of this article is also faulty. It states that DSMO (you really mean DMSO, standing for dimethylsulfoxide), also was used in the Bionetics test. That is only half true, for 2,4,5-T was supplied to the animals in two ways: in the diet in honey (no DMSO used) and by subcutaneous injection in DMSO as a spreading agent. Since the dietary administration method without DMSO yielded as much teratogenicity as the injection method, DMSO cannot be a factor.

An accurate account of the Bionetics Laboratory Report can be found in "Report of the Secretary's Commission on Pesticides and Their Relationship to Environmental Health, Parts I and II," published by the U. S. Department of Health, Education and Welfare in December, 1969. The final chapter (Chapter 8) deals with teratogenicity of pesticides and includes some of the Bionetics data. These are also included in a government pamphlet entitled "Chemical-Biological Warfare, U. S. Policy and International Effects," prepared by the Committee on Foreign Affairs of the House of Representatives, dated 1970. Your readers should be referred to these sources for accurate and complete estimates of the present status of alleged 2,4,5-T toxicity.

On page 54, in another column under the title "Trimmings," there is also a discussion of 2,4,5-T in which it is said that "2,4,5-T is under fire because a laboratory test indicated the herbicide caused cancer in mice." This again is inaccurate. There was no indication of cancer formation, but rather of teratogenicity, i.e., malformation of developing embryos *in utero*.

In my view the use of 2,4,5-T ought to be greatly restricted or even halted until it is absolutely certain that it is not harmful. Whether the effect is due to the acid itself or to the dioxin impurity, the material as sold and sprayed constitutes a potential public health hazard. We need to know whether the dioxin can be eliminated completely, whether it may be formed in the field after 2,4,5-T application, and whether the dioxin's persistence is such as to make it a long time hazard.

Neither the science of chemical agriculture nor the Weeds Trees and Turf readership will be benefited by misrepresenting the issue, and by taking an anti-public health stand. In any event, I think it important that your readers get the accurate facts, and that you correct the statements that you have published.—**ARTHUR W. GALSTON,** professor of biology, Yale University, New Haven, Conn.

Appreciates Aquatic Coverage

I was most pleased to hear you had selected two slides to use in your June special on Aquatic Weed Control. We are most enthusiastic about the coverage your magazine has given this relatively new field, and to some degree its development can be attributed to your efforts.—**JASON M. CORTELL,** consultant biologist, Allied Biological Control Corp., Wellesley Hills, Mass.

Pesticide Articles Commended

Thank you for another excellent article on the pesticide controversy in your April issue. I do wish such articles were more available to the general public. I can't help but wonder why newspapers and popular home magazines don't present this type of factual report. — **KATHLEEN H. GUSTAFSON,** Northland-Midwest Spraying & Pest Control, Inc., Burnsville, Minn.

You are to be commended for the excellent April issue. The special, "Pesticide Laws — As They Stand, What Changes Could Mean," is an outstanding example of the type of documented information that the pesticide industry needs so urgently. — **W. D. BROOKS,** marketing manager, agrichemicals marketing, Elanco Products Co., Indianapolis, Ind.

Irrigation Cover Impressive

We have received your current magazine, and are absolutely ecstatic with the exposure you have given us; the photos graphically illustrate sprinklers in operation on the front cover, plus the article is a real plus factor for the irrigation industry. We have received several telephone calls from various readers, and they were much impressed. They wanted some assistance in the design and layout of irrigation equipment. — **A. BROWN,** vice-president, sales, Turf Irrigation Corp., Commack, N. Y.

meeting dates

S	M	T	W	T	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

22nd Annual Nurserymen's Refresher Course, sponsored by the California Association of Nurserymen at Cal Poly, San Luis Obispo, June 9-11.

Purdue-Michigan State Weed Day at Agronomy Farm, Lafayette, Ind., June 18.

Penn State Field Day, formally dedicating the Joseph Valentine Turfgrass Research Center, June 24 and 25.

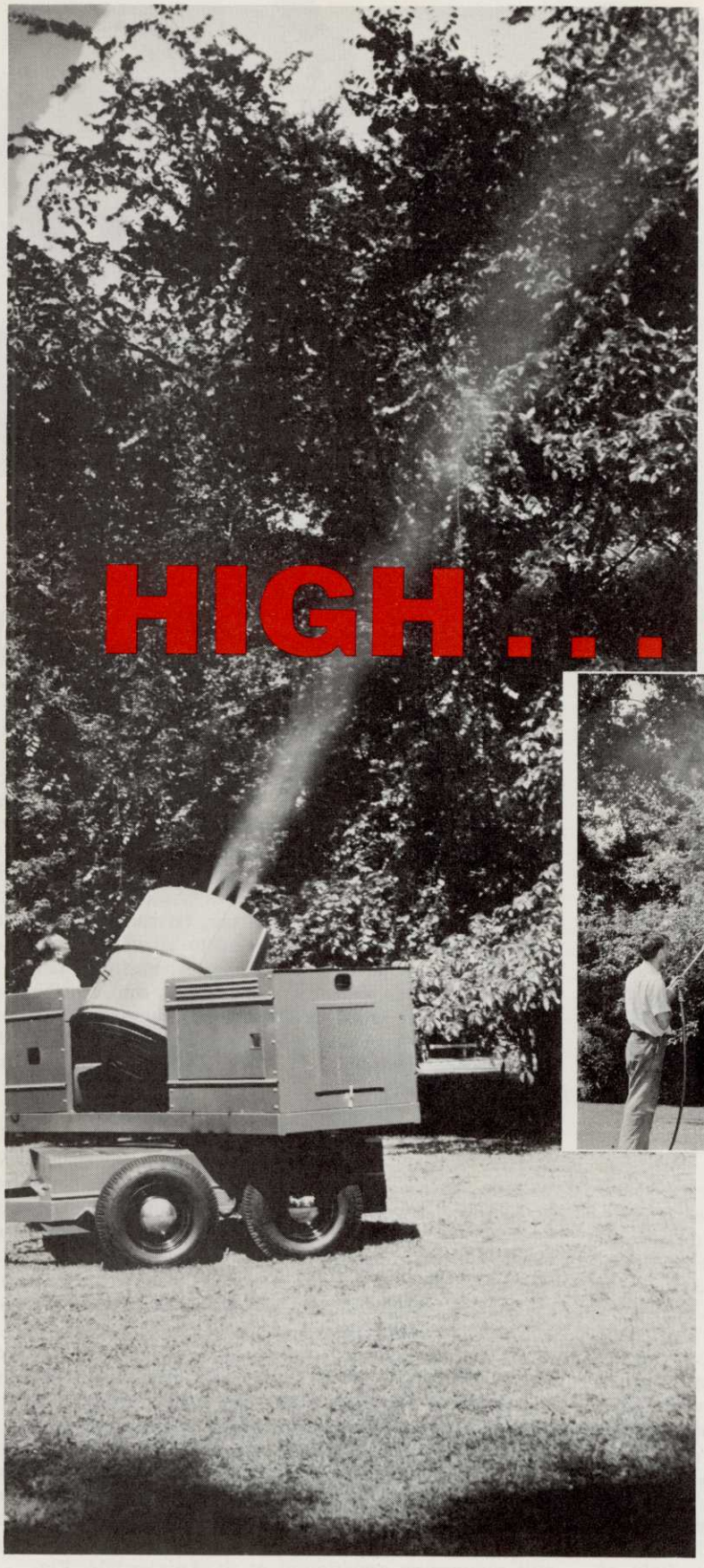
Ohio Chapter, International Shade Tree Conference, at the USDA Shade Tree and Ornamental Plants Laboratory at Delaware, Ohio, July 8.

Hyacinth Control Society at the Sheraton Motor Inn, Huntsville, Ala., July 12-15.

American Sod Producers Association 4th annual conference and field day, Ramada Dorchester Inn, Dolton, Ill., and the H & E Sod Farm, Momence. Ill., July 28-30.

Indiana Association of Nurserymen summer meeting, Executive Inn, Evansville, Ind., Aug. 9-11.

46th International Shade Tree Conference, Hotel Flagship-Rochester, N.Y., Aug. 9-14.



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In Memoriam to

Dr. Lyle W. Weldon

Aquatic Weed Scientist

THE NEWS OF YOUR HUSBAND'S DEATH came as a complete shock to me. I cannot begin to tell you how much I admired Lyle's intent interest in the natural resources of our state. I know of no other more dedicated public official.—**CLAUDE R. KIRK, JR.,** Governor, State of Florida.

* * *

WHEREAS, THE GOVERNING BOARD, upon receiving word that Dr. Lyle W. Weldon, while performing routine underwater experiments, met his untimely death on Feb. 1, 1970, wishes to express its heartfelt condolences to the bereaved family of Dr. Lyle W. Weldon and to pay tribute to and acknowledge the outstanding contributions and services performed by him for the District and for the State of Florida.—Portion of resolution passed by the **CENTRAL AND SOUTHERN FLORIDA FLOOD CONTROL DISTRICT.**

* * *

I KNEW AND WORKED WITH LYLE for 10 years. During this period, he and I became very close friends. I often thought of him as a brother instead of a research partner. This, the death of Lyle was a tragic and personal loss to me. The field of aquatic weed science lost a great scientist. The contribution he made to the field will stand long after his death is forgotten by most people. The aquatic research station at Fort Lauderdale will continue to carry out many of his research ideas for years into the future. It was a pleasure to have worked with Lyle; it was an even greater pleasure to have known the enthusiasm and dedication he had for the field of aquatic weed science. This one point illustrates his dedication to the field. He and I published most of our research together. It is a privilege to have my name associated with this scientist, and I intend to see that those ideas and dedication to the field of aquatic weed science which cost him his life are continued in the future at this laboratory.—**ROBERT D. BLACKBURN,** botanist, Crops Research Division, Agricultural Research Service, USDA, Fort Lauderdale, Fla.

THE HYACINTH CONTROL SOCIETY and aquatic weed research are but two areas in which a void must be recognized from the loss of Lyle Weldon. Certainly, his family, his friends, his co-workers and his community have found this tragedy difficult to accept and consolation hard to find. I could say quite a bit about what I have personally gained from knowing and working with Lyle the past seven years or so, as I'm sure can many others. This must, however, be considered minor when we give proper recognition to all of the contributions he has made and we all have benefitted from, in discovering and learning more about our aquatic environment, our weed problems and what to do about them. His mark in his field has been indelible.—**PAUL R. COHEE,** president, The Hyacinth Control Society, Inc., Montgomery, Ala.

* * *

IT IS WITH MIXED FEELINGS OF PRIDE AND SORROW that I express my evaluation of Dr. Lyle W. Weldon. Lyle began his career in aquatic weed research at Laramie, Wyo., as an ambitious young scientist with a brand new M.S. degree. During the 3½ years we worked closely together, Lyle showed his potential as an outstanding scientist: curiosity, initiative, eagerness to learn, self-confidence, insistence on knowing why, and extreme dedication to his job and to science.

His impatience with details and questioning attitude were irritating at times to me and other scientists, but I recognized them as attributes of a perfectionist. He would always accept advice and even reprimands as part of the learning process. Because of these qualities and his abundant energy and dedication which enabled him to complete requirements for his Ph.D. by June 1959, while spending much contributed overtime to official research, I prevailed upon him to accept a difficult pioneering assignment at Ft. Lauderdale, Fla.

During his 10 years of research in Florida under my distant and unneeded supervision, Dr. Weldon equalled and far exceeded my highest expectations. He and his research accomplishments became well known and ad-

EDITOR'S NOTE: On this page are tributes to Lyle Weldon from a few of the many persons in industry, government and education who knew him personally or were aware of his work. Hundreds of others remember him as he is pictured at left, speaking vigorously about research findings in weed science. His appearances were numerous. This scene is from a meeting of the Hyacinth Control Society, to which Weldon contributed an immense amount of time and energy, as an organizer, speaker, editor and officer.

mired among weed scientists and other specialists in Florida, the Southern Weed Conference, the Weed Science Society of America and in many foreign countries. If he had a fault, it was over dedication to his job and to science at personal sacrifice and risk to his health. In my opinion, Dr. Weldon's contribution to Weed Science at age 35 has not been exceeded or even equalled by another scientist at that age.—**F. L. TIMMONS** leader, Weed Investigations, Aquatic and Non-crop, ARS, USDA, Laramie, Wyo.

* * *

DR. LYLE WELDON was without question one of the foremost research men as well as one of the most knowledgeable in the aquatic weed science field. His death is a severe blow to this industry. The team of Weldon and Blackburn seldom, if ever, was matched for effectiveness. These scientists planned together . . . and published together. Rarely did they publish a scientific paper which did not carry the names of both. It is doubtful that this kind of relationship—directed toward a specific scientific phase of the weed control industry—can be repeated.

As a man, Lyle leaves an enviable legacy. Those of us who worked with him in various disciplines concerned with this industry knew him both as friend and congenial companion. We know Lyle for the competent, driving, hard-working, and intelligent person that he was.—**ARTHUR V. EDWARDS,** editorial director, WEEDS TREES and TURF, Cleveland, Ohio.

* * *

IT CAN BEST BE SAID of Lyle that in his short life span he achieved that which many of us never do in a full three score and ten years. Lyle left his mark in accomplishments, long range visions and a person-to-person relationship with all who came in contact with him. He was never too busy to explain to the water user the work that was under way. He believed that an informed lakefront cottage owner became an ally to those of us involved in weed work. Lyle, above all, had a total concept of the place and need for aquatic weed control. We will all miss him with his curiosity, enthusiasm and willingness to work the clock around in his search for answers. He left a large pair of shoes to fill.—**JOHN E. GALLAGHER,** agricultural chemicals division, research and development, Amchem Products, Inc., Ambler, Pa.

* * *

HAVING WORKED in most of the world's countries, I can tell you—Lyle Weldon was one of the best aquatic weed scientists in the world. He had few peers. He understood the biology of aquatic plants and he was an expert on control measures for species which were troublesome. He was technically competent, but he also recognized the social impact of weed problems. He was aware that politicians, farmers, urban people, and citizens from many walks of life would have to be brought together in support of the solution of such problems. His determination and enthusiasm inspired some of us to do things we didn't know we could do. We have lost one of the leaders for our work.—**PROF. LEROY HOLM,** University of Wisconsin, Madison.

* * *

DR. LYLE WELDON had a zest for life and with it a vigorous, contagious aggressiveness directed toward control procedures of aquatic weeds. This made him a leader in this field. We all miss him as a co-worker and as a friend. — **JOHN H. STEENIS,** USDI, Patuxent Wildlife Research Center, Laurel, Md.

* * *

THE LOSS OF LYLE WELDON has been a terrible blow to the field of weed science. His techniques, abilities and methods of developing and transmitting data will be sorely missed in the years to come. Rarely, if ever, in my 20 years of experience in the weed control industry have I had the opportunity and good fortune to work with anyone as dynamic, forceful and determined as Lyle. His precise approach to difficult problems will always be remembered. I will miss him, as will so many others who have worked with him for these last number of years. — **HERBERT J. FRIEDMAN,** president, Southern Mill Creek Products Co., Inc., Tampa, Fla.

Consulting Biologist Jason Cortell inspects some alligator weed research during a tour of USDA's aquatic research facility at Ft. Lauderdale, Fla.

THE ROLE OF HERBICIDES

In the preservation of our urban and industrial water resources

By Jason M. Cortell
JASON M. CORTELL & ASSOCIATES
Consulting Biologists
Wellesley Hills, Mass.

TODAY, MORE than ever, in the midst of the current indiscriminate attack on herbicides and other pesticides, it seems as good a time as any to review the role of these materials in the use and preservation of our water resources. At no time in our nation's history has the public been as aroused about the quality of the environment and nowhere are these problems more acute than in and around our cities.

In recent years, the urban nature of much of today's water resource problems has become increasingly apparent. The growth of metropolitan areas, particularly along our coastlines and inland waterways, is well documented. Population shifts in the last 50 years have been unparalleled in history. According to the U.S. Census Bureau in 1900, one out of 20 Americans lived in urban areas; and in 1968, 14 out of 20 Americans lived in urban or suburban communities. During the same period, the population doubled, meaning that while the rural population dropped about 30%, the urban population has increased 2,800%. It is estimated that the existing population will double again within the next 30 years and some 80% will live in urban areas.

Use of Water

Spiralling use of potable water has increased over the past 50 years from 30 to 150 gallons per person per day, and the total per capita consumption for all purposes, is 1,600 gallons per day. However, surface water flowing from fertile watersheds into reservoirs and holding areas, have caused the accelerated growth of aquatic weeds and algae, seriously affecting the quantity, if not the quality, of our drinking water. Municipal water systems, private water companies, and state and interstate water resource commissions have raised increasingly vocal concern over the needs for an effective means for controlling nuisance aquatic vegetation in hundreds of thousands of acres of eutrophic reservoir and watershed areas.

According to the U.S. Geological Survey, in 1965, the total use of fresh water resources for all purposes was in excess of 310 billion gallons per day. Of this total, about 54% was used by industry, 38% by agriculture for irrigation, 7% for domestic needs and about 1% for rural domestic and stock use. About 23.6 billion gallons of fresh water per day is consumed for domestic purposes.

Holm, Weldon and Blackburn, in a recent article appearing in *Science*, detail the explosive growth of aquatic vegetation throughout the world. They describe the spread of floating plants, such as water hyacinth, *Salvinia*, and water lettuce in Africa and South America, particularly in connection with man-made lakes and hydroelectric schemes. Additionally, the spread of submersed weeds, such as watermilfoil and *Hydrilla* in navigable waters and canals has had a retardant effect on the industrialization of many developing areas, both in this hemisphere and in other parts of the world.

Another consideration is the use of our water resources for recreation.

The extent and nature of outdoor recreation was the subject of a congressionally authorized $2.5 million three-year study. The Outdoor Recreation Resources Review Commission reported in 1962 that most people seeking outdoor recreation want water to sit by, to swim and fish in, to water ski across, to dive under and to run their boats over. Swimming has become one of the post popular outdoor sports. Boating and fishing are also among the top ten leisure activities.

The Commandant of the U.S. Coast Guard reports in *Boating Statistics—1968* that 4,742,800 pleasure crafts of all description were registered and numbered in the U.S.

In addition to boating, swimming and fishing — camping picnicking, and hiking, are also more attractive near water sites and have thus become part of the multiple-use water concept.

Multiple-Use of Water

The use of aquatic herbicides in and around urban areas is complicated by the multiple-use character of our water resources. Regional and state regulatory agencies, municipal water authorities and districts, private water companies, private industry, local health officials, lake and pond associations, private riperian owners and conservationists all have a stake in the control of aquatic weeds in one form or another.

Unlike the comparative seclusion of the field station or the rural isolation of the single agrarian consumer, the use and evaluation of aquatic herbicides in urban areas is not a simple task. Yet, with the need for control becoming ever more acute, substantial progress in urban areas is still slow.

Evaluation of Herbicides

Currently, thousands of acres of recreational waters are being successfully treated for the control of aquatic vegetation using the present limited arsenal of aquatic herbicides.

In most cases, preliminary field evaluations have been made to further refine the desired project specifications. In still other circumstances, where considerable acreage is involved, post-registration field evaluation is required as a standard practice. On many occasions, this initial series of field trials may be the sponsor's first contact with the new aquatic herbicide.

The individual who carries the

main responsibility for the expenditure involved for chemicals will provide the level of control desired.

But others are also involved — state and local health officers must be satisfied that the new herbicide can be safely introduced into public waters without causing injury. Fisheries and game personnel are interested in the chemical's effect on wildlife, as in the regional extension representative concerned about its effect on irrigation water and agriculture. The manager of an industrial facility which may use the treated water for manufacturing or cooling is also concerned about the chemicals introduced therein as it may affect his manufacturing process or equipment. Lastly, the professional applicator may be concerned about the ability of his personnel and the adaptability of his equipment to handle the new aquatic herbicide.

One can easily see that before the chemical even gets an opportunity to perform, a great deal of preliminary work is required. The responsibility for liaison with all interested parties prior to the development and implementation of a field evaluation plan is usually that of the project engineer.

Landmark Projects

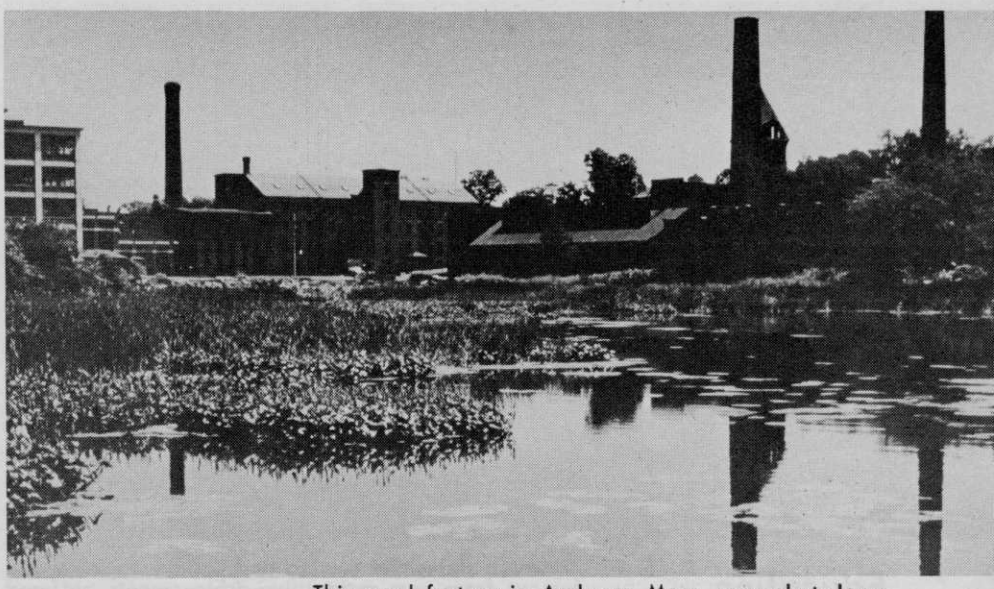
With this as a background I would like to discuss briefly several typical projects which, to one degree or another, have achieved landmark status, illustrating the role of aquatic herbicides in urban and industrial water resource problems.

Let us briefly review the problems particularly associated with the use of aquatic herbicides in potable water systems. Of all areas of research, the need here is substantial.

Copper sulfate has long been used with great success for the control of algae. At one time, one or two treatments a season were enough to control algae growth in an average reservoir or impoundment. Today, however, the influx of nutrients from surface water runoff has accelerated the growth of algae where, in some cases, bi-monthly treatment is required. The American Water Works Association noted in 1968, a 60% increase in total copper used for algae control since 1960.

While today, copper sulfate still provides a satisfactory level of control in potable waters, a pressing need exists for the development of new algicides which are not only more effective, but which do not have the limiting characteristics of copper such as toxicity to fish and build-up of residual copper in mud.

In recent years, the use of 2,4-D



Business Halted

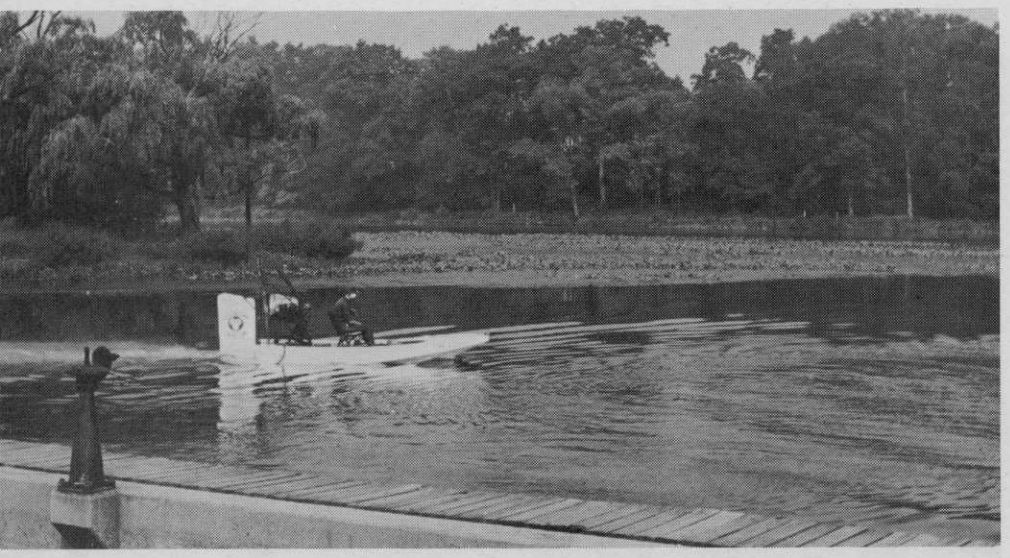
This wool factory in Andover, Mass., was shut down by aquatic weeds. The lake was built in the 1800s to supply water for power and for the woolen process and later as an equipment coolant. Weeds clogged the intake system forcing the factory to close until the weeds were killed.

Flood Control Compromised

Arrowhead, elodea and cattail seriously reduced the effectiveness of this flood control canal winding its way through Chelsea in eastern Massachusetts. The illustrations with this report show typical problems handled by the author's firm, Allied Biological Control, Inc.

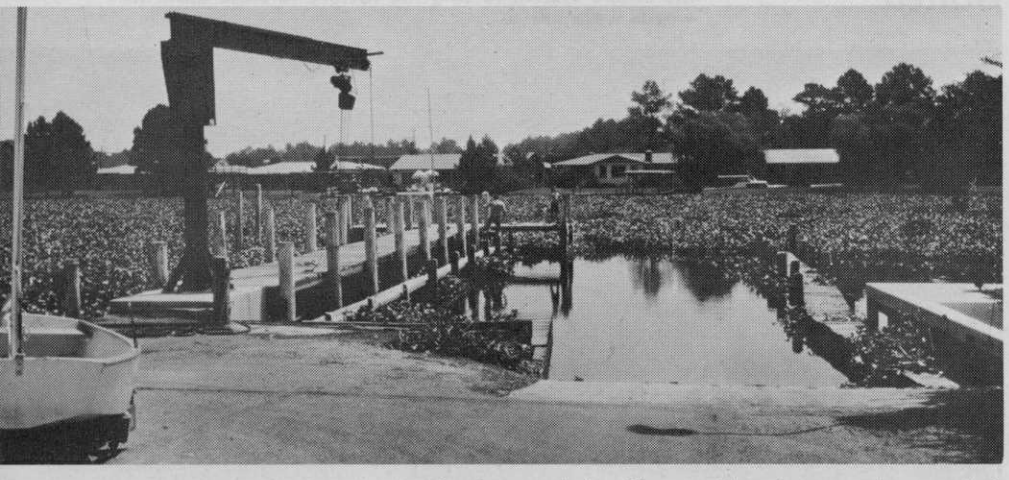
Transportation Endangered

Barely showing behind a formidable "phragmite curtain" is the Boston-Logan International Airport. This weed problem attracts heavy populations of birds, particularly starlings. Flocks of birds present a very real hazard to aircraft landing or taking off.



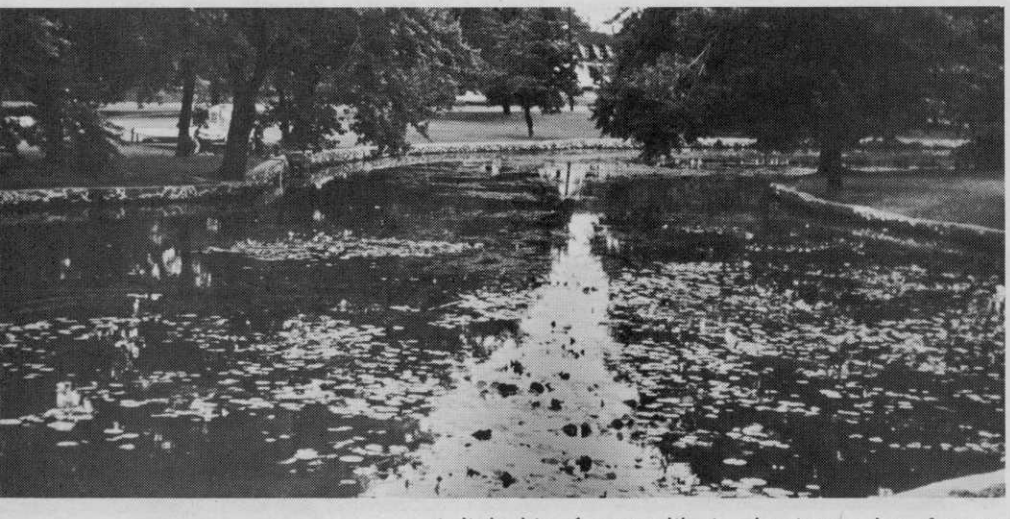
Education Stifled

Princeton University rowing and sailing crews, world famous from past competitive achievements, suffered an ignominious defeat to watermilfoil on their own Lake Cabomba. The sports program was halted until Allied Biological controlled the aquatic pest.



Recreation Prevented

The boat at left without sail and aground on asphalt nevertheless has about as good a chance of moving in the wind as it would on the lake in the background. Water hyacinth closed down this yacht club in the heart of downtown Jacksonville, Fla.



Beauty Impaired

A little bit of water lily is pleasing; a lot of water lily and elodea combined is a problem. This eyesore, before it was cleaned up, was an impoundment of the Wepawag River as it passed through River Park in the middle of Milford, Conn.

Granular for the control of watermilfoil and certain other submersed aquatic species have become a standard operational procedure in many recreational lakes. Early work by Grigsby in Michigan, set the pattern for similar large-scale field evaluations in New Jersey in 1959. Horricks and Smith, with technical assistance from Gallagher, treated more than 750 acres in New Jersey's 2,680-acre Lake Hopetcong. The results obtained from the Lake Hopetcong evaluation work were to set a pattern for operational treatments throughout the decade. Steenis, through the early-1960s, had carried out a series of intensive evaluation studies on the control of eurasian watermilfoil *(Myriophyllum spicatum)* with Granular 2,4-D in Chesapeake Bay, which eventually led to its acceptance as an operational specification. This early work provided a sound basis for future large-scale programs in the TVA reservoirs, North Carolina's Currituck Sound, New York's Chautauqua and Findley Lakes and Rondoe Bay in Canada. Virtually, thousands of weed infested acreage has been cleared in recreational waters using this approach.

Back in 1958, work in Massachusetts by Boschetti and Cortell pointed out that a large group of submersed and floating aquatic plants were susceptible to relatively low rates (0.5 ppm) of silvex. Whereas watermilfoil, elodea, coontail and waterlily represent major problems in this part of the country, silvex has been used extensively for control purposes since that time.

Early field evaluations with diquat in England, Malaysia, Canada and the United States have resulted in the widespread use of this material throughout the world. It has been particularly effective in Florida for the control of water hyacinth *(Eichhornia crassipes)* and waterlettuce *(Pistia stratioites)* in drainage canals. Diquat also has been found to be quite specific for the control of another floating plant — duckweed *(Lemna minor)*. All three of these free floating aquatic plants have a worldwide range and are extremely troublesome when found in the vicinity of hydro-electric water intakes.

Diquat is used widely also in urban areas for the control of numerous submersed aquatic species. Large-scale operational treatments of diquat have been recently carried out in Florida at the Orlando Naval Training Center under the direction of Weldon and in New Jersey's and New York's 1,920-acre Greenwood

Lake by Gilbert. In the latter project, a bottom-release technique was utilized to control flatleaf pondweed *(Potamogeton robbinsii)*.

Another much heralded urban aquatic weed problem is that which besets Winter Park, Fla. Here both chemical and mechanical control procedures are presently being employed by the City's Parks and Recreation Department to abate the rapid growth of Florida elodea *(Hydrilla verticillata)*. At present, about 800 acres of surface water is infested with this and other submersed weeds. Based on extensive work at the U.S.D.A.-A.R.S. Fort Lauderdale Laboratory by Blackburn, numerous herbicidal approaches for the control of *Hydrilla* have been under study. This past year, field evaluation of two endothall products, Hydrothal 191 and 3M System E were made by Pennwalt Corporation and the 3M Company, respectively. While results of this work are still under study, Blanchard reports that municipal officials plan to move ahead on an ever-expanding program which is expected to run in the vicinity of $180,000 this coming year. Other work on *Hydrilla* has been conducted at the Fort Lauderdale Plantation Laboratory by Blackburn and Weldon. Recent field results appear to indicate that a combination of 1 ppm diquat and 4 ppm copper sulfate has given excellent control of *Hydrilla* and other submersed species in non-flowing waters. As a result of these studies, this combination is now being used commercially for *Hydrilla* control in urban sites.

The liquid formulation of 2,4-D Amine has been extremely valuable in controlling both waterhyacinth in the south and waterchestnut *(Trapc natans)* in the northeast. Wunderlich and his co-workers are generally given credit for the early evaluation of this formulation, both in Louisiana and in Chesapeake Bay. The early work of Smith, Greeley and Steenis, on the Mohawk and Hudson Rivers near Albany, further extended the field testing of 2,4-D Amine liquid on waterchestnut already begun by the Corps of Engineers.

Field evaluation of dalapon, in combination with Amitrol-T, back in 1962, for phragmites *(Phragmites communis)* control by workers in Delaware and Massachusetts has proved extremely useful in urban and industrial sites. Treatments with this combination have become an important part of the environment control program at Boston's Logan International Airport in connection with aircraft-related bird control.

Informed Public Wants Action

The foregoing represents a fragment of the evaluation work which has been under way in urban areas for the past decade or so.

We should acknowledge that the general public is more involved, and better informed, today than at any time in history about the problems of environment and the effects of pollution.

Urbanization, in connection with industrialization, has created environmental problems which can no longer be ignored or dismissed as the "price of progress" or the by-product of an expanding G.N.P.

Interest groups from all sectors of the community are now demanding clean air and water, water which is essentially free of undesirable aquatic weeds and algae.

The role of aquatic nuisance control should not be underestimated, as today, the urban dweller is vitally concerned and increasingly articulate about the quality of his drinking water, as well as that of the recreational ponds and lakes nearby.

3M Company Announces Aquatic Weed Service

Constant treatment is necessary to keep south Florida flood canals free of aquatic weeds and algae. Weeds act somewhat like quicksand. A child falling into weed-choked water might not be able to swim in it.

ONE OF THE NATION'S largest industrial corporations has launched a program to help combat Florida's serious lakes and waterways weed and algae problems.

The 3M Company—known for its Scotch, Tartan and 3M brand labels on such diverse products as tapes, sandpaper, copying machines, synthetic football fields and reflective highway signs—has formed a new unit within its New Business Ventures division to accomplish the task.

Dr. William G. Paterson heads its Aquatic Control Systems program at the firm's headquarters in St. Paul. Working under him is Dr. Robert W. Geiger who heads the program's "Lakes and Waterways Management Service" (LAWMS) with facilities in Miami Lakes and Pompano Beach, Fla.

LAWMS is specializing in clearing aquatic weeds and algae from highly-infested bodies of water and in maintaining water in an essentially weed- and algae-free condition. It is accomplishing its work in part with a series of new, selective herbicide systems of low toxicity that have wide margins of safety to fish and wildlife.

LAWMS offers two types of services:

- It will handle water management problems for local and county governmental units or private groups on an annual contract basis, or
- It will train personnel and provide products and "expertise" to qualified governmental agencies that desire to do their own water management work.

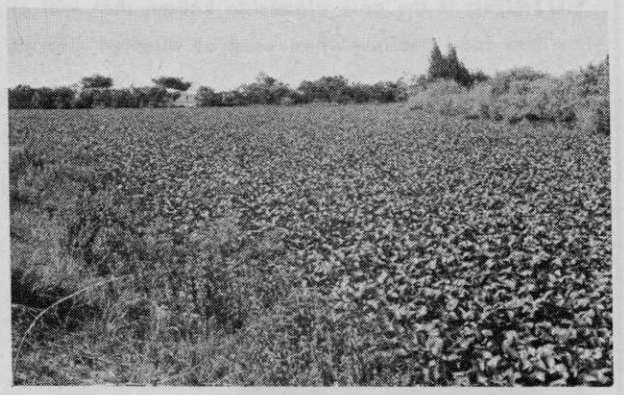
"In the first instance, our yearly contractual agreements are all-encompassing," Dr. Paterson says. "They include an initial survey to identify the scope of the problem and as many treatments as necessary to accomplish the objective."

"We won't merely furnish some herbicides or show up for one quick spray application," says Dr. Geiger. "We want full control over the entire year to make sure the job is done right."

LAWMS has actually been in Florida nearly two years. Initial aquatic weed and algae control work was done with Dade County (Miami). This work continues and LAWMS also has agreements with several city and related governmental units and lake associations.

LAWMS is equipped to handle virtually all of Florida's major aquatic weed and algae problems, including hydrilla, water hyacinth, aquatic grasses, watermilfoil, pondweed, filamentous algae and the weedlike algae, chara.

For more information contact: 3M Company Lakes and Waterways Management Service, 501E N.E. 28th St., Pompano Beach, Fla. 33064, (305) 943-0481, or Aquatic Control Systems, New Business Ventures division, 3M Company, 3M Center, St. Paul, Minn. 55101, (612) 733-1052.



3M Company's Lakes and Waterways Management Service is keeping the 15-acre pond in the infield area of Florida's famed Tropical Park race track free of weeds and algae. Severe infestations of hydrilla, southern naiad, large leaf pondweed, chara and algae scum had driven away waterfowl and were threatening game fish. Much aquatic weed work is left to be done, as indicated by lake of water hyacinths above.

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By NORMAN J. SCHEIN
The Lake Biologist, Inc.
Onalaska, Wis.

Wisconsin lake biologist tells how to convince public

TOTAL LAKE

TOTAL LAKE management is here to stay. Our philosophy in Wisconsin for conducting this type of program is to develop initially a cordial understanding between the applicator and the people concerned.

We tackle a project by first holding several meetings to describe the problem. We want to determine, among other things, these factors:

—How many people desire treatment?

—What cost can be beneficial to the people and to the applicator?

—Will the group allow an area for experimentation?

—Does the group want treatment in public areas, such as landings and center-of-lake areas?

—Do the people understand the chemical to be used, what it will do, what restrictions on water use will be necessary, what regrowth can be expected, what additional controls (such as algae and itch) can be optional?

A lake survey is necessary to determine immediate and long-range treatment. Normally, each lake community has a lake improvement association. If not, one is set up with our assistance. Representatives of this group are invited to participate in the survey of the entire lake. Sketches are made of acreage and places in the worst condition. Desired treatment areas are then determined.

Some people do not desire treatment for a variety of reasons. They are not disturbed. People wanting treatment are pinpointed on the survey and advised as to the most beneficial type of control indicated.

A form letter is mailed to each interested person. In return, he submits his payment to the lake association treasurer. The letter describes the preparation of treatment. For example: A property owner marks his lot line with flags, places a sign on his dock stating dimensions of the area (100x100—meaning 100 feet from shore along 100 feet of shoreline), posts his name and lot number.

A date for treatment is set, depending on growth rate, type of plant, and weather conditions.

When the treatment begins, a committee member (or two) precedes the treatment boat to locate the lots. This person can also observe the treatment from a safe distance.

Each dock is marked with a card notifying the owner that work has been completed. Local press and radio are willing to give notice of treatment date to the public. Almost always these media are contacted. Public areas and landings are posted.

One of the options on the initial treatment is acquiring additional assessment (usually $5 to $10 per owner) for treatment in lake areas or troublesome spots other than along shorelines. The local committee determines feasible locations to be treated.

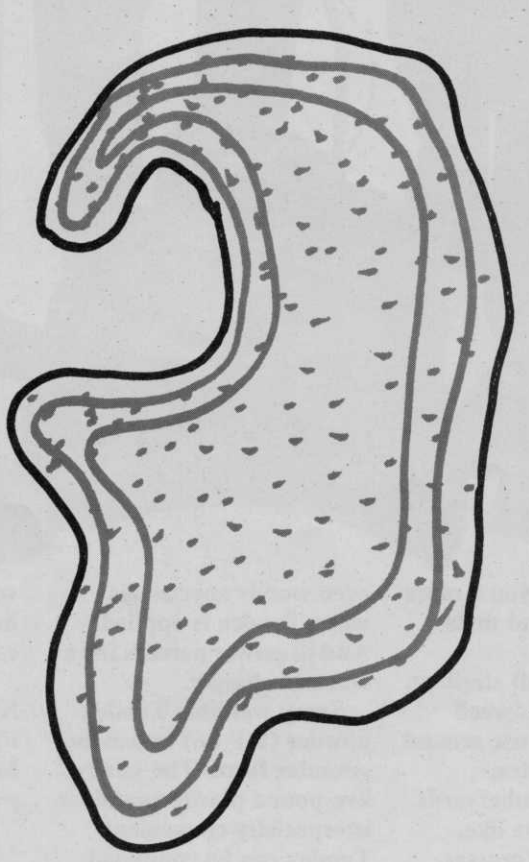
The Three-Year Plan

Because growth is sometimes unpredictable, a three-year plan has been devised. According to the condition, areas are treated as needed. Some badly infested areas will not respond to complete control for three years. Others will hold for two years. Therefore, a gradual and continual control is negotiated. This plan calls for routine supervision and treatment as the need arises. It also includes treatment for filamentous and planktonic algae growth using a copper sulfate (IPPM) on a marginal area.

The complete lake is never treated for any kind of condition, as this would cause a badly unbalanced lake. For algae control, marginal or half-lake control has been successful. Half-lake control is used by watching prevailing winds and algae concentrations. This also eliminates the possibility of a low dissolved oxygen problem.

Our lakes are put on a schedule and are visited about once a week or once every 10 days. Treatment is done or skipped as the situation demands. This routine survey keeps us on the problem without letting it get out of control. It is especially

DIAGRAM 1. Double marginal application technique.



A skip of about 200-300 feet is maintained so the dead algae does not concentrate at once. Of course, wind action must be considered. If there is a wind causing a wave action of more than four inches in height, then treatment should be confined to areas unaffected by wind. At no time should algae be sprayed in excessive wind. Control is negligible. A weekly routine spraying of less than 1 ppm of copper sulfate will clear this lake in two to three weeks and keep it clear all summer.

of the need for . . .

MANAGEMENT

successful on planktonic algae control.

We have controlled algae in a 1,500-acre lake with marginal control by routine spraying of 500 pounds of copper sulfate at about a .05 ppm rate. If a two-week period elapsed between treatments, the algae again got severely out of control. Of course, weather conditions can influence growth.

As an example of a routine inspection: In one lake in the southern part of Wisconsin, the weeds were in need of treatment in late May because of the earlier growing season. Treatment was accomplished, but with the recommendation that a second treatment be done in August to control regrowth. Regrowth did occur but it was chara instead. Therefore, we treated for chara, with about 4 ppm of copper sulfate using underwater injection.

Unless people understand why a situation like this can occur, you are in trouble. A routine inspection and a complete mutual understanding of seasonal lake management is a necessity.

At the end of the summer, each association plans a business meeting. We attend these meetings to discuss our progress with the management plan. Suggestions for the coming year are made, questions answered, and prices are discussed.

The Sanitary District

Some lake areas have organized a step beyond the lake association. By law, they have formed a Sanitary District, which has the right to assess a tax for lake improvement. A board of directors is elected and it works in conjunction with town and county boards. The Sanitary District is quite effective in bringing about a total lake management program. These men are devoted to improving their lake. The sanitary board controls sewages codes, dredging, chemical control, shoreline development, parks, and landings.

Partial-Lake Concept

The state of Wisconsin allows no more than 80% of a lake to be treated for aquatic weeds with 20% remaining for fish habitat. In the 10 years as a Wisconsin state lake biologist, I have never seen this much of a lake treated at one time. What I am suggesting is that it is more beneficial to a lake to treat for aquatic vegetation over a period of several years to gain control, rather than treat a large portion or the entire lake in one season. The shock of released available nutrients from decaying plants most assuredly will cause a terrific algae growth. Beneficial results may not result. It took many years to cause an obnoxious weed problem, and restoring the lake balance also could take a carefully plan treatment lasting several years.

Planktonic algae treatment has a varied number of concepts, but we have gained excellent control with copper sulfate at the rate of 1 ppm, thoroughly covering the surface on a marginal basis. In some cases where a lake has a well-mixed bloom along with large acreage and good depth—more than 20 feet—a double marginal treatment is carried out. See diagram 1)

On the partial lake algae treatment plan, we discovered that there seems to be a chain reaction taking place with aphanezomenon; that is, a copper sulfate treated algal cell appears to be toxic to a living cell and a small area treated results in control over a much larger portion of the lake.

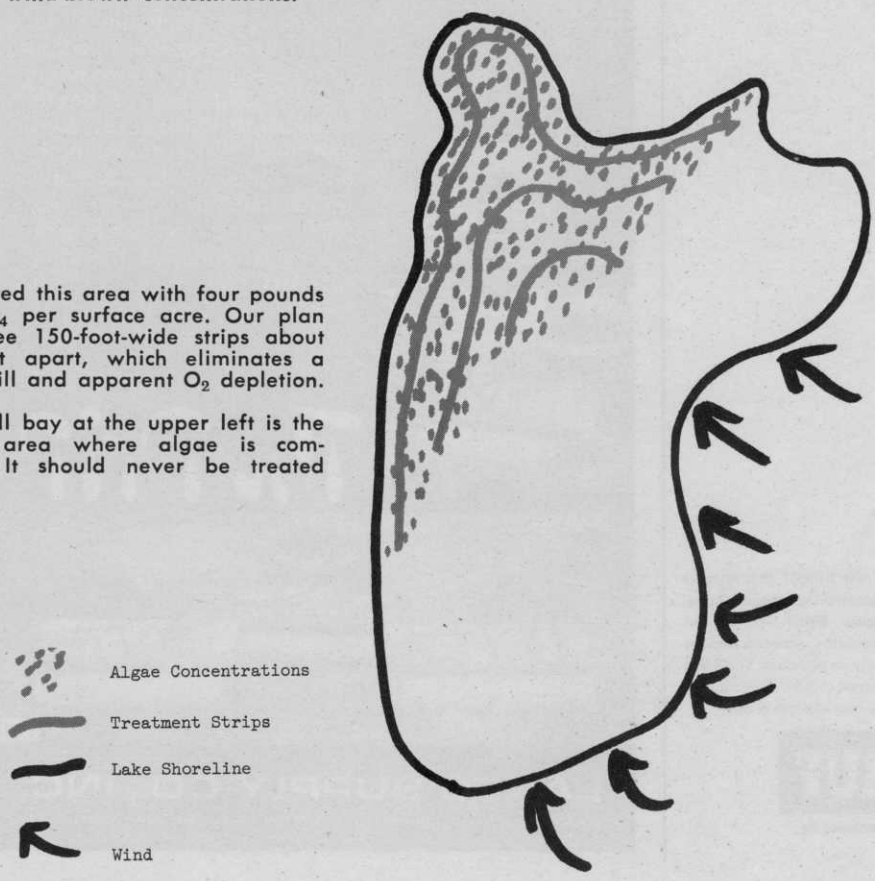
Each lake has its own characteristics. Sometimes the double marginal plan is not needed, usually on smaller lakes.

If a lake has had a bloom for several days and winds have been prevailing from one direction, the resulting situation can be used to the applicator's benefit. (See diagram 2)

At times during any type of marginal control, a concentrated area of algae may be found in the center of the lake. Spot treatment of these concentrations can be effective in gaining control.

Any combination of these ideas

DIAGRAM 2. Successful planktonic algae control treating wind-blown concentrations.



Equipment used: High-speed Homelite pump XL, ½-inch nozzle. Mixing (polyethylene) barrel, 2-inch intake hose with foot valve, venturi system with direct flow of chemical into water intake eliminating heavy mixing barrel, and 25 hp, 79 lb. Johnson Outboard with extended shaft. Our boat is an 18-ft. Kenner Ski Barge (fiberglas).

An example of partial control — the outside area to the upper right shows untreated area. No algae resulted from this treatment, and the following year treatment area was increased. In this manner, in three years we had complete control over the entire lake except for untreated fish habitat areas.

can be utilized to avoid total lake algae spraying. Total treatment can lead to disaster. A complete oxygen depletion is possible. The key to good control is an extremely light treatment done in a routinely devised program. It is advisable to stay away from the "shock" treatment of algae as well as for weeds.

"On Call" Concept

Our algae control programs usually are scheduled on a once-a-week basis, starting when the first bloom appears. It is necessary to instruct one of the lake residents to recognize the beginning of a bloom and inform us of the condition.

This leads to another concept of total lake management: Being on call.

Calls are made by designated people to keep us informed, so we can schedule changes as needed. We

Wind-concentrated duckweed presents this unpleasant scene. The picture at left is the same area from a different side two weeks after treatment.

keep in contact weekly with our lakes and know what changes are occurring. This saves time. Some lakes will hold for more than a week, so we can eliminate a trip.

Any aquatic treatment success can be noticeably affected by wind. Chemical drift can occur rapidly, with the result being no control at all. Expense goes up, profits go down, and people are dissatisfied.

The Clear Lake Project

Clear Lake in northwestern Wisconsin is illustrative of a typical lake with several problems.

It's about 40 feet below the level of the village by the same name, which includes a large creamery. Below the creamery was a seven-acre pond infested with brush, a variety of submerged weeds, duck weed and filamentous algae.

This pond was treated three times successfully for control of all the above-mentioned problems. The pond's water drains into Clear Lake, covering about 100 acres.

When we first surveyed the problem, the lake was infested with elodea packed solid in the swimming area of six acres, plus scattered masses around the lake. Planktonic algae was heavy throughout.

My first impression was to forget it and concentrate on other jobs. However, the challenge spurred me to tackle it.

The elodea was controlled completely in two years. The first year, I supervised the job as a state biologist. The village crew treated with aquathol-plus pellets at 600 pounds per acre. In three weeks, the entire mass of elodea broke loose and rose to the surface, but eventually decayed.

The algae became worse.

Last year, we took on the maintenance problem, which consisted of elodea treatment, then a weekly routine algae treatment. We used diquat for complete elodea control in the treated areas and 50 pounds of copper sulfate for algae control on a once-around marginal basis. Each week we sprayed using the marginal plan. In three weeks, we had clear water throughout. Planktonic algae disappeared and clumps of clodophora, hydrodictyon and spiro gyra occurred. We then changed from marginal to spot spraying of filamentous algae.

The result was a clear, usable lake all summer long. The fishing was excellent, with northern pike, bluegills, perch, and largemouth bass being taken. We never used more than 50 pounds of copper sulfate per week and never spent more than 45 minutes a week on the lake. The rapid growth of filamentous algae was indicative of the high nutrient content of the water.

We skipped one week and a filamentous growth again started and would have gone completely out of control had we not been on call and informed of the condition.

This plan of total lake management has been very successful for us. We plan on using it on most of our jobs.

It is highly important to develop ethical practices on the water, develop a good understanding and working relationship with property owners, and to report failures and successes to chemical companies and state governing agencies.

It also is a feasible way to carry on a continual year-by-year research program of new techniques, chemical mixtures, new chemicals, and new equipment to better achieve a beneficial program for all concerned.

Book for Water Specialists

THE PRACTICE OF WATER POLLUTION BIOLOGY, Kenneth M. Mackenthun, U.S. Department of Interior. Single copies free from the Office of Public Information, Federal Water Pollution Control Administration, Washington, D.C. 20242. The book also is for sale at $1.50 per copy from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

This book presents some practical water pollution biological field investigative techniques and practices, procedures to solve problems, data analyses, interpretation and display, and the development and writing of the investigative report. It is written principally for the biologist inexperienced in these activities, and for sanitary engineers, chemists, attorneys, water pollution control administrators, and others who are interested in broadening their understanding of this discipline.

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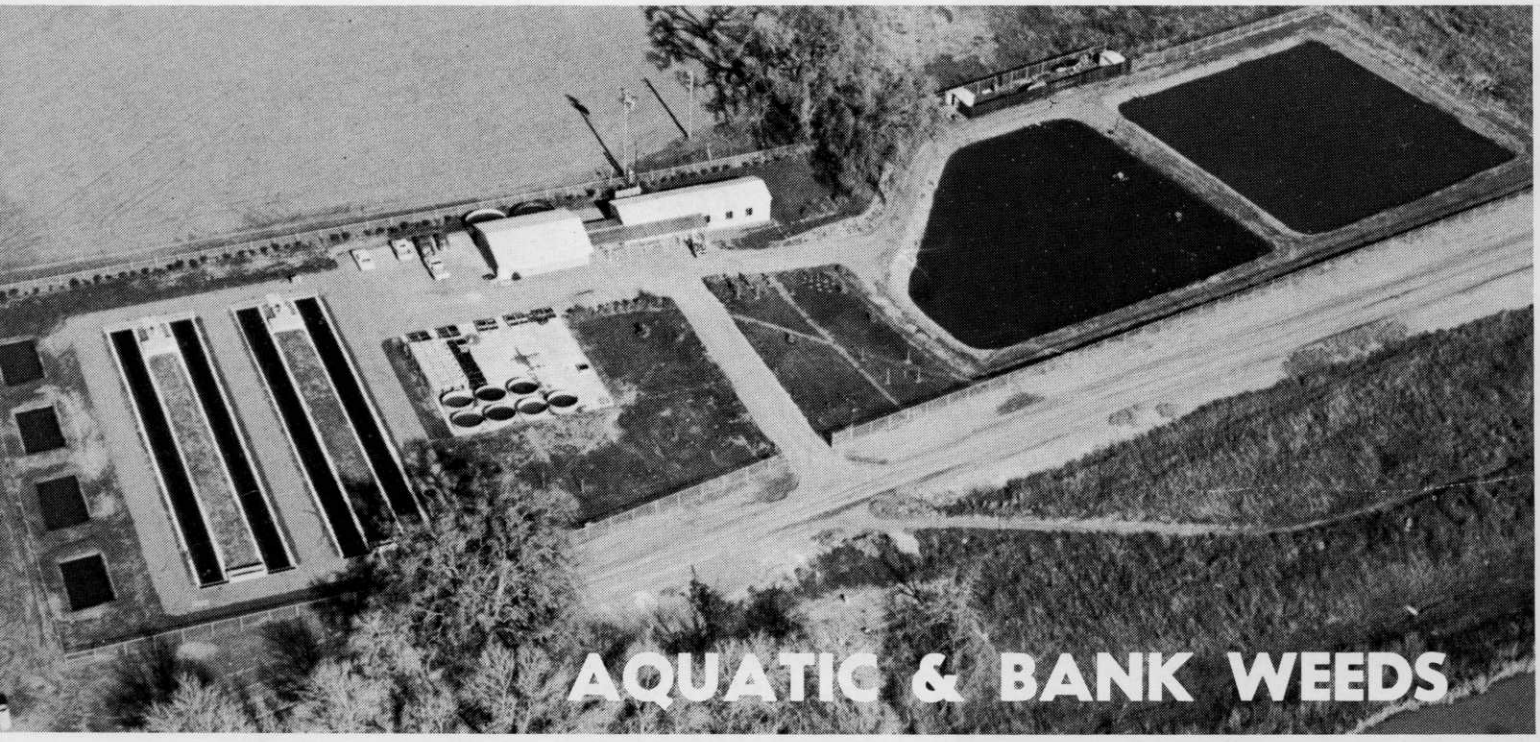


AQUATIC & BANK WEEDS

*Research Techniques and Challenges Are Unique**

By F. L. TIMMONS**

RESEARCH on control of aquatic and bank weeds involves many challenging problems not encountered in research with terrestrial weeds. Equipment and techniques required are quite different, and often nonexistent.

Bank weeds, for example, along unlined earth irrigation canals, drainage channels, and pond and lake shorelines present situations and require research techniques much different from those on terrestrial weeds, but not nearly as unique as those with floating and submersed aquatic weeds.

Bank weeds range in type from semi-aquatic species at the waterline to drought-resistant species high on the bank. Even the same species grows much more vigorously at the waterline, and it often responds differently to herbicide treatments than it does several feet higher on the bank. The spectrum of bank weeds includes most weeds that grow on cropland and the semi-aquatic species, such as canarygrass *(Phalaris arundinacea)* and smartweeds *(Polygonum* spp.) in the West and paragrass *(Panicum purpurascens)*, torpedograss *(Panicum repens)*, Johnsongrass *(Sorghum halepense)*, and phragmites *(Phragmites communis)* in the South. Woody plants such as saltcedar *(Tamarix pentandra)*, willows *(Salix* spp.), and wild rose *(Rosa* spp.) are also common bank weeds.

The full width of canal bank must be included in each experimental plot. Canals run in all directions, so that the incidence of sunlight affects bank weed growth. The response to herbicides is different on north, south, east, and west bank slopes. These narrow bands of weeds grow immediately beside water on one side and, frequently, close to herbicide-sensitive irrigated crops on the other side. That raises the problem of herbicide residues in the water on one side, and of spray drift onto sensitive crops on the other.

In experiments to determine effectiveness of herbicides on bank weeds, the plots must be located where there are uniform stands of weeds. To obtain reliable results, each plot must include both banks; or different replicate blocks must be located on opposite sides of the canal.

Because banks are usually steep, and often uneven, wheel-mounted sprayers can seldom be used. Hand-spray booms and guns usually work best. A single-nozzle wand boom is ideal for following the bank contour. Sometimes a wind board must be carried by a second man, walking beside the man who carries the sprayer to prevent spray drift onto the adjacent crop, or elsewhere off the target plot.

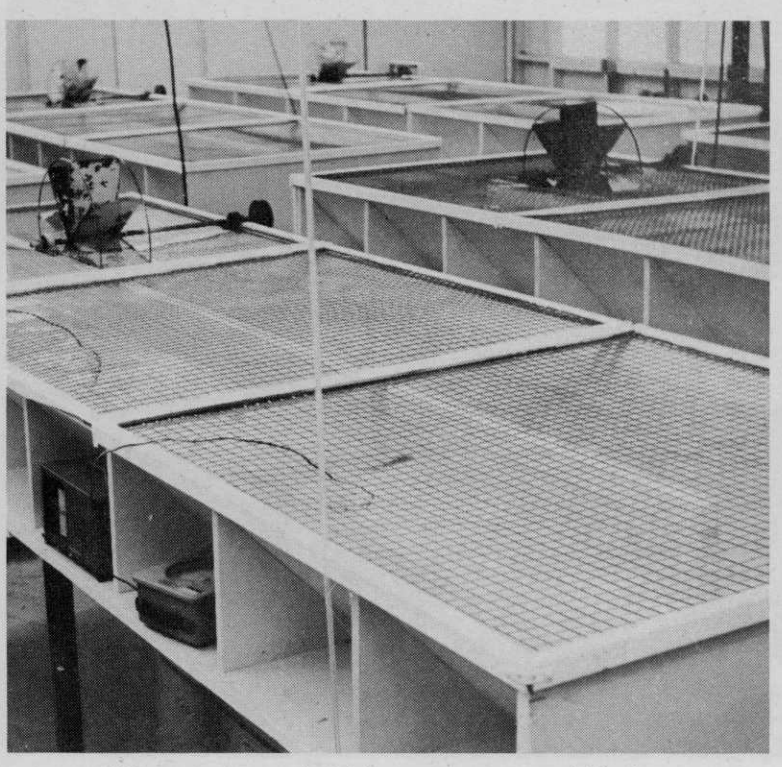
When you are evaluating results of herbicide treatments on bank weeds, it usually is necessary to make the determinations on each plot, one at the waterline and one higher on the bank, beginning two or three feet above the waterline. Extreme care is necessary in selecting replicate blocks of plots to reduce within-block error. Variation in results from the same treatment is often considerable between blocks of plots under different conditions. Thus, many repetitions of the experiment are necessary for conclusive results, whether for average conditions or for each condition along the same type of canal.

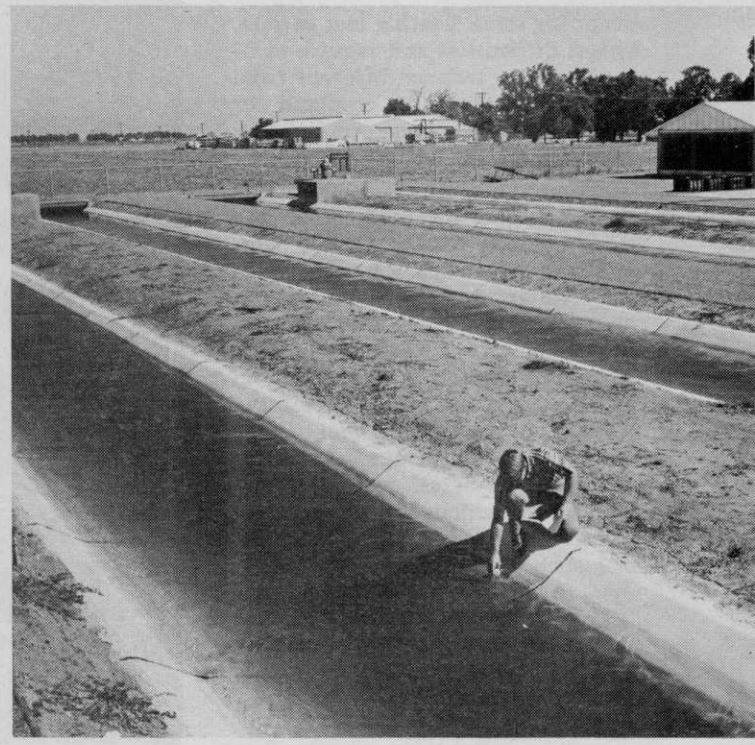
Emersed Aquatic Weeds

With some exceptions, emersed aquatic weeds present research difficulties similar to those with bank weeds. Emersed weeds such as cattails *(Typha* spp.), tules *(Scirpus* spp.), smartweeds, and watercress *(Nasturtium officinale)* in the West,

* Presented at the Western Society of Weed Science, Sacramento, Calif., Mar. 17-19, and published in the proceedings.

** Leader, Weed Investigations - Aquatic and Noncrop Areas, Crops Research Division, Agricultural Research Service, U. S. Department of Agriculture, Laramie, Wyo.





With aquatic weed field experimentation difficult to carry out in California, an elaborate and unique research facility has been constructed (aerial view, left) at the Davis campus of the University of California. Six two-part "mini" canals (above, left) in a greenhouse are used for preliminary flowing water experiments with herbicides and algicides that have shown promise for control of submersed weeds or algae in static water tests. Then initial field tests are conducted in four concrete-lined, 150x15x3-foot canals. The experiments determine the effects of herbicides on different species of submersed weeds, and on fish and Asiatic clams. Photos by California Department of Water Resources.

and all of these plus alligatorweed *(Alternanthera philoxeroides)*, waterprimrose *(Jussiaea* spp.), and others in the South, grow under less variable conditions of water supply. All are rooted in mud, usually below the waterline.

When the water is less than three feet deep for a considerable distance from shore, the bands of emersed weeds around ponds or lakes are often much wider than those in canals. The broader bands permit use of wider plots and, sometimes, two or more rows of adjacent plots.

When two or more rows of plots are present, herbicide applications of granules, pellets, or spray must be made from a boat or by wading in water or walking on water shoes, instead of from a sprayer or broadcaster moving on land.

If the emersed weeds are tall, like cattail, this often requires underwater mowing or otherwise removing plants to provide access passageways to and between the plots. Airboats are useful and often necessary for making herbicide applications and determining results in extensive areas of emersed weeds.

Growth conditions and vigor of emersed aquatic weeds usually are uniform within experimental plots. Except where water depth varies greatly, variability of results from control treatments within experiments is much less than it is with bank weeds. Results are particularly uniform from herbicide applications made on emersed or floating leaf weeds such as waterlilies *(Nymphaea* spp.*)*, lotus *(Nelumbo lutea)*, spatterdock *(Nuphar advena)*, or watershield *(Brasenia screberi)*, which grow in water two to six or more feet deep.

Uniform applications of 2,6-dichlorobenzonitrile (dichlobenil) granules applied in early spring gave spectacularly effective, uniform, and long-lasting control of white waterlily *(N. tuberosa)* in Washington and Florida. Granular applications of dichlobenil or (2,4-dichloropenoxy)-acetic acid (2,4-D) were also effective on emersed alligatorweed in southeastern states.

Weeds, Algae in Irrigation Systems

Submersed weeds and algae, which grow entirely under water

Two scuba divers inspect submersed weeds in a large irrigation canal. Two divers following safety regulations are indispensible to safe and accurate surveys and test evaluations in lakes and large canals. Photo by V. F. Bruns, research agronomist.

except for some floating leaf species, present difficulties and require techniques in research as different from those involved with cropland or rangeland weeds as one can imagine.

Because of the flowing water in irrigation and drain canals, only one treatment can be applied to the water in each canal. Canals vary widely in flow capacity, velocity of flow, water quality, temperature, and turbidity. Canals also vary in length. The size and volume of flow becomes increasingly less down an irrigation canal, but increasingly more down a drain canal. Some canals have numerous structures such as check dams, drops, siphons, and flumes, which often drastically reduce the effectiveness of herbicides such as acrolein and oxylene.

The difficulty in obtaining permission to use irrigation canals for experimental control treatments on submersed weeds or algae is even greater than that for experiments on control of bank weeds. The herbicide has to be applied directly in the flowing water at a concentration high enough to kill the pondweeds or algae for several miles down the canal.

Before the researcher introduces the herbicide into the water, he must know whether the treated water will kill or injure fish, livestock that drink the water, or irrigated crops. Frequently, the water from a single long canal is used to irrigate 10 to 30 different crop species. If there are hazards, the irrigation company or district board and farmers along the canal must be convinced that results will justify the hazards.

In order for a researcher to know that much about a herbicide before it is field tested in a commercial canal or drain, the herbicide must successfully pass a series of increasingly rigorous tests in greenhouse or growth room aquaria, outdoor bins or pools, and small closed system flowing "mini-canals." In addition, the effects that the herbicide in the water may have on irrigated crops must be ascertained.

Davis Research Stations

Equipment for all, or several, of these preliminary tests are in use at our research stations at Davis, Calif., Denver, Colo., Prosser, Wash.; and Fort Lauderdale, Fla. These include glass aquaria for submersed weeds at Fort Lauderdale and Denver, plastic aquaria for floating weeds at Fort Lauderdale, 4x4 plastic pools for submersed weeds, fish, and Asiatic clams at Davis, outdoor plastic pools at Fort Lauderdale and Davis, and the experimental plots at Prosser for research on crop tolerance to herbicides in irrigation water and on herbicide residues in crops.

Herbicides that are soluble or

Watershoes come in handy when working near weed infested shorelines. The footgear facilitates getting samples, making herbicide applications, and checking results. Dr. Lyle Weldon is the man at far left. In the picture above, Weldon is spraying an experimental plot of Carex on an irrigation ditchbank in Wyoming. The windboard prevents spray drift off of test plot.

emulsifiable in water are applied under water in a canal at one location or at a series of locations several miles apart. Application equipment depends upon the size of the canal and type and amount of herbicides to be applied. For xylene, they range from small one- or two-nozzle sprayers, usually located above a weir drop, to large many-nozzle booms, spray guns, or open hoses with high pressure for larger canals.

Concentrations of only 0.1 to 0.6 ppm of acrolein over long exposure periods of 8 to 48 hours will control most submersed weeds. Because acrolein creates an explosive mixture with air in a tank and polymerizes at small jet openings into air, the herbicide must be stored in pressure-resistant cylinders and delivered beneath the water surface under nitrogen gas pressure. Small plastic tubs with a screw clamp or regulator valve will deliver enough acrolein from a nitrogen gas pressurized cylinder to treat canals carrying from 200 to 2,000 cfs. The small tank holds 50 gallons of acrolein. Large tanks hold 250 gallons each. A small plastic tube delivers 0.1 ppm into a canal carrying 2000 cfs of water. The acrolein applied from one bank dispersed entirely across that large canal within about 200 ft. The treatment gave complete control of submersed weeds from there down the canal 20 miles and gave adequate control for 50 miles.

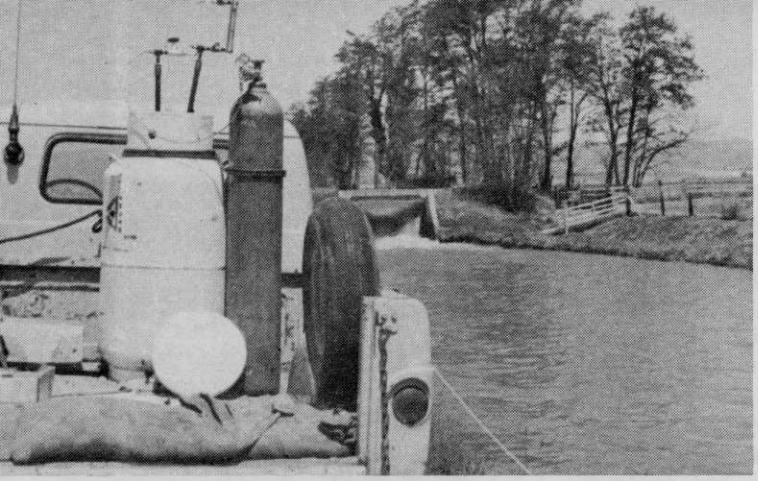
Herbicide Evaluation

Evaluating the results of herbicide treatments is simple in small canals with clear water. The degree of collapsing of weeds, of increased water flow at several day intervals after treatment, and, finally, sloughing of the leaves and stems are good criteria. Later, at intervals of one to several weeks, the degree of sloughing of wood leaves and stems, and, finally, the beginning and rapidity of regrowth, are observed and recorded. In large deeper canals or in small canals with turbid water, surface observations are not reliable. Dragging a long handle rake through small canals or many pronged gadgets on the end of a long nylon rope through large canals were techniques used for several years.

We are now much more sophisticated and use scuba diving in large canals and in lakes to evaluate results of herbicide treatments and make weed surveys and ecological studies of submersed weeds. Scuba diving equipment and techniques are efficient and essential for weed studies in deep water. All safety rules of scuba diving must be scrupulously followed without exception, just as safety belts must always be fastened in moving cars and trucks to greatly reduce the chances of serious or fatal injury.

Only one treatment can be made in each canal at one time. It is difficult to get permission to use several similar canals for identical treatments on the same day or during a span of several days. Therefore, it is almost impossible to replicate treatments that are applied in flowing water. For that reason, and because of the variability, repetitions of the treatment must be made in as many existing canals as possible at each of our field stations each year. Usually, these applications must be repeated at all stations for several years before conclusive results are obtained.

Fortunately, it is still possible to obtain permission to use existing canals and ponds or lakes for testing promising new herbicides in Washington, Montana, Wyoming, Colorado, and even in Florida. In highly urbanized California, it is much more difficult, and almost impossible. Because of that situation, and the urgent need for information on control of the critical submersed weed and algae problems in California, four federal and state agencies have constructed, on the experiment station campus at Davis, an



To treat this Washington irrigation canal, an experiment was set up to apply 1 ppm of acrolein during a 48-hour period. The acrolein was metered through the plastic tube from the high pressure tank under nitrogen gas pressure from the adjacent cylinder. Acrolein applied from the opposite bank eliminated the submersed weeds from a widening swath that reached across the canal 100 yards below. From there it gave excellent weed control for 20 miles and adequate control for 50 miles. Photos by V. F. Bruns, research agronomist.

aquatic weed research center at a total cost of nearly $250,000. The cooperating agencies are the Bureau of Reclamation, the California Department of Water Resources, the Agricultural Research Service, and the California Agricultural Experiment Station.

The center consists of four 15x30x3-ft, ponds for biological control studies, four concrete-lined canals 150-15x3 ft. with an enclosed flowing water system, a well-drained concrete platform with space for ten 10-ft.-diameter plastic bins and eighty 4-sq. ft. plastic bins, a 30x40-ft. greenhouse, a 28x70-ft. headhouse-shop complex, and two lined ¾-acre holding and evaporation ponds which receive all herbicide-treated water and prevent it from getting into the underground water table.

Weeds in Lakes and Ponds

Field research on control of submersed weed problems in lakes and ponds is conducted by two main techniques:

1. metal or plastic enclosures 5 to 12 sq. ft., which separate the water and weeds within each enclosure from the remainder of the lake during the desired period of treatment exposure; and

2. large open-water plots 50 to 100 ft. square with untreated borders of about equal widths between plots.

The first technique is used for

preliminary tests of promising herbicides and mixtures. The large open-water plots are used for final replicated plot tests before the herbicide is used for total or partial area lake or pond treatments.

In "Winderful," Wyo., or anywhere the wind blows, it is very difficult to stake out open water plots from a boat. It is much more accurate and easier to cut holes in the ice in winter and insert a concrete block weighted plastic bottle float with a black metal shield for each plot corner marker.

Metal enclosures, 12 sq. ft., have been used for preliminary lake treatments in Wyoming. Each enclosure can be lifted by inflating the rubber tube that is attached near the bottom, the enclosure moved to a new location, and settled into place by deflating the rubber tube. The enclosure can be quickly dismantled into four metal sheets 4x12 ft. for hauling long distances.

Inexpensive, and quickly set up or dismantled plastic enclosures were developed by John Gallagher of Amchem Products, Inc., for preliminary test of herbicides on submersed weeds in lakes and marshes. These plastic enclosures are being extensively used by our Agricultural Research Service team at Fort Lauderdale. They are being used in several other eastern states by other investigators.

Space does not permit my discussing in detail the unique difficulties and research techniques involved in working with floating weeds like waterhyacinth *(Eichhornia crassipes)*, waterlettuce *(Pistia stratiotes)*, and alligatorweed. The most difficult problem is holding the treated plots in place long enough after treatment to determine results of the treatment. This has been successfully accomplished in some situations by inserting bamboo or other poles two to four feet apart around each plot, a tedious and time-consuming, but necessary, procedure.

Herbicide Residues in Water

In recent years, the need for information on concentrations of herbicides in water and the rate of dissipation from water after treatments for control of aquatic or bank weeds has necessitated the development of reliable sampling techniques and effective methods of preserving the water samples against deteriorations prior to chemical analysis.

The sampling technique finally established for both aquatic and bank weed treatments in or along canals is to begin by marking the beginning and end of the treatment with a slug of dye in the flowing water. Water samples are taken at pre-selected locations down the canal below the lower end of the bank treatment, or beginning half-mile below the point of introducing the aquatic weed treatment.

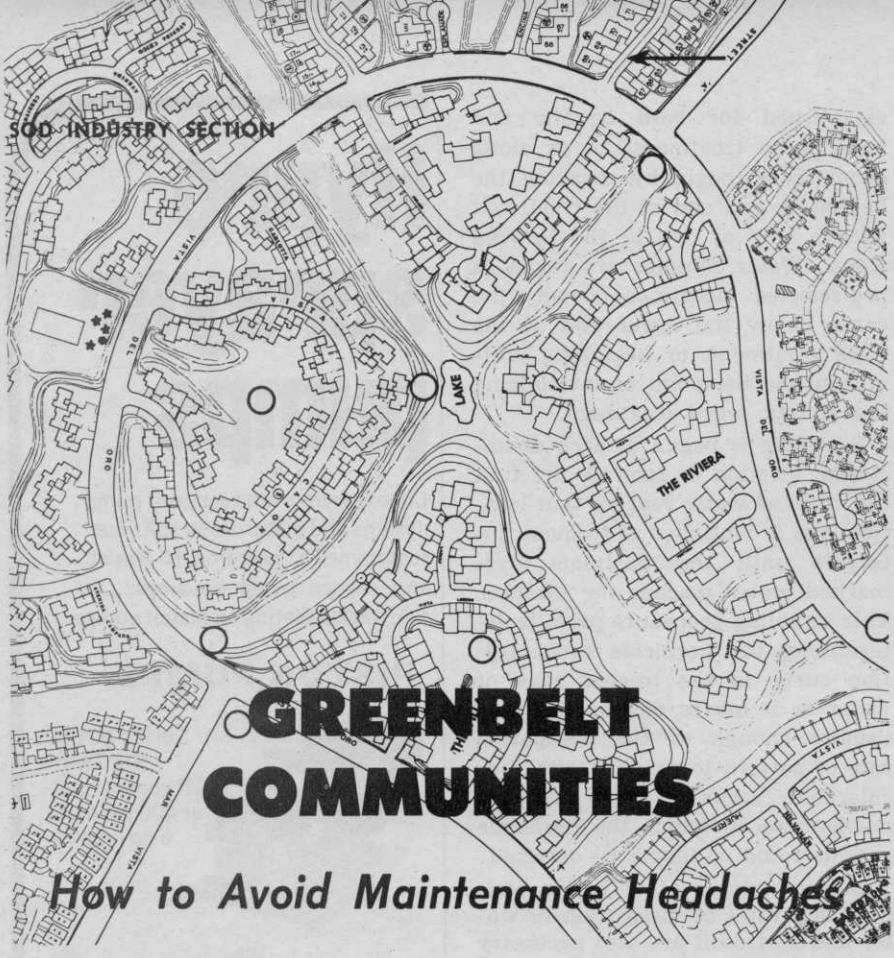
Sampling is begun at each downstream location as soon as the first dye-marked water reaches that location, and is continued at frequent intervals until the upstream dye-marked water reaches the location. This sampling procedure permits determining the herbicide concentration curve in the treated zone of water as it moves downstream and usually enough of the dissipation rate of pattern to predict, with considerable accuracy, the distance downstream at which the herbicide residue could no longer be detected.

Determinations of herbicide residues and rates of dissipation in water and hydrosoil are also necessary following applications for control of aquatic weeds in ponds.

Studies were initiated several years ago in ponds and small reservoirs in Colorado and California following total area application. Sampling of water or hydrosoil following total area treatments is not complicated, but care must be used to obtain a sufficient number of samples on each sampling date to accurately represent the water and hydrosoil throughout the treated area.

In bodies of water six feet or more deep, water samples should be taken near the surface and near the bottom to determine whether a thermocline exists and is affecting the concentration of herbicide at different depths. Samplings of water and hydrosoil are continued for a sufficient period after treatment to measure the trends of dissipation and, when possible, until residues are no longer found.

Studies are now under way in Washington and Florida to determine herbicide residues and rates of dissipation following isolated plot treatments with a granular formulation of dichlobenil. In these situations, samples are taken periodically in the treated area and also at various distances from the treated area in at least two directions to measure lateral dispersion of the herbicide in the water, and subsequent absorption by the hydrosoil.



GREENBELT COMMUNITIES

How to Avoid Maintenance Headaches

Greenbelt neighborhoods, though a boon to residents and to developers, sometimes become maintenance monsters. City and county park officials are seeking a greater voice in design plans in an effort to avert maintenance problems later. Planned communities with strip parks are fast rising in popularity. Landscaped parkways between homes, as shown below and on plat map above, are tremendous selling points to families with children. In this greenbelt development in Orange County, Calif., broad paths shuttle residents through an inter-community of walks that glide past a variety of pleasing landscaped pockets.

By LOU SPEER
El Toro, Calif.

RECENTLY, in Simi Valley, Calif., the park department narrowly escaped the attempts of a subdivision developer to foist the maintenance of his projected greenbelt neighborhood onto the park's already over-crowded general budget.

Further south, in Fountain Valley, the Homeowner's Association of a five - year - old greenbelt neighborhood approached that city's park director asking: Would the city be interested in assuming title to the Association's strip parks? The spiraling maintenance costs were too high for them.

In an unincorporated South Coast section of Orange County, residents of a highly touted "hillside with a view" retreat complained to county maintenance officials that the hillside was just their trouble: Architects of their planned community had given them nothing for their maintenance money but landscaped slopes. Where were their children to play?

"These problems do happen," stated Kenneth Sampson, Orange County park director, who received the South Coast community's complaint. A husky man with a number of year's planning experience as well as park work behind him, he thoughtfully considers these and

other greenbelt problems, and recognizes something needs to be done about them.

Designs Sales-Oriented

"Initially, problems occur because subdividers are not supervised in their planning," he says. "Many developers want to show a good splash for sales purposes, and instead of including areas of slope easements in lots, they plant these into large permanent green tracts. When the sales reach the point where they turn the development over to the community association or service district, in order to maintain it, the tax rate often becomes tremendous.

"A few developers," continues Sampson, "Tend to overplant with high maintenance vegetation without any idea as to cost. We have had the attempts on the part of some people to dedicate parks to us that have 50-60% slopes on them. They are not workable, and this is the reason we now have a planned program of checking every subdivision, every planted area, to make sure the facilities that go in will not be a drain upon the service area."

With the growing popularity of planned communities across the nation, Sampson recommends strongly other park departments adopt a similar check system.

Rebirth of Greenbelt Idea

The first greenbelt plan Director Sampson recalls seeing was in 1926. "It was called the 'Radburn Plan' in New Jersey," he said, "where they took the back yards and made greenbelts so people could walk from one block to the next to visit and so on. It was copied from an English plan. Then the idea was dropped. We got into this big building boom right after the war, particularly here in the West. So it became a case of obtaining as many lots as you could, and getting as many tract houses built as possible."

Times change. People needed a greater incentive to buy. The advent of the cul-de-sac, promising privacy, was the forerunner of the rebirth of the greenbelt community, claims Sampson.

These self-contained units, today, with their honeycomb of arterials, offer residents quiet seclusion, vast expanses of beautiful work-free greenspace, family recreational centers, and schools so convenient children are under their parents' surveillance most of the time.

Design Supervision Needed

But there is always that dark moment that can turn these darlings of the building industry into service district maintenance monsters.

"Sometimes developers skimp on installation of the sprinkler system because these are costs they have to pay," hints Lester Fant, Management Services Company partner, presently contracting maintenance services to 23 Orange County Homeowner's Associations. "Then the sprinkler system has to be replaced, the cost of wihch falls into the maintenance budget of the homeowners' association. Also, more preparation materials should be put into the soil. I see no way of controlling this except perhaps education of the developers."

Director Sampson agrees. "This is our responsibility," he says, "to educate the developer and to protect the people. I feel a competent landscape architect should not only prepare the development plans, but that he should be checked and supervised by competent people, so the greenbelt will remain the usable piece of property for which it was intended, and not cause future problems."

The system of checkout, first developed two years ago by Orange County planning officials, whose boundaries of responsibility presently include 15 service areas with five

Orange County Park Director Kenneth Sampson, left, has gained a measure of supervision over greenbelt design. He and Ralph Hudson, chief of development, are studying a greenbelt developer's final landscape design. Their signatures okaying the design are necessary before the developer can get his plans approved by Orange County's Board of Supervisors.

operating greenbelt neighborhoods, calls for a landscape architect from the park department to sit with the subdivision committee in a three-stage review: First, in the schematic stage of planning to see where the developer is heading; second in the finalized preliminary design for general development; and finally, the finished drawings must be signed off by the park department before the developer can appear before the Board of County Supervisors for final approval of his plan.

"If we don't approve it, he doesn't get his subdivision," Sampson said bluntly. "The subdivider must go back and revise his plans."

Ten-Point Checklist

What points in these plans do Sampson and his staff particularly consider? These can be broken down into the ten following steps with site selection receiving primary attention:

1. See that the terrain is a usable piece of property.
2. Check the site's availability to the people it is going to serve.
3. Note the amount of turf space for playfields.
4. Determine what future maintenance costs the terrain, soil condition, availability of water, and other variables might produce.
5. Know what vegetation is going in, its upkeep, and replacement costs.
6. Suggest—if necessary, for more economical maintenance — where mow strips should be added, trees placed, ground cover and shrubbery minimized.
7. Decide, if the automatic irrigation system is of good standards and adequate.
8. Ask for details of the lighting plan to avoid dark spots and nusiance lights.
9. Consider the walks for aesthetics as well as maintenance.
10. Look into the maintenance financing plan.

"In other words," Sampson sums it up, "it is the tendency of all of us to get rid of culls. We don't want to accept culls. We want to set our standard high so the whole planned community program will remain as tremendous as it set out to be."

American Sod Producers Gather July 28-30

If you want to know more about "The Sod Industry in the United States," then mark July 28, 29 and 30 on your calendar. This subject will be the theme for the fourth annual session of the American Sod Producers Association.

The conference and field day shapes up this way: On July 28, a bus tour, leaving from the Ramada Inn at Dolton, Ill., will be conducted to Warren's Turf Nurseries and Evergreen Sod Farm. The educational session will begin at 9 a.m., July 29, at the Ramada Inn, followed by the annual meeting and banquet. Field demonstrations of sod equipment will be shown on July 30 at the H & E Sod Farm at Momence, Ill.

Arthur V. Edwards, editorial director of WEEDS TREES and TURF magazine, will keynote the educational session with an updated survey report on the national sod industry. Complementing his presentation will be reports on the "State of the Michigan Sod Industry" and a Chicago accounting firm's survey of "Sod Production Costs in the United States."

Beck Invents Sod System For Harvesting and Laying

Beck Manufacturing Co., Auburn, Ala., announces development of a revolutionary new sod harvesting and laying system.

Using this new system, two men can easily harvest up to 1,000 square yards of sod per hour. A unique feature of the new system permits laying sod with an inexpensive tractor attachment almost as fast as it is harvested.

Manual lifting and handling of sod is completely eliminated, so tiring of workers is not a factor.

Sale price of the laying device is expected to be under $200.

Demonstration of the entire system is planned for the American Sod Producers Association field day in August.

AUGUST Is the Shade Tree Issue

New officers of the American Society of Consulting Arborists, Inc., are, from the left: Seated — Past president and director-at-large H. M. Van Wormer, Richmond, Va.; President Ray Gustin, Jr., Silver Spring, Md.; and President-elect George W. Goodall, Sr., Portland, Me. Standing — Vice-president Walter P. Morrow, Sewickley, Pa.; Secretary-treasurer H. N. Engledow, Indianapolis, Ind.; and directors F. L. Dinsmore of St. Louis, Mo., L. C. Chadwick of Columbus, Ohio, Riley R. Stevens of Portland, Ore. Director F. Earle Martin of West Toronto, Canada, was absent. H. M. Van Wormer received the Society's first Service Award. Henry Vaughan-Eames of Stockton, N.J., received a special award for his "work and dedication to the establishment of the society." He was the first president when ASCA was formed two years ago.

Real Estate Appraiser, Arborist Working Closer

E. L. "Bud" Dieudonne, real estate appraiser, and Phil Ziedner, U.S. Department of Justice attorney, discussed with the members of the American Society of Consulting Arborists the growing relationship between the real estate appraiser, the attorney and the arboricultural consultant. The discussion came at the Society's second annual business meeting recently in Washington, D. C.

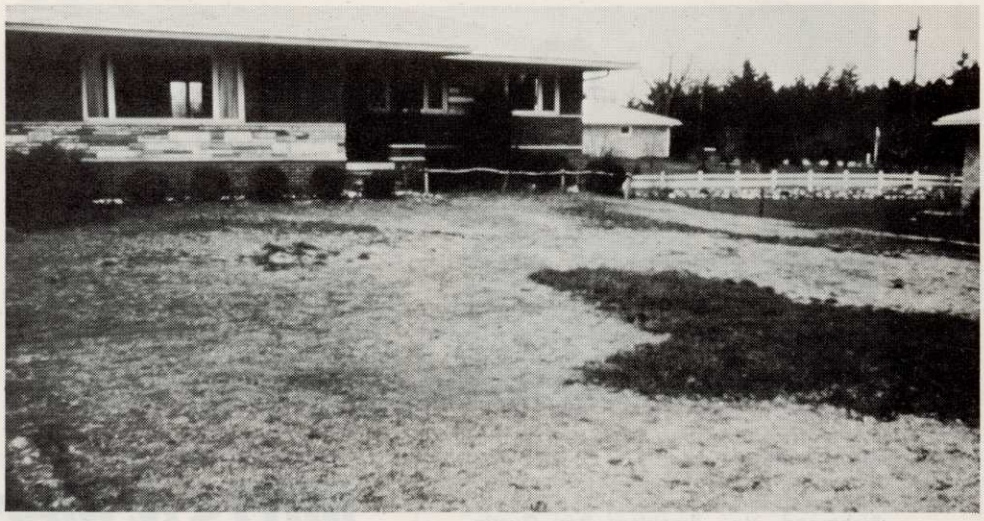
E. L. "Bud" Dieudonne is a licensed real estate appraiser in the Washington metropolitan area. Real estate appraising and arboricultural consulting, he said, must go hand-in-hand. He indicated that his job is made far easier when he can rely on the assistance of a qualified, professional arboricultural consultant.

Phil Ziedner, an attorney for the Department of Justice described the legal aspects of arboricultural consulting. He explained exactly what "facts" were and were not acceptable in a court of law. Ziedner related some of his own experiences in this field and explained to attending members just how they might better prepare themselves to be effective witnesses when called to the courts.

AAN Members Exceed 1,800

More than 1,800 firms are now members of the American Association of Nurserymen. The figure is a new record. The latest membership statistics represent a net increase of more than 35% in four years. Forty-nine percent (882 firms) of the total AAN membership has joined in the past four years.

"Our goal of 2,000 members," said President William Flemer, "appears much more realistic than it did four years ago when we had 1,300 member firms."



European chafers got away with this Rochester area homeowner's lawn when they were unaffected by heptachlor, dieldrin and chlordane.

Sevin With One Blow Kills Lawn-Devastating Trio

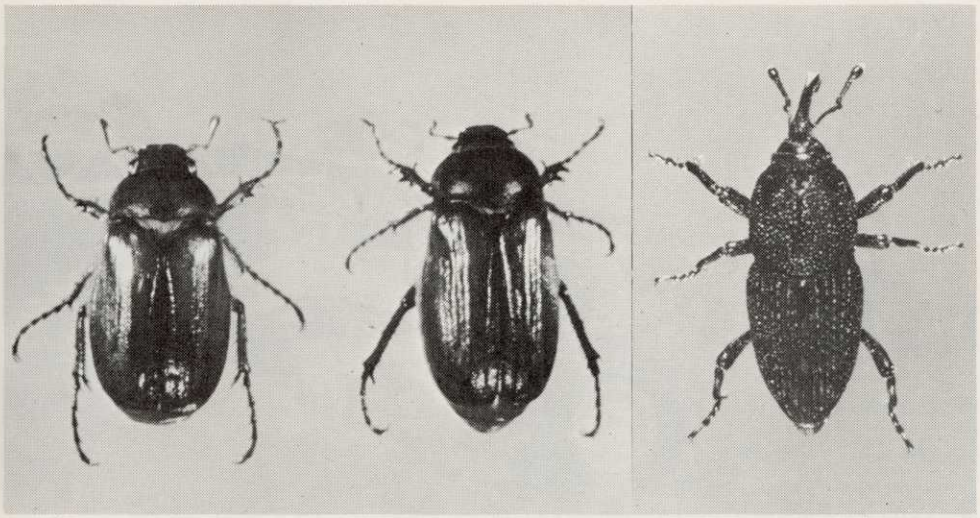
Homeowners have always prided themselves on their fine lawns, attractive landscaping, and beautiful trees in the Rochester, N.Y. area. Each summer, however, they must battle a trio of highly destructive lawn insects — the sod webworm, bluegrass billbug, and the European chafer grubs.

Three important people in this "battle of the bugs" are Marshall, Allan and Donald Zinter, co-owners of a family business, High Point Mills at nearby Henrietta.

Rochester homeowners were exhibiting magnificent lawns, without serious problems, until 1967. As Marshall Zinter, High Point President related, "We had the sod webworm and European chafer pretty much under control during the early 1960s, but in July, 1967, home lawns near Benfield, a suburb of Rochester, started showing damage resembling that caused by European Chafer, despite preventive treatment taken with various chlorinated hydrocarbon insecticides.

"We didn't know what to make of it, until Cornell University and U.S. Department of Agriculture lawn specialists discovered the insects causing the damage—a small snout beetle and a tiny legless grub found in

The Zinter brothers, from the left, Allan, Marshall and Donald, co-owners of High Point Mills at Henrietta, N.Y., look over new advertising posters. They're offering a new and revised line of products containing Sevin to control the sod webworm, bluegrass billbug and European chafer grub that have been devastating area lawns.



The new threats around Rochester: On the left is the resistant European chafer adult male, female center, and the adult female bluegrass billbug.

the root zone of the lawns. They soon identified them as the bluegrass billbug, a widely distributed insect in the United States and Canada, and its larval stage.

While Cornell research specialists sought solutions to the billbug problem by testing new chemicals in 1968, a second major problem surfaced in 1969. "Last spring," Zinter continued, "we began to get quite a few calls from our dealers who reported many homeowners in Eastern Monroe County were complaining about heptachlor, dieldrin and chlordane. Applications of any one of these hydrocarbons, used at normally adequate rates, were not preventing considerable lawn damage by the European chafer. We called in Cornell specialists, including Dr. H. Tashiro, from the New York State Agricultural Experiment Station at Geneva, and Kirkwood Personius, our county extension agent. Dr. Tashiro collected several hundred grubs from many lawns, took them back to his laboratory in Geneva, and soon found that these European Chafer grubs had 'built-in' resistance to chlorinated hydrocarbon chemicals."

High Point Mills management continued to work with Dr. Tashiro and Cooperative Extension through 1969 in a general testing program to find chemicals that would be effective against this new resistant European Chafer. It was found that two widely used insecticides—Sevin and Diazinon — effectively controlled the resistant as well as the normal European Chafer. The same two materials had been previously tested in 1968 and found effective against the new billbug problem.

This year, remarked High Point Mills vice-president Allan Zinter, "We're ready as we've never been ready before, with facts, folders, information, and best of all, our new Turf Line products containing Sevin."

The Zinters say their new Lawn Insect Killer with Sevin will control all three—the European chafer grub, the bluegrass billbug, and sod webworm. "Any one of these insects has the capability of destroying

grass, says Monroe County Extension Agent Kirkwood Personius, although lawn damage in our Rochester area is often caused by not just one but a combination of two or even all three of these insects. I would estimate we had some 1,500 lawns damaged by these insects in Monroe County in 1969."

While summer is the prime season for preventing damage, here is what Allan Zinter reports they'll be telling homeowners, "First, we're saying that eggs from these three insects will hatch mostly during June, July, and August into grubs or worms that will do the major damage to lawn grasses. Only the European chafer, of these soil insects, over-winters as a grub to feed on the grass in the early spring." So the Zinter brothers' Turf line recommended program will be as follows:

EUROPEAN CHAFER GRUB — Treat first in April, unless the lawn was treated the previous August, September or October with their Lawn Insect Killer containing Sevin. Then treat again in early August for the new hatch of summer grubs.

BLUEGRASS BILLBUG — Treat once between June 20, and July 10, to avoid damage.

SOD WEBWORM—The June and August treatment for bluegrass billbug and European chafer grub will also control sod webworm.

Right after World War II, Donald and Oscar Zinter started a feed and grain business near Rochester. By 1948 they were joined by Marshall and Allan, but as farming moved out and suburbia moved in during the late 1950s, High Point Mills gradually quit the feed business. Now Marshall, Allan, and Don Zinter concentrate solely on fertilizer and fertilizer-pesticide products, sold mostly in their Monroe County communities through more than 200 dealers and landscaping specialists.

This IH 3444 Backhoe Special was among the 1970 equipment line shown at Louisville, Ky., fairgrounds. The ⅞-yd. loader tractor with 12½ or 14½ ft. backhoe is furnished with a 73.4-inch-wide loader bucket and a 24-inch trenching bucket. It is available with a 43.5 gasoline or diesel engine, mechanical-shuttle or Hydra-Shuttle (power shift) with Torque Converter transmission.

IH Dealers Eye New Machines In Broadened Industrial Line

International Harvester Company expects to garner a bigger share of the industrial equipment market, beginning right now. This goal was enthusiastically presented to dealers and the press at a showing of the new 1970 lines last month at Louisville, Ky.

Vice-President David C. Haney said the company expected a "brilliant growth of the industrial division." He expanded on this by saying that IH expects farm equipment sales to hold firm in '70 and a big upturn for the industrial equipment lines. Last year, truck sales accounted for almost half of IH income. Farm equipment sales brought in just over 30%. The balance of about 20% came from the industrial line, which included construction equipment.

Another IH executive, John F. Burk, divisional sales manager, said dealers already were reporting a retail upturn for spring. Burk felt that the few weeks preceding the showing were a good indicator since spring throughout the country was late in coming.

In outlining the industrial market for the press, Burk said that IH has five major competitors plus hundreds of smaller companies who make one or more industrial equipment items. He, like Haney, sees industrial equipment as the growing end of IH business. Burk said that IH would be interested in a new item only if the company could immediately capture 25% of the market. This, he said, is feasible because of the big IH dealer organization. Burk pointed to the new 3200 Compact Loader, designed and marketed to compete with the leader in the field, the Melroe Bobcat. Of the current $50 million market for this line, IH expects to pick up 25%.

The 3200 which features hydrostatic drive and oscillating wheels is but one new item presented to 800 dealers and about 30 trade magazine editors. Held at Freedom Hall on the Kentucky State Fairgrounds,

A completely new piece of equipment, this IH 3200 Compact Loader with hydrostatic drive has infinite forward and reverse speeds from 0 to 8 mph and anywhere in between. This ¾-ton, 6.8 to 20 cu. ft. capacity loader with 30 hp engine pivots in its own length, works under 6-ft. clearance, and passes through 4-ft. wide openings, and is available with ½-yd. bucket and 8-ft. backhoe.

the show was near IH's Louisville tractor plant where a number of the industrial lines are built. Extensive testing of equipment, especially motors, practically eliminates a faulty unit from reaching the retail showroom. All motors undergo three running tests, one by the original maker, one upon reaching the assembly line, and a final test after installation on an industrial tractor or related unit.

Also featured among the new equipment were six new models of industrial crawler tractors, three new PAY loggers, three new series of fork lifts, and a number of industrial tractors and accessory equipment.

Special emphasis on a number of engineering factors have become important in the manufacturing program at IH. Steven M. Young, manager of engineering, said emphasis has been placed on reducing noise levels through mufflers, insulation, and the manufacturing processes. Others are being studied, he said.

Haney pointed out that "operator protection is becoming the same concern for industrial equipment as for autos." Also emphasized was the fact that the safety approach for equipment is a prime concern today. This, according to Burk, is not a new company philosophy but one that is getting more attention.

Arthur V. Edwards, right, editorial director of WEEDS TREES and TURF, chats with Charles E. Walker, general supervisor of farm equipment and advertising and sales promotion. Walker is at the controls of one of three new series of fork lifts with lift capacities ranging from 4,000 to 6,000 lbs. and heights from 14 to 28 feet.

insect report

TURF INSECTS

A GROUND PEARL

(Margarodes meridionalis)

ARIZONA: More damage to grasses appearing in lawns at Phoenix, Maricopa County ALABAMA: Numerous "pearls" collected from centipede grass sod sample from Geneva County.

A WIREWORM

(Limonius infuscatus)

IDAHO: Collected in bluegrass crowns at Post Falls, Kootenai County. About 1 larva per 5 square feet of crown April 14.

INSECTS OF ORNAMENTALS

IVY APHID

ARMORED SCALES

OKLAHOMA: *Unaspis euonymi* (euonymus scale) laying eggs on Payne County eunonymus. Crawlers should be active in few days and controls will be needed. GEORGIA: *U. euonymi* heavy on euonymus and *Fioronia theae* (tea scale) heavy on camellias in Tift County.

FLETCHER SCALE

(Lecanium fletcheri)

NEW YORK: Immatures on yew at Mattituck, Laurel, Jamesport, and Moriches, and on English holly at Mattituck, Suffolk County, in mid-April. Building up; should cause more problems.

TREE INSECTS

TENT CATERPILLARS

(Malacosoma spp.)

ALABAMA: *M. disstria* (forest tent capterpillar) defoliated large areas in river and creek swamps in Mobile, Baldwin, and Escambia Counties. Pupation begun. UTAH: *M. californicum fragile* (western tent caterpillar) on cottonwoods at Santa Clara, Washington County.

A PHYLLOXERA

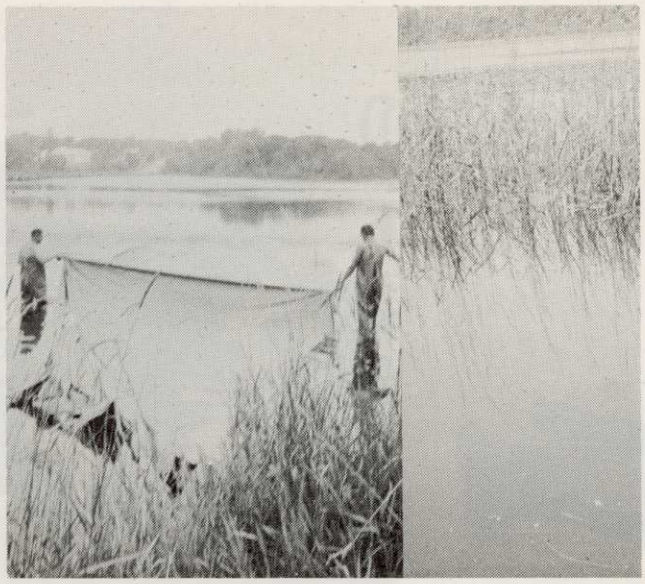
(Pineus sylvestris)

ARIZONA: About 1,000 collected on black pine Feb. 2, in nursery at Phoenix, Maricopa County. Black pine shipped in from out of state. This is a new state record.

SPRUCE BUD SCALE

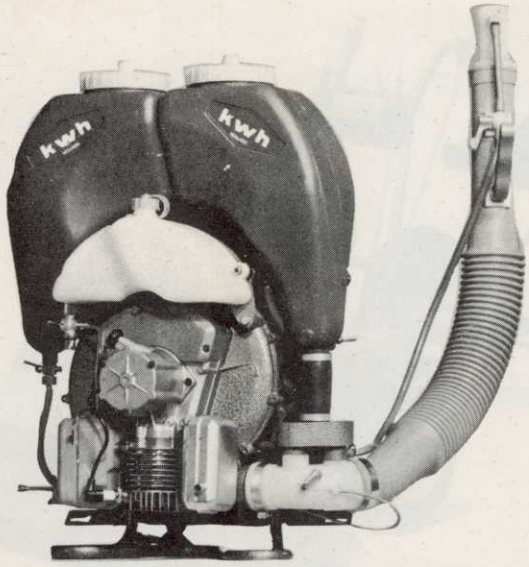
(Physokermes piceae)

CALIFORNIA: Adults 2 per stem on western white spruce nursery stock at Napa, Napa County. This is a new county record.



AQUA SHEET, Male International Corp., New York, N.Y.

Aqua Sheet is a mechanical device for the complete elimination of nuisance water weeds. Though initial cost may seem high, it will last for years, making yearly cost reasonable. Aqua Sheet is a special vinyl-covered nylon with high tear resistance. Special perforations relieve gases of decomposition from decaying aquatic vegetation. Special tie-downs and sandbags are furnished. Aqua Sheet is deep blue in color. It creates a "swimming pool" in your lake. It may be left in the lake year around or removed when desired. Aqua Sheet usually kills all nuisance aquatic weeds in three to four weeks maximum. Installation or removal takes less than one hour. For more details, circle (707) on the reply card.



KNAPSACK BLOWERS, Vandermolen Co., West Caldwell, N.J.

The KWH-66TT is a combination mistblower and duster. It features a powerful blower capable of generating 480 cfm of air at 225 mph. The unit weighs 23 lbs. and disperses dust, wet dust and granules. Spray will reach 40 ft., granules 30 to 40 ft. Controls allow fine metering with positive, instant shut off. Each tank holds 1.6 gallons. Dust capacity is about 15 lbs. The KWH 66TT is the only power knapsack that can apply a liquid spray and a dry dust together in one operation. Dust and atomized liquid mix outside of the patented KWH "non-clog" nozzle before reaching the plant. For more details, circle (708) on the reply card.

SHORE CONVEYOR: Aquamarine Corporation, Waukesha, Wis.

A new feature of the mechanical weed harvesting system from Aquamarine allows one-man operation of the H-650 aquatic weed harvester and the S-650 shore conveyor. The operator maneuvers the weed-filled harvester into the coupled position (as shown) with the shore conveyor. He then can go ashore to start up the hydraulically operated, two-section shore conveyor. Through the use of electrical, shore-mounted remote controls, the operator can convey weeds from the harvester into a truck at the rate of four tons per minute. The complete "Aqua-Trio" consists of the above two units plus a third barge-mounted unit, the T-650 transport. For more details, circle (709) on the reply card.

LIQUID FERTILIZER CONCENTRATE, National Liquid Fertilizer Corporation, Chicago, Ill.

Two new formulations of ENVY liquid fertilizer concentrate have been introduced. Recommendations for use of the solutions state that one quart of the 10-8-6 turf fertilizer be diluted with water to 50 gallons and applied to 1,000 sq. ft. of turfgrass; that one gallon of the 10-20-10 general purpose fertilizer be diluted to 100 gallons and applied to the foliage of all types of broadleaf plants. Both formulations contain secondary nutrients and essential trace elements. The material can be combined with many pesticides, applied with any spray device, is readily absorbed, does not burn, and produces a balanced growth. For more details, circle (710) on the reply card.

COMMERCIAL ROTARY MOWER, Goodall Division, Louisville, Ky.

Any operator, young or old, can do a better mowing job and do it faster, riding or walking, as conditions and safety permit. Fingertip power steering makes this 52-inch the most maneuverable and easiest to use, high capacity, commercial rotary mower. Mows steep grades, heavy grasses, cuts its own width and trims close with both sides. All three blades rotate clockwise with discharge chute on right side to mulch clippings evenly. Short wheelbase lets this "big" 52-inch cut and turn shorter than some 24-inch mowers. Dual wheels and brakes are standard equipment. Models also available in 21, 28, and 36 inch cutting swath. For more details, circle (711) on the reply card.

DIADEM SPREADER AND SEEDER, Vandermolen Corp., West Caldwell, N.J.

New epoxy finish that promotes equipment longevity and makes cleaning easier is a new feature of the Diadem spreader and seeder. The unique anti-corrosion and rust-proof epoxy over coating is designed to last a lifetime. Centrifugal spinner capable of spreading powder, seeds and granular fertilizer in 50-ft. swath. The Diadem is ideal also for applying herbicides, salt and sand. For more details, circle (712) on reply card.

18-INCH SOD CUTTER, Ryan Equipment Co., St. Paul, Minn.

This third model added to Ryan's JR line cuts sod to the standard commercial 18" width. While the JR4-18 is an ideal rental unit, it will find wide use by golf courses, institutions, commercial and industrial firms. Ryan says this self-propelled unit increases sod production by 50%. It cuts up to 1,150 sq. yds. per hour, at any thickness up to 2½". Among optional equipment is a Tote Trailer specifically designed for the unit. Optional blades are for edging, tilling, trenching, sod stripping and laying flexible pipe or tubing. For more details, circle (715) on the reply card.

50-INCH WHIRLWIND ROTARY MOWER, Toro Manufacturing Corp., Minneapolis, Minn.

This TROJAN II is Toro's answer to heavy-duty institutional and commercial grass-mowing problems. The totally new line of attachments make it a quick-change artist: from rotary broom, snow grader, leaf blower and mulcher, and snow thrower. The Trojan II is shown with an optional sulky and padded seat that converts it from a walking to riding mower. Both the engine shut-off and choke are now on the dashboard. Gas tank is farther from the engine, a 12 hp Kohler. Four forward speeds, quick forward-reverse shifting, new recoil starter, parking brake, and power-steering. For more details, circle (716) on the reply card.

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PARK SUPERINTENDENT Simi Valley Recreation and Park District, Venture County. $11,350-13,800 (salary open within range). Degree and three years experience in administration and/or supervision desirable. Applicable education and experience would be in park management, landscape architecture, horticulture, forestry, engineering, or public administration. Position will be responsible for planning and development of parks and maintenance of parks, buildings, pools, and golf course. Apply: General Manager, 1692 Sycamore Drive, Simi, California 93065.

POSITIONS WANTED

FORESTER, age 35 desires position in recreation administration. Ten years varied experience with the federal government and three years with local government in park administration. References and resume available. Box 53, Weeds Trees and Turf, 9800 Detroit Avenue, Cleveland, Ohio 44102.

EXPERIENCED in sod production, sales, management. Presently employed but seek new challenge and opportunity with sod company interested in growth. Capable of organizing a new operation. Box 54, Weeds Trees and Turf, 9800 Detroit Ave., Cleveland, Ohio 44102.

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WANT TO BUY BUSINESSES — engaged in landscape construction, grassing, nursery, landscape maintenance, tree service, horticultural spraying, and related fields. Major New York Stock Exchange Company wishes to acquire successful businesses with top flight management. Reply to: Mr. E. Berthe, President, Cut N' Care, Inc., 2615 De Leon Street, Tampa, Florida 33609. A subsidiary of Consolidated Foods Corporation, Oxford Building Services Division.

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1967 INTERNATIONAL 1500 equipped with factory built six man crew cab, 14,000 lb. hoist, 7 yd. chip bin and all necessary tool compartments. Asplundt Brush chipper, 12" powered with 6 cylinder Ford Industrial engine. Will sell units individually or as one unit. Truck, $3,450.00. Chipper, $1,850.00. Funk Bros. Tree Service, Inc., 1260 East Main St., Ashland, Ohio 44805. Office phone 419 324-1549 Ashland, Ohio. Home phone 419 522-5620 Mansfield, Ohio.

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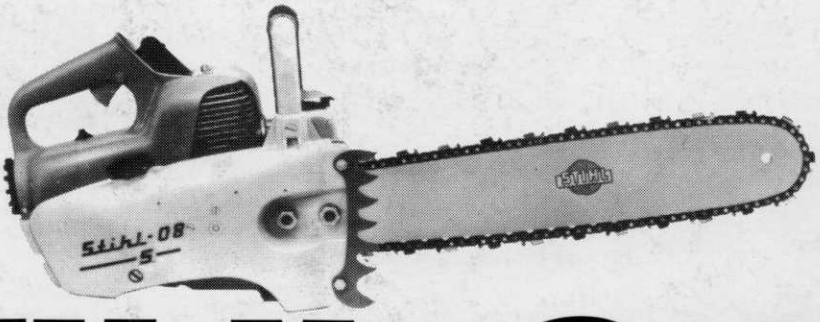

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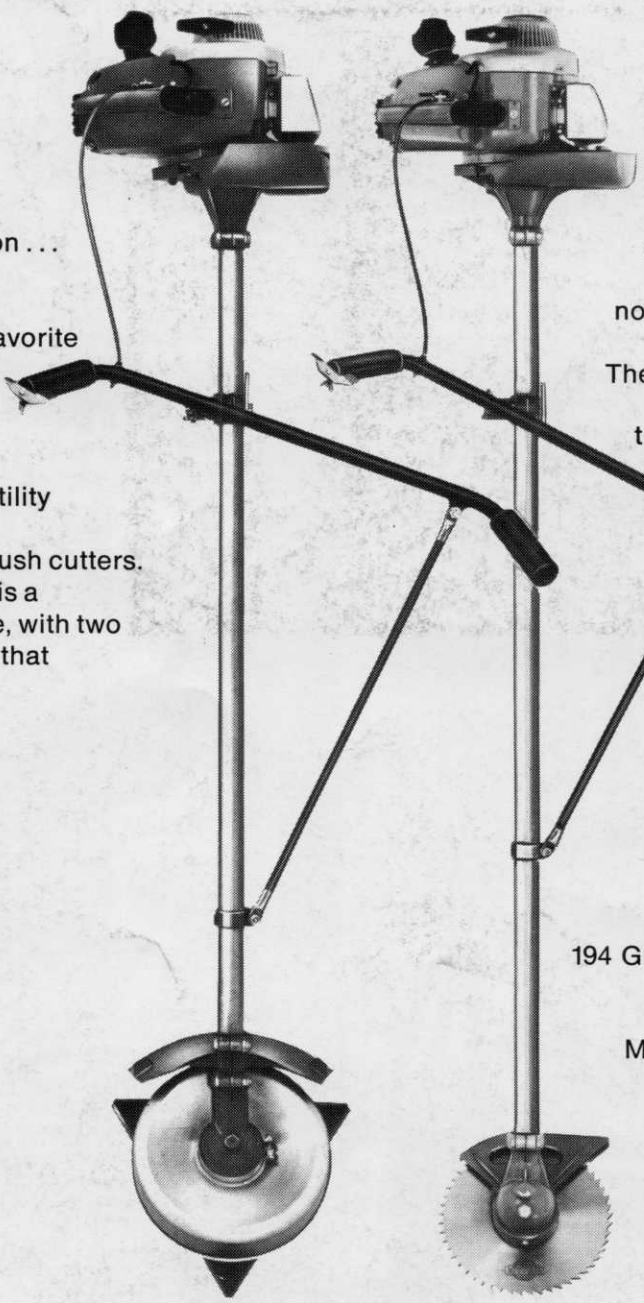

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