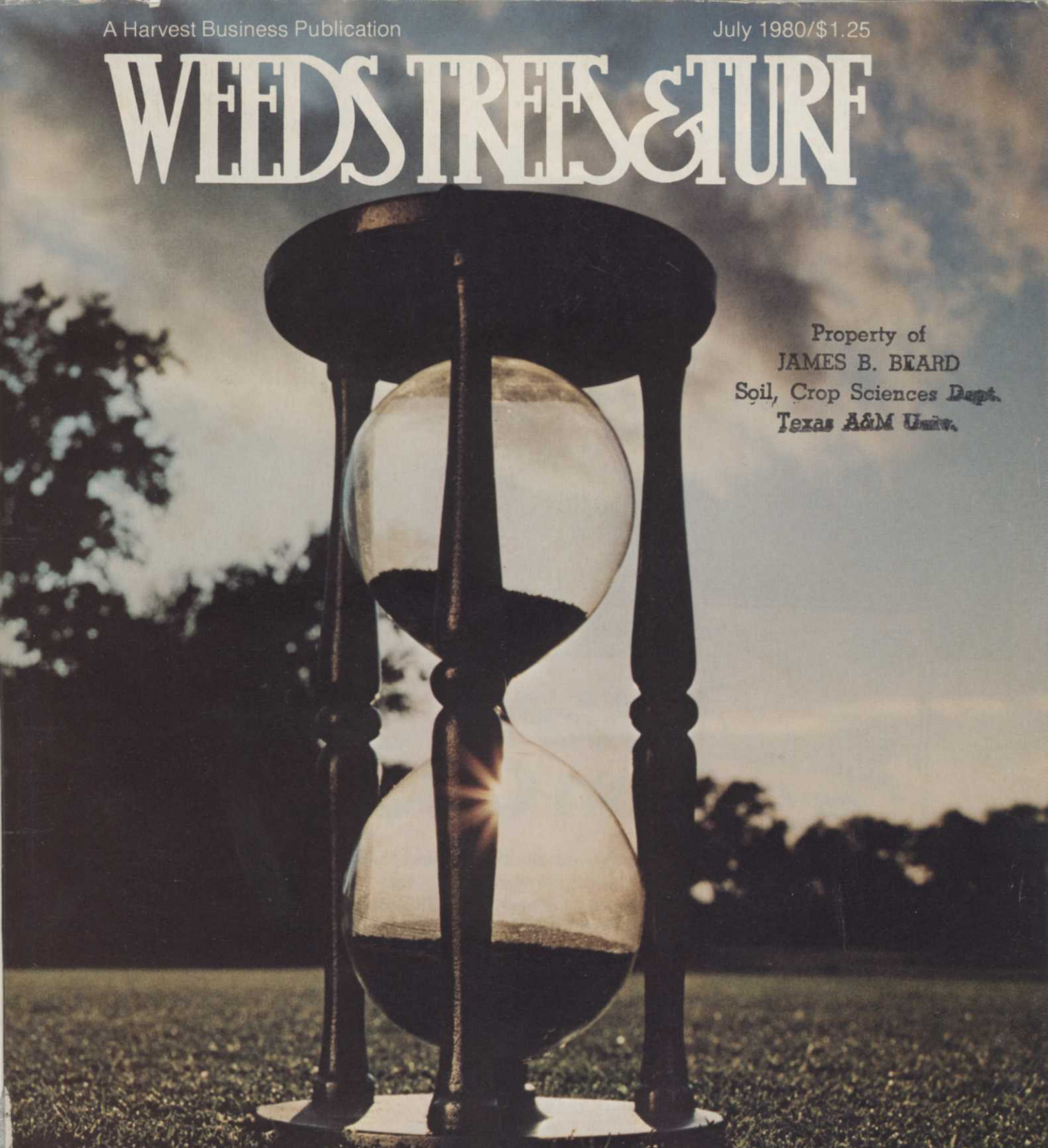
A Harvest Business Publication July 1980/$1.25

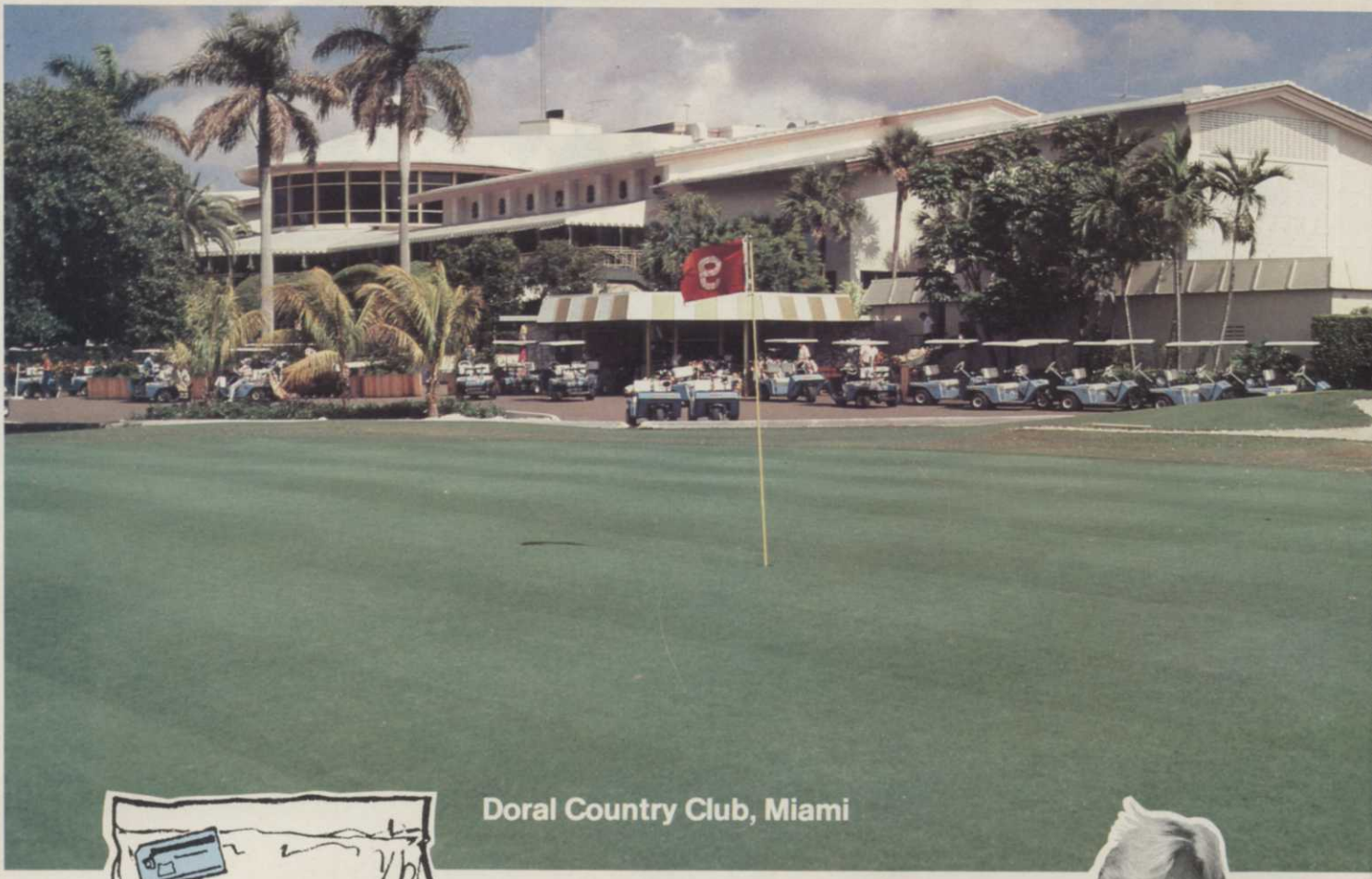
WEEDS TREES & TURF



BEGINNING IN THIS ISSUE/TURF MANAGEMENT SERIES/PART 1

The Turfgrass Market

ISSN 0043-1753



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CONTENTS

JULY 1980/VOL. 19, NO. 7

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Cover: Bentgrass seed in hourglass represents past and future of the turfgrass seed market.


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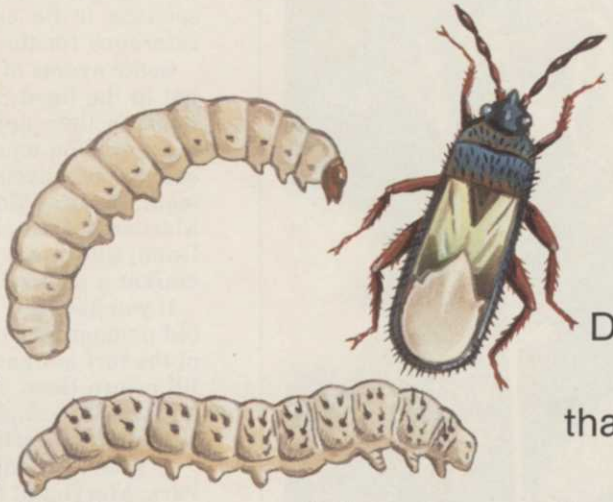

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OUTLOOK

By Bruce F. Shank, Editor

The editorial staff would like to express its gratitude for the tremendous cooperation of many turf industry principals during the construction of the Seed Section in this issue. Without them the section would have been the same as past coverage of the seed market, showing only the surface of this complex and interesting group of people.

We welcome any remarks on the Seed Section, or any part of the magazine, and intend to make any necessary corrections to the Section before it is put into book form with the next five parts of the Turf Management Series. We want everything in these sections to be accurate and endure as a future reference for the industry.

Some events of historical significance which are not in the Seed Section will appear in future sections as they apply more directly. For example, there will be more on USGA, GCSAA, ASPA, and our valued specialists in the area of turf management, such as Engel, Watson, Indyke, Kneebone, Mascaro, Daniel, Beard, Turgeon, Shearman, Dunn, and many others who have made the turf market a sophisticated and respected one.

If you have any historical information to relate or old photographs of events significant to the growth of the turf market, please contact me or send them. I'll return them as soon as the project is complete and credit each photo used in the cutline. Everyone is invited to participate in this history.

A special thanks goes to Fred Grau of College Park, Maryland. He is an amazing source of information and he has lived each major event of the turf market for more than 50 years. Weeds Trees & Turf and Harvest Publishing Co. have made a matching gift to the Musser International Turfgrass Foundation in Fred's name. It is very likely that much of the royalties from the book will go to turf research via the Fred V. Grau Turfgrass Fellowship Fund.

Please read the Seed Section and send any comments or suggestions to Bruce Shank, Weeds Trees & Turf, 9800 Detroit Ave., Cleveland, OH 44102. I'll contact you for more information.

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GREEN INDUSTRY NEWS

PESTS

Gypsy moth plagues Northeast trees

The gypsy moth and other types of caterpillars are wrecking havoc on oaks, poplars, and fruit trees in Massachusetts, Connecticut, Long Island, and parts of Pennsylvania and New York.

In areas of severe infestation, the pests are defoliating or greatly reducing the vigor of trees. Entomologists say that if the problem continues through this summer and next, they expect to see high losses of trees.

Joe Savage, an entomologist with the Nassau County Cooperative Extension, says that three years of defoliation expose trees to severe winter damage. After this three years, 80 percent of a healthy stand of trees will die in five to eight years. For trees in poor health, 80 percent will die in three to five years.

Savage says that the past mild winter did not kill a great number of the pests. Others blame the problem on a peak in the cyclical caterpillar population and restrictions on spraying pesticides.

In northeast Connecticut, scientists have found 10,000 egg masses per acre. Towns in other parts of the state have reported infestations, with no pattern of location, except that many have come from western Connecticut. One indicator of their preference may be the type of native trees. Gypsy moth caterpillars feed primarily on oak, poplar, willow, apple, speckled alder, basswood, and gray and river birch.

In Nassau County, one resident heard caterpillars dropping from trees one night "like hailstones falling." A Massachusetts resident, driven from his home, said the caterpillars poured from old poplar trees "like water from a faucet."

The eastern tent caterpillar and fall canker worm have also ravaged foliage, but these have about completed their feeding.

Although the problem is not as bad as 1971, when 600,000 acres were defoliated by the gypsy moth and elm span worm, it is more serious than last year, says Ken Welsh, assistant entomologist for the Connecticut Agricultural Experiment Station in New Haven.

Welsh answers calls daily on the pest and provides information to homeowners. It is too late to begin spraying trees, but he suggests a band of wax paper or sticky material like tar paper to keep the caterpillars off or stop them from spreading. Yet there is nothing to prevent the wind blowing caterpillars from an infested to uninfested area.

SOIL

Volcanic ash fair as soil, poor fertilizer

Mt. St. Helens volcanic ash "might not be too bad" as a soil material, a University of Idaho soil scientist says.

Dr. Denny Naylor, professor of soil science, said results of first analysis of ash samples showed it to be high in sulfur and potassium and medium in phosphorus. The material also has a small amount of nitrate-ammonia nitrogen, around 10 parts per million.

He said the nitrogen content was a surprise as was the amount of chloride and sulfate salts of sodium, potassium, calcium, and magnesium. While the salt content is not high, there is enough to make the material "a pretty good electrical conductor." Salts of calcium and magnesium make up most of the salt compounds in the ash, and the sodium content is low.

Meanwhile, specialists at the U.S. Department of Agriculture have begun gathering reports from federal, state, and local officials in the state of Washington to coordinate emergency programs for farmers and others affected by Mt. St. Helens' eruption.

Nursery growers may apply for disaster loans from the Farmers Home Administration or Small Business Administration (either, not both). Landscape and retail firms should apply to SBA. The area must be declared a disaster area to receive federal assistance.

The first ride on the Excel 261 mower occurred this May at the company's Optimistic Day in Hesston, KS. About 350 people attended the plant tours and equipment demonstrations. The 261 sports a three-way deck with side discharge, rear discharge, and mulching modes.

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LANDSCAPE CONTRACTOR NEWS

ASLA gets home in downtown Washington

On Monday, April 29, the Executive Committee of the American Society of Landscape Architects voted to enter into a lease with option to purchase a building at 1733 Connecticut Ave.

ASLA President Robert Woerner said the committee decided the property met requirements to protect ASLA's long-term rental costs and to invest in its future, and took the necessary action.

Woerner said: "A year from now, ASLA will be in its new quarters. Should all things go according to our plans, we will be located in our historic building on Connecticut Ave.—one which will be eventually acquired as our own."

Executive Director Ed Able said the soaring cost of real estate in the metropolitan Washington area motivated the action. "The one method of putting a cap on this spiral is to ultimately purchase our own property and stabilize our cost of office space. Needless to say, the result would mean more dollars for programs and less dollars for rent," Able said.

Maryland professor warns of scale insects

Scale insects on camellia and some other ornamental shrubs could be especially severe this year because of a relatively mild winter, says Dr. Conrad B. Link, extension floriculture specialist and professor of horticulture at the University of Maryland in College Park.

Inspecting plants for insect and disease problems should head the list of things to do, Link says. Other priorities include shaping and pruning of azalea and other spring-flowering shrubs which have finished blooming. Also cut back poinsettia plants to save them for blooming again by next Christmas.

ALCA schedules interior short courses

The Interior Landscape Div. of the Associated Landscape Contractors of America has designed a series of short courses for all personnel who are involved in any phase of interior maintenance.

The short courses will include a review of basic horticultural knowledge, followed by a lengthy discussion of plant problems and solutions. Robert T. DeNeve, a horticultural expert with Tropical Ornamentals of Delray Beach, FL, and Dr. William Noble, instructor at California Polytechnic State University at San Luis Obispo, will conduct the programs.

Locations, dates, and contacts are: West Palm Beach, July 30, contact Laine Craft, Living Interiors, 305/842-1823; Atlanta, Aug. 1, contact David Korstad, Sedgefield Atlanta, 404/872-0701; Seattle, Aug. 21, contact Jack Ballard, The Greenery, Inc., 206/622-3373; and San Diego, Aug. 23, contact Nancy Hughes, Habitat International Design, 714/753-5007.

VEGETATION MANAGEMENT

First program set for roadside management

The Transportation Research Board's committees on landscape and environmental design and roadside maintenance are hosting a joint session on vegetation management in San Antonio, TX, Aug. 4-8.

The week-long program will include presentations on chemicals and machinery now being manufactured, operations research now being conducted that may affect the future work programs, side effects of a roadside management program, current practice, and a comprehensive field demonstration trip.

Byron Blaschke, chief engineer, maintenance and operations, will direct the meeting. For more details or arrangements, contact Robert Guinn, engineer of maintenance, Texas Dept. of Highways and Public Transportation, Highway Building, Austin, TX 78701.

EQUIPMENT

Snow thrower shipments increase 40 percent in 1980

U.S. manufacturers shipped 1,571,000 walk-behind snow throwers during the shipment year which ended Feb. 29, 1980, according to the Outdoor Power Equipment Institute.

Although this represents an increase of 40% over the 1,118,000 units shipped in the 1979 model year, the past winter's extremely light snowfall in major markets has resulted in higher-than-normal inventory at the dealer level. Factory value of the units shipped was $396 million, up 58% from last year's $250 million.

Convention will stress togetherness theme

"Together Through The 80's" will be the theme this year at the 105th Annual Convention and Trade Show sponsored by the American Association of Nurserymen.

Educational sessions each day will deal with contemporary topics of the industry, which is meeting at the historic Radisson Muehlbach Hotel, Kansas City, MO, July 12-16. The trade show promises to display the latest products and services available to nursery business people.

Nine other national associations will be meeting at the same time, as well as various committee meetings, regional caucuses, legislative and research conferences, and state meetings.

For more information, contact Robert S. Fortna, 230 Southern Building, Washington, DC 20005, 202/737-4060.

NURSERYMEN

Reilly named exec sec for Mailorder Assn.

Ann Reilly has accepted the position of executive secretary/public rela-

tions coordinator for the Mailorder Association of Nurserymen.

Reilly is also executive secretary of the New York State Flower Industries, the New York State Turf Grass Association, the Long Island Flower Growers Association, and the Long Island Horticultural Society. She has authored several gardening books and has contributed numerous articles and photographs to many gardening and shelter magazines.

PESTICIDES

Dutch Elm control gets EPA approval

Elm owners who have injected their trees with Arbotect 20-S systemic fungicide to prevent Dutch Elm disease for the past two years can continue treatments this year.

Two years ago when Arbotect was first registered, the EPA placed a restriction on the label specifying that the fungicide should not be used for more than two consecutive years. The reason was to allow more time for research into the long-range effects of continuous annual treatments. Since subsequent testing has shown no significant problems, the restriction has been dropped.

Using a fungicide in this capacity is one of the four important steps in controlling the disease, says Dr. Ronald Landis, director of agricultural research and development for MSD AGVET, Div. of Merck & Co., Inc. Other steps include good sanitation, insect control, and elimination of root grafts.

EQUIPMENT

Program proposed for equipment anti-theft

The Construction Industry Manufacturers Association (CIMA) has been studying a special anti-theft training program for law enforcement, said Earl O. Christianson, director of security for J I Case.

Speaking to the Heavy Equipment Committee of the International Association of Automotive Theft Investigators (IAATI), Christianson said the proposed educational program is also studying resource materials to assist in identification and recovery of stolen equipment.

A Case study made of law enforcement agency response to the equip-

Continues on page 78

GOVERNMENT UPDATE

Feds propose ban on equipment with PCB

Pesticide and fertilizer companies would be required to remove equipment containing liquid polychlorinated biphenyl (PCB) or flush the PCB from the equipment under regulations proposed by the USDA, FDA, and EPA.

Producers and processors would also be required to remove any liquid PCB stored separately at their facilities under proposals by the U.S. Departments of Agriculture and Health and Human Services and the EPA.

Assistant Secretary of Agriculture Carol Tucker Foreman said the proposals represent a coordinated effort by the federal agencies to protect consumers from environmental contamination of the food supply and protect producers and processors from catastrophic losses which may result from such contamination.

Regs for wage and hour laws may change

Changes in regulations have been proposed to facilitate the hearing and appeal process for issues concerning the Davis-Bacon and related acts, the Service Contract Act, and Contract Work Hours and Safety Standards Act.

Under the Service Contract Act, the hearing and appeal process regarding enforcement, debarment, and wage determination matters would be revised. A Board of Service Contract Appeals would be created to hear appeals from decisions of administrative law judges.

The existing Wage Appeals Board would continue to hear appeals involving the Davis-Bacon and related acts. The proposal would also establish certain new procedures, such as formal hearings before administrative law judges concerning enforcement and debarment of contractors from federal contracts for violating the acts.

New procedures would be established for expediting cases involving the Contract Hours and Safety Standards Act.

National Arbor Day bill passes Senate

The bill to annually designate the last Friday in April as Arbor Day has passed the Senate but needs 218 members from the House to cosponsor it.

The House Committee on Post Office and Civil Service has a policy that this type of bill will neither be heard nor reported unless 218 members cosponsor it. Neither will the committee hold hearings on the Senate-passed bill. House Bill (HJR-159), introduced by Rep. Minish (D-NJ), has 22 cosponsors to date (May 31).

EPA bars six new plastic compounds

The Environmental Protection Agency has issued the first order of its kind to prohibit the manufacture of six new chemicals on grounds that they may pose serious risks to human health and the environment.

The chemicals, called "phthalate esters," are "plasticizers" used to give flexibility to polyvinyl chloride plastic products such as garden hoses, floor tiles, and refrigerator gaskets.

EPA imposed the manufacturing ban under the Toxic Substances Control Act because of evidence indicating that the new substances could pose a cancer risk to production workers and could kill and deform fish and other organisms.

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If your underground requirements are tough ones, take a look at the most Ditch Witch has to offer—the R100 Modularmatic unit—the most rugged, high-performance piece of 100-HP-class equipment available. Rough terrain or cross-country work, the R100 can handle it.

An exclusive frame-tilt feature lets you trench vertically on side slopes. Its rubber tires let you maneuver around the work site with little or no damage to surface areas. And four-wheel steering puts you into position easily.

The R100's front-mounted, six-way hydraulic blade makes backfilling or site clearance routine. Lock on an optional vibratory plow module and you can plow-in cable, tubing or plastic pipe.

Even our "least" is the MOST.

When your underground work falls into the light construction category, the least from Ditch Witch—the C77 handlebar trencher—offers the most work capability within its class.

The standard 20,000-pound-test digging chain on the C77, our smallest model, is comparable to that of larger trenchers. The controls are marked for quick identification and are located within easy reach of the operator.

A rugged 7-HP engine allows the C77 to take hours of tough use. Its compact size permits maneuvering through yard gates and around the tightest job sites. And loading is a one-person operation.

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When your smallest plowing requirements create the most problems, turn to the least from Ditch Witch—The VP12 vibratory plow—to clear that 36-inch backyard gate and get on with the job.

This self-contained, self-propelled, 4-wheel drive unit is a natural for close-quarter work. Its rigid frame permits the accurate and effective laying of cable, tubing or plastic pipe in the finest lawn.

The VP12's mechanically-driven shaker box makes maximum use of the plow's 25-HP engine. The standard plow blade provides a 12-inch depth with 10 inches of cover. Blades are also available for direct burying or pull-in.

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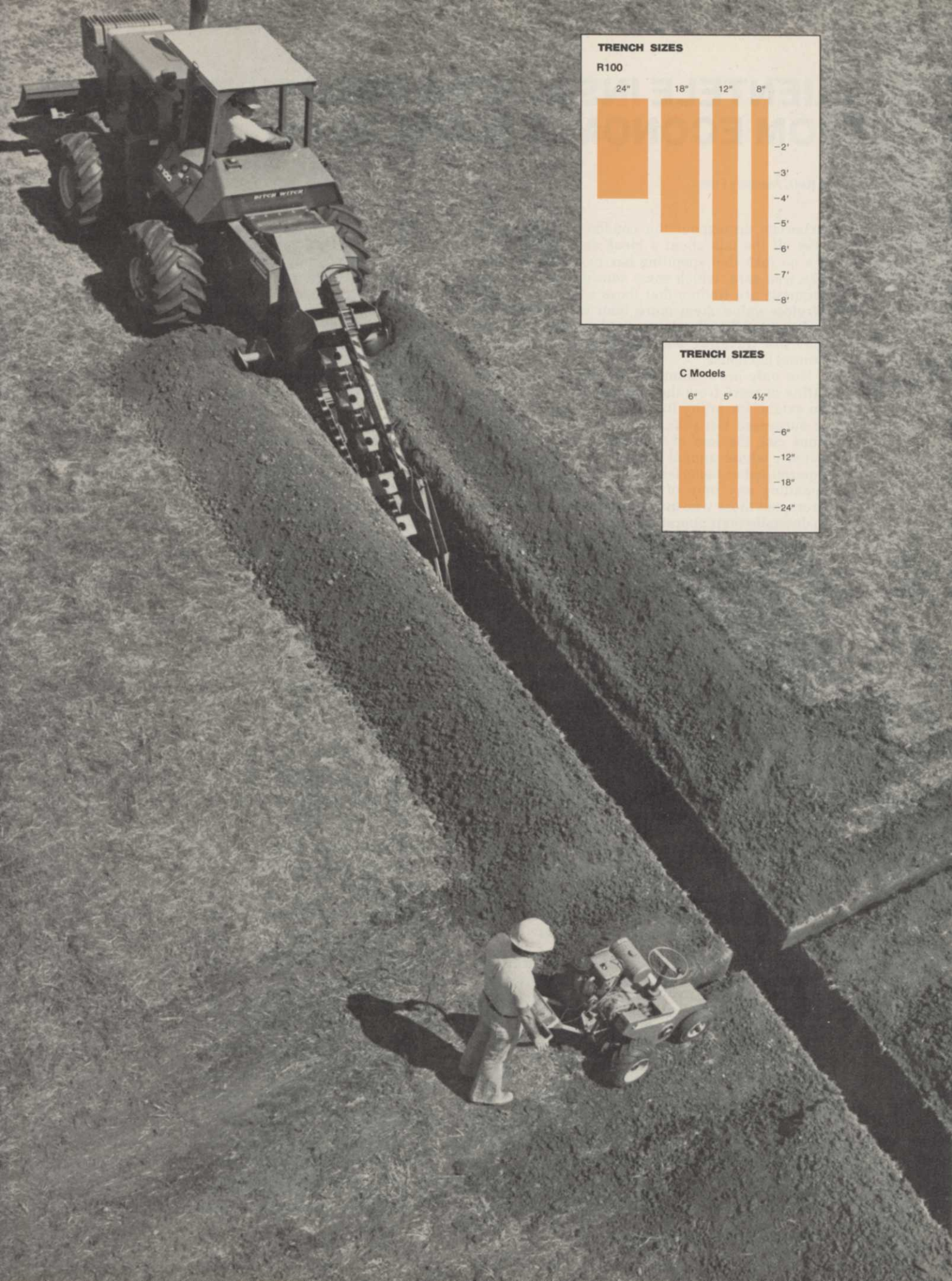
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CLIENTELE INSULATES ARBORISTS FROM ECONOMIC SLOW-DOWN

By John Kerr, Assistant Editor

Arborists throughout the country are wondering why all the talk about a bleak economic climate. It's no joke that spending has been cut for items like tree care, which some consider luxuries. But arborists are finding that those who request such services value them more than ever. People are scrutinizing their landscape with acute vision since they are traveling less and spending more time around the house.

Not only are residential customers steady. The influx of work from the commercial sector, and to an extent, for utility line clearance, has kept pace or surpassed last year. Arborists who clear utility lines risk the loss of business from power companies, whose annual budgets are not as strictly determined as factories or institutions and may cut spending any time of the year. This factor has prompted those who mainly worked on utility lines to diversify their operation.

Other reasons exist for the general optimism among arborists. Environmental awareness and promotion of events such as Arbor Day have boosted the public's appreciation of trees. Bob Felix, executive director of the National Arborist Association, says that American people are jealous of their leisure time and won't begin to do the work themselves. "People wish to take care of their property and will spend money to do that," he says.

Many arborists agree that the socio-economic level of their customers makes them nearly the last to be affected by a recession. "Some feel that by the time the ripple affect of a recession reaches the level of tree care clients that you customarily deal with, the economy will be climbing out of the recession and it will not be felt at all," says Felix. For the present, when arborists hear talk of a "so-called recession," they don't listen.

Neil Engledow, who runs Midwestern Tree Experts Inc., was concerned about the slow request for work a few months ago. Now it appears that people staying home more, damage from winter, and high sales of shade trees could make this one of his best years. Tornados have caused extra work and the epidemic of pests forced Engledow to add a new rig for spraying.

Five different types of scale and 16 varieties of caterpillars have infested trees in Engledow's Indianapolis area. Last winter's mild temperatures didn't kill the scales; the winters of two and three years ago were so harsh that they killed the fibrous feeding roots, a condition which is just manifesting itself this summer in the form of weak foliage on some trees. Engledow is worrying that chemicals he uses that no longer have a strong residual effect will not solve the problem. His customers don't like spraying done over and over so he is looking at superior oil sprays, which have to be diluted and used at the right humidity and temperature.

Because many factory workers with qualified skills for tree care are laid off, Engledow can be very selective in who he hires. He thinks his employees are also starting to appreciate their jobs more. An incentive program learned from a fellow arborist helps production.

Engledow has improved business by going to more contract work instead of an hourly rate. When his crew is on a job, they inspect the property to anticipate future needs. To reduce fuel costs he has cut back to a 15-mile perimeter around headquarters. That's also because business is so good. "I'm in a very fortunate position," he says. "I can hardly get out of my own realm."

Eric Haupt, owner of The Haupt Tree Co. in Sheffield, MA, hasn't seen any direct evidence of recession. He attributes some cancellations and a volume up-net down.situation to inflation rather than recession. What's hurt is the high cost of pesticides and overhead on office space and garages, which make it difficult to compete with those who leave their equipment outside and charge less per hour.

"Overregulation is a bigger problem than recession," says Haupt. Overlapping regulations from the EPA for pesticides, OSHA for safety, and the Dept. of Transportation for hazardous materials cost much to comply with. They force gypsy tree companies to raise their standards, which gives the profession a better image, but the good operations still suffer. For example, Haupt says the decal on his spray rigs which identifies a registered applicator expired this March. The EPA, behind on its paperwork, has OK'd Haupt for continued spraying. The agency must OK every operation then, even those spraying indiscriminately.

Concerned with keeping his good reputation with clients, Haupt makes a point to contact them. "The public and clients are fickle," he says, "We sell them on skilled service, but if they find out later about another company with a lower price, we run the risk of losing them."

One lesson Haupt has learned is not to put all his eggs in one basket. He has seen the power company running Three Mile Island lose everything. He is determined to prevent this and will not make his utility line operation more than 50 percent of his business. Extra emphasis has also been put on maintenance for safety, appearance, and better fuel consumption.

Haupt believes from a nursery standpoint, the recession will probably help. He now has more employees than ever. With better coordination of his expanding family-run business, there will be plenty more work to do.

On the other side of the country in Clackamas, OR, volume of work is holding well for William Owen, owner of General Tree Service (formerly General Spray). Owen has experienced no particular impact from the "so-called recession" in general, but has had two sizable commercial accounts make substantial cutbacks in service. Business has increased from last year.

Owen recognizes the economic situation but

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shucks the negative talk which feeds the fire. "I questioned a number of big associations and found there was almost no significant impact because of the so-called recession," he says. "The biggest defense against it is to do things on a positive note, take a move to create new business unless the crippling cost of cash flow makes it impossible."

Because of the high fuel expense, Owen methodically routes his crews to reduce driving and reminds them to idle trucks less. When working in a neighborhood, someone will canvas the area to describe services and spread the name of General Tree Service.

The company advertises no more than it always has, but sends a special printing of its brochure to certain accounts—offices, commercial installations, or factories which need landscape. "This market considers tree care a necessity," says Owens.

Reaching the level of clients who can afford the arborist's service through advertising and other efforts will become increasingly important in the future, Owen thinks. Other pursuits he considers vital to survival are to be a top-line professional in a diversified manner, and to realize this professionalism particularly in the area of integrated pest management.

Down in San Antonio, TX, the Horti-Care Corp., owned by Alan Brook, has raised its volume 10 percent with consideration for inflation. Small accounts on fixed retirement incomes have dropped off, but otherwise business has been strong. "I've always had people say 'it's too much, I can't afford it'," says Brook. "I take the approach that if they're going to take care of their trees, they can't wait until next year."

Brook is trying to get better people and equip-

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TREE CARE SAFETY PROGRAMS—FACT OR FICTION

By Robert Felix,
Executive Vice President,
National Arborist Association

In 1979, accident frequency in the tree care industry increased by 30% over 1978.

Workers compensation rates continue to increase at an alarming rate.

These are statistical facts that cannot be disputed. Everybody talks about safety. Many claim to have safety programs, but how many of these programs are effective?

Paying lip service to safety, passing out safety bulletins without explanations, and assuming that tree workers understand is a presumption that the tree care industry cannot afford.

The only way to reduce the frequency of lost time accidents and reduce your cost of workers compensation insurance is to make a sincere effort to properly train your employees. This requires time and costs money but it pays dividends. Anything less is a figment of your imagination. Anything less is a fictitious safety program!

Some say that "It's safe if you know how to do it!" That is a half truth. It is only safe if you know how to do it, safely.

The tree care industry is a high risk industry. The heights that we work at, the electrical hazards involved, the equipment that we work with, and the pesticides that we use each pose a threat to the safety of the untrained. It is easy to measure an increased cost for insurance, but not so easy to measure the pain and suffering resulting from an injury, much less production and inefficiency.

Much of this can be avoided with an ongoing safety program. Such programs exist in the form of slide/cassette programs from the National Arborist Association, as well as a Tail Gate Safety program. Both are based on the Z-133.1 Standard of the American National Standards Institute, "Safety Requirements for Pruning, Trimming, Reparing, Maintaining and Removing Trees, and for Cutting Brush."

The economics of a safety program without even giving any consideration to the pain or suffering of an injured worker are very simple. For example: If a three-man crew, which ordinarily produces $60 per hour, devoted one hour per week to safety, lost production for the year would be about $3,000. At an average of $6 per hour per worker, plus payroll taxes and benefits, the payroll cost per year would be $1,125 resulting in a loss of revenue of only $1,875 per year.

Three men earning an average of $6 per hour would earn $37,440 per year. If your manual rate for workers compensation was 20%, your cost would be $7,488 per year. A 25% experience credit would equal $1,872, as much as was sacrificed in revenue for the one hour per week safety training program, plus fewer lost-time accidents and more production.

The National Arborist Association safety training programs are tailor made for the tree care industry. The slide/cassette program provides an audio/visual exposure to safe practices presented in an informal atmosphere. The Tail Gate Safety Program is highly structured yet designed to be presented in the field. It includes attendance records and provides all of the necessary ingredients required by OSHA.

Tree care safety is an essential ingredient in good arboricultural practice. We must do a better job of putting it into practice.

For more information on the slide/cassette and Tail Gate Safety programs, contact the National Arborist Association, Inc., 3537 Stratford Road, Wantagh, NY 11793, 516/221-3082.

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PROPER MATERIAL, CLOSE OBSERVATION PREVENT FAILURES IN HERBICIDE USE

By Thomas A. Fretz, Professor and Head, Department of Horticulture, Kansas State University, Manhattan, KS

Most nurserymen and landscape contractors who regularly use herbicides in their businesses have experienced occasions where the herbicide did not perform to their expectations. Many of these herbicide failures are not failures of the herbicide itself; more likely the conditions under which the material has been applied is usually responsible for this "so-called failure." When one takes time to consider all of the external forces that can ultimately affect herbicidal action, it's a miracle they work at all!

Three major degradation processes, photo, chemical and biological decomposition, can occur which can alter the structure of the herbicide molecule and eventually its selectivity and activity. Biological decomposition includes the breakdown of the herbicide by living organisms in the soil; chemical decomposition is an altering of the chemical structure of the herbicide in the absence of any living organism; and photo decomposition is the degradation of the molecule by any chemical processes requiring radiant energy from the sun.

In addition, there are several major transfer processes that affect herbicide activity once the herbicide has been introduced into the environment. The herbicide can be absorbed by plants and animals, retained in vegetation and transferred to the harvested products, absorbed on soil colloids and thus rendered unavailable, volatilized into the atmosphere, or lost through surface runoff and leaching, eventually to end up in the water table.

Not only can these above factors alter herbicidal activity, but the chances for human error are present right from the initial selection of the herbicide, through its application and following into crop management.

The discussion that follows is not meant to be an excuse for previous herbicide failures you might have experienced, but rather to help you draw attention to those variables which may help you avoid a costly failure with your herbicide program in the future.

Weeds

Above all, proper herbicide selection is paramount in achieving a successful weed control program, whether it is for container grown nursery crops or the plants in an established landscape situation. Never forget that herbicides are very selective and while some are noted for their annual grass control, others control only broadleaf weed species. Still, other herbicides have a relatively broad spectrum in terms of the weed species they will control. Knowing what weed species are present in any particular situation will ultimately help in choosing the proper herbicide for the job. The herbicides listed in Table 1 illustrate the fact that herbicides vary with regard to their ability to control particular weed species. For example, selecting DCPA (Dacthal) to control broadleaf weeds will almost certainly produce unsatisfactory results.

In addition to considering the major weed species present in any given nursery or landscape situation, the applicator must constantly be reminded of the fact that the weed spectrum will change with repeated application of a single herbicide. Surely every nurseryman and landscape contractor can cite examples of the elimination of one troublesome weed pest only to observe the encroachment of another weed species. For this reason, the development of a program of alternative herbicides which can be used in particular situations should be carefully considered.

Crops

We all realize that an herbicide may effectively control weeds around one plant species while severely damaging another. For example, dichlobenil (Casoron) may be used on junipers to effectively control many perennial weed species. However, this herbicide will cause severe injury if used around Japanese holly. The application of herbicides to various crops is, by far, one of the most exacting tasks that a grower must perform. The aim is always to injure or kill the weeds while at the same time not causing any crop damage.

Once a grower has decided on the herbicide that is specifically labelled for use on his crops or in a particular landscape situation and has an exact knowledge of the weeds which are present, he is ready to apply an herbicide, that is tailor-made for the job.

Time of application

All herbicides have an optimum time for application. **Preplant** herbicides such as trifluralin (Treflan) are applied prior to the planting of the crop, while **preemergent** herbicides, such as diphenamid, oryzalen and oxadiazon (Enide, Surflan and Ronstar, resp.) are applied prior to the emergence of weeds. With nursery crops and in landscape situations we generally think of preemergent herbicides as being used on established crops prior to weed emergence. **Postemergent** herbicides, like paraquat and glyphosate (Roundup), are applied after weeds have emerged from the soil.

Most nurserymen and landscape contractors have seen numerous examples of correct and incorrect timing of herbicide applications. As an example, most nurserymen realize that in order to achieve successful weed control with dichlobenil (Casoron) it must be applied at temperatures

Continues on page 73

WEEDS TREES & TURF
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The Turfgrass Seed Market

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Protects high wear turf areas. And your reputation.

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WEEDS TREES & TURF
TURF MANAGEMENT SERIES/PART 1

The Turfgrass Seed Market

What was once a relatively simple task of selecting turfgrasses for a particular site is now a skill requiring a degree of expertise by turf managers.

As recently as the 1960s, the choices were limited to a few improved public varieties for each type (genus) of turfgrass. Merion Kentucky bluegrass, released in 1950, proved there was an interest in improved (and more expensive) turfgrasses.

Today this interest has developed into an industry valued in excess of $400 million and a multitude of improved turfgrasses. The monostand is gone. Quite often a fairway, lawn, or athletic field will be seeded with a mixture of three bluegrasses, two or three fine fescues, and two or three perennial ryegrasses. Turf managers consequently need an expanded basic knowledge of turf seed.

This knowledge should include a history of turfgrass improvement, the advantages of certain turfgrasses, the technology of seed production, and trends in variety development. Such information can provide the logic required to make a wise selection for a particular site.

The total of this information would stress anyone's memory, but portions of it can be memorized if the desire is present. To create the desire, one needs only to realize the historical richness of the story. The remainder of the information can be as close as this magazine for reference.

For these reasons, we offer this profile of the turf seed market. We hope it results in a new perspective of improved varieties and the recognition of the effort, dedication, and cooperation of those who developed them.

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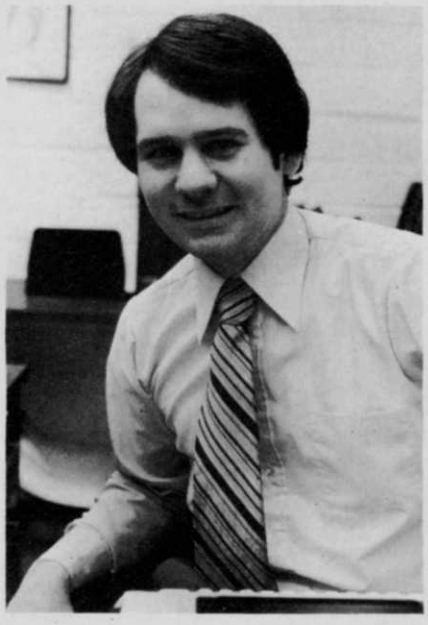


Bruce F. Shank

Bruce F. Shank, Editor

THE EARLY YEARS

Although cultivation of grasses for grazing, gardens, and sports dates back thousands of years, nearly all advancement in the turf seed industry has taken place in the last century. Advances in plant genetics, seed production technology, and the commercial attractiveness of the turf seed market have provided the impetus for growth, especially in the last 30 years.

Prior to 1886, when J. R. Olcott created an experimental turfgrass garden at the Connecticut Agricultural Experiment Station at Storrs, most discovery had been in the areas of taxonomy, genetics, and use.

One of Aristotle's students, Theophrastus, is credited with classifying plants into annuals, biennials, and perennials in approximately 300 B.C. The Romans made the first clear distinction between agriculture and ornamental horticulture in their language.

The Renaissance revived interest in formal gardens. Sports such as bowls, golf and soccer were developing from the 1300s (A.D.) to the 19th Century.

In 1694, the Dutch botanist Camerarius proved the sexual nature of plants. In the next century, Carl von Linne' (Linnaeus) improved upon previous methods of classifying living creatures and plants and developed the standard method of classification used today.

During this time, explorers from European countries were establishing the first settlements in the Western Hemisphere. Whether accidental or intentional, seed from European grasses found the North American soil suitable for growth. Settlers, afraid of attacks, preferred to surround themselves with open fields rather than closely spaced buildings and trees. The town green therefore became a characteristic of early settlements. Livestock grazed in the green to keep it under control.

Fred V. Grau

The first extension turf specialist in the country at Pennsylvania State University working with Burt Musser. Grau also served as director of the USGA Green Section from 1945 to 1953.

During the 1800s, Gregor Mendel, an Austrian monk, created the base for the science of genetics by describing inheritance factors called genes and Dane Wilhelm Johannsen identified the difference between the genetic makeup of an organism and its physical appearance under varied conditions (genotype and phenotype).

At the end of the 19th Century, the turf market was beginning to organize for growth. In addition to Olcott's work in Connecticut, Rhode Island started evaluation plots at its Agricultural Experiment Station. In 1894, the United States Golf Association was formed to encourage the growth and improvement of all phases of golf. In 1883, the American Seed Trade Association was created and the industry of supplying seed to end users was clearly recognized.

As the 20th Century began, interest in turf was present but technology was not. Little was known about management practices, turf diseases, hybridization of turfgrasses, or even equipment needed to mow. Agriculture was not much further ahead in a technological sense. The engine-driven tractor was still on the drawing boards.

The next 30 years were critical for both agriculture and turf industries. Unfortunately, when many improved agricultural products received protection from the original Plant Patent Act of 1930, no protection was afforded improved turfgrasses. Not for another 40 years did turf seed breeders get commercial protection so that they could recoup their development costs for improved turfgrasses.

By 1930, 13 states had turfgrass research of some type underway. Many of these state programs were established by the recommendation and cooperation of the United States Department of Agriculture and later the USGA Green Section who jointly managed the center of turf research, The Arlington Turf Gardens, located on the present site of the Pentagon. The Green Section was established in 1920, four years after the creation of the Arlington Turf Gardens. The Gardens, later moved to Beltsville, MD, was the central point for collecting and testing turfgrasses from natural stands as well as a testing site for management practices.

The Green Section worked closely with the Arlington Gardens and published much of the research in "The Bulletin", which was published from 1921 to 1933. During that period Dr. John Montieth Jr. served as Green Section pathologist. From 1925 to 1940, Montieth made major contributions to the development of turf fungicides and other management practices.

In 1940, Dr. Fanny Fern Davis became acting director of the Green Section. She helped develop the early use of the new herbicide 2,4-D for turf. Dr. Fred Grau assumed the directorship in 1945 and served until 1953 when USGA changed the scope of the Green Section.

Another major organizational factor in the development of turfgrasses and turf management was the National Association of Greenskeepers of America, formed in 1926. Today known as the Golf Course Superintendents Association of America, the group was formed largely by the organizational efforts of John Morley, superintendent of Youngstown Country Club, Youngstown, OH; Robert E. Power, green chairman at Westwood Country Club, Cleveland, OH.; and Fred Burkhardt, greenskeeper at Westwood. They helped organize a meeting of representatives of greenskeeper associations from New England, Michigan, Philadelphia and western Pennsylvania which led to the formation of NAGA. GCSAA has proceeded to make major contributions to turf management during its 54 years of service.

Joseph Valentine
Superintendent of Merion Golf Club near Philadelphia who discovered Merion bluegrass on his course in 1936.

Jesse A. DeFrance
Director of the turf program at Rhode Island during the 40's and 50's. His work involved bentgrasses and tall fescues.

The method used to find improved turfgrasses into the 1940s was the search of golf courses, parks, and any other turf area for stands of grass which exhibited superior appearance, disease resistance, shade tolerance, etc. They were natural selections to common turfgrasses. The most famous turfgrass discovered this way, and the grass that made the market boom, was Merion, found on Merion Golf Club near Philadelphia by golf superintendent Joe Valentine in 1936.

The USGA Green Section and GCSAA encouraged golf course superintendents to search their course for stands of naturally selected turfgrasses. These grasses were those which persisted and developed under conditions of low mowing, periodic fertilization, shade, irrigation, and other conditions found on golf courses. Ben Warren, founder of Warren's Turf Nursery in Chicago, and university turf specialists such as Fred Grau, Jesse de France, and Glenn Burton travelled extensively looking for naturally selected turfgrasses in golf courses, parks and cemeteries. From these searches the original genetic base was established.

These collections were evaluated for characteristics desired of turfgrasses; color, leaf coarseness, disease resistance, drought tolerance, low mowing, and fertilizer requirements. Once a grass was identified as promising, its seed producing ability had to be judged to determine the cost of production as compared to the price of the seed on the market.

Merion was considered a poor seed producer, but it offered the special advantage of resistance to leaf spot, powdery mildew and stripe smut. A high price was set to cover production costs and the market was willing to bear it. Poor seed production is considered less than 400 lbs. per acre.

Hundreds of candidates for new grasses are under evaluation by universities and seed companies. Few of these will pass the seed production test. Compromising certain qualities for seed production ability is sometimes necessary.

While turf research began in the United States in 1885, the actual release dates of some of the earlier selected turfgrasses were: Merion Kentucky bluegrass - 1950; Illahee creeping red fescue - 1950; Meyer zoysiagrass - 1951; Tiflawn bermudagrass - 1952; Penncross bentgrass - 1954; and NK100 perennial ryegrass - 1962.

John Morley
The first president of the National Association of Greenskeepers of America in 1926. Today the group is known as the Golf Course Superintendents Association of America.

Although important advances in breeding turfgrasses took place in the 1930s, few if any hybridized turfgrasses reached the market by 1960.

History of State Turfgrass Research Programs

State	Turf research initiated	First turf grass conf.	Location	Early investigators
Alabama	1927	1960	Auburn Univ.	D. G. Sturkie
Alaska	1950	None	Univ. of Alaska	H. Hodgson, A. Kallio, A. Wilton, R. Taylor, L. J. Klebesadel
Arizona	1949	1953	Univ. of Arizona	S. Fazio, J. Folkner A. Baltensperger
Arkansas	1959	None	Univ. of Arkansas	A. M. Davis
California	1951	1951	Univ. Cal., Davis	L. Currier, R. Hagan
	1948	1949	Univ. Cal., Riverside	V. Stoutemeyer, P. Miller, R. E. Endo
Colorado	Early 1940's	1954	Colo. State Univ.	G. Beach, J. Fults
Connecticut	1885	None	Univ. of Connecticut	J. B. Olcott
Delaware	1965	1968	Univ. of Delaware	W. Mitchell, C. Phillips
Florida	1945	1953	Univ. of Florida	R. Bair, G. Nutter
Georgia	1946	1946	Tifton, Georgia	G. W. Burton
Hawaii	1963	1965	Univ. of Hawaii	R. Voss, D. Watson, W. McCall
Idaho	None	None	Univ. of Idaho	None
Illinois	1934	1960	Univ. of Illinois	A. Lang, J. Pieper, F. Weinard
Indiana	1942	1937	Purdue Univ.	M. Clevitt, G. Hoffer, G. Mott
Iowa	1931	1932	Iowa State Univ.	V. Stoutemeyer, H. Lantz, S. Edgecomb, E. Roberts
Kansas	Late 1920's	1950	Kansas State Univ.	J. Zahnley, L. Quinlan
Kentucky	1948	None	Univ. of Kentucky	E. Fergus, J. Spencer
Louisiana	1960	1963	Louisiana State Univ.	T. E. Pope
Maine	1958	1962	Univ. of Maine	R. Struchtemeyer
Maryland	1931	1928	Univ. of Maryland	R. Thomas, E. Cory, E. Deal
Massachusetts	1927	1931	Univ. of Massachusetts	L. Dickinson
Michigan	1929	1930	Michigan State Univ.	R. Cook, J. Tyson, M. McCool
Minnesota	1936	1964	Univ. of Minnesota	H. Hayes, H. Schultz
Mississippi	1956	1960	Mississippi State Univ.	C. Johnson, L. Wise
Missouri	1910	1960	Univ. of Missouri	J. Whitten, E. Brown
Montana	1920's	None	Montana State Univ.	None
Nebraska	1927	1963	Univ. of Nebraska	F. Keim, F. Grau
New Hampshire	1961	1965	Univ. of New Hampshire	L. J. Higgins
New Mexico	1954	1955	New Mexico State Univ.	C. E. Watson
Nevada	1965	None	Univ. of Nevada	R. Ruf, R. Post
New Jersey	1924	1929	Rutgers Univ.	H. Sprague, E. Evaul, G. W. Musgrave
New York	1947	1947	Cornell Univ.	J. F. Cornman
North Carolina	1961	1963	N. Carolina State Univ.	J. Harris, W. Gilbert
North Dakota	1962	None	N. Dakota State Univ.	J. Carter, K. Larson, I. Dietrich
Ohio	Early 1920's	1938	Ohio State Univ.	F. Welton, G. McClure, R. Davis, K. Bader
Oklahoma	1948	1946	Oklahoma State Univ.	W. Elder, R. Chessmore
Oregon	1930	1948	Oregon State Univ.	H. A. Schoth
Pennsylvania	1929	1929	Penna. State Univ.	H. Musser, F. Grau
Rhode Island	1890	None	Univ. of Rhode Island	L. Kinney, H. Wheeler J. A. DeFrance
South Carolina	1959	None	Clemson Univ.	P. M. Alexander
South Dakota	1955	None	S. Dakota State Univ.	William Macksam
Tennessee	1938	1947	Univ. of Tennessee	J. K. Underwood
Texas	1940	1946	Texas A & M Univ.	G. Warner, R. Potts, A. Crain, J. Watson, E. Holt
Utah	1958	1964	Utah State Univ.	H. Peterson, K. Allred
Vermont	1959	1965	Univ. of Vermont	G. M. Wood
Virginia	1910-1915	1957	Va. Polytechnic Institute	L. Carrier, A. Smith
Washington	1942	1948	Washington State Univ.	A. G. Law
West Virginia	1930	1967	W. Virginia Univ.	Collins Veatch
Wisconsin	1920	1959	Univ. of Wisconsin	F. Burcalow, E. Nielsen, D. C. Smith, J. Sund
Wyoming	1962	None	Univ. of Wyoming	Loyd Ayres
USDA cooperating with USGA	1920 1941	None None	Arlington, Va. Beltsville, Md.	John Monteith, Jr. John Monteith, Jr.

Reprinted from Turfgrass Science, American Society of Agronomy, 1969.

H. B. Musser

Leader in turfgrass development at Pennsylvania State University. Had a part in the development of many improved turfgrasses such as Pennfine and Penncross.

Following the war, the prewar work had to be reorganized. Strong pressure from universities and the Green Section resulted in the release of American improved varieties in the 50's. In the late 40's, the American Society of Agronomy, encouraged by Fred Grau and others, created a Turf Committee. A minor setback was the repositioning of the Green Section in 1953 to serve USGA member clubs only. Although its work still benefitted everyone indirectly, USGA concentrated its support on golf turf work.

The postwar years brought new consumer interest in housing and home landscapes. The value of a nice lawn was growing. Gradually, the dollars shifted to the homeowner market. Along with the seed industry, the sod industry grew rapidly to meet the new demand for quality lawns.

This growth in home lawn care, added to turf needs generated by golf, sod production, and road construction permitted states to increase their support of turf programs at state universities. This resurgence of support of university research resulted in most of the improved hybrids during the 60's and 70's. In 1961, Rutgers created a fulltime turfgrass breeder position and filled it with a graduate student from its corn breeding program, C. Reed Funk. His contributions, combined with breeding work of Penn State, Rhode Island, Oregon State and others, is the foundation of today's breeding effort.

When this low-growing, Swedish lawn beauty first stepped into the turf world it revolutionized the lawn industry.

Now another step! Fylking Kentucky bluegrass costs less than most other elite bluegrasses!

Fylking establishes fast, develops a greater density of rhizomes and root system. Fine-textured, velvety green, Fylking performs well when cut low (even low as one-half inch), and may need less mowing. Amazingly tough, Fylking Kentucky bluegrass has improved disease resistance to leaf spot, stripe smut, stem rust and leaf rust, as rated in tests by many major universities and institutions. Physically pure, genetically true seed, Fylking contains no annual bluegrass (Poa annua), bent grass or short-awned foxtail.

Take a giant step ahead by using Fylking as the backbone bargain of your next lawn turf mix. Ask for the Swedish beauty, Fylking Kentucky bluegrass at your local wholesale seed or sod distributor.

FYLKING KENTUCKY BLUEGRASS U.S. Plant Patent 2887

Another fine, quality-controlled product of Jacklin Seed Company.

Write **125** on free information card

THE FORMATIVE YEARS

During 1930-1960, seed producers were highly involved with production of common grasses. They had a reliable demand for a product which they had developed an acceptable technology to handle. Basically, they collected seed from natural stands of common grasses by a practice called stripping. Seed companies would arrange with farmers in the midwest to have certain pastures ungrazed during late spring and early summer.

"Many millions of pounds of seed were gathered with strippers beginning in mid-June in Kentucky and the southern portion of the Western District (Missouri north to southern Canada), and following the weather northward to finish up in Minnesota and Canada during July," says Robert Schery, Director, of the Lawn Institute.

Arden Jacklin of Jacklin Seed Company recalls, "Common Kentucky bluegrass was occasionally overproduced. When I was working for the USDA Soil Conservation Ser-

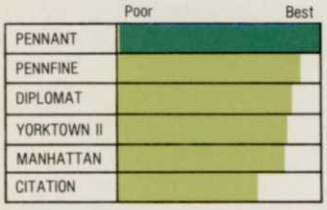
Arden Jacklin *checks a seed field in 1958 in eastern Washington.*

What do turfgrass experts say about Pennant* ryegrass?

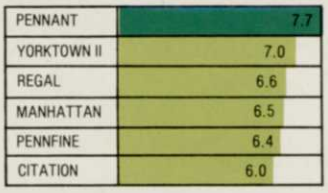
The Turf Trial results speak for themselves. **Pennant** is a champion. Rigidly controlled, comparative testing involving **Pennant** and competing varieties of perennial ryegrasses were conducted by turf experts across a broad region of the U.S.—the Pacific Northwest, the Southwest, the Northeast.

In other tests, **Pennant** topped many of its competitors in overseeding in Southern Arizona, and in heat tolerance in Southern Texas. Some of their findings are illustrated below.

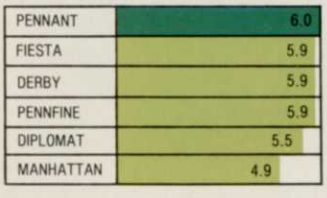
Warm and cool season average turf score, Southern California first-year tests, 1979.



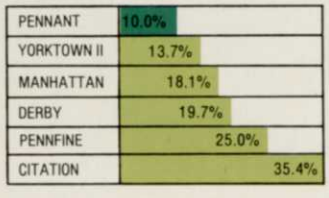
Turf performance scores, Hubbard, OR., 1978-79. (9 = best)



Average Reaction scores to red thread disease (Corticium fuciforme), Hubbard, OR., 1979. (9 = least disease)

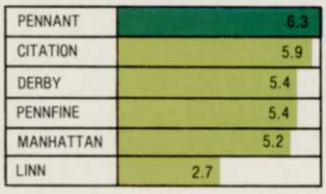


Reaction to brown blight disease (Helminthosporium), Hubbard, OR., Dec. 1977 and Feb. 1978 samplings. (% diseased).

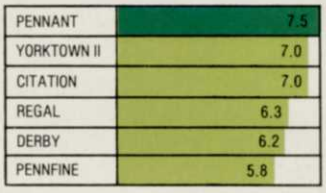


*Plant variety protection pending and anticipated

Turf performance scores. North Brunswick, N.J., 1975-78. (9 = best)



Reaction to brown patch disease (Rhizoctonia), Adelphia, N.J., 1978. (9 = least damage)



Pennant was also found to maintain its excellent turf color and quality late into the season. **Pennant** will impress you with its rich, moderately dark green hue, its fine leaf blades, and its improved mowing properties. We call it "The Trophy Turf". We think you will, too.

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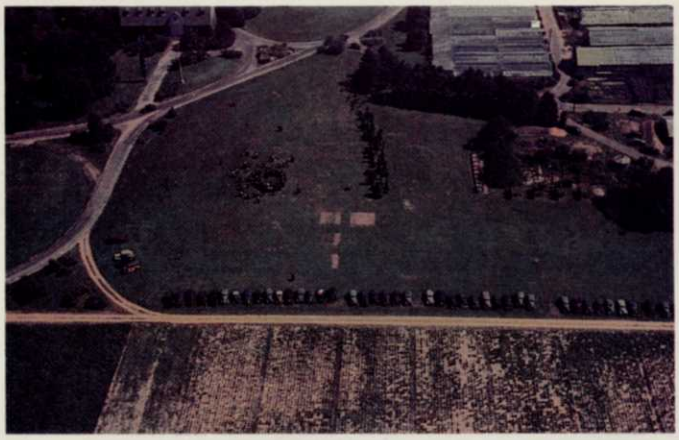


Arlington Turf Gardens *prior to the construction of the Pentagon (left).* **Turf plot** *in front of administration building at Beltsville, MD. (right). Photos by F. V. Grau.*

vice in 1936, the government bought up the excess seed and distributed it across the United States in carloads. As late as 1946, there were farmers who had picked up carloads of surplus seed in 1936 and were still trying to sell it to seed companies."

During the stripping process, green seedheads were removed, and laid out in fields to dry. Perhaps half the seed would be good after this process and germination rates were considerably lower than the 90% rate common today. Overall, production in this fashion could generate 20 million pounds of common bluegrass in a year.

Representatives of these seed companies used to meet each year to gauge production and estimate value. This group eventually became known as the Better Lawn & Turf Institute (The Lawn Institute) which now represents many turfgrasses to users.

Common bluegrass is still in demand today. Park common Kentucky bluegrass is still produced in Minnesota and the Dakotas. Of course, there are large producers of Common Kentucky bluegrass in Kentucky, the largest is Robert Dye Seed Ranch in Pomeroy, Washington. Nearly twice as much public and common bluegrass is produced annually in the United States as proprietary Kentucky bluegrass.

By far the most productive area in the U.S. today for grass seed is the Pacific Northwest, the states of Idaho, Oregon and Washington. In the mid-40's, the Jacklins and a few others promoted the improved purity of grasses grown in the Northwest and the better yields per acre allowed by temperate weather. Many offtypes of grasses existed in the Midwest because grasses had a 200 year lead on introduction there.

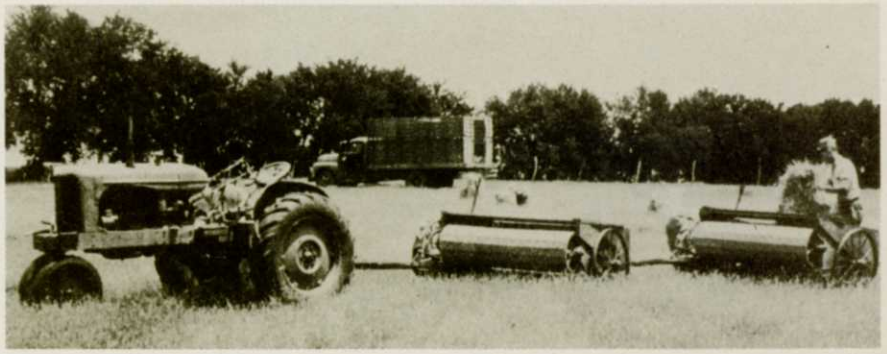
Modern seed production practices evolved in the Pacific Northwest. Arden Jacklin, after leaving the Soil Conservation Service, and helping convince his father and brothers to risk part of their vegetable farming business for the turf seed industry, developed many of the current techniques of row planting of foundation seed, improved roguing the field for weeds and volunteers, windrowing the cut grass, and using combines to pick up and separate seed from the straw.

No one had any exclusive rights to the common grasses. The interest and technology to gather large quantities of seed were centered in the Midwest. As the Northwest proved to be a better area to produce turf seed and improved seed from the Northwest brought a considerably higher price, Midwestern seed companies specializing in stripping slowly faded away.

Of course, another major factor in the development and production of improved varieties was the seed company. A look at the incorporation dates of nationally known seed companies reveals these groups:

- local seed store selling garden, agricultural and grass seed to a community. Some of these include Adikes (1855), Northrup King (1884), Stanford (1910), Rudy Patrick (1911), O. M. Scott & Sons (1870), E. F. Burlingham (1921), and Lofts (1923).
- early recognition of new market potential for turf seed. Some of these include Jacklin (1935) and Warren's (1938).
- created due to new protection by 1970 Seed Act. Some of these include Agricultural Services (1970), International Seeds (1972), Pickseed West (1969), Turf Seed (1970), Whitney Dickinson (1972), and North American Plant Breeders (1973).

Green seed windrowed *in curing yard in the Midwest during common bluegrass production.*



Stripping machines *on midwestern field during the 50's. Photos courtesy of The Lawn Institute.*

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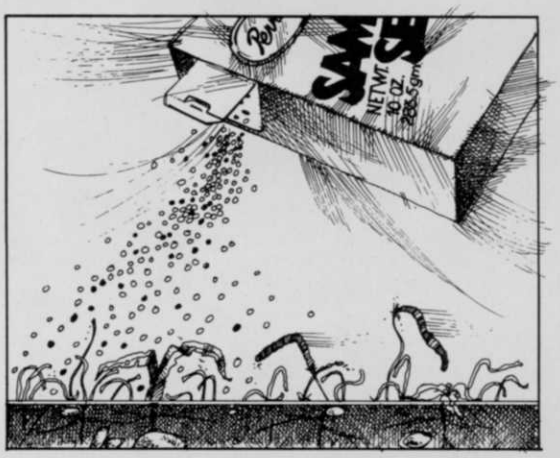

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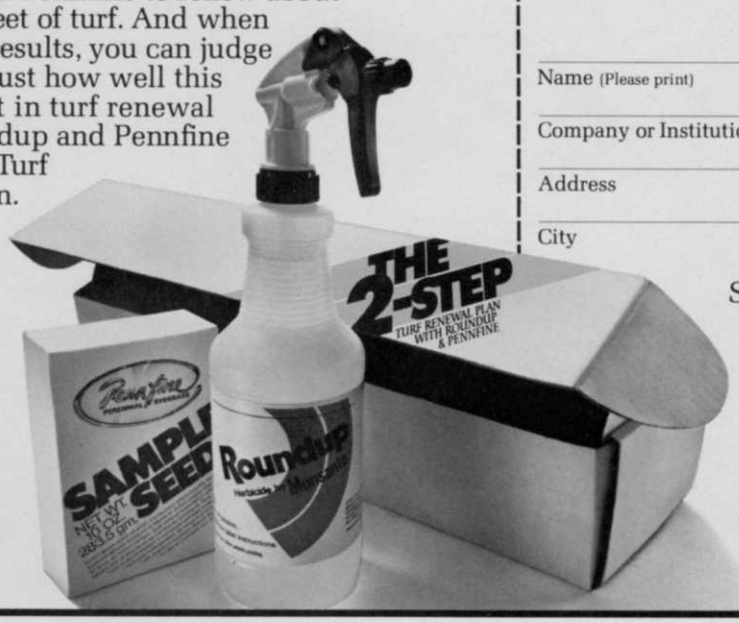

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THE SEED COMPANY

The structure of the turf seed industry is considered to be in five parts; the breeder, grower, marketer, distributor, and retailer or end-user. A seed company may perform more than one function in this arrangement. For example, Jacklin has a breeding program, owns part of its production acreage, markets the seed in advertising and at shows, and in some cases acts as the distributor. It also contracts with farmers for production, receives breeding support from universities and other seed companies, and sells bulk to regional distributors. In fact, as part of Vaughan Jacklin Co., its parent company retails the seed.

Scotts, Lofts, Vaughan Jacklin and Northrup King market packaged seed to homeowners. Some companies sell private label seed to chain stores and all companies sell bulk to regional distributors, contractors and garden centers.

Another level of complexity is added in the production, marketing

Early Lawn Institute Officers *in the late 50's. Shaking hands are Edward Spears (left) of Paris, KN, and William Gassnor of Kingdom City, MO. Bob Schery is on the far right.*

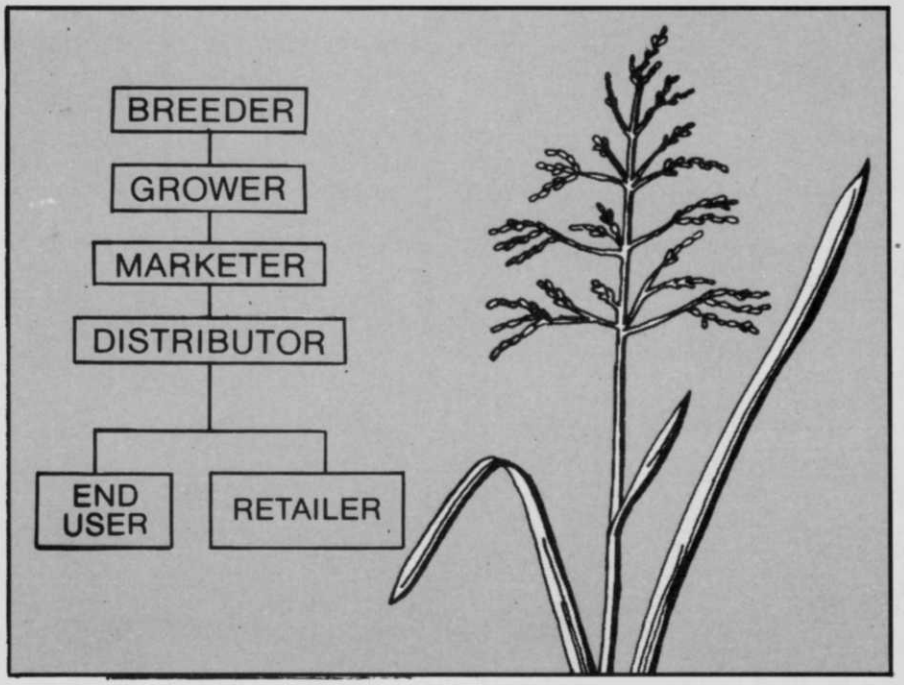
and distribution of European varieties such as Baron, Birka, Sydsport, and Fylking Kentucky bluegrasses. U.S. seed companies go directly or through brokers to European companies and arrange royalties to market European varieties. Barenbrug recently established an office in the Northwest to work directly with growers in production of seed. On the other hand, U.S. companies sell to European seed companies and grow for them under contract.

Commercial interest in producing and distributing turf seed began primarily in the 30's. Regional seed companies such as Scotts, Adikes, Lofts, Stanford, Northrup King and Rudy Patrick realized that recent developments in turf seed collection would create a demand for improved varieties. They treated the turf market for the most part as a special addition to their agricultural seed business.

After waiting patiently through the depression, war years, and most of the 50's, the seed market recuperated with a surge of new varieties. These early companies held the inside track as common varieties were replaced with improved ones. The market looked so good that W. R. Grace purchased Rudy Patrick in 1957 as a growth investment. (Rudy Patrick was also involved with agricultural seeds, so not all of Grace's interest was in turfgrass.) Rudy Patrick had its own development work underway during the late 60's. Dr. Jerry Pepin, a student of Reed Funk and currently research director for International Seeds Inc., did much of the turf seed research for Rudy Patrick during the 60's. Jim Carnes, co-owner of International Seeds, was director of specialty turf.

After a turfgrass is judged to meet quality and seed production standards, a process begins to generate seed for production. Research work may have generated less than 10 pounds of breeder seed. This breeder seed is taken by special growers and planted to produce foundation seed. It may take two or three years to produce enough foundation seed to meet the demand of the growers of the final product, certified seed. Purity is extremely important in all phases of seed production, but especially important during production of foundation seed from breeder seed. It is the foundation seed that is planted to produce the certified seed for market.

Early growers of foundation seed were Otto Bohnert in Oregon and the Geary Brothers in Oregon. These two growers took four pounds of Merion breeder seed, which Penn State had produced from a thimbleful of seed saved by Fred Grau when the Pentagon forced the move of the Arlington Turf Gardens. They have performed similar roles with other improved varieties. Otto Bohnert was also the first grower of Newport and Penncross.



Today, breeder and foundation seed is produced under control of the seed companies owning the proprietary rights.

Disenchanted with the seed market, W. R. Grace began to divest itself of its seed companies in 1970. As a result, research locations of Rudy Patrick were purchased by investor groups, Northrup King, Olin Corp., and Nickerson, a British concern. The result was the creation of three new seed companies and the acquisition in 1972 of Rudy Patrick seed facilities in the Northwest by Northrup King and the formation of Tee-2-Green Corp. to market Penncross.

Olin Corp. and Nickerson jointly acquired most of Rudy Patrick's Kansas City facilities and created North American Plant Breeders in 1973. Jim Carnes and Willard McLagan (A prominent seed grower) purchased the Halsey, Oregon facilities of Rudy Patrick and created International Seeds, Inc. in 1972.

The third company to come out of this divestiture was Whitney-Dickinson of Buffalo, New York by an investment group including E. L. Townsend and E. J. Glatty.

As a result, Whitney Dickinson gained marketing rights to Manhattan perennial ryegrass, and North American Plant Breeders, International Seeds, and Northrup King divided much of the research work with perennial ryegrasses, bluegrasses and fescues developed by Rudy Patrick.

Another firm established in the 70's, and just beginning to enter turf seed marketing, is Agricultural Services of Oregon. Its perennial ryegrasses Pennant, Premier and Pronto were developed in cooperation with Reed Funk at Rutgers. John Rutkai and Dave Amoth formed the company in 1973. According to Rutkai the extensive breeding advances in the U.S. turfgrass industry will shorten the commercial life of most varieties, creating new introduction more quickly.

Turf Seed of Hubbard, Oregon, was created in 1970 by another Rudy Patrick marketing specialist, Dick Bailey, and Bill Rose, a big producer of Merion seed and president of the Manhattan Ryegrass, Penncross Bentgrass, and Exeter Bentgrass associations. Rose had produced the first foundation seed of Manhattan.

Originally the company concentrated on Merion seed production and Manhattan perennial ryegrass as comarketers with Whitney Dickinson of Buffalo, New York. In 1975, Bill Meyer joined Turf Seed as full-time researcher to improve seed yields of current varieties and create new varieties. Meyer created Pure Seed Testing and played a major role in the introduction of Shasta

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and Columbia Kentucky bluegrasses; Citation, Omega and Birdie perennial ryegrasses; and very soon improved types of Merion and Manhattan. This year Turf Seed will produce and market a new tall fescue, Falcon. Turf Seed also produces seed for Warren's A-20, A-34, I-13, and A-20-6A.

From its inception in 1972, International Seeds Inc. took an aggressive marketing position with material acquired from Rudy Patrick and arrangements with Van Engelen and SUBICO of the Netherlands. They have European rights as well as U.S. rights to many proprietaries.

Jerry Pepin moved to International with the Rudy Patrick breeding program and released Derby perennial ryegrass in 1975 and Regal in 1976. North American Plant Breeders markets both Regal and Enmundi Kentucky bluegrass from International.

International has marketing rights to Emerald creeping bentgrass, Highlight chewings fescue, Merit Kentucky bluegrass, and Shasta Kentucky bluegrass. International is co-breeder and marketer of Admiral Kentucky bluegrass. It produces Vantage Kentucky bluegrass for O.M. Scott & Sons.

International Seeds has entered the southern overseeding market with DixieGreen and Sabre, *Poa trivialis*.

International developed America Kentucky bluegrass which is marketed by Pickseed West Inc.

Seaboard Seed Co. was founded in Philadelphia in 1932 as a farm seed company. Following the war, Seaboard entered the turfgrass seed market, and added a branch in Bristol, Illinois. In 1962, the company was merged into Heritage House Products, part of Diamond Alkali Co. In 1965, E.F. Burlingham & Sons went together with Chris and G.H. Valentine, and Alan Hirsch to purchase the turfgrass seed business of Heritage House as well as the Bristol, Illinois facility.

Pickseed West in Tangent, Oregon was created by Martin and Tom Pick, of Otto Pick & Sons Ltd. in Canada and Kent Wiley, son of a seed broker in 1970. Today they have several agronomists on staff and have acquired rights to a number of improved grasses out of Rutgers and Rhode Island. Touchdown Kentucky bluegrass is one of these that has experienced high acceptance in the market. They have just announced production of America, from Rutgers breeding work. America exhibits good resistance to disease and good shade tolerance. Pickseed is calling America a low maintenance bluegrass. Recently, Pickseed arranged to begin marketing of material from Rhode Island, such as Exeter, Colonail bentgrass and Kingstown velvet bentgrass.

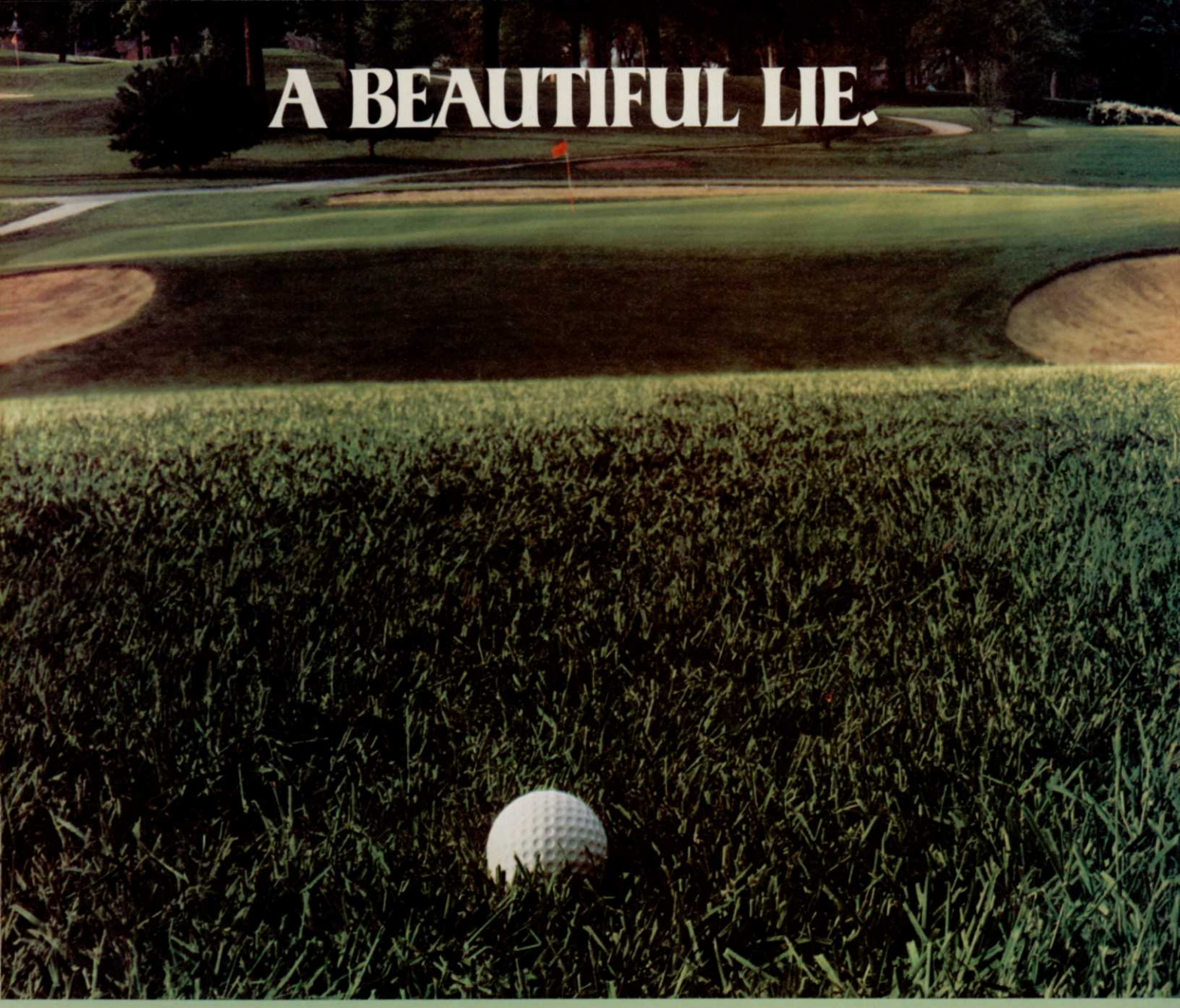
Of course, many of these companies would not exist today had it not been for the foundation built by the early seed companies. Jacklin, Scotts, Rudy Patrick, Lofts, Northrup King, Stanford, Adikes, Warren's and Burlingham survived and prospered through the conversion from common to improved turfgrasses. They made investments in research and technology when needed to serve the professional turf market as well as the (homeowner market). They worked with universities, anticipated changes in market demand, and seed production technology, and put marketing money behind the new turfgrasses.

Warren's began as a turf nursery in 1938 by Ben Warren near Chicago. Warren's interest was in improved grasses for sod, not so much for seed. He and his staff were primary collectors of new material from golf courses, parks, and lawns across the U.S. His collection work paid off well with the material that contributed to the production of A-20 and A-34.

Much of Warren's sod production was by vegetative means and only in the last ten years has Warren's sought to produce seed. Today, Warren's remains a sod producer first, and a seed producer second.

Jacklin Seed Company is a multifaceted company serving both the professional and homeowner markets. It was founded in 1935, by Ben Jacklin and his three sons Lyle, Owen and Arden, in Dishman, WA., originally a grower of seed peas. Arden Jacklin after serving the Soil Conservation Service, convinced his father and brothers to get behind the turfgrass market in the 40's obtaining foundation seed from Otto Bohnert and Ed Geary. Initially, the Jacklins produced some field grasses and creeping red fescue. At that time they had to have the seed cleaned at the only seed cleaning plant in the area owned by Max Hinricks. Jacklin received some of the first foundation seed of Merion and put full effort into production.

It has since provided a considerable amount of production and promotion for various other improved grasses such as Glade, Fylking, Newport, Nugget, Birka.



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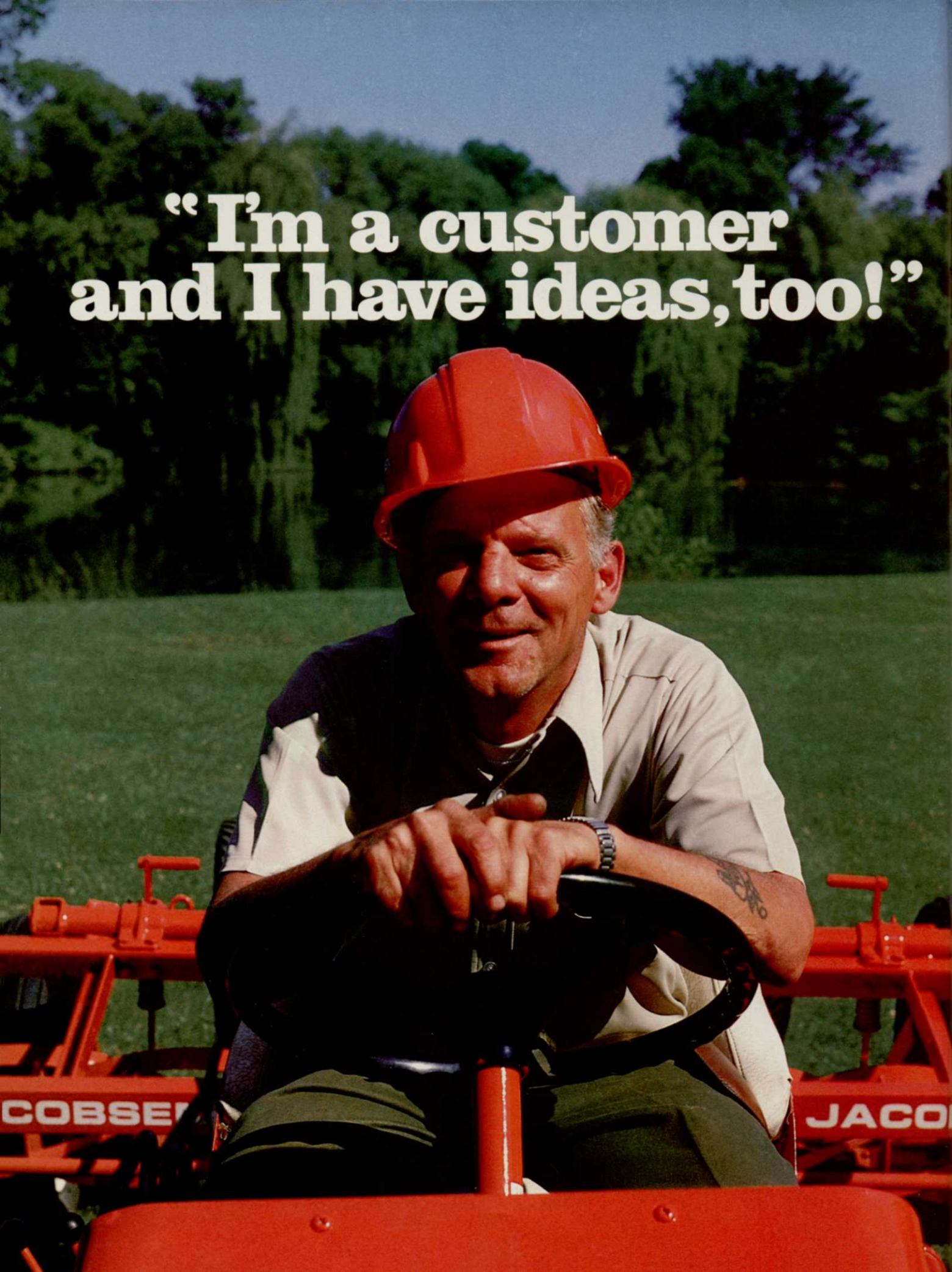
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Peter Loft

President of Loft's Pedigreed Seed Co., Peter and his brother Jon manage a diverse company in the turf and vegetable seed industry. Loft's proprietaries include Baron, Jamestown, Ram I, Yorktown, Rebel and Pinto reclamation mixtures.

Jacklin has commercial relationships with nearly all major seed companies in the world. They work closely with Lofts on reclamation mixtures and improved grasses. They work with many European firms for production and distribution. They produce much of the seed for Scotts, Bristol and Windsor, and Warren's A-20 and A-34.

Equally as significant are Jacklin's contributions to seed production technology. Row cropping to produce foundation seed had been done before by Bohnert, but Jacklin applied it to the production of certified seed. The original technology was using a stripper on natural stands in the midwest. In the Northwest this technology was altered to solid seeded stands of grasses which were cut and dried on large concrete drying slabs. Arden Jacklin applied row cropping to the field production of certified seed, used a swather to put the cut grass in windrows for drying in the field, and used a combine to pickup and separate the dryed seed from the stems. This technology cut losses of seed during drying and reduced seed handling to a minimum.

In 1972, Jacklin Seed Co. merged with Vaughan Seed Co. of Chicago to form the Vaughan-Jacklin Corporation. The Jacklin Seed division maintains its original integrity under this agreement according to Doyle Jacklin. In 1978, Jacklin moved to a new location in Post Falls, Idaho, and is rapidly expanding its seed handling and storage facilities there.

Today, Jacklin handles 80 different proprietary turfgrasses, half of which are in commercial production. It owns 5,500 acres and contracts another 16,000 acres for production.

Northrup King Co. began the first commercial breeding effort on the perennial ryegrasses for turfgrass use in 1956.

Northrup King Co., founded in 1884 as a seed store in Minneapolis, Minnesota, entered the turf seed business in the 40's with a line of lawn seeds. It was one of the first developers of improved varieties of agricultural crops in the 30's, with corn, and radishes.

Northrup King was among the first U.S. companies to begin a turfgrass breeding program in 1948, for ryegrasses and Kentucky bluegrass. In 1954, the first turfgrass trials to contain a large group of European varieties was established. During the early 60's, Northrup King released NK100 perennial ryegrass, Holfior Colonial bentgrass, Pelo perennial ryegrass, Prato Kentucky bluegrass and Ruby creeping red fescue. NK100, sold primarily through J & L Adikes, was the first improved turf-type perennial ryegrass made available to the market. Holfior was the first pure colonial bentgrass released in the U.S. and Ruby was the first pure spreading red fescue released in the U.S. Newport was the second improved bluegrass variety released in the U.S., following Merion.

Northrup King was one of the first to recognize and supply an overseeding mixture for the South with the release of Medalist in 1970. In 1972, it released NK200 perennial ryegrass which exhibited improved winter hardiness. In 1974, NK released Aquila and Parade Kentucky bluegrass varieties.

Since that time, Northrup King has been part of the release of the cultivars Adelphi Kentucky bluegrass, Pennfine Perennial ryegrass, Rugby Kentucky bluegrass, Eton, Delray, and Goalie perennial ryegrasses; Wintergreen and Atlanta Chewings fescues; Dawson red fescue; Scaldis hard fescue, and Fults *Puccinellia distans*.

Lofts Pedigreed Seed, Inc. was founded in 1923 by Selmer Loft as a local seed supplier. From its New Jersey location, it has been close to nearly all U.S. breeding work from Rutgers. Today, Peter and Jon Loft manage one of the largest seed companies in the U.S.

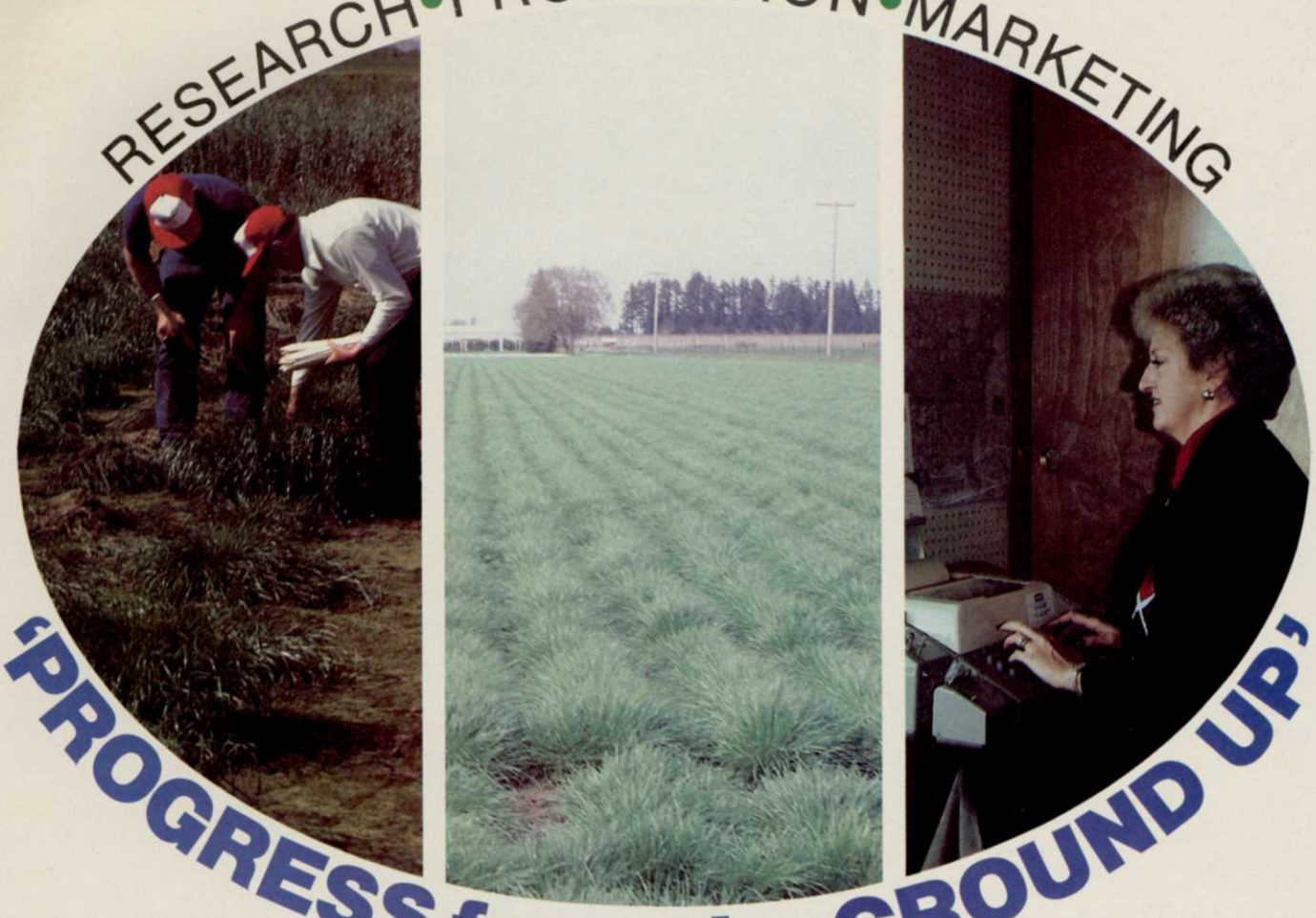
In 1962, Lofts purchased Great Western Seed Co., in Albany, Oregon, which had vast production contacts in the Willamette Valley and marketing arrangements with European seed producers. This strengthened its marketing and production position in the turf seed market. Through a series of expansion and acquisitions, Lofts broadened its base even further with outlets in Maryland, New York, Massachusetts, Wisconsin, and recently Sunbelt Seeds in Tucker, Georgia.

Lofts' closeness to university research, Northwestern production, European seed companies, and other U.S. seed companies, positions it very close to the center of the turf seed industry. Lofts and Jacklin are cooperating on reclamation mixtures for the future.

Included in the Lofts' stable of U.S. proprietary varieties are: Baron, Ram I, Georgetown and Mystic Kentucky bluegrasses; Yorktown, Yorktown II, and Diplomat perennial ryegrasses;

Bob Peterson

In the 15 years that Peterson has worked for E. F. Burlingham he has arranged for the proprietaries Bonnieblue, Majestic, Banner, and Falcon.



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Rebel tall fescue; Jamestown chewings fescue; and Beamont meadow fescue. Lofts and Jacklin share rights to the Pinto Reclamation mixtures.

O.M. Scott & Sons is greatly responsible for the commercial success of both professional and homeowner seed markets. Founded as a supplier of agricultural seeds in 1870, by Orlando Scott and his sons Hubert and Dwight. In 1890, the company began to handle turf seed and was prominent in the early years of common seed production in the Midwest. In the early 20's Scotts was a supplier of seed and stolons to golf courses and was the first to market German bentgrass to U.S. golf courses. In 1928, realizing the potential of the homeowner market long before others, Scotts began publication of Lawn Care, a small magazine of how-to tips for homeowners. Combined with the seed and the release of Turf Builder, the first turf fertilizer formulated for lawns, Scotts had begun to provide homeowners with a total lawn care package that was supported by educational material on its use. In 1936, the spreader was added to the product line, and in 1941, Scotts was one of the first to market 2,4-D as a turf herbicide. Another accomplishment was the introduction of the first preemergent crabgrass herbicide in 1950.

Scotts was more than a seed producer. Its emphasis was on meeting all the turf needs of a customer, not just one. Scotts has one of the largest turf research centers at its ProTurf headquarters in Marysville. The ProTurf Division was created in 1965 to realign the company with professional users of turf products. The division provides technical assistance in addition to products to golf course superintendents and landscape contractors across the U.S. ITT purchased Scotts in the early 70's.

Some of the improved turfgrass seed sold by Scotts includes Vantage, Victa and Bristol Kentucky bluegrass; Loretta and Caravelle perennial ryegrass; Banner chewings fescue, and Biljart hard fescue. Scotts deals with Jacklin for much of its seed production needs.

E. F. Burlingham and Sons was formed in the early 1900's by E. F. Burlingham as a feed and seed operation in Forest Grove, Oregon. His son Gordon and grandson George have followed in his footsteps. Burlingham has been involved in a variety of ways with the seed market. The company has a reputation as an international trader of turf seed due to its North American rights to European turfgrass seed such as Sydsport and Birka. These grasses may be sold by other seed companies but they are marketed through Burlingham as the wholesaler.

In 1964, Bob Peterson joined Burlingham from Northrup King and proceeded to arrange marketing rights for new material from Rutgers. These arrangements include turf seed Majestic and Bonnieblue bluegrasses; Banner chewings fescue; Belle perennial ryegrass; and Falcon tall fescue.

Dwight Scott

Son of the founder of O. M. Scott & Sons, Dwight led the company through the first half of the 20th Century. His goal was a complete product line for the turf industry and consumer education through Lawn Care.

Prior to this new material, Burlingham had handled mainly public varieties such as Merion, Highland bentgrass, Pennlawn red fescue, Linn perennial ryegrass and others. They manage seed production for re-export to seed companies in Europe.

J. & L. Adikes, like Scotts, was founded in 1855 as a local seed supplier and added a line of turf seeds later, in this case the early 30's. Located in Jamaica, New York, Adikes was not far from universities working on improved varieties. The company played an early role in the marketing of NK100 perennial ryegrass. Bob Russell, vice president, tells the story that Northrup King had abandoned the seed as a poor seed producer. He obtained some seed and had it tested in two different locations and it proved to be green longer in the fall and earlier in the spring. Adikes got Northrup King to look for any leftover NK100 seed. They found about 300 pounds and Northrup King took it from there, arranging production and Adikes handling marketing. This was prior to variety protection regulations and Adikes had to devise a way to protect its investment in the perennial ryegrass. This was accomplished by only selling NK100 in a mixture. Adikes took all production of NK100 into the mid 70's. Russell believes this experience with NK100 in the late 50's got Reed Funk interested in a perennial ryegrass improvement program at Rutgers which resulted in the development of Manhattan.

Adikes owns the rights to the first bluegrass hybrid from Reed Funk and Jerry Pepin at Rutgers, Adelphi. Adelphi is considered one of the most consistent bluegrass performers across the country. Adikes was an early promoter of using a blend of bluegrass over a single one in the mid-50's.

Stanford Seed Co. in Plymouth Meeting, Pennsylvania, is a strong supporter of the reclamation market with Penngift crownvetch. Tioga deertongue, Birdsfoot Trefoil and Lathco flatpea. It was also the original marketer of Pennfine perennial ryegrass. The company has placed reclamation and highway grasses as a specialty.

In late 1979, Stanford arranged the purchase of Whitney Dickinson in Buffalo, New York, and thereby regained a marketing role with Pennfine as a member of SPIC. Stanford had earlier been one of the original marketers of Pennfine.

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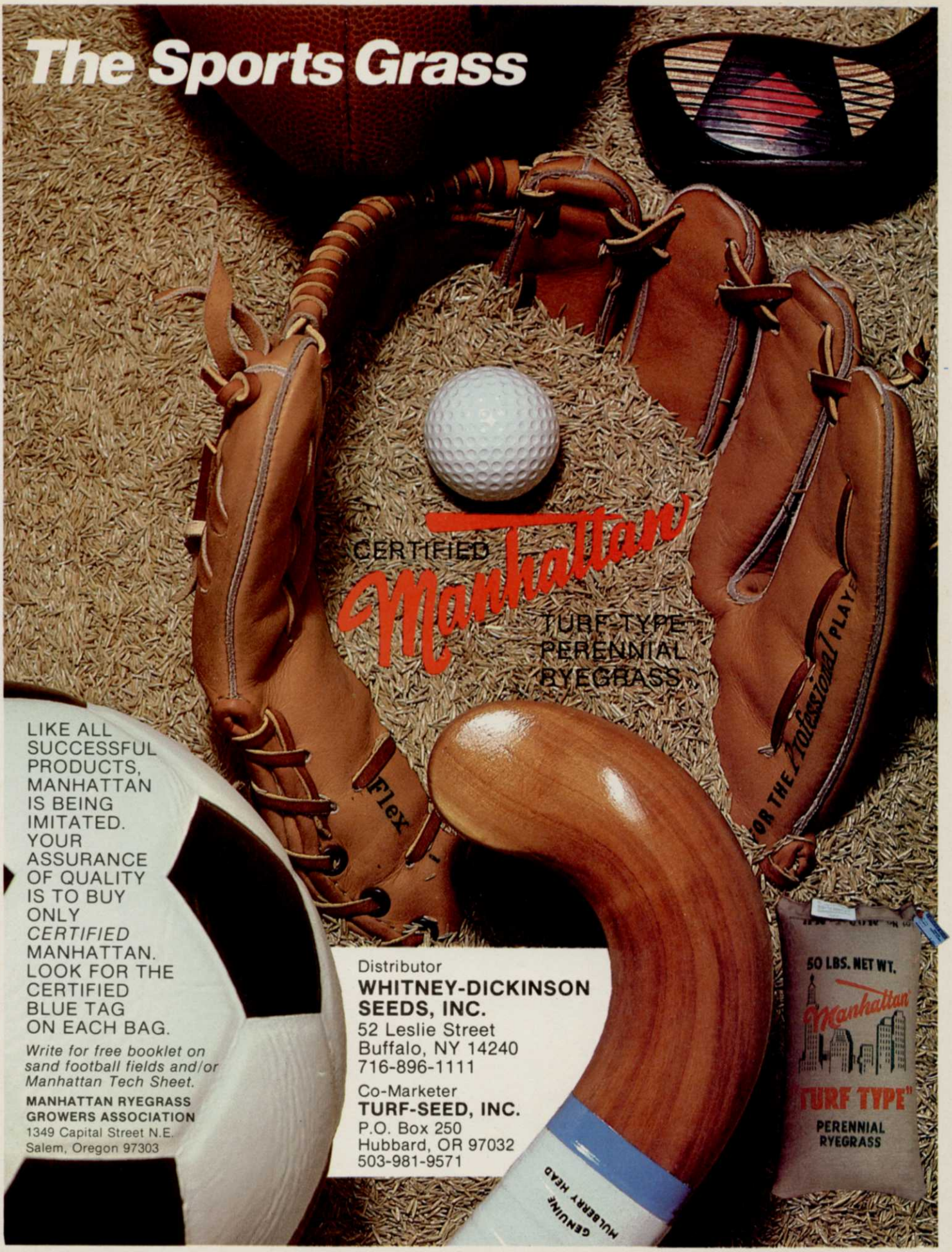

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THE BREEDER

In the last 50 years, plant geneticists have brought us from virtual ignorance to space age radioactive mutation techniques. The research, once lagging , is now ahead of the consumer in many respects.

The pioneers in turfgrass breeding had little to go on. Today, students have the opportunity to train under the originators of the science.

For example, Dr. Richard Skogley at Rhode Island, worked and trained under Jesse DeFrance, one of the original specialists in bentgrasses. Skogley's students include Richard Hurley, vice president of research and development at Lofts Pedigreed Seed Co.; Jim Wilkinson, director of research for Chemlawn Corp.; Victor Gibeault, extension agronomist for the University of California; Tom Cook, extension turf specialist at Oregon State University; and Bob Mazer, turf specialist at Clemson University.

Another example is Henry Indyk of Rutgers had considerable influence on Reed Funk's decision to be the first full-time turf geneticist at Rutgers. Indyk came from Nebraska where Fred Grau had helped establish a turf program. Today, Jerry Pepin Kevin McVeigh, and other Funk students are making substantial contributions to turf breeding.

The future presents significant challenges to turf breeders. Rising costs for water, fertilizer, insecticides, fungicides and herbicides will force development of hardier species for climatic regions. Joe Duich of Penn State points out, "There is still no satisfactory turfgrass for fairways in the North. Fairway grasses must stand up to low cutting, heavy irrigation, and *Poa annua*. In the future, overuse of water and chemicals will be discouraged and the grass on the fairway will have to get by on less. We have been working on a strongly rhizomatous colonial bentgrass. We must adapt to reduced levels of maintenance by developing turfgrasses that match this lower level of maintenance."

For the transition zone tall fescues and other deep rooting grasses are needed to survive without extreme dependence upon irrigation.

In the South, insect resistance must be added to the traits of improved grasses. Work with centipede may eventually obtain this goal.

Reclamation grasses are bringing us back to the grasses indigenous to North America, such as buffalograss, gama grass, and reed canarygrass. We are rediscovering our prepioneer ecology. These grasses survived years of natural selection and have potential for low or no maintenance areas such as highway roadsides, large parks, and reclamation.

The progress in the next 20 years will match and exceed that of the last 50 years. To be part of this progress, one must know what happened in the first 50, to appreciate the next 20.

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IMPROVED TURFGRASSES

All grasses are Monocotyledons belonging to the family Gramineae. They are constructed of narrow and parallel-veined leaves which grow from a hollow stem, the culm.

The grass family is one of the most numerous and most important plant species to man, with more than 600 genera and 10,000 species.

All cool and warm-season grasses considered turf type today originated outside of the United States. Most cool-season grasses were brought to North America from Europe during colonization, including bentgrass, all fescues, ryegrasses, and bluegrasses. Even crabgrass came from Europe. If you are wondering what grasses are indigenous to North America, they include buffalograss, reed canarygrass, and blue gama.

Warm-season grasses had the following origins; Bermudagrass - Africa, Centipedegrass - S.E. Asia, Zoysia - Asia, St. Augustine - Africa, Bahiagrass - Brazil, and Kikuyugrass - Africa.

Turfseed selection and development is a building process. First collections of turf and forage type grasses are made. Selections from these collections are the first level of improved turfgrasses. These selections are crossed to get first generation hybrids. The most recent group of improved turfgrasses are crosses of first generation hybrids. These are considered second generation hybrids.

The turf seed market has developed into an attractive market with adequate protection for proprietary turfgrasses. The additional push on development of new turfgrass varieties by private enterprise is causing an evaluation of all types of grasses for turfgrass use. The reclamation market and low maintenance turfgrass market are considering grasses which were previously excluded from breeding and selection work. Now, all genera and species are being considered for a role in the turf market.

Glenn W. Burton

Breeder of the "Tif" series of bermudagrasses and originator of radioactive mutation techniques for turfgrasses.

An outline of each genus applicable to turf are needed to grasp the overall scope of turfgrasses today.

COOL SEASON GRASSES

Bentgrasses

Bentgrasses, because of their importance to golf, received much of the initial attention of turf researchers. Bentgrasses are naturally low-growing and tolerate low mowing. Redtop and German creeping bentgrasses were common on golf courses and other turf areas prior to the 40s. Scotts used to sell German bentgrass stolons to golf courses in the 20's.

Much of the early work of the USDA and USGA Green Section involved bentgrasses. Pennsylvania State, the University of Rhode Island, Oregon State Agricultural Experiment Station, and Rutgers all contributed to selection and development of bentgrasses.

There are three primary types of bentgrasses used for turf today; creeping bentgrass, colonial bentgrass and velvet bentgrass.

Creeping bentgrass, *Agrostis palustris*, is very aggressive when fertilized and irrigated. It is propagated either by seed or stolons. Seeded varieties at one time exhibited a certain degree of segregation which would cause a green to look patchy. The problem has been resolved for the most part with the newer varieties. Improvements in disease suceptibility have also been made with newer varieties. The latest release is Penneagle (1979) developed by Joe Duich at Pennsylvania State University. Penneagle was evaluated for more than 20 years before its release. Penncross was released in 1954 by Penn State and suffered from lack of protection until Tee-2-Green Corp. was established to represent growers and to control purity in the mid-70's. Tee-2-Green also markets Penneagle.

International Seeds, Inc., distributes a Swedish creeping bentgrass called Emerald. It is known as Smaragd in Europe and is owned by W. Weibull in Sweden. Emerald was developed in Europe from progeny of Congressional, a vegetative variety developed in the U.S.

The oldest seed type creeping bentgrass marketed today is Seaside, selected by Oregonian Lyman Carrier and released in 1928.

Colonial bentgrass, *Agrostis tenuis*, is aggressive but has a lower tendency to creep. The last cultivar to be released in the U.S. was Exeter by Rhode Island in 1963. It too suffered from lack of protection and marketing effort, but will soon be repromoted by Pickseed.

Introducing RAM I -a shade better...and better in the shade.

KENTUCKY BLUEGRASS

RAM I was found growing on the ninth putting green at Webhannet Golf Club in Maine. There it grew vigorously though consistently mowed at ¼". It was selected by Mr. Ernest W. Brown, superintendent, in consultation with Alexander M. Radko, National Research Director, USGA Green Section. The original plant was submitted to Dr. C.R. Funk at Rutgers University for further evaluation and testing. University testing proved this new variety to have superior qualities.

Having been selected and tested by two of the leading turf specialists, RAM I is now brought to you by two leading seed companies.

Available through your nearest Lofts or Jacklin distributor.

Test results available on request.

- Thrives, even in the shade.
- Gives faster spring green-up when compared with other Kentucky bluegrasses.
- Is very competitive against Poa annua even when mowed under 3/4".
- Has improved disease resistance — especially to stripe smut and powdery mildew.

LOFTS

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RAM I Kentucky bluegrass is in no way connected with RAM of the Colgate Sports Groups of Companies.

1. *Lime is applied to the fields after they have been turned under. Then the fields are plowed again and fine graded, very similar to soil preparation for lawn seeding.*

2. *Charcoal banding is a process where the seed and liquid fertilizer are layed in rows and sprayed with a band of charcoal covering the seed. The charcoal protects the seed from Karmex or Atrazine applied to kill weeds.*

3. *Grassland drills are an economical way of reestablishment of the seed crop. This can only be done if the fields are burned to get rid of the straw. Drilling is a one-step process putting down both seed and fertilizer.*

Northrup King distributes Holfior, a colonial bent developed in 1940 by D.J. van der Have of the Netherlands. Highland colonial bentgrass is a public variety released by the Oregon Agricultural Experiment Station in 1934. Production of this seed is carefully watched by an association of growers for quality and supply reasons.

Astoria was also released by Oregon in 1936. It does not have the winter hardiness of Exeter.

Velvet bentgrass, *Agrostis canina* L., has an extremely fine leaf which gives it a velvet appearance. It is less aggressive than creeping bentgrass but more aggressive than colonial. Velvet bentgrass is more tolerant of acidic soils than the other bentgrasses but prefers well drained and well aerated soil. New England is a prime area for use of velvet bentgrass in the U.S.

Rhode Island's Richard Skogley released Kingstown in 1963 as a public variety. It was the first velvet bentgrass released since the depression. Pickseed intends to market and promote Kingstown soon.

Redtop bentgrass, *Agrostis alba* L., is a coarse, stemmy bentgrass well adapted for use on poorly drained, infertile soils such as roadsides. It is occasionally used in mixtures for low maintenance areas.

Bluegrasses

Kentucky bluegrass is the most popular turfgrass in North America and as such has more cultivars available than any other turfgrass. The prime factor in bluegrass improvement was the discovery of apomixis, a characteristic which limits cross-pollination of some Kentucky bluegrass varieties. Kentucky bluegrasses which exhibit this characteristic were considered asexual and thus received patent protection prior to the 1970 Plant Variety Protection Act which provided protection to sexually propagated plants.

Dr. C. Reed Funk at Rutgers developed the technique to create Kentucky bluegrass hybrids that were apomictic. His work is part of nearly every Kentucky bluegrass developed since the mid-60's. Most other improved varieties are based upon collection and selection work.

Recently, International Seed, Inc., released a variety of rough bluegrass, *Poa trivialis*, called Sabre. Sabre was developed by Reed Funk and William Dickson at Rutgers for shady, moist areas where a low-growing bluegrass is desired and for southern overseeding.

Kentucky bluegrass, *Poa pratensis* L., is the backbone of turf in the Northern U.S. Releases of improved Kentucky bluegrasses began in 1947 with the official release of Merion. The emphasis behind improvement programs for Kentucky bluegrass was disease resistance, color, low growth habit, texture, and sod strength. Later winter hardiness, shade tolerance, traffic tolerance, establishment rate, and spring and fall color were added to the list.

Merion had been found as a naturally superior Kentucky bluegrass by Superintendent Joe Valentine at Merion Golf Club near Philadelphia in 1936. It has proven itself under low mowing and golfer abuse. Nature did the work, but it took Valentine to find it and the Green Section's Fred Grau and Pennsylvania State's Musser and Duich to refine and evaluate it for the market.

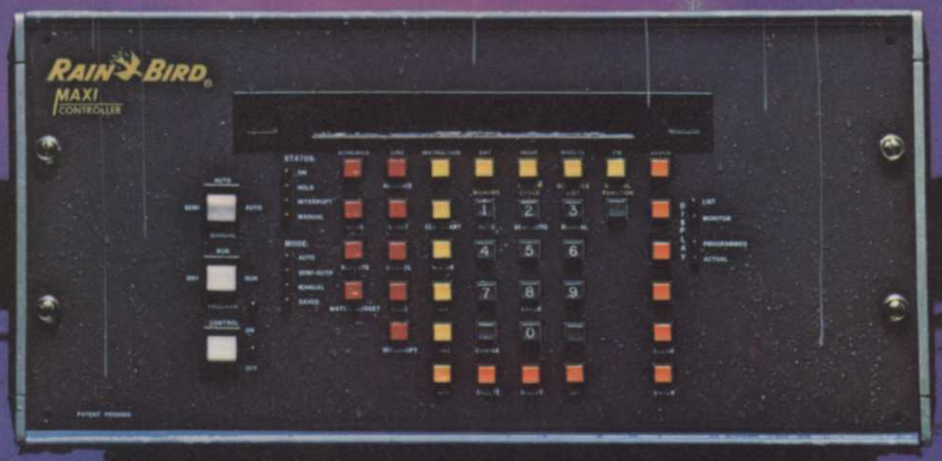
Other Kentucky bluegrasses collected and selected include the European varieties Fylking, Baron, Aquila, Parade, Sydsport, Cheri, Birka, Enmundi, and Rugby. U.S. varieties collected and selected include Warren's A-20 and A-34; Glade, a shade tolerant bluegrass found by Reed Funk in an Albany, NY lawn ; Ram I, which Green Section director Al Radko and Superintendent Ernest Brown found on his golf course in Maine; Scenic, picked out of a field of Merion by seed grower Otto Bohnert; and Newport, found by extension specialists in Oregon.

The selection process continues as an important contributor to new Kentucky bluegrasses. As the germ plasm base is expanded, the number of possible hybrids increases. From selections processed through Rutgers, Funk's team was able to develop the hybrids Adelphi, Bonnieblue, Majestic, America, and Bristol. Rutgers has been involved with the selections Glade, Touchdown, Columbia, Plush, and Brunswick.

O.M. Scott & Sons has developed the hybrid Merit and the selections Vantage, Victa and Windsor.

Dick Bailey, formerly a partner in Turf Seed and now working for Jacklin, found the selection Shasta out of a field of Pennstar. Shasta is considered a bluegrass specifically for the Northwest. Pennstar was a selection by Pennsylvania State. Sodco is a selection developed at Purdue.

THE SHAPE OF RAIN TO COME.



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SEED PRODUCTION

6. *Spot spraying in the spring. The spray is a combination of Roundup and a red dye so one can tell what has been sprayed.*

5. *Fields are sprayed with selective herbicide in the fall to control broad-leaf weeds. Each swath of the sprayer is 40 feet wide.*

4. *Fields in early spring. Taller plants are volunteer ryegrass and will be spot sprayed in the spring*

Fescues

There is currently a great deal of effort on fescue improvement and development. A number of companies are working to serve the transition zone with an improved tall fescue. Hard fescues are also being studied and two have been released.

There are five types of fescue used for turf; creeping red, chewings, tall, hard and sheep.

Creeping red fescue, *Festuca rubra*, is a fine leaved fescue which is often used in mixtures with Kentucky bluegrass and perennial ryegrass. It germinates more rapidly than bluegrass, but not as rapidly as perennial ryegrass. Fescues tolerate drought and infertile soil better than both Kentucky bluegrass and perennial ryegrass. Under dry periods on clay soils, the fescue may dominate the stand.

Much of the improvement in creeping red fescues has taken place in Europe. D.J. van der Have of the Netherlands developed Ruby and the Sports Turf Research Institute in Bingley, England developed Dawson. Both of these are marketed in the U.S. by Northrup King. International Seeds Inc. markets Ensylva. In 1954, Pennsylvania State released Pennlawn. Prior to that, Oregon State released Illahee. Pickseed markets Agram from the Netherlands.

A chewings fescue is one that doesn't creep. Chewings fescue, *Festuca rubra* var. *commutata*, originated in Europe, but much of the original production took place in New Zealand. In the 30's, much of the chewings fescue on the market came from New Zealand and suffered from poor germination. Rhode Island, Michigan, and New Jersey (Rutgers) experiment stations contributed to the improvement of chewings fescues. Rutgers developed Banner which is marketed by Burlingham. Rhode Island developed Jamestown from material found by Richard Skogley on an abandoned green in Jamaica, NY. Jamestown is marketed by Lofts. Wintergreen was developed at Michigan State from material from the Netherlands. Northrup King markets Wintergreen, and the European variety Atlanta. Turf Seed released Shadow chewings fescue in 1980. International Seeds markets Highlight, developed by Van Engelen of the Netherlands as a chewings type red fescue. Other well-known chewings fescues are Golfrood from the Netherlands and Cascade developed at Oregon State University in 1964.

Tall fescue, *Festuca arundinacea*, is a coarse fescue with a bunch type growth habit. However, it has a deep root system and survives on infertile, salty, low maintenance areas such as roadsides and parks.

The primary varieties are Kentucky 31 developed by E.N. Fergus at the University of Kentucky in the late 40's, and Alta, developed in 1947 by Harry Schoth, an agronomist with USDA in Corvallis, OR. Fred Grau assisted in getting Alta planted on a number of highways to prove its advantages. Alta is not a preferred grazing grass for cattle.

C. Reed Funk

The first full-time turfgrass breeder in the U.S. serving the New Jersey Agricultural Experiment Station at Rutgers. Funk was the first to develop hybridization techniques for Kentucky bluegrasses.

Kentucky 31 is often used for turf in the transition zone due to its ability to withstand hot humid summers and acid soil. To provide turf managers in the transition zone with finer-bladed tall fescue, Loft has released Rebel tall fescue and Burlingham has released Falcon, developed in cooperation with Bill Meyer at Turf Seed.

For similar reasons, hard fescue, *Festuca ovina* var. *duriuscula* L. Koch, has received attention. In addition to good drought tolerance, it exhibits good shade tolerance. Northrup King markets Scaldis and Scotts markets Biljart developed in the Netherlands. Pickseed markets Tournament from the Netherlands.

Sheep fescue, *Festuca ovina* L., has fine leaf texture and exists on acid, coarse soils. It has good shade and drought tolerance but appears bunchy.

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SEED PRODUCTION

7. *Fields are cut and windrowed while seed is still green and less prone to shatter.*

8. *Whirlwinds can pick up the windrowed grass and carry it up to a mile contaminating nearby fields of other seed types. Whirlwinds and rain can seriously damage the crop in its last days of production.*

9. *Combines mechanically separate the seed from the straw by a series of rub bars incorporated in the thrashing machine.*

Perennial Ryegrass

Next to Kentucky bluegrass, perennial ryegrass, *Lolium perenne*, has received the most attention from breeders and developers. This attention, however, wasn't attracted until the late 60's when new material from Rutgers and Penn State reached the market.

In the mid-60's, production of perennial ryegrasses rarely exceeded 150,000 pounds. Manhattan, Pennfine and a whole new series of perennial ryegrasses made turfgrass seed buyers take note, and in 1980 growers expect a crop of nearly 25 million pounds.

Bob Russell of Adikes is credited for the acceptance of perennial ryegrasses by northeastern golf course superintendents, sod producers and landscape contractors with his NK100 mixtures. The southern overseeding market was first broken by Northrup King and the other members of the Seed Production and Introduction Corp. (SPIC). Lofts, Turf Seed, Pickseed West, and International Seeds have southern overseeding mixtures available also.

Perennial ryegrasses are sexually propagated by crossing and polycrossing. This is similar to bentgrasses in that various parents are grown together in the seed field and crosspollinate to produce the variety of seed.

In the mid-60's, the New Jersey Agricultural Experiment Station (Rutgers) turfgrass breeding program was led by C. Reed Funk. Jerry Pepin was Funk's student at the time. These two men at Rutgers and Joe Duich at Penn State started a revolution with improved ryegrasses.

Pennfine was released by Duich in 1968, after Manhattan had been released from Rutgers. It was a three-clone variety, with two parents originally from Pennsylvania golf courses and one from a grass tennis court. Duich made the decision to hold off marketing Pennfine until the expected Plant Variety Protection Act was passed (1970). Today, Pennfine is succesfully marketed by SPIC.

Manhattan, however, was released prior to the Plant Variety Protection Act and did experience problems early in its marketing. It was first marketed in 1968 by Bill Rose of Turf Seed who had taken six pounds of breeder seed and gotten production started. Today, Manhattan is marketed by Turf Seed and Whitney Dickinson as agents to the Manhattan Ryegrass Growers Association.

Rutgers has taken part in some way with an amazing number of perennial ryegrasses. They include: Blazer, Dasher, and Fiesta from Pickseed West; Belle from Burlingham; Derby from International Seeds; Goalie, Delray and NK-100 from Northrup King; Omega from Turf Seed; Pennant from Agricultural Services; Diplomat, Yorktown and Yorktown II from Lofts; and Regal from North American Plant Breeders.

Turf Seed developed Birdie and Citation. Northrup King has developed Eton, Epic, and NK-200. International Seeds has developed Clipper and Scotts has developed Caravelle.

European material includes Loretta from Scotts and Hunter and Elka from International Seeds.

One use of perennial ryegrasses that is receiving a great deal of attention is as a transition grass for the south. It is overseeded in large quantities to keep greens colorful and soft in the winter. Turf Seed has developed a annual/perennial ryegrass for overseeding, called Dragreen.

Jerry Pepin

A student of Reed Funk's in the 60's, Pepin has carried perennial ryegrass improvement from Rutgers to Rudy Patrick and now to International Seeds Inc. of Halsey, Oregon. He is the breeder of Derby, Regal and a number of other improved turfgrasses.

Crownvetch

Crownvetch, *Coronilla varia L.*, is not a grass or monocotyledon. It is a perennial, dicotyledon herbaceous plant with pinkish blossoms that serves to cover and stabilize roadsides and slopes due to its spreading ability and deep root system. Stanford and Turf Seed market Penngift Crownvetch, which was discovered, produced, and promoted by Fred Grau of Penn State. Grasslyn Farms, managed by Fred Grau Jr., produces much of the seed for Stanford to market.

An odd situation with Penngift was when Grasslyn was the only producer of the seed, the Highway Department would not buy from it because it was a monopoly. This led to the development of Chemung and Emerald Crownvetch by the Soil Conservation Service in the early 60's.

Grau discovered the legume on a Pennsylvania farm in 1935. In 1947, he had produced seed on his farm and gave demonstrations of the cover across the state. Burt Musser suggested Grau scarify the seed to improve germination in 1951. Due to the problem with the Highway Department, Grau had to assist in setting up his competition.

WARM SEASON GRASSES

Bahiagrass

Bahiagrass, *Paspalum notatum* Flugge, was brought to the U.S. from Brazil as a low maintenance turf for semitropical areas. Argentine and Pensacola are varieties developed by the Florida Agricultural Experiment Station in the late 40's.

Hugh Whiting, a private turf breeder in California has developed Adalayd, *Paspalum vaginatum*, to improve the species.

Bermudagrass

Bermudagrass *Cynodon dactylon*, is the most important warm-season turfgrass in the U.S. It is propagated mainly vegetatively.

Many states have been involved in improving bermudagrass, including Florida, Kansas, Texas, California, South Carolina, Oklahoma, Arkansas, Alabama, Georgia and Maryland. However, their work is overshadowed by the developments of Glenn Burton with the USDA in Tifton, Georgia.

Burton began his work on the "Tif" series in 1946 after being encouraged by Fred Grau and Olaf Aamodt from USDA Beltsville. He collected dwarf pasture bermudagrasses and crossed them with selections from golf greens. Golfers were complaining that bermuda greens were too coarse. From these hybrids, Burton selected one released as Tiflawn in 1952. But Tiflawn was still too coarse for greens. A finer turf was required.

Bill Meyer

Director of Pure Seed Testing in Hubbard, Oregon, and leading turfgrass specialist in the area of stem rust. Meyer is finishing development work on an improved Merion and an improved Manhattan.

Burton got hold of a bermudagrass from Africa, *Cynodon transvaalensis*, a softer, finer variety. He bred the African bermuda with a dense selection of *Cynodon dactylon*. The result was a sterile, but improved variety which he called Tiffine. It was released in 1953. But the bermuda was sterile and improvement stopped at that point for that turfgrass.

Burton went back to his collection for another *C. dactylon* to breed with *C. transvaalensis*. He selected a bermuda from Charlott Country Club in North Carolina. The cross produced another sterile bermuda which he called Tifgreen. It was released in 1956 and made a much improved bermuda for greens.

Looking for better frost tolerance, Burton made a third cross with *C. transvaalensis*. He got what he wanted but it was stiffer than Tifgreen. This bermuda was released in 1960 as Tifway.

Fortunately, Tifgreen produced a vegetative mutant with finer stems, smaller and darker leaves. Burton

SEED PRODUCTION

10. *Field burning to stimulate the plants for next year's production, remove straw residue from the fields, and disease and insect control.*

11. *Experimental field burning machines were tried to control the volume of burning but they were dropped as too expensive and unreliable.*

Photos courtesy of Harry Stalford, International Seeds Inc.

released Tifdwarf in 1965.

Since 1965, Burton has experimented with ways to cause mutations of the sterile bermudas he has produced. In 1970, he first used radiation to produce mutants and was successful.

This space-age technology has produced more than 150 mutants for evaluation. Burton says he expects to release one or more of the mutants within the next year.

In more conventional methods of selection, good varieties of *C. dactylon* have been developed. U-3 was one of the first selected from material supplied to USDA in Arlington and later Beltsville by Lester Hall. Hall found the bermuda on his golf course in Savannah, Georgia. It was released as U-3 in 1947. Ormond from Florida, Royal Cape from California, Texturf from Texas,and Tufcote from Maryland are selections of *C. dactylon*.

Other crosses of C. dactylon and *C. transvaalensis* have been accomplished by Florida (Everglades), Kansas (Midway), and South Carolina (Pee Dee).

Uganda is a natural selection of *C. Transvaalensis.*

Centipedegrass

Centipedegrass *Eremochloa ophiuroides*, originated from China. It exhibits poor wear tolerance, but provides an adequate turf in warm regions without great care. It exhibits extremely tough resistance to insects and disease which may cause a closer evaluation in the future. It may serve for lower traffic areas on fairways and roughs.

Kikuyugrass

Kikuyugrass, *Pennisetum clandestinum* is another turfgrass brought from Africa for use in the U.S. It is a tough turfgrass which tolerates high temperatures, low cutting, wear, and some shade. Extended cold weather will damage it however.

St. Augustine

St. Augustine *Stenotaphrum secundatum*, is second to bermudagrass for warm season turfgrass use. It is an aggressive, low-growing, heat tolerant, blue-green turfgrass. Like Kikuyugrass, it will not tolerate extended cold temperature. It forms a good sod and can tolerate some shade. Overfertilization can create severe thatch buildup. Floratine is a variety developed by Florida Agricultural Experiment Station specialists.

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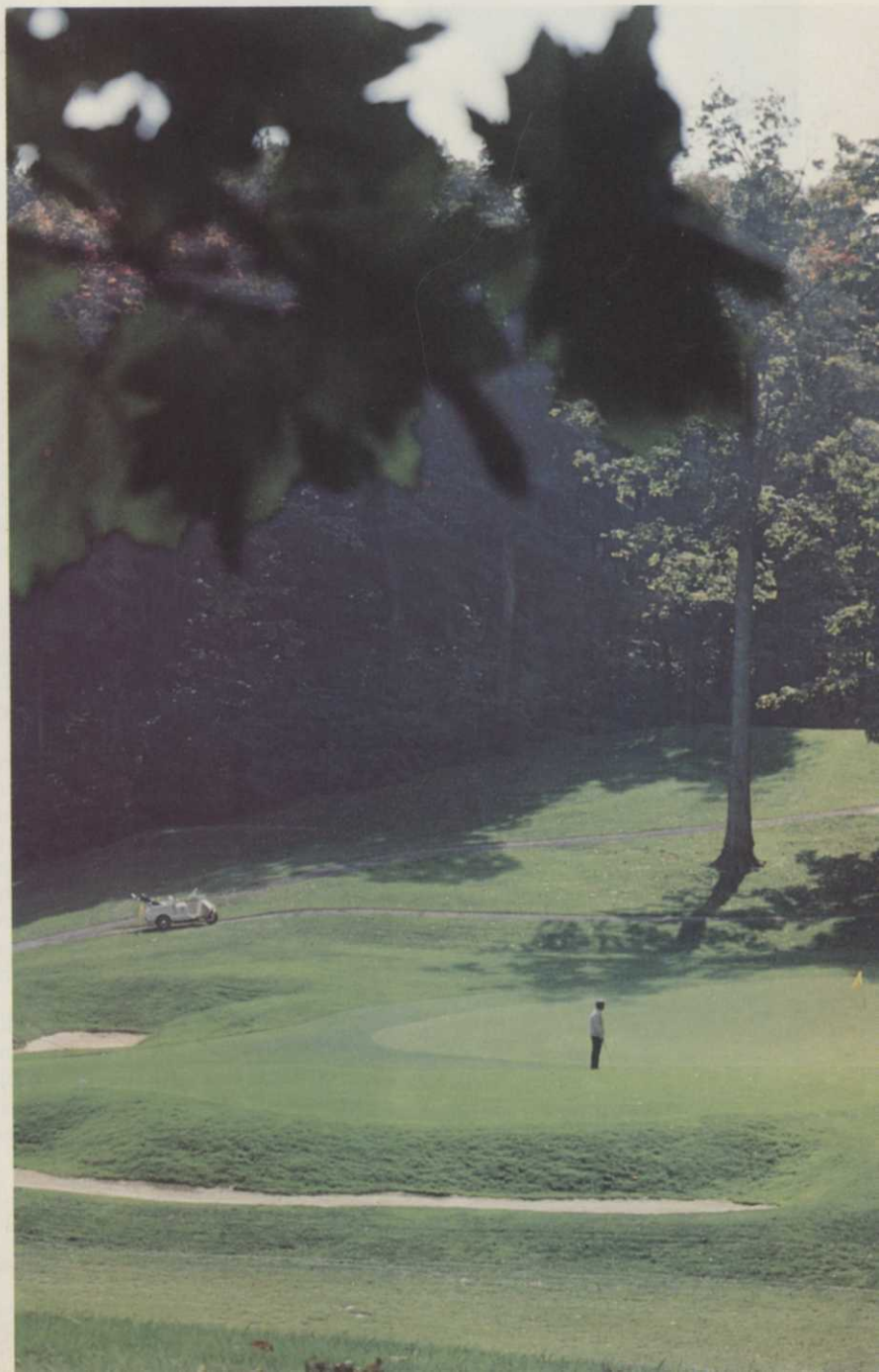

THE GROWER

The grower turns the hopeful findings of the breeder into reality. He is an agronomist, an engineer, a speculator. If a crop fails, he is responsible for the loss.

In the history of improved turf seed production, there have been three types of growers. The first is the old Midwestern farmer who agreed to keep his cattle off a field of common bluegrass so that the stripping crew could harvest the seed in summer.

The second is the farmer in the Northwest, driven by curiosity and financial temptation, trying something new. Otto Bohnert, Howard Wagner and the Geary brothers are this type of grower. Their curiosity motivated them to enter the turfgrass seed business in the 40's and 50's. Today, there are many more farmers in the Northwest who could grow other seed or vegetable crops, but instead grow turfgrass seed.

The third is the owner/grower. He is more than a supplier to a marketing agency. He owns the land, grows the seed crop, owns the cleaning plant, and has large impact on marketing decisions. The Jacklin family were notably the first. More recently, Bill Rose of Turf Seed and Willard McLagan of International Seeds Inc. wear a number of hats during the year.

These men must contend with things like unpredictable volcanoes, summer rains, environmental regulations about field burning, collecting from distributors, construction and depreciation of large cleaning plants, and how universities are rating their product. Their load of responsibility is tremendous. They have more to lose and they try harder as a result. Without their constant pushing the market may not have progressed as it has.

The ability to control production of a new turfgrass seed has pushed them toward a new dimension, their own breeding programs. Today, a grower can manage seed production from the development of the cultivar to the bag on the loading dock.

The grower has quality standards which he must meet. State seed certification regulations require constant sampling of seed for offtypes and inert matter. Bentgrass or *Poa annua* in bluegrass is disastrous and the grower must constantly prove his product is labelled properly. To a degree, there is a bit of the buyer beware in the seed market. Reading the seed tag is the only way to know what you're buying. Certified seed is your only assurance of that.

The grower is the key link in the production and distribution of turf seed. If he has a bad year, seed prices go up and every turf manager pays. If you buy certified seed, the grower will provide you with a reliable, high quality product on which you can stake your professional reputation on daily.

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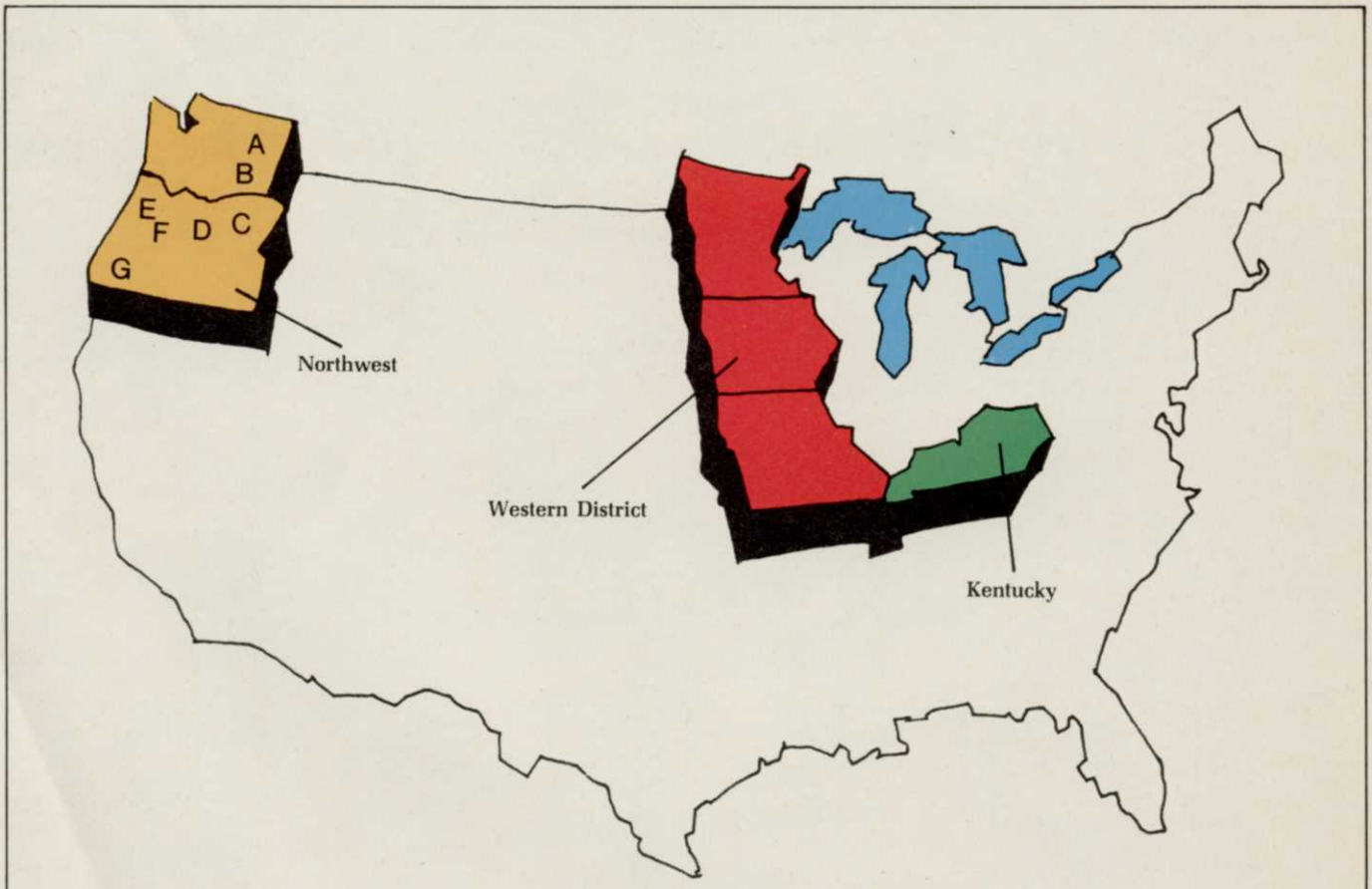
CERTIFICATION AND MARKETING

The reputation of a golf course superintendent, grounds manager, or landscape contractor depends upon his materials. Not only is it his responsibility to recommend the appropriate type of seed for a particular site, he must make certain the seed he buys is weed-free.

For example, if you are seeding a Kentucky bluegrass/perennial ryegrass/red fescue mixture, you could end up with more bentgrass than ryegrass or fescue. Where did the bentgrass come from? If you purchased uncertified seed this is very possible. As little as two percent bentgrass in a mixture with ryegrass or fescue will provide more bentgrass seeds than ryegrass or fescue seeds.

The need for certification is obvious. Under pressure from agricultural interests, states began to establish minimum purity standards in the 40's. Each state has specific requirements for seed purity. These standards are not merely about



Seed Production Areas. *Seed stripping crews started in Kentucky in early June and worked northward in the Western District. Today, some common bluegrass is grown in the Midwest and Canada, but by far the most improved turfgrass seed is produced in the States of Oregon, Washington and Western Idaho. Notable areas in the Northwest are (A) Spokane Valley, (B) Pomeroy area, (C) Union County, OR, (D) Madras area, (E) Willamette Valley, (F) Silverton Hills bentgrass region, (G) Rogue River Valley.*

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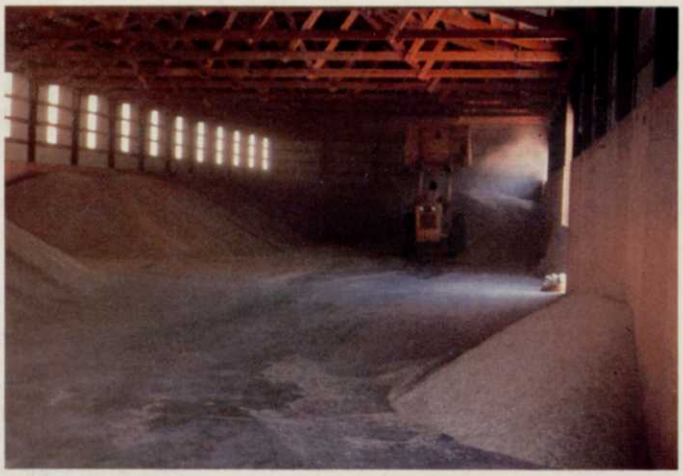
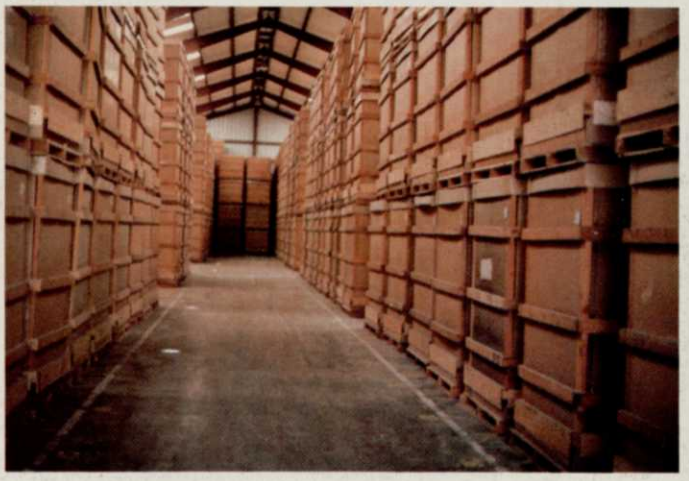




Bin storage of seed *following harvest and before cleaning (upper left).*
Seed separator *(right)which removes weed seeds, improper turfgrass seeds and trash from the seed brought from the fields and stored.*
Bulk storage *after cleaning and before bagging (bottom left).*

levels of impurities in the final product, they dictate how close a field of one seed type is to a field of another type. Each step of production is inspected by state officials to keep track of the seed lot from planting to bagging.

The purpose of certification is not just to protect the consumer from impurities, it is to protect the genetic integrity of the turfgrass type. With the increased number of cultivars of a particular species of grass, it is critical to keep the seed of one separate from another. The similarities between some Kentucky bluegrass seeds is so great, even microscopic detection is impossible. You may not know what cultivar you have until the seed germinates and the actual plant becomes evidence.

To prevent intermingling of cultivars, fields used for growing seed of one type may be restricted for growth of another seed type. Fields must be at least regulation distance apart to prevent contamination of adjacent fields. Herbicide treatments are timed to eliminate any weed seeds brought to the surface by cultivation. Burning eliminates all straw, weed seeds, and new generation seed left on a field after combining. Usually a planting produces seed for three years before it is plowed under and a new planting made. The burning does not kill the parent seed plants, only seed and trash leftover in the field after harvest.

Current production techniques were developed to produce purity at a reasonable cost. Seed is drilled into the soil rather than upsetting the soil by cultivation and surface seeding. Soil disturbance uncovers buried, but viable weed seed. Studies have shown that colonial bentgrass seed can remain viable for more than five years when buried.

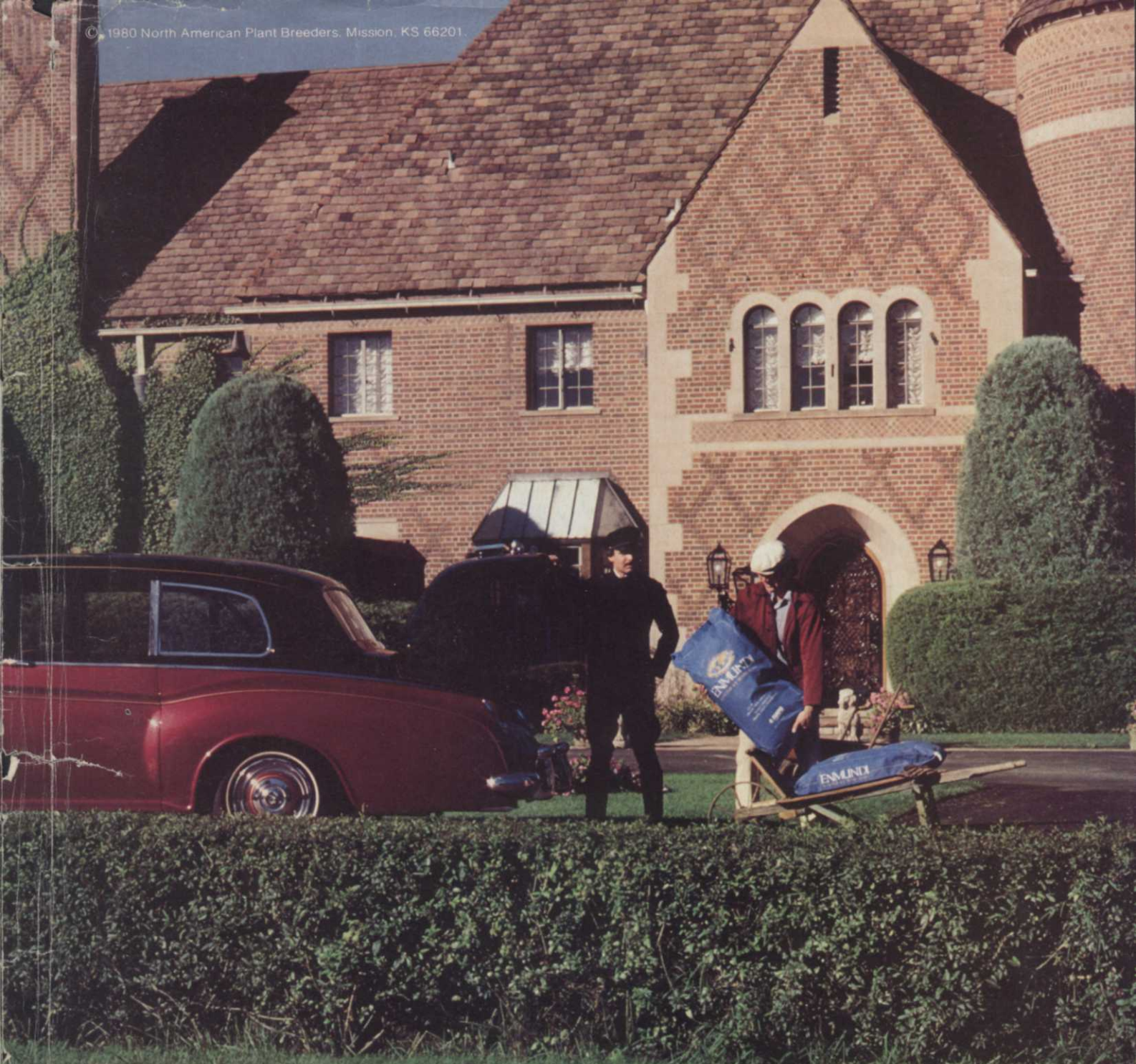
One method of planting uses a seed drill and a devise which covers the seeded row with activated charcoal. Herbicide is then applied with a boom sprayer and the charcoal protects the foundation seed from harm.

After the seed has germinated and grown for two or three months, a selective herbicide is applied to remove weeds. The grass goes into dormancy for the winter.

In the spring, spot treatments are made during a procedure called roguing to eliminate offtypes and weeds.

In June and July fields are mown when still green. This eliminates losses to seed shattering by equipment. The seed dries on the stalk in windrows in the field. If it rains the windrows are turned over once. About two weeks later, providing rain has not spoiled the process, a combine is used to pick up the windrows of seed and stalk. The combine separates the seed from the other material. The seed is placed in large boxes and stored until cleaned.

Cleaning is a mechanical process involving air separation and screen-



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Bags of cleaned and tagged seed *ready for pickup by trucks and rail cars.*

ing. It is an amazing process that can distinguish between almost identical seeds in huge volumes. Many farmers have their own cleaning plants.

When cleaning of one type of turfgrass seed is completed, the machinery is thoroughly cleaned before the next seed is cleaned. Rarely will the machinery used to clean bentgrass be used to clean bluegrass or ryegrass.

After cleaning, the seed is again stored in boxes until bagged or blended. Bags are placed on pallets and inspectors take representative samples from bags. These samples are sent to state labs for inspection. If the seed meets the standards set for certification, the bags are tagged.

Some of the checks made from seed samples are for weed seed, inert matter, and germination percentage. Perennial ryegrasses undergo a test for annual ryegrass. This test uses ultraviolet light. If more than a certain percentage of the seeds fluoresce under the light, the seed cannot be certified.

Certification is a process which begins by filling out records prior to planting and doesn't end until the bags leave the hands of the grower. Meeting these standards adds considerably to the cost of the seed. But the results are worth the extra expense from an end-user standpoint.

Marketing and Distribution

Prior to the Plant Variety Protection Act of 1970 there was relatively little promotion of improved turfgrasses. Although chemical and equipment suppliers to the turf industry advertised in the 60's, seed companies did not begin national promotional efforts until Jacklin and a few grower associations started small schedules in 1968. The American Sod Producers Association had been created the year before and Weeds Trees & Turf, then only five years old, started to provide regular coverage of sod production. Jacklin was promoting Fylking in their original ads.

In 1972, Lofts began their promotion of Baron. Pennfine promotion first appeared in 1972. Warren's began A-20 promotion in 1973, as did Burlingham with Bonnieblue.

Today, promotion of improved turfgrasses can be estimated at more than $1 million with shows, magazine advertising, and direct mail. At the same time the market has grown from an estimated $62 million in 1965 to an estimated $400 million in 1979.

The market is more sophisticated than it was in the early 60's. Quality involves more than dark green color, it involves disease resistance, germination percentages, seed mixtures, and many new varieties. Obviously, marketing helped the growers and distributors. But, it also improved the market. The individual industries which use seed are now significant markets of commercial importance. The local seed store is now a million dollar enterprise with many products. Turfgrass seed improvement is to be credited with this achievement.

Ten grams *of a seed sample are checked for weed and offtype seed in a lab.*

VARIETY PROTECTION

European turf researchers made great strides in the 30's with discovery of bluegrass apomixis by the Swedish researcher Munpzing and developed and released a few improved varieties. Some of the reasons for their gain in this period was variety protection between countries in Europe, a cutback in U.S. efforts during the depression, and eventually the World War II. The fact that the Arlington Turf Gardens was moved to Beltsville so that the Pentagon could be built there, was a clear sign of the setback caused by the war.

Before protective legislation from the USDA, a number of methods were tried to guard the seed from any interested seed grower. Growers of Manhattan perennial ryegrass. Penncross bentgrass, Merion Kentucky bluegrass, and other improved grasses formed cooperative associations to simplify supply lines and to promote their seed. Other tacts used to protect development costs were swelling the seed only in mixtures (Adikes did this with NK-100 in the 50's and 60's) and secrecy. Cooperatives still exist for some grasses, Manhattan Ryegrass Growers, Highland Bentgrass Growers, Seed Production and Introduction Corporation, and Merion Bluegrass Growers Association among others. Many of these associations are sponsoring research which may soon lead to the development of improved cultivars of their primary turfgrass, and which will provide them with exclusive rights under the Plant Variety Protection Act of 1970. Manhattan and Merion cultivars are expected within the next three years.

So, by 1960, technological aspects of seed production had been mastered. The ability to grow large quantities of high grade turf seed existed. The price of improved turfgrasses had become commercially attractive. However, concern existed for the lack of protection of improved turfgrass seed from a commercial standpoint. Grower associations worked with regional and national seed companies to control seed quality. States had begun to require certification of seed to insure the genetic integrity.

When protection was finally obtained from the 1970 Plant Variety Protection Act, a new importance was placed upon improved varieties. The differences between public and patented varieties were stressed by patent holders. Universities began to receive financial support for research into improved turfgrasses and some larger seed companies created their own research department. The seed company could now control production of its improved varieties released after 1970. The term proprietary turfgrass was coined.

Glade glade

U.S. Plant Patent 3151

KENTUCKY BLUEGRASS

Double-duty turf beauty.

The natural choice.

The elite bluegrass growing in the sun is Glade. The elite bluegrass growing in the shade is Glade. That makes it the natural choice for all lawns. It performs well in up to 60% shade with a higher resistance to powdery mildew. Additionally, Glade has better-than-average resistance to Fusarium blight. It's now used as a prime ingredient for fortification in many professional turf grass mixes. A Rutgers selection, Glade has outstanding medium to deep green color. Low-growing Glade germinates and establishes fast, developing a thick rhizome and root system for close-knit sod.

Most lawn areas have both sun and shade naturally. That's why Glade Kentucky bluegrass is the natural choice. Specify Glade for your next turf grass mix. It's available at your local wholesale seed distributor.

Another fine, quality-controlled product of Jacklin Seed Company.

VEGETATION MANAGEMENT

By Roger Funk, Ph.D., Davey Tree Expert Co., Kent, Ohio

Q: *What causes gummosis?*

A: Trunk, limbs, and twigs of certain trees (particularly stone fruits) exude gummy sap when injured by mechanical agents, insect punctures, or diseases. Some species are susceptible to a bacterial canker that also causes exudation of sap.

Q: *What would you suggest for the control of yellow nutsedge that will not injure lawns? Last year we tried MSMA but were not satisfied with the results.*

A: The methanearsonates such as MSMA (monosodium methanerasonate) usually give good control when applied properly. We had excellent results with Bentazon (Basagran) last year with no noticeable injury to Kentucky bluegrass.

Q: *I used glyphosate (4 ozs. to 1 gal.) on Bermudagrass in trailing gazanias. The glyphosate killed the Bermudagrass but not the gazanias. The trailing gazanias are still living after six months. Why?*

A: Gazania is not on the glyphosate label. I called Monsanto, basic producers of glyphosate and was told that they have no information for its control. In general, the glyphosate has not been absorbed into plants that show no injury symptoms, and the chemical has not translocated properly in plants that show initial injury and then recover. Glyphosate is absorbed only through green tissue and since gazania is a relatively tender herbaceous plant you should have gotten control unless you did not get adequate coverage over the leaf surface.

Q: *Why do nitrogen fertilizers increase soil acidity?*

A: Soil is acidic because of the presence of hydrogen ions H+ and any material which releases or causes the release of hydrogen ions increases the acidity. During the nitrification process, hydrogen ions are released when the ammonium ion is converted to nitrate. Therefore, any nitrogen fertilizer containing or forming ammonium will increase soil acidity.

$$2NH_4^+ + O \xrightarrow[\text{bacteria}]{\text{nitrification}} 2NO_3^- + 8H^+$$

ammonium oxygen nitrate hydrogen

Nitrogen fertilizers containing strong acid-forming

anions, such as sulfate, have the greatest effect on soil acidity.

Q: *What chemical can you use to neutralize preemergent herbicides so you can reseed a lawn?*

A: Depending upon the herbicide used, you could simply wait the recommended time period before seeding or apply activated charcoal. Finely powdered activated charcoal should completely neutralize just about any preemergence herbicide in the soil even if the herbicide has been applied shortly before the charcoal. Activated charcoal is effective either incorporated dry into the upper soil or suspended in water as a slurry and sprayed on the soil surface.

Q: *Last year many of the maples started dropping leaves early in the spring and the same thing is happening again this year. What is causing the leaf drop and can it be controlled?*

A: I can't positively identify the problem without a sample, but it sounds like petiole borer. The larva of a sawfly *(Caulocampus acericaulis)* tunnels in the upper end of the leaf petiole about ½ inch from the leaf blade. Leaf drop may be abundant on sugar and sycamore maples, particularly on the lower branches but defoliation rarely injures the trees.

Insecticides such as malathion and methoxychlor sprayed as the leaves open in May are recommended for control.

Q: *How can you identify verticillium wilt on Norway maple?*

A: Positive diagnosis for verticillium wilt can be made only by isolation culturing of infected sapwood in the laboratory because many other problems cause similar symptoms.

In Norway maples, the discoloration in the outer sapwood rings is characteristically a bright olive-green and is more commonly found near the base of the trunk or in the main roots since verticillium is primarily a soil-inhabiting fungus.

Q: *Our lawn service includes mowing and last year we raised our mower height to three inches for the bluegrass lawns during the summer. Most of the lawns looked real nice but some had a thin, shaggy appearance and the grass lay down. What are we doing wrong?*

A: The common Kentucky bluegrasses and some of the improved cultivars can be mowed at a 3-inch height but others should not be mowed at a height over 2½ inches. The symptoms you mentioned are typical of improved Kentucky bluegrasses mowed too high.

Send your question or comments to: Vegetation Management c/o WEEDS TREES & TURF, 9800 Detroit Ave., Cleveland, OH 44102. Leave at least two months for Roger Funk's response in this column.

PRODUCTS

Rover flail mower cuts tall grass under tough conditions. Equipped with

an 11-horsepower engine and five-speed transmission, the self-propelled, walk-behind Fairway Flail is ideal to use for parks, highways, institutions, and other areas. Rover Mowers, a major Australian power equipment manufacturer, has introduced the mower to the U.S. market.

Write 701 on reader service card

Vertical turbine irrigation pumps from Western Land Roller Co. come with many options for different conditions and pumping requirements. These include vertical hollowshaft electric motor drive, right angle gear drive, or V-belt drive; flanged or threaded column; water or oil lubricated line shaft; column and discharge head sizes of 4, 6, 8, and 10 inches; bowl diameters of 6, 8, 10, 12, and 14 inches; semi-open or enclosed impellers; low or high total head design; and capacities from 100 to 3,200 gallons per minute.

Write 702 on free information card

TVL Model 520 locates solenoids that are lost or hidden as fast as you can walk to them. At the same time, it

traces the path of the station control wires. It is easy to use and easy to operate. Progressive Inc., makes it.

Write 706 on free information card

A broad-spectrum plant growth regulator, Atrinal, has been registered for use on 17 additional species of landscape plantings and 11 additional species grown in the greenhouse and nursery. Landscape plants include oleander, elaeagnus,

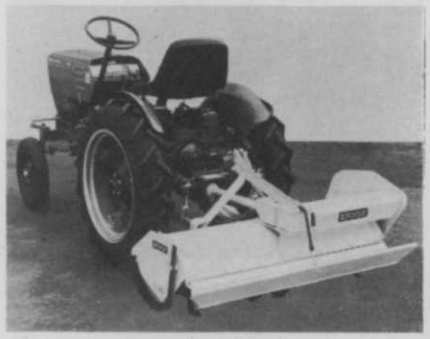
juniper, honeysuckle, and photinia. Greenhouse species include miniature crepe-myrtle, fuchsia, kalanchoe, and euonymus. The liquid concentrate, made by Maag Agrochemicals Marketing, can be diluted for different species. In landscape maintenance it retards hedges, shrubs, and ground covers. In the greenhouse, it works to pinch many species, promoting lateral branching and suppressing long shoots.

Write 710 on free information card

Sightguard single lens goggles help protect eyes from the impact of flying particles, chemical splash, and intense glare. The lightweight goggles can be worn alone or over plastic or metal-framed industrial safety spectacles. Five types of goggles are available from Mine Safety Appliances Co.: softframe, chemical splash, wide vision, rubber frame, and visor.

Write 713 on free information card

A heavy-duty 48-inch rotary tiller covers a 4-foot swath and is equipped with 24 heat-treated Bolo tines which provide ground contact 200 times a minute to completely break up the soil without pulverization. A chain drive at the end of the shaft assures an unbroken tilling swath with no center void. Heavy-duty



design and wide choice of tractor gear ratios provide capability to handle tough soil conditions.

The tiller can be used with 14-, 16-, or 18-horsepower Power King tractors equipped with a tandem transmission and rear PTO. Engineering Products Co. makes them and the tiller.

Write 717 on free information card

A new breed Kentucky bluegrass, "America," comes from Pickseed West. Its 15-year breeding program has produced a unique, low, compact dwarf-type plant with a very slow rate of vertical growth. It has dark green, fine textured leaves and resists disease extremely well. America will perform well in shady conditions. Its adaptability suits use by sod growers, golf courses, landscapers, and home owners.

Write 703 on reader service card

Hydraulic assisted, gravity-flow drum rack allows for storing and dispensing of 55-gallon drums as well as other cylindrical objects. The design of Drum-Runner saves floor space, reduces handling time, and improves inventory control and less stock damage. It comes in five standard models for inside or outside storage of full or empty drums from Storage Architects, Inc.

Write 712 on free information card

below 50°F. Similarly, we might cite chlorpropham (CIPC) as an herbicide which can cause a great deal of damage if applied at the wrong time of the year. This material is labelled for use on dormant plants, and if applied during periods of active growth, can cause severe injury.

Likewise, time of application in terms of weed seed germination can greatly influence the degree of control achieved from an herbicide application. For example, simazine (Princep) applications during the late fall or early winter after the emergence of the cool-season broadleaf weeds will be less effective than if it had been applied in the early fall prior to their germination. Thus, using the proper herbicide at the proper time can help insure good weed control.

Amount of herbicide used

As we all know, herbicides in contrast to fungicides and insecticides, generally have a very narrow range of activity, between acceptable weed control and crop injury. Few herbicides can be used at higher than recommended rates to insure weed control without causing excessive crop injury to cultivated ornamental plants.

Soil type

More than any other factor, soil type has great influence on herbicidal activity. While herbicides are sold nationwide, no two soil types react exactly the same when it comes to herbicide performance. For example, triazine herbicides (Simazine and Atrazine) are generally considered to be more effective on soils with a higher content of clay, while materials like trifluralin (Treflan) are more effective on sandy soils.

In addition, weed control with preemergent herbicides can be influenced by the surface condition of the soil at the time of application, but the soil should be freshly tilled or disced. Also, if granular preemergent herbicides are being used, the soil surface should be relatively smooth at the time of application in order to achieve a uniform distribution.

Table 2. Rate of trifluralin (Treflan) required to achieve desired weed control in soils with varying organic matter levels.[1]

Percent organic matter in soil	Trifluralin Required/acre (lbs/active)
1	¼
2	½
3	¾
4	1
6	1½
6	2
16	4

[1] Adapted from G.F. Warren, 1973. Action of herbicides in soil affected by organic matter. Weeds Today, Vol. 4(2): 10:12.

Soil organic matter

More than any other soil constituent, the level of soil organic matter determines the activity of herbicides. If in the selection of the herbicide or in the calculation of the rate to apply, soil organic matter is ignored, be prepared to observe some erratic results.

The importance of soil organic matter lies in its capacity to attract and hold a variety of molecules on its surface through the process of absorption, or more simply, the sticking of the herbicide to the surface of the organic matter such that it is not free to move in the soil solution and is thus less available to be absorbed by plants.

Generally, if soils have been amended with large amounts of organic matter, the rate of herbicide application will need to be increased. For example, trifluralin (Treflan) must be increased in its rate of application in order to achieve weed control in soils with high amounts of organic matter. Specifically, studies on nursery crops grown in media with varying organic matter levels require higher than recommended rates of trifluralin in order to achieve satisfactory weed control in comparison to similar crops grown in low organic matter medium (Table 2). These studies have shown that with container grown nursery crops, a range of 1-2 lb aia of trifluralin is necessary to achieve satisfactory weed control.

Table 1. Weed Species Responses to Herbicides[1]

Herbicides (Common name — Trade name)	COMMON WEED FAMILIES					
	Amaranthaceae (Pigweed Family)	Compositae (Daisy Family)	Cruciferae (Mustard Family)	Gramineae (Grass Family)	Leguminosae (Pea Family)	Euphorbiaceae (Spurge Family)
Alachlor (Lasso)	*	O	O	*	O	X
DCPA (Dacthal)	X	O	O	*	O	*
Dichlobenil (Casoron)	*	*	X	X	X	X
Diphenamid (Enide)	*	X	O	*	O	O
EPTC (Eptam)	*	X	O	*	O	*
Simazine (Princep)	X	*	*	O	?	O
Trifluralin (Treflan)	*	O	O	*	O	X

Key: O = not controlled; X = partially or erratically controlled; * = controlled.

[1] Reprinted in part from Lange, O.H., 1971. Agrichemical Age 14(4):5.

Weather conditions

Generally, weather conditions during and immediately after application of the herbicide have a great deal to do with the success or failure of a herbicide program. Of all of the environmental factors that influence herbicidal activity, temperature and moisture play a major role in determining the success or failure of the program.

Actually when we realize the great diversity of conditions under which herbicides are applied in the nursery or landscape situation, it's a wonder that there are so many weed control successes. At the time of herbicidal application, soil temperature may vary from 40-100°F.; soil moisture from air-dried to flooded; relative humidity from 10-100%; sunlight from 500-10,000 ft candles; and a wind-speed from 0-30 mph. Under such a wide range of possible weather conditions at the time of application, we spray a few ounces of herbicide on a half million or more weed seeds per acre and the majority of the time are rewarded with excellent weed control.

Temperature

Preemergent herbicides perform best at soil temperatures that promote rapid, uniform weed seed germination. Cool soil temperatures that delay weed germination can reduce the effectiveness of preemergent herbicide activity.

Also preemergent herbicides such as EPTC and Trifluralin (Eptam and Treflan) volatilize rapidly as soil temperatures increase, and as such, weed control effectiveness is reduced. In the case of Eptam and Treflan, these volatilization losses can be reduced by cultural practices, such as incorporation into the soil immediately following application.

Temperature also influences the performance of postemergence herbicides. In general, these materials work better at warmer air temperatures. The major influence of temperature on postemergent herbicides is on the rate of uptake into the plant. This effort is offset to some extent by the increased rate of drying of the herbicide on the leaf surface at higher temperatures, as once the spray dries, the penetration of the herbicide into the plant is reduced. Generally with the postemergent herbicides, fast movement into the plant is favored by high temperatures, and as a result more favorable weed control can be obtained if the temperature is high at the time of application.

In addition, the thickness and chemical composition of the cuticle of the leaf is influenced by temperature. Cool nights and moderate day temperatures often favor this increased cuticle thickness in some weed species, thereby reducing postemergent herbicide penetration into the plant, and ultimately effecting herbicidal activity.

Moisture

Adequate soil moisture prior to the time of herbicide application stimulates uniform and vigorous growth of weeds. Dry soil conditions cause uneven weed seed germination, and often result in poor weed control following herbicide application. As a result, proper timing of preemergent herbicide ap-

Continues on page 76

Arborists *from page 18*

ment to overcome a production lag. Although experienced personnel have become more available in many parts of the country, not in Texas. His turnover of trainees is too high, about two out of 50. Texas A&M has begun teaching forestry. "They come from there and think they'll sit behind a desk and cut trees," he says. "Most college students don't like to sweat."

A search for an experienced supervisor has been unsuccessful. The right man could help double business, Brook thinks. Getting a person with the right attitude is the most difficult task.

To cut fuel costs, Brook leaves his equipment at the site of a fairly large job instead of driving it back and forth. He thinks that because money is a little tighter, people are taking advantage of pay delays, paying in 45 instead of 10 days.

Brook built his business from scratch and has seen people become much more conscious of taking care of trees over the last 18 years. "The environmental groups are a thorn in the side, but are making people more aware," he says. He worries that the arborist societies may be their own worse enemies.

"I don't believe the National Arborist Association, the International Society of Arboriculture, and the American Society of Consulting Arborists are doing enough to sell our expertise and the value of tree care. Eighty to ninety percent of the people who claim they are arborists are line clearers. Many are installing cables. They don't want the public to know of good standards for tree care. The premise they're working on is build the volume of business. The push is clear the lines, hell with the trees. If the public knew what damage they were causing, they'd have to revise their whole approach."

Fewer companies will be doing pure arboriculture in the future, Brook thinks. "The work being done on public institutions is not being supervised by professionals. The general public thinks this is what good tree care is. Unless we, as a profession, take the bull by the horns and teach the public what good tree care is and get professional public relations in back of it, they never will."

A couple arborists in Colorado see the recession but haven't been much affected by it. Jerry Morris, who runs Rocky Mountain Tree Experts, Inc., has found work very strong throughout Colorado and adjoining states. His crew of 70 has become a solid force after much trouble finding experienced help.

The best way to promote business, Morris thinks, is by knocking on doors and speaking to groups about trees, lawns, and yards and how to maintain them. He also solicits by mail and puts out a calendar each year.

Accounts receivable is higher than Morris likes it, but it doesn't look threatening to him. Customers wait more time between billing and payment, some up to the full 30 days.

What does threaten Morris is the EPA. The agency is especially active in Colorado because the state voted not to certify spray applicators and all are under federal jurisdiction. "The word is get Colorado and they're going to do it," says Morris. "It's a matter of time before they get after us. There isn't anybody in the EPA who's got a head for the practical use of chemicals. People who regulate should have a knowledge of the business."

Bob Schulhoff, a neighbor in Golden, CO, owns Arborist Service Inc., which operates in the western suburbs of Denver. New business is a hair down but old business is steady. He has steadily increased business this year 18-20 percent, although the May wind and rain storms slowed things down.

Although he must be more careful of spraying, his spraying business has actually increased. His attitude about the EPA action differs slightly from Morris's. He realizes that regulation will probably spell the end to ground spraying over the next 10-20 years. But this will force the need for injections and systemics, which would be "fantastic — only the certified can handle it," he says, "and it will be harder to get certified." He thinks work may turn to more consulting, which would also be more profitable. "People will call us for advice, like attorneys and doctors."

Schulhoff has cut back the number of employees, but has more experienced help. His payroll is higher, paying more for the experience, but he gets the work done more efficiently. His best advertisement is doing gift work, such as for a YMCA, church, or other non-profit organization.

In Rockville, MD, close to Washington, DC, Walt Money and his Guardian Tree Experts are finding business ahead of last year and a little more than inflation. Money is more concerned in skyrocketing labor costs. Spraying and feeding customers are opting for these jobs over pruning.

"It's not a bread and butter industry," says Money. "When something is going to be cut out, it could be us. He is not eliciting a super increase in work, but a moderate one.

Instead of a spring or fall letter to customers, Money and his six reps call and visit every one, every year. "During the 74-75 recession we were calling people to tell them their trees won't wait until next year." He thinks it's important to call people in good times as well as bad. "They get used to hearing from you."

When cash flow is slow and people take longer to pay bills, Money's crew calls and asks the problem. He thinks this helps to read the pulse of the times.

Money echoes many arborist's comments that business is recession proof. "People we are working for are in the upper income and won't feel the brunt of recession as much. They'll feel a slowdown but not a stop."

This arborist sees wider interest in technology and management seminars. "There seems to be a hunger and thirst for knowledge in the profession," Money says.

Managing efficiently and utilizing valuable information provided by the arborists' societies and industry representatives is becoming very important to the arborist in the 80's. Competition as well as regulation will grow, forcing the professional arborist to be a standout in his field.

As the country slows its pace a bit, people will notice their environment more and demand it be maintained. Not only will the arborist continually have to upgrade his technical skills, he will need to promote his profession to the public as well as his clients. Since what he does will be inspected closely, the professional arborist, like a doctor or lawyer, will often be consulted. **WTT**

Herbicides *from page 74*

plication in regard to soil moisture levels can help insure good weed control.

In addition, rainfall or irrigation is essential for successful preemergent weed control. Water is necessary to carry the herbicide into the top ½ inch of the soil where the maximum number of weed seeds will germinate. A delay in rainfall of more than a few days following application may severely reduce the degree of weed control achieved. Of course, with irrigation this is not a problem.

For many preemergent herbicides, a period of 10-14 days without moisture to incorporate them into the soil following application, is often the cause for complete failure. During this period without rainfall, the herbicide may actually be destroyed by exposure to sunlight while it lies on the soil surface, or weeds may germinate and emerge without taking up the herbicide.

In contrast, heavy rainfall of several inches or more soon after preemergent applications can be detrimental in regard to herbicidal activity, in that it may carry the herbicide beyond the zone of major concentration of weed seeds in the soil or may actually remove the herbicide from the site of application in runoff water.

Herbicide programs

The ideas conveyed so far have dealt with the reasons for success or failures with herbicide applications. Nurserymen and landscape contractors must strive for a program utilizing selected materials applied singly or in combination in order to achieve year-round weed control. In most nursery and landscape situations there is a need for fall or early winter applications in order to reduce winter broadleaf weeds, followed by spring and summer applications to control annual and perennial weeds.

In addition, it should be pointed out that observation and good record keeping is a key to a successful weed control program. The nurseryman or landscape contractor should not be looking for 100% control with his weed control program since this could ultimately result in soil sterilization, but rather for control in the 90-95% range. Thus, by carefully observing when weeds are beginning to reinfest a treated area, the nurseryman or landscape contractor can carefully plan and time his reapplications to suit his herbicide program in order to insure success.

Also, each user should use the material under test conditions for 2 to 3 years on small areas in order to better understand its use. Remember that all of the above factors we have discussed will affect the degree of weed control achieved. **WTT**

SOD PRODUCER NEWS

Mallinckrodt, Rhone-Poulenc establish turf fungicides

Duosan, a broad-spectrum turf fungicide which combines both systemic and contact control, has been introduced by the Specialty Agricultural Products Div. of Mallinckrodt, Inc.

The scientifically formulated combination results in a synergistic effect with the two ingredients complementing and magnifying each other. It controls most major spring and summer diseases except Pythium.

Chipco 26019, Rhone-Poulenc's registered fungicide for many diseases, has recently received EPA registration for the control of Fusarium Blight on all common turf grasses.

Lofts releases tall fescue for turf

Lofts Pedigreed Seed, Inc. has introduced the first turf-type tall fescue for commercial use.

In performance tests with other tall fescues, Rebel has provided up to 30 percent finer leaf width and over 188 percent more tillers, providing a denser, finer turf, its manufacturer claims. In addition, Rebel exhibits a good green color when compared with other tall fescue varieties.

Rebel performs well under heavy traffic yet requires low maintenance. It maintains a solid stand even when mowed at 1¼ inches, and is recommended for use on athletic fields, parks, home lawns, and industrial parks located in transition zones where conventional cool-season grasses do not perform well in summer.

Workshops on use of land wastes scheduled for MD, Los Angeles

The Cooperative Extension Service, USDA and the Extension Committee on Planning Subcommittee on Agriculture, Forestry and Related Industries are sponsoring two workshops this summer on the "Utilization of Wastes on Land: Emphasis on Municipal Sewage."

The workshops will be held July 15-17 at the University of Maryland and at the Sheraton-Anaheim Hotel in Los Angeles on Aug. 12-14. Speakers will discuss management for lands receiving wastes, composting, waste utilization options, and sludge and wastewater application techniques.

For more information and registration forms, contact Hunter Follett, Agronomy Dept., Kansas State University, Manhattan, KS 66506.

News *from page 13*

ment theft problem included discussions with the FBI, Law Enforcement Assistance Assn., International Assn. of Chiefs of Police, National Sheriffs Assn., and several local, state, and regional enforcement officials.

RECLAMATION

OSM seeks clearup of prime farmland rule

The Office of Surface Mining has proposed to define "contiguous land," which would satisfy a "grandfather" exemption for the mining of coal on prime farmland.

The proposed regulation would allow coal removal to continue on prime farmlands without meeting special performance requirements if they were being mined (1) under a permit prior to August 3,1977, the date of the Surface Mining Control and Reclamation Act; (2) under a revision or renewal of that mining permit, as these terms are used in the Act, or (3) are continuations of existing permitted mining in the same contiguous pit on lands on which the operator had the right to mine prior to Aug. 3,1977.

In addition, the proposed regulation sets June 3,1982, for ending prime farmland grandfather exceptions allowed by the Act.

GOLF

James Long named NGF President

James M. Long, senior vice president with Spalding Worldwide, was elected president of the National Golf Foundation during its semi-annual Board of Directors meeting held in late April at the Doral Hotel and Club in Miami, FL.

Long joined Spalding's engineering department in 1932. He has held many management positions with Spalding, including vice president of manufacturing and vice president of engineering.

EVENTS

The current issue of WEEDS TREES & TURF carries meeting dates beginning with the following month. To insure that your event is included, please forward it, 90 days in advance, to: WEEDS TREES & TURF Events, 9800 Detroit Ave., Cleveland, OH 44102.

2nd Exhibition for Horticulture and Landscape Construction, "Gruen 80," Basel, Switzerland, **thru Oct. 12** Contact Beat Baechler, 104 South Michigan Ave., Chicago, IL 60603, 312/641-0050.

Southern Nurserymen's Trade Show, Atlanta Convention Center, Atlanta, GA, **Aug. 2-6.** Contact Tommy Henegar, Southern Nurserymen's Assn., 3813 Hillsboro Rd., Nashville, TN 37215, 615/383-5674.

Green Pro Executive Newsletter 1980 summer conference, Tamiment Resort and Country Club, Pocono Mountains, PA, **Aug. 3-5.** Contact Mrs. Rice, 380 S. Franklin St., Hempstead, NY 11550, 516/483-0100.

Roadside Vegetation Management and Manipulation Program, San Antonio, TX, **Aug. 4-8.** Contact Robert Guinn, Engineer of Maintenance, Texas Department of Highways and Public Transportation, Highway Building, Austin, TX 78701.

Ohio State University Turf Field Day, OSU Turfgrass Research Facility, Columbus, OH, **Aug. 5.** Contact Keith Karnok, OSU Dept. of Agronomy, 1827 Neil Ave., Columbus, OH 43210, 614/422-2591.

Fertilizer Institute Trade Fair, Roe Vartle Hall, Kansas City, MO, **Aug. 5-6.** Contact Barbara Schoen, 1015 18th St., NW., Washington, DC 20036, 202/ 466-2700.

Rutgers Turfgrass Research Day, New Brunswick, NJ, **Aug. 6.** Contact Ralph E. Engel, Research Professor of Turfgrass Management, Rutgers University, P.O. Box 231, New Brunswick, NJ 08903, 201/932-9427.

Illinois Landscape Contractors Association annual summer field day, Chicago Horticultural Society Botanic Gardens, Glencoe, IL, **Aug. 6.** Contact Lucile Little, 202 W. Main, Box 1049, St. Charles,. IL 60174, 312/584-5770.

Penn State Turfgrass Field Days, Joseph Valentine Turfgrass Research Center, Pennsylvania State University, University Park, PA, **Aug. 6-7.** Contact Dr. Joseph Duich, 21 Tyson Building, Dept. of Agronomy, University Park, PA 16802.

Residential Landscape Design Course I, Seattle, WA, **Aug. 7-9.** Contact John Shaw, Executive Director, ALCA, 1750 Old Meadow Rd., McLean VA 22101, 703/821-8611.

International Society of Arboriculture, Sheraton-Hartford Hotel, Hartford, CT, **Aug. 10-14.** Contact Ervin C. Bundy, ISA Executive Director, P.O. Box 71, 5 Lincoln Square, Urbana, IL 61801, 217/320-2032.

American Association of Nurserymen management seminar, St. Louis, MO, **Aug. 10-15.** Contact Robert S. Fortna, 230 Southern Building, Washington, DC 20005, 202/ 737-4060.

Residential Landscape Design Course II, Seattle, WA, **Aug. 11-13.** Contact John Shaw, Executive Director, ALCA, 1750 Old Meadow Road, McLean, VA 22101, 703/821-8611.

Iowa State University Turfgrass Field Day, Horticulture Research Station, Ames, IA, **Aug. 12.** Contact A.E. Cott, Extension Horticulturist, Dept. of Horticulture, Iowa State University, Ames, IA 50011, 515/294-1870.

Central Plains Turfgrass Foundation Field Day, Kansas State University Turf Conference, KSU Union, Manhattan, KS, **Aug. 13.** Contact Dr. R.N. Carrow, Secretary/Treasurer, Horticulture Dept., Waters Hall, Kansas State University, Manhattan, KS 66506, 913/532-6170.

Massachusetts Nurserymen's Association and the New England Nurserymen's Association summer meeting, Weston Nurseries, Hopkinton, MA, **Aug. 13.** Contact Deborah M. Fanning, Associate Director, MNA, 715 Boylston Street, Boston, MA 02116, 617/266-6800.

Minnesota Park Supervisors Association summer meeting, Duluth, MN, **Aug. 15-16;** fall meeting, Red Wing, MN, **Oct. 10-11;** and winter meeting, Washington County Park Dept., **Dec. 2.** Contact Thomas Feltl, M.P.S.A. Secretary, 8200 Wayzata Blvd., Golden Valley, MN 55427.

Lawn, Garden Outdoor Living, Div. National Hardware Show, McCormick Place, Chicago, IL, **Aug. 13-16.** Contact National Hardware Show, Charles Snitow, 331 Madison Ave., New York, NY 10017, 212/682-4802.

Tan-Misslark Trade Show, Astro Hall, Houston, TX, **Aug. 16-19.** Contact Bill Fullingim, Texas Assn. of Nurserymen, 512 E. Riverside Dr., Austin, TX 78704, 512/444-7489.

International Arboricultural Conference, University of Sussex, Brighton, England, **Aug. 18-21.** Contact Mrs. Moira Allan, Latchetts, 23 Portsmouth Lane, Haywards Heath, Sussex. RH 16 1SE, England, Tel: 04447-3344.

Rhode Island Turfgrass Field Day, Turf Research Farm, University of Rhode Island, Kingston, RI, **Aug. 20.** 3500 Ridge Road, P.O. Box 6900, Colorado Springs, CO 80934.
Contact Professor C.R. Skogley, Plant and Soil Science Dept., University of Rhode Island, Kingston, RI 02881, 401/792-2570.

Irrigation Association of New Jersey Annual Field Day, Reed's Sod Farm, Princeton, NJ, **Aug. 20.** Contact Irrigation Assn. of New Jersey, P.O. Box 128, Dayton, NJ 08810.

Residential Landscape Design Course I, Albany, NY, **Aug. 20-22.** Contact John Shaw, Executive Director, Associated Landscape Contractors of America, 1750 Old Meadow Rd., McLean, VA 22101, 703/821-8611.

Farwest Nursery Garden & Supply Show, Seattle Center Coliseum, Seattle, WA, **Aug. 24-26.** Contact Dan Barnhart, Farwest Nursery Show, 224 S.W. Hamilton St., Portland, OR 97201, 503/221-1182.

Western Regional Grounds Maintenance and Equipment Show, Bear Creek Park, Colorado Springs, CO, **Aug. 26.** Contact Frank Cosgrove,

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ALONE OR IN COMBINATION PLANTINGS, YEWS COMPLEMENT LANDSCAPE WELL

By Douglas Chapman, Horticulturist, Dow Gardens, Midland, MI

The yew (Taxus), one of the finest narrow-leaf evergreens for use in the landscape, has a long history. Taxus fossils have been found between layers of sandstone and shale, originating in the Jurassic Period (plus or minus 150 million years ago). Records show yew foliage was used as a poison during Caesar's time. The English Yew *(Taxus baccata)* is the patriarch of European trees. It is native to the British Isles, growing best in the alkaline soils which are deep, fertile, and well-drained.

In England, the Yew has long been associated with religion. During the Druidic Period, the yew was a sacred tree, believed to be a symbol of long life and/or immortality. Early Christian churches were built in yew groves (Fountains Abbey, Yorkshire). In most English churchyards, one can find the yew — a symbolic link to immortality.

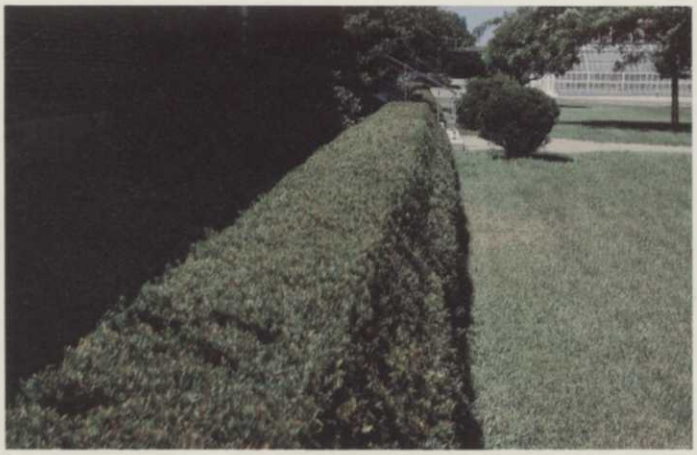
Yew wood is extremely hard and durable. It is tough enough to be used as cogs in a mill, on cart wheels, and cabinets. During medieval times, it was a medium for warfare, being a part of the finest bows and arrows. Today, furniture makers use yew wood for fine quality pieces.

There is much controversy about how many species of Taxus exist. There are three species somewhat universally accepted — English Yew *(Taxus baccata)*, Canadian Yew *(Taxus canadensis)*, and Japanese Yew *(Taxus cuspidata)*.

English Yew *(T. baccata)* is completely hardy as far north as New York City and a few varieties are hardy into the Boston area. This plant reaches 30 to 60 feet in height, growing as broad as tall, and best suited for partially shaded areas. The hardiest of the English Yews is *T. baccata* 'Repandens' which was developed in the United States. This prostrate growing plant reaches 20 feet in width and 5 feet in height. It makes a wonderful ground cover.

Canadian Yew *(T. canadensis)* is a native species reaching 3 to 4 feet in height. Its native growing range is from Virginia to the Great Lakes Forest. It will tolerate shade and has light, pale green foliage. The only hybrid grown in the trade today for use in the landscape is X *T. hunnewelliana* — a cross chance of *T. canadensis* and *T. cuspidata*.

Japanese Yew *(T. cuspidata)* was brought from Japan to the United States in the late 1860's by Dr. Gordon Hall. This plant often reaches 60 feet in height and is extremely hardy. Cultivars used in the United States are hybrids — crosses between *T. cuspidata* and *T. baccata*, called Anglojapanese Yew (X *T. media*). The Anglojapanese Yew cultivar is the hardiest and most versatile group of yews that has adapted to conditions through the Midwest



Trimmed correctly, this *Taxus media* 'Browni' (left) makes an attractive hedge in a landscape. It is the hardiest and most versatile cultivar of yews that has adapted to conditions through the Midwest and Northern U.S.

A nearly prostrate yew with bluish-green leaves, the *Taxus baccata* 'Repandens' grows to 20 feet wide and five feet high. 'Repandens' is the hardiest of English yews and makes a wonderful ground cover.

and Northern U.S. A few of the common varieties grown in the trade which display good growth characteristics include 'Chadwick', 'Browni', 'Densiformis', 'Flemer', 'Ward', 'Ohio Globe', 'Costich', 'Hatfield', 'Hick's' and 'Fairview'. A close look at some of these varieties will show their adaptability to shade or sun, hardiness of continental winters, and their great variation in form, ranging from 5 to 40 feet in height and 8 to 25 feet in width. For many years, yews couldn't be grown in the Midwest, due to the continental climate. With the development of the Anglojapanese Yew cultivars and the hardiness bred in the plants from the Japanese Yews, yews became a regal Midwestern plant.

'Chadwick' Yew is a low-spreading type, reaching 3 to 5 feet in height. It has rich dark-green foliage and doesn't break down when grown in areas of heavy snow.

'Brown' Yew is a plant reaching 6 feet in height and 10 feet in width with a round habit. This plant has rich dark-green foliage year-round but winterburns if exposed to southwest dry winds or sun. 'Brown' was one of the best yews developed by horticulturist T.D. Hatfield.

X *Taxus media* 'Densiformis' has a loose habit of growth, reaching 6 to 8 feet in height and 18 feet in width. This plant must be pruned or it will break apart under the weight of heavy snow.

'Ward's' Yew is in common use throughout the Midwest. If unpruned, it will reach 6 feet in height and 25 feet in width. This plant must be pruned heavily to avoid snow injury and become extremely resistant to desiccation (winterburn).

'Ohio Globe' is a round plant reaching 10 feet in height and width. It grows well in exposed or shady areas, rarely winterburns, and is an exciting blue-green year-round.

'Costich' is a columnar yew reaching 15 feet in height. It is difficult to find in the trade but grows well under Midwest conditions. It requires little pruning, is strong, and doesn't break under the weight of even the heaviest snow, while rarely winterburning.

'Hatfield' Yew is the tallest of the yews developed by Hatfield at the Honeywell Estate. It has a pyramidal habit of growth reaching 30 feet in height. During the past twenty years, this plant has shown little damage due to desiccation or mechanical injury. This tree-like yew fits into many areas, e.g., foundation plantings around public buildings or two-story homes.

When selecting yews for the home landscape, one of these Anglojapanese cultivars is perfectly hardy from Kansas City to Boston, throughout the Northeast as well as Midwest. Once the correct variety is chosen, understanding the insects, diseases, and maintenance requirements makes yew an outstanding addition to the landscape. Everyone should visit the Ohio Research and Development Center to view the Taxus collection started by L.C. Chadwick. Here one can observe the unpruned habit and landscape height of many yew cultivars.

Yews should be planted in slightly alkaline, well-drained, fertile soils, preferably in the spring. The pH should range from 6.5 to 7.5. A sandy, well-drained loam high in organic matter is optimal. Yews are often considered slow-growing plants but, if grown in fertile soils and fertilized annually with the equivalent of 10 to 15 pounds of 12-4-8 per 1,000 square feet, they regularly will grow 10 to 20 inches in height per year. Clay or poorly-drained soils often result in decreased growth and even death (root rot).

When selecting a site, one should remember yews are shade-loving plants. They will grow best in a north to northeast side of a building or as an understory plant. Many yews burn severely (desiccate during the winter) if exposed to south or southwest winds. (Check above varieties for tolerance to sun and southwest winds.) If one has a specimen plant exposed to southern winds, it should be sprayed with an anti-desiccant or, more effectively, wrapped in late November with burlap to reduce water loss.

Pruning is important to remove weak, diseased, or dead branches and shape where desirable. Yews should be pruned in mid-summer (July) and again after the feather growth stops (first week of August). Pruning no later than mid August will allow the plant to callus and, therefore, reduce winter injury.

Yews have few insect problems, but there are several that are catastrophic. Black vine weevil is a most serious problem. The adult feeds on the foliage, taking crescent-shaped bites out of the needles while the larvae feed on the root system, reducing it to a point where the plant declines or dies, going downhill slowly. There has been much work done recently at the Ohio Research and Development Station for the control of black vine weevil. Several compounds are showing effective control, such as Orthene or Guthion (registered Michigan label). One should check with one's individual Cooperative Extension Service.

Fletcher's scale can cause some defoliation, but if one is a keen observer, a simple spray in the spring with superior dormant oil (70+ second) will totally control this problem.

Red spider mite can cause problems during dry periods of summer. The symptoms include a reddish or bronze foliage. Two sprays of an adult miticide, e.g. Kelthane, or one spray with an ovacide, e.g. Morestan, will clean up this potential problem, but one should spray only when a problem exists.

Yews, due to their rich regal-green color, are effectively used in mass plantings or as specimen plantings. They are effectively combined with many plants but are aesthetically outstanding when combined with bedding plants, such as red geraniums or salvia. Yews grow well in shade or sunny conditions (watch varietal selections). While being perfectly hardy and able to withstand even the coldest winters, yews seem to be most sensitive to over watering or poorly drained soils. There are many growers who specialize in the production of yews. The areas of concentration would include Rhode Island, Connecticut, Pennsylvania, Ohio, and Western Michigan. Whereas L.C. Chadwick was instrumental in the wide-spread production of yews in Ohio, Mr. N.I.W. Criek of Cottage Gardens was instrumental in its introduction to Michigan. Each area of the country has its favorite selections, but yews can be looked upon as truly regal landscape evergreens. **WTT**

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*Table 1

Variety	1975 to 1978 Avg.	No. of Tillers per sq. ft.	Leaf Width (mm) January 1980
Rebel	6.1	2271	2.4
Kenhy	3.1	724	3.5
Kenwell	3.0	806	3.4
Kentucky 31	2.6	789	3.4

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Table 2

Variety	1979 Average	No. of Tillers per sq.ft. 11/79	Leaf Width (mm) November 1979
Rebel	6.4	1801	2.7
Kentucky 31	4.3	1319	3.2
Kenwell	4.1	945	3.6
Kenhy	3.8	1013	3.5
Kenmont	3.8	1086	3.6
Alta	2.9	902	3.8
Fawn	2.6	1102	3.7
Goar	1.7	1062	3.5

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