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Fall 1976

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TURF BULLETIN

MASSACHUSETTS TURF
AND LAWN GRASS COUNCIL
I N C O R P O R A T E D



Featured in this issue:

Seed Labeling

Weed Control

Problems And Solutions
Associated With Heavily
Used Turfgrass Areas

FALL 1976

BETTER TURF THROUGH RESEARCH AND EDUCATION

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Fall 1976

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The Massachusetts Turf and Lawn Grass Council Incorporated is chartered under the laws of the Commonwealth of Massachusetts as a non-profit corporation. The turf council seeks to foster "Better turf through research and education."

More detailed information on the subjects discussed here can be found in bulletins and circulars or may be had through correspondence with the editor.

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Lawn & Turf Seed Labeling—Are Changes Needed?

By Dr. William Rice
Associate Professor In Charge
of Feed Seed and Fertilizer Lab.
Agricultural Experiment Station
University of Massachusetts

Did you ever hear of a farmer who went to much work and expense to properly prepare his field for planting, testing his soil, plowing, discing, liming, and fertilizing according to recommendations by experts then planted seed corn of an unknown variety and questionable quality?

No! One could be fairly certain that any knowledgeable farmer would know the variety and be fairly sure of the quality of his seed corn. The corn farmer has been educated and knows the value of good seed. He has learned what quality information is important, and understands the quality statement on the label. He therefore has a good basis for selecting his seed and uses the labeled information to his advantage.

What is the labeled information that a corn farmer wants to know before he buys his seed?

The Massachusetts Seed Law as well as the seed laws of most other states has labeling requirements which must be fulfilled before seed can be sold for planting purposes. Naturally a farmer wants to know if all of the essential information is given, that is all seeds must be labeled to show the kind and variety or hybrid name, the labeler or seller, the treatment statement if there is a treatment and whether there are present any noxious weed seeds. Agricultural and turf seeds also must show the germination percentage and date of test and a purity statement giving the percentage of pure seed, weed seed, inert material, and other crop seed. The corn farmer wants to know this information and more. He is interested in the number of growing days required for maturity, the kernel size, and additional information provided by some seed corn companies such as vigor test results.

Of all the information found on the label the most important to the corn farmer may be the hybrid variety name. No matter how good the farmer, nor how favorable the weather or season the production of the crop will most likely be within the limits of the performance history of the variety.

What am I implying about lawn and turf seed? That all depends on the variety. Certainly selecting the variety or varieties in a mixture, maybe the one most important decision a turf specialist can make. Although selecting a good variety does not guarantee success, planting a variety with a poor performance history can almost assure one of disappointment if not failure.

One can learn about the proper selection of varieties by personal experience and by observation of trials carried out

by specialists. Of course one must keep in mind expected effects of various soil and climate situations for the different varieties and all agronomists know of the delicate balance of fertilizer, moisture, and chemical applications required for thrifty and luxuriant turf development, some varieties requiring more care than others!

Important as variety selection is, there are other points of seed quality found on the label which have great significance in the ultimate establishment of turf grasses. There are more than 20 quality parameters which can be determined in a laboratory, some of them have so much impact on the ultimate success of crop production that they have been established by law as required labeling information.

Let us examine a grass mixture label. See the present and Association of Seed Control Officials of the Northeastern States suggested labels given on page 4.

After the name and address of the labeler the mixture name is given. The name may or may not reflect the intended use of the seed but in no way may be an exaggerated or false claim. A lot number is required which identifies the dealer's records and history of the seed in case there is reason to trace back to its origin. If the seed has been treated, a treatment statement including the chemical name and an adequate warning must be given.

Next comes the purity and germination information. Massachusetts requires the pure seed components to be listed in order of predominance under the headings "Fine Textured Grasses" and "Coarse Kinds". These categories were established to help the public in making a choice as to whether to purchase seed of fine textured grasses expected to produce a fine permanent turf or seed of coarse grasses normally producing a quickly established but not so permanent or desirable a turf. Massachusetts classifies the following as "Fine Textured Grasses": colonial bentgrass, creeping bentgrass, velvet bluegrass, Kentucky bluegrass, rough bluegrass, wood bluegrass, Canada bluegrass, red fescue, Chewings fescue and sheep fescue and as "Coarse Kinds" seeds of all other plants. The Seed Law classified all varieties of perennial and annual ryegrass as coarse kinds, so the introduction into the market of ryegrass varieties with fine textured leaves and a permanent habit of growth has caused much confusion and many states have changed their laws to allow certain ryegrass varieties to be classed as fine textured grasses. This has precipi-

(Continued on Page 4)

(Continued from Page 3)

tated the action taken recently by the American Association of Seed Control Officials to recommend that all states eliminate the label requirement of having "Fine Textured Grasses" and "Coarse Kinds" categories. If states follow this suggestion they will eliminate the dilemma of the ryegrass problem but the public will have to use more judgement and be more responsible in selecting the right variety of grass seed.

Is this too much to expect the public to do? One argument is that the public is already selecting named varieties of vegetables and flower seeds and they can also learn to select their grass seed by variety name. Another view is that the public can not cope with the proper selection of varieties because of continued release of new varieties and confusion as to their relative value. For this reason states may be slow to eliminate the fine textured category.

In the process of selecting a mixture of grass seed the buyer should examine the purity and germination figures carefully to be sure the components are balanced in the proportions turf specialists recommend and that the germina-

tion of each is above the suggested minimum. Most states do not have minimum germination standards for agricultural and turf seeds but one might well be guided by the standards set by the Association of Official Seed Certifying Agencies.

Following the pure seed statement the label calls for the percentage of Weed Seeds, Inert Matter and Other Crop Seeds. Massachusetts law limits the quantity of weed seeds to 1% of the total weight and inert material to 20%. Any crop seed component constituting less than 5% (except white clover and agrostis species) must not be named but must be included in the other crop seed figure.

The date tested refers to the month and year of the latest completion of the germination test. If the latest test date on one component precedes the latest test of any other component the earliest date is used.

There should be no question about the net weight statement but it must be given according to the fair packaging and labeling laws.

There is some ado about the noxious weed seed statement. Massachusetts like most other states has a list of Restricted Noxious Weed Seeds which must be declared by

PRESENT LABEL

JOHN DOE SEED COMPANY
1234 Doe Street, Amherst, Mass.

No. 2 Shady Lawn Seed Mixture

Lot No. 56789.

Origin of white clover component is Denmark.

TREATED WITH THIRAM (Arasan (R))
DO NOT USE FOR FOOD FEED OR OIL PURPOSES.

Purity Test

Pure Seed	Component	Germination	Hard
<u>Fine Textured Grasses:</u>			
60.00%	Pennlawn red fescue	90%	--
21.00%	Kentucky bluegrass	80%	--
<u>Coarse Kinds:</u>			
10.00%	Manhattan per. ryegrass	80%	--
0.80%	White clover	65%	--
<u>Other Ingredients</u>			
0.10%	Weed Seeds		
7.00%	Inert Matter		
1.10%	Other crop seeds		

Tested September 1976.

Net weight 5 pounds.

Restricted Noxious Weed Seeds

Contains 20 buckhorn plantain seeds per pound.

ASCONS SUGGESTED LABEL

JOHN DOE SEED COMPANY
1234 Doe Street, Amherst, Mass.

No. 2 Shady Lawn Seed Mixture

Lot No. 56789.

Origin of white clover component is Denmark.

TREATED WITH THIRAM (Arasan (R))
DO NOT USE FOR FOOD FEED OR OIL PURPOSES.

Purity Test

Pure Seed	Component	Germination	Hard
<u>Fine Textured Grasses:</u>			
60.00%	Pennlawn red fescue	90%	--
21.00%	Ky. bluegrass	80%	--
10.00%	Manhattan per. ryegrass	80%	--
0.80%	White clover	65%	10%
<u>Other Ingredients</u>			
0.60	Weed Seed		
7.00	Inert Matter		
.60	Other crop seeds		

Tested September 1976.

Net weight 5 pounds.

Restricted Noxious Weed Seeds:

Contains 20 buckhorn plantain and 1033 tall fescue seeds per pound.

name and number found per pound in the seed lot under the heading "Restricted Noxious Weed Seeds," and a list of "Prohibited Noxious Weed Seeds" which must not occur in any number in any portion of the seed lot. It is recognized by turf specialists that certain seeds classed as crop seeds in reality act as noxious weed seeds when occurring in certain grass seed mixtures.

An example of this is: A state seed inspector collected a sample of grass seed being offered for sale in a hardware store in Massachusetts. The mixture name on the package proclaimed it to be good for many uses and a prospective buyer would assume it to be good for lawns. But the mixture contained 85% tall fescue varieties which are considered coarse kinds and 13% Kentucky bluegrass, which is considered as suitable for fine quality lawns. The planter of this mixture would get an unsuitable lawn.

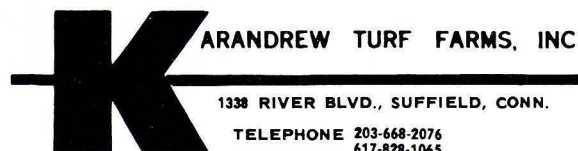
Through many years of experience turf specialists and the American Association of Seed Control Officials have compiled a list of plants considered as noxious for lawns but no state has adopted a comprehensive list for seed law purposes. But there may be changes coming soon because the Association of Seed Control Officials of the Northeastern States (ASCONS) during their August 1976 meeting adopted a list of seeds recommended to be considered as noxious weeds for lawns and turf in the Northeastern states. This list could be altered by additions or deletions and would apply to seeds of lawn and turf grasses for marketing in the Northeastern states.

Recommended List of Noxious Weed Seeds for Lawn & Turf Grasses in the Northeastern States

(when not listed as a pure seed component)

Agrostis spp.	meadow foxtail
Allium spp.	orchard grass
Bromus spp.	Poa annua
bermudagrass	Poa trivialis
Canada thistle	quackgrass
foxtail (questionable)	tall fescue
junegrass	timothy
meadow fescue	velvetgrass

In conclusion I would like to summarize and say that labeling of lawn and turf grass seeds is important and serious business and that a buyer should easily be able to judge the seed quality by reading the label. If the label does not give enough information or if it is too complicated and confusing the label requirements can be changed. The Director of the Agricultural Experiment Station who has been assigned the responsibility of adopting and amending Rules and Regulations for the Seed Law depends on input from the consumer or buyer of seeds, turf experts, Seed Control Officials, Official Seed Analysts, as well as the seed trade for developing Rules and Regulations which will be helpful to the grower as well as fair to the dealer. In the near future Rules and Regulations will be adopted for the new Massachusetts Seed Law and it is my opinion that the new Rules and Regulations will be good ones, reflecting the best judgment of people working with seeds and seed legislation for many years.



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Weed control: More options ahead

To supplement herbicides and tillage, researchers are trying everything from death rays to weed-eating fish

By Rex Gogerty

North American farmers now apply about \$1 billion worth of herbicides on 200 million acres annually. Combined with modern cultural weed controls, chemicals have made easier work of weed fighting, a task that once occupied nearly half the waking hours of farmers during the growing season.

Still, weed-free fields are rare, and it's apparent that current weed-control technology leaves something to be desired. Old weed problems persist; new ones keep popping up. For instance, agronomists say the trend toward less tillage is making certain weeds more difficult to control. And there's growing evidence that some species, such as lambsquarter, are developing true chemical resistance.

With an eye toward closing some of these weed-control loopholes, scientists are stepping up their efforts to develop new alternatives to traditional chemical and cultural methods.

Possibilities. "This is the era of herbicides, but as weed scientists we don't want to confine our thinking to a single control method," says Ellery Knake, a University of Illinois weed specialist. "It's important that we conduct research with every possible weed-control theory. Think what would happen, for example, if we could cause all weed seeds in a field to germinate just ahead of Jack Frost."

Richard Fawcett, a University of Wisconsin weed specialist, is already working with one approach to triggering this self-destruct mechanism. He applies very low

rates of Sutan, Eptam, and other related chemicals to induce weed seeds to germinate faster and earlier than normal. "Many of the weed seeds that germinate would otherwise stay dormant until they caused trouble later in the season," Fawcett says. "Applying precise amounts of certain chemicals gives these shallow, dormant seeds a 'kick' and squeezes their germination span into a shorter period. Subsequent herbicide applications can then be more effective. Or, if germination is induced in the fall, the seedlings are wiped out by frost."

Induced germination is also being used against witchweed, a tough problem for farmers in the Southeastern states. A parasite, witchweed attaches itself to corn, sugarcane, and sorghum. Scientists at the USDA Witchweed Laboratory in Whiteville, N.C., inject ethylene gas into the soil to stimulate witchweed germination before there is a host plant, thus causing the weed to commit suicide. Robert Eplee, laboratory supervisor, says a naturally occurring stimulant called strigol has been synthesized and may soon replace ethylene gas.

Freezing. Another trick with certain weeds is to reduce their tolerance to cool temperatures, causing poor growth or even death. It's done experimentally by spraying a chemical that prevents weeds from producing a compound thought to be associated with cold hardiness.

In Ontario, University of Guelph weed scientists use

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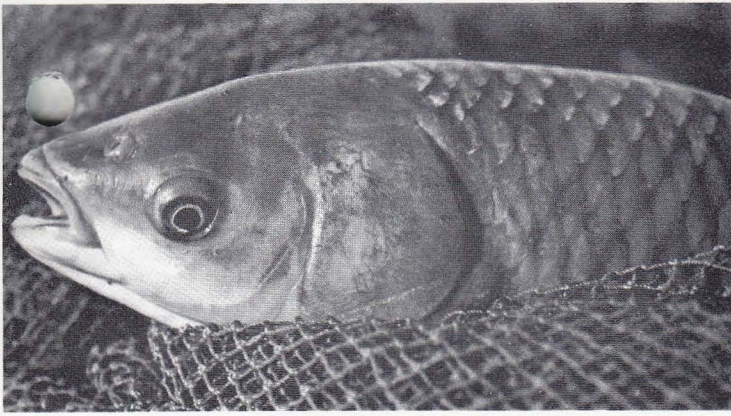
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Weed-eating fish and sea cows are keeping waterways in some areas free of aquatic vegetation.

Connecticut experiments are showing that some late-season weeds don't hurt corn yields much.

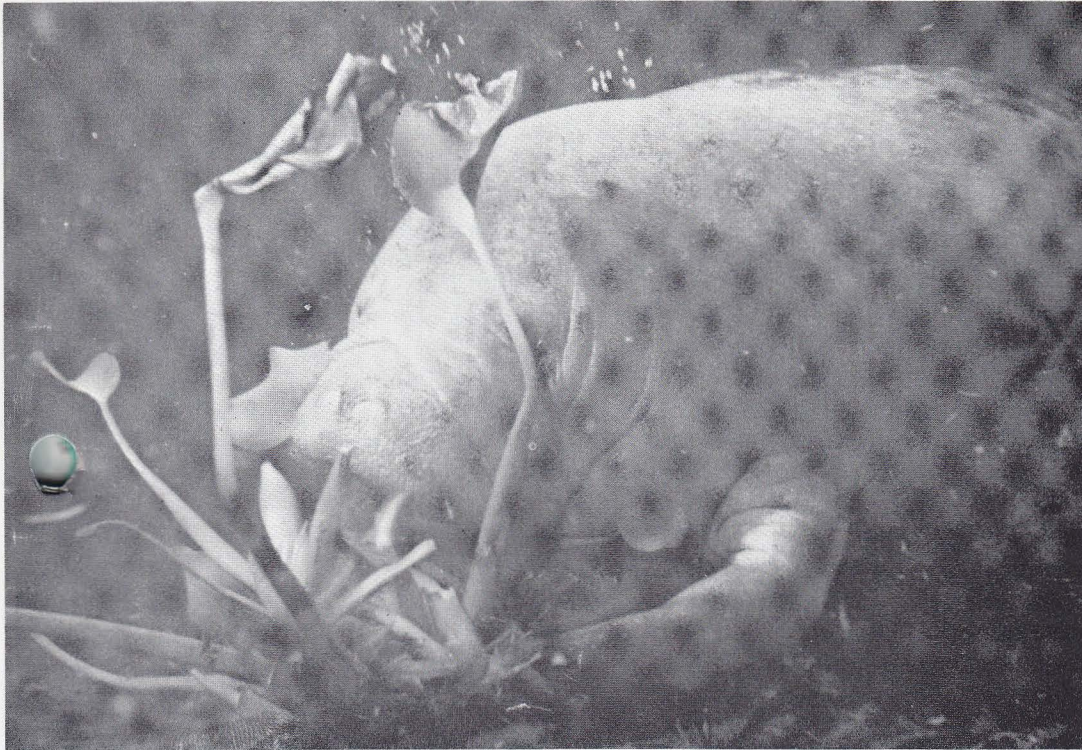


PHOTO JAMES POWELL



North Carolina researchers inject ethylene gas to stimulate premature witchweed germination.

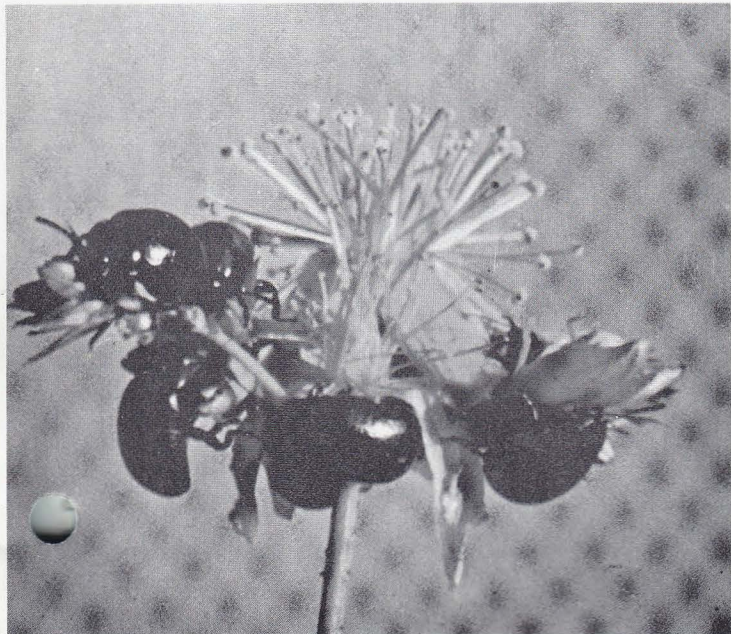


PHOTO WASHINGTON STATE UNIVERSITY

Biological controls include weed-eating beetles.



Induced late-season germination doomed this velvetleaf to a frosty death.

(Continued from Page 6)

other chemicals to make weed control so specific that they can safely kill wild oats in a field of cultivated oats. They treat oat seed with a compound called Protect, then spray the field with the herbicide Barban later in the season. John Bandeen, one of the discoverers of the protective compound, says wild oat plants wither, but crop oats are unaffected.

Coexistence. One option to full weed control is finding weed levels we can live with economically. R.A. Peters, University of Connecticut agronomist, is testing this alternative by reducing herbicide rates and aiming only for early control of such weeds as crabgrass and fall panicum in notill corn.

"After the corn shades the ground, late-germinating grasses seem to have little effect on yields," Peters says. "Besides savings in production costs and reduction of residue problems, we gain a thin cover of dead grass that keeps the soil in place."

Another option under study is greater use of plants that compete better with weeds. For example, Cornell University horticulturalists have found that Hudson and Green Mountain potato varieties stay nearly weed-free, while Katahdin is severely overgrown. Cornell's R.D. Sweet says profuse early branching in Hudson and Green Mountain potatoes results in a tighter canopy and fewer weeds.

Some plants can compete by "poisoning" neighboring plants. Through a mechanism called allelopathy, their plant roots secrete substances into surrounding soil and inhibit

growth of nearby plants. Allelopathy is known to exist to some degree in such commonly grown crops as corn, soybeans, and cereal grains. Even as the plants decay, their residues may continue to exude toxins.

Researchers Alan Putnam of Michigan State University and William Duke of Cornell have found one cucumber variety that inhibits 75 percent of normal nearby weed growth. Scientists theorize that it might be possible to increase allelopathy through plant breeding.

Enemies. Among other natural weed controls are such pathogens as fungi, bacteria, viruses, and nematodes. Pathogenic weed control, a new field, promises to become much more useful in the future.

Scientists hope to use it, for example, against spurred anoda, a troublesome weed in Southern cotton and soybean fields. In tests, adding two naturally occurring fungus diseases to fields reduced populations of spurred anoda to zero.


Various pathogens have also been used to control skeleton weed, brush weed, citrus vine, curly dock, and tea-weed. Roy J. Smith Jr., a USDA research agronomist at Stuttgart, Ark., has developed a fungus spray that kills curly indigo in rice.

Good bugs. An older biocontrol method is use of insects. This goes back to nearly a century ago, when selected species were turned loose on prickly pear cactus in Australia. Many of the original test areas are still cactus-free. And 25 years after Klamath weed beetles were re-


(Continued on Page 10)



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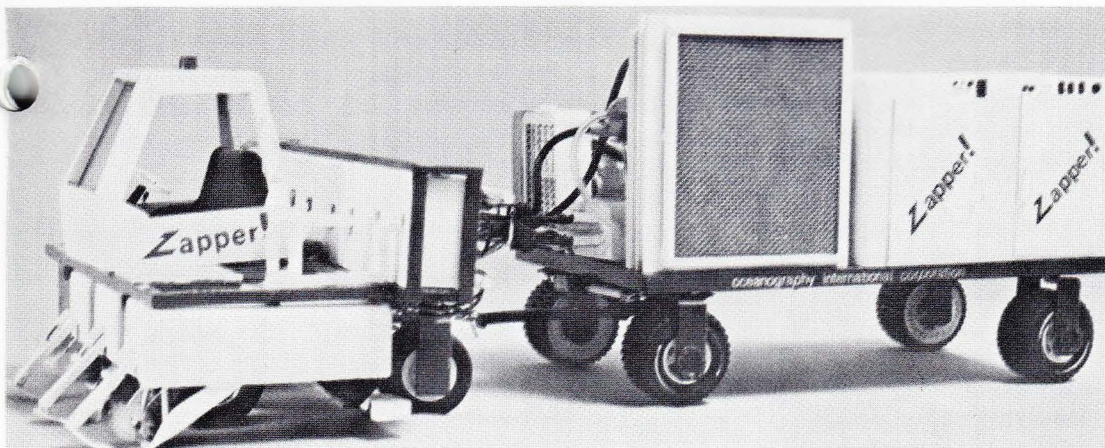
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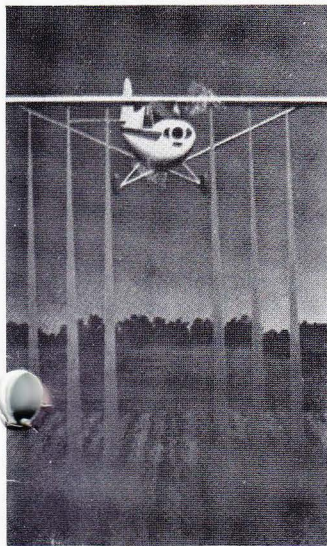


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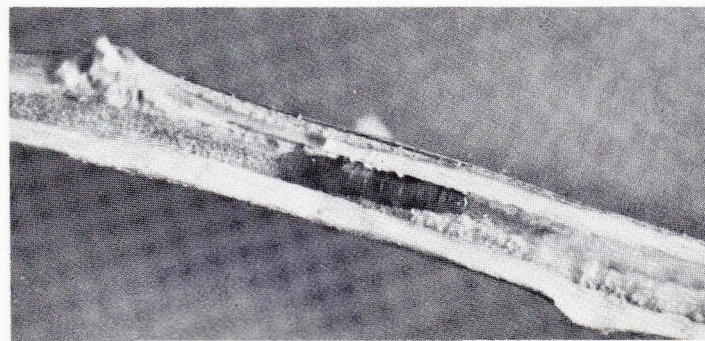
A naturally occurring fungus was sprayed to shrivel this jointvetch in a rice field.

PHOTO: USDA



Recirculating sprayer applies “hot” herbicides to tall weeds and captures excess herbicide.

Weed-munching insects hollow out a tumbleweed stem.



(Continued from Page 8)

leased on 2 million acres of California rangeland, the weed remains at only 1 percent of its former population.

More recently, the cinnabar moth has reduced tansy ragwort populations to nearly zero at original release sites in Canada's Maritime Provinces.

Now other insects are being groomed to attack important weeds. A small moth, *Bactra verunta*, shows promise for controlling purple nutsedge, which is considered one of the 10 worst weeds in the U.S.

Peter Harris, a biocontrol scientist at the Agriculture Canada Research Station, Regina, Sask., is using a European weevil to control musk thistle. "The weevil feeds on musk thistle seed heads," he explains. "It has reduced thistle populations as much as 95 percent."

South Dakota entomologists have imported a moth from Canada to control leafy spurge. They say the moth's larvae spend most of their time eating.

Entomologists at the USDA Biological Control of Weeds Laboratory, Albany, Calif., have released larvae that bore into the leaves, stems, and branches of one of the West's worst weeds: Russian thistle, or tumbleweed. The insects, released in California, Nevada, Utah, and Idaho, have reduced some tumbleweed stands substantially, according to entomologist Bob Hawks.

Clean canals. Among the more unusual biocontrol methods are those used to limit aquatic weed growth. These include use of weed-eating fish capable of consuming half their body weight daily in algae, waterhyacinth, and other waterway chokers.

One example is the white amur, or grass carp. David Sutton, a University of Florida agronomist, has stocked them at the rate of 160 per surface acre to eliminate hydrilla and pond grasses. Weed-eating fish are being tried in California irrigation ditches and in ponds as far north as Iowa.

The jumbo control for aquatic weeds is the manatee, a weed-loving mammal weighing up to 500 pounds. Also called sea cows, manatees are being introduced to larger canals in warm climates, where they live, swim, and graze on aquatic weeds.

While some researchers work to perfect these and additional biological controls, others are developing new mechanical and electronic aids for fighting weeds. For example, a recirculating sprayer developed by C.G. McWhorter at the Delta Branch Experiment Station, Stoneville, Miss., squirts "hot" herbicides across tall-growing weeds, but keeps them off susceptible crops.

Researchers in California and Texas are getting excellent control of field bindweed with precise application of Treflan in a subsurface layer. They mount nozzles under a blade to apply a herbicidal weed barrier as the blade is pulled through the soil.

Fried weeds. For hard-hitting nonchemical control, a Texas firm is marketing a tank-size weed shriveler dubbed "The Zapper." As it travels over a field, it reportedly cooks weeds (and insects) much the same as a microwave oven bakes potatoes.

Also off the drawing board is Lightning III, a tractor-

drawn machine that shocks weeds with an electric current. "It's now being used to control weeds in soybeans, on tree farms, and along railroad rights-of-way," says Gerry Dykes, president of Lasco Inc., the Vicksburg, Miss., firm that markets Lightning III. The machine will also be used to desiccate crops for early harvest.

University of Alberta scientists are testing electromagnet-equipped tillage tools that can alter weed-seed dormancy.


Ricks Pluenneke, a Texas crop physiologist who has worked on several nonchemical approaches, says light may one day be used for weed control. But he adds that this would require a powerful, precise light source capable of reaching long distances.

A beginning. "Field application of lasers and other similar light sources for weed control is probably years away," Pluenneke says. "But small quantities of light have been used to influence growth of light-sensitive weeds and crops."

In one experiment, Pluenneke reduced flowering of cockleburrs 51 percent by interrupting dark periods with flashes of red light from a helium-neon laser. The cockleburrs were fooled into sensing it was the wrong time of year to flower.

Many of these new weed-control options are still experimental—much as 2,4-D was in the early 1940s. But the quest for new controls will no doubt be far-reaching. One expert says current developments are "only the tip of an iceberg."

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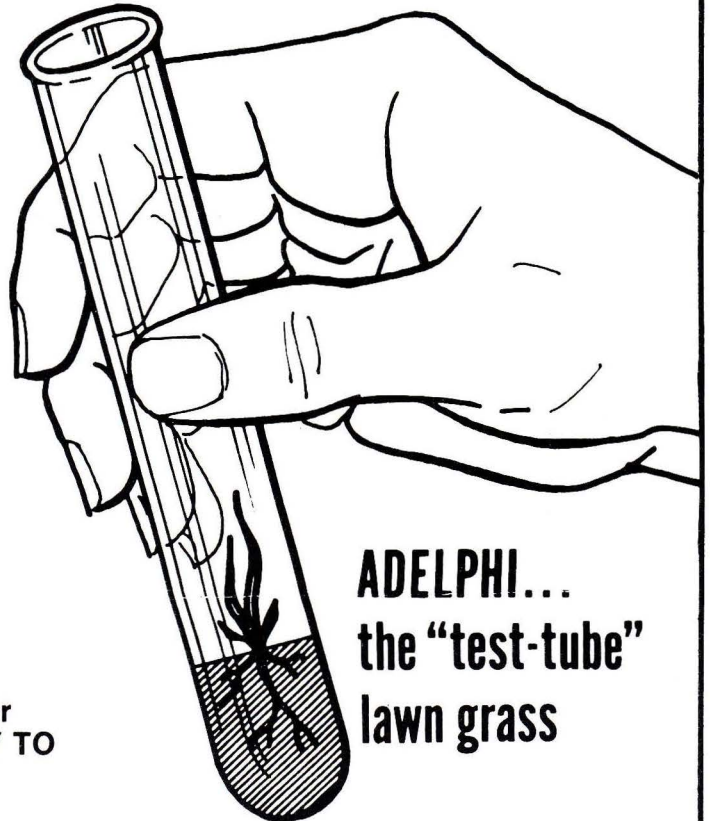
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Problems And Solutions Associated With Heavily Used Turfgrass Areas

Prepared by Forest Cress, Victor Gibeault*

At the 1976 Turf and Landscape Institute, a panel discussion with five turfgrass researchers was held. This presentation summarizes the two-hour session that was moderated by William Davis of U.C. Davis. Panel members were Drs. V. B. Youngner, U.C. Riverside; J. Madison, U.C. Davis; J. Butler, Colorado State University; J. B. Beard, Texas A & M University; and A. Turgeon, University of Illinois.

There are four major dimensions of traffic on turfgrass. The two that are of most concern are soil compaction and turfgrass wear. Of lesser concern are divot damage to turf, resulting from sport activities, and rutting which can be caused by vehicles on certain soil textures under high moisture conditions.

Which Grass to Use

It was noted that research by Youngner has shown that zoysiagrass, bermudagrass and bahiagrass, in that order, are the best warm-season grasses to survive the combined effect of wear and soil compaction. Zoysiagrass,

once injured, is slower to recover than bermudagrass which often influences its lack of selection for high trafficked areas, especially where there is continuous traffic. Dr. Youngner explained that a zoysiagrass breeding program is underway in California to develop varieties that will recover more rapidly. Meyer zoysiagrass, which is used quite widely in the midwest and east, isn't recommended for California because it is dormant for several months of the year.

Of the bermudagrasses, Tifway and Tifgreen have shown superior tolerance to traffic because of their greater accumulation of total vegetation. In California, it was noted that Santa Ana has significantly gained in popularity on heavily used facilities.

Madison pointed out that the best grass for traffic tolerance is the one that can be best grown on a facility. He often suggests using common bermudagrass in warm season areas where management may be minimum because of limited finance available.

Beard observed that kikuyugrass, a weed problem for California turfgrass managers, had good traffic tolerance. He reported that in Africa golf tees were established to kikuyugrass where they were mowed and irrigated frequently, and were maintained at a quite high nitrogen level. "Maybe there are going to be some new grasses coming along . . . that we call weeds now," he said, "that

*Educational Communicator and Environmental Horticulturist, U.C. Riverside, respectively.

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might help out on these intensely trafficked turfgrass areas. There are going to be increasing problems with more traffic on them in the future."

Turning to a comparison of the cool-season turfgrasses, Turgeon commented that ryegrasses have given an advantage over the bluegrasses by having the same color and texture but a tremendously improved resistance to wear.

Turgeon added that tall fescues also has advantages. In a large area, they do give a uniform appearance without disease problems that tend to appear when you have Kentucky bluegrass. Tall fescues also have great wear potential. The species is fairly economical with respect to water, according to Turgeon, and is tolerant to a fair amount of shade.

Turgeon said that the tall fescues and ryegrasses are good turfgrasses for intermediate transition zones, and they both have high fiber content which gives good wearability.

With respect to the ryegrasses and tall fescues, Beard noted, one should keep in mind that their recuperative potential isn't the greatest, if one is looking for speed of recovery in a turfgrass. A lot of the recuperative potential, he said, comes from lateral stem development, which is minimal with most ryegrasses and tall fescues. An exception, he added, is Manhattan, a ryegrass which he said appears to have a certain degree of creeping tendency to it. It's the one that really stood out in the wear tolerance tests he conducted. He noted that many ryegrasses he tested rank way below many Kentucky bluegrasses in wear tolerance.

Butler noted that the wear tolerance of Kentucky bluegrass is very good in areas of its adaptation. In areas where Kentucky bluegrass is only marginally adapted, it does not have good wear resistance.

Beard commented that in Kentucky bluegrass comparison studies he conducted with wear simulator for short-term abrasive effects on Kentucky bluegrasses, he found quite a range of tolerance. Out of 18 tested varieties, he would only rate A-34 as excellent. In the good category were Merion, Baron, Nugget, A-20 and Georgetown. Medium were Primo, Fylking, Adelphi, Newport. Fair were Sodco, Galaxy, Bonnieblue, and Belturf. Poor were Campus, Sydsport, Kenblue and Park.

For intensely trafficked putting grasses, bentgrasses would be the best choice, according to Beard. In comparison studies for wear tolerance, he found Penncross to be the best of the commercially available varieties. One that had poor wear tolerance, he added, was Emerald. Toronto and Congressional didn't do very well, either. He found considerable variation among the cultivars with respect to wearability.

Turgeon pointed out that the improved varieties of perennial ryegrass are being used. Ryegrass, when compared with the Kentucky bluegrasses, has a very rapid germination rate, and because of its seedling vigor in its early immature stage of growth, presumably has what might be called an induced recuperative potential by virtue of an overseeding operation. This is being done today, he noted, not only during the renovation program on football fields

but even during the season of play, itself. An overseeding program is practiced perhaps right after a game so that there is some new grass developed prior to the next game which, say, might be two weeks away.

On the other hand, he added, with Kentucky bluegrass that is properly managed you can develop over a period of time what he calls a rhizome base or underground system of extensive rhizome development that he believes can add to the wear tolerance of the grass as well as provide for a rapid recuperative potential given a certain amount of wear injury.

He finds it intriguing to compare the two grasses and then to consider the possibility of a combination of the two. "I don't know that we've adequately worked that out," he said. "I think that it is certainly of need of further research and evaluation."

Influence of Cutting Height

The turf experts agreed that height of cut can have a considerable effect on the wear resistance of turfgrasses.

Youngner, as an example, said that if you have a turf of Kentucky bluegrass and are mowing at $\frac{1}{2}$ to $\frac{3}{4}$ inch you're going to very drastically reduce its wear resistance, because you're weakening its root system and reducing the density of the grass and that both of these factors influence wear resistance. On the other hand, he added, if a turf, say a bermudagrass, is cut too high, it tends to become very fluffy. Wear resistance will be decreased again but for a different reason: "You'll have a loose, open, rather fluffy turf that will tear rather easily, particularly under cleats and that type of wear action."

He noted that he ran a series of tests many years ago at UCLA where turfgrass was mowed very low, below the desirable range, and then allowed to grow again to the desirable cutting height. There was a time lag before its wear resistance was at the level of turfgrass which had been mowed within the desired range throughout the same period of time.

Turgeon says he thinks it is fair to generalize that within the mowing tolerance range for a particular grass, there is a general increase in the wear tolerance of turf as one increases mowing height. Associated with this, he said, we see an overall increase in biomass which occurs in two dimensions: an increase in the verdure or above-ground biomass or what is left of the green growing turf after mowing, and, second, the below-ground biomass, the root and rhizome system. Usually, he added, both of these increase significantly with even small increases in mowing height.

For vertical mowing, Youngner said, once or twice a year should be ample for bermudagrasses for most athletic field uses. The mowings should be when the grass will recover very quickly and early enough that recovery will be sufficiently complete before the time for germination of fall weeds. He recommends vertical mowing of bermudagrass early in the summer for southern California, during its main growing season.

(Continued from Page 13)

Wetting Agents on Trafficked Turf

Beard said that considerable work was done while he was at Michigan with wetting agents on sand soils possessing hydrophobic characteristics. Soil microorganisms were active in these soils. When they died, they coated the sand particles with an organic material similar to a wax. Water wouldn't penetrate it. Under those conditions, Beard said, one can show a response to certain wetting agents, but, Beard stressed, he was talking about effective use of wetting agents on a hydrophobic, water-repelling soil, and that he was not talking about a compacted, high density, low aeration/low pore space soil. There are no data, to his knowledge, which show a response by compacted soils to wetting agents.

Turgeon commented that with wetting agent compounds and biological dethatching compounds, he would suggest that turfgrass managers initially try such products for a specific problem on a small-area basis. Some of these products conceivably might work under a particular set of conditions.

Modifying Soil Compaction on High Trafficked Turf

Turgeon reported that at the University of Illinois researchers have been evaluating the new concept of subsurface cultivation. They are comparing it to coring, measuring results three months following cultivation and then a year later using a soil cone penetrometer to measure soil strength which would be rated as soil compaction. Characteristically throughout the area, he said, they encountered a zone of resistance or a subsurface compaction layer at about the 3-inch depth. "The only thing we could come up with to explain the existence of this sub-surface

compaction layer," he said, "was the effect of coring over many years. That site had been core-cultivated at the maximum depth of penetration for that aerifier." The results indicate, according to Turgeon, that through a regular system of core cultivation one actually might be doing some damage to the soil system by inducing a compaction zone, and that perhaps from time to time some measures should be taken to break that zone up. Perhaps there is a role for a new concept or system of cultivating the subsurface by deep slicing.

Butler said there's a need for improvements in mechanical aerifiers since the same techniques are being used today that essentially were used 15 to 25 years ago.

Beard said he believes that the preventive approach is best for solving or ameliorating surface compaction problems for those who can afford it. By prevention, he explained that he meant proper surface drainage, a root zone of a texture that excess water can be removed rapidly, and that there are subsurface drainage tiles to remove excess water from the soil. If this approach is not affordable, then turf culture approaches must be used to ensure active deep root systems. Finally, if one must, there is cultivation such as coring and slicing, spiking, and shattering. He doesn't see cultivation as a standard practice in a program that is to be done at a certain time according to a schedule. He said one should go out and core only as a specific problem is assessed.

Turgeon saw three fundamental approaches to deal with traffic intensity: (1) trying to prevent or reduce traffic intensity on a site through design layout (e.g. design to encourage traffic to flow over a broad area rather than being confined to a relatively narrow area); (2) develop a soil medium that is relatively resistant to compaction over time; and (3) compensating for intensive use by physically improving the soil by a method or methods of cultivation.

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Past And Present Golf Course Maintenance

By Sherwood A. Moore

In a panel discussion of this nature it is very difficult not to have some overlapping of remarks and viewpoints. You will just have to bear with us, and perhaps by the repetition you will learn. You remember, if you were in the military service, the number of times you had to drill, and to dismantle and assemble that d --- rifle.

It is also difficult when you discuss the present not to reminisce about the past, and although you have already heard the three previous speakers talk about the past you are also going to hear us mention it at times—especially if we have to make comparisons.

I was going to preface my remarks by stating that I thought present day golf course maintenance was more exacting and demanding than pre-World War II, because of greater knowledge, and research and especially the golfer's demands. But then on doing a little research in past literature on this subject I came across this article in the "Proceedings of the Fourth Annual Greenkeepers Convention" held in Louisville, Kentucky on February 4-7, 1930, entitled "The Trend of Greenkeeping" by O.J. Noer, in which O.J. contrasted golfing conditions of today with those existing thirty-five years previously. O.J. said in 1930 "Thirty five years ago a golfer was not hard to satisfy in the matter of turf. Now, however, there is strong competition between courses and members and so it is necessary to provide excellent playing conditions or clubs will not hold members. All of this has, of course, multiplied the greenkeepers' worries but as a whole they are meeting the test and learning how to produce better turf through cooperation among themselves and through intensive study." Remember, this was written forty-six years ago. They were saying the same thing then that we are today. I know that I can find in my files articles written at the end of most any year stating that that year was the worst year in the history of turf!

So actually, is present day maintenance that different? Emphatically YES! Maybe not that much more difficult, but certainly different. We had our problems in the past and we attempted to solve them with the tools and knowledge we had at that time. I, for one, would not want to return to those days of hand spiking, hand weeding, hand mowing, hand raking, applying fungicide by hand after it was previously mixed with sand, dragging hose and sprinklers around, digging drainage ditches and water lines by hand, and the million and one other things that you can recall. Like my son says, "That's in the Stone Age, Dad."

Naturally, turf maintenance should be different today with all of our new knowledge through research and practical experience, and with new tools and equipment. This has not eliminated the long hours and worrisome nights that Superintendents encounter in attempting to work with nature and player demands, just as they did forty-six years ago. When we think that we know all of

the answers, then nature has a way of humbling us, knocking us down to size by a tough summer or even a tough winter.

But I will take the present day turf maintenance—especially in irrigation. Many of us have run the full gant-

(Continued on Page 17)

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let—of dragging out hose and sprinklers to greens and tees, starting the pump, moving the sprinklers to various spots; then having our pump house pressurized; and when fairway watering became popular, to using traveling sprinklers with hundreds of feet of hose; graduating to snap valve systems in fairways, greens and tees; and finally on to automatic irrigation—even the dual row system. And now we have central control with rain gauges that shut off the system while we are in slumberland and dreaming about the grass dying.

Automatic irrigation, if not abused, is certainly a wonderful tool. You definitely have better control of your watering program; it is a tremendous labor saver; and of course, a great aid in growing fine turf. What a contrast to the hose and sprinkler system and even the quick coupling system. With automation you can gamble a little more—let the grass grow to the point of stress, for then if it does not rain, you can still get around the course faster and easier than with the old systems.

Of course automatic irrigation can be abused—AND IS. One of its greater disadvantages is “It is too easy to push buttons.” I find that a lot of Superintendents overwater—every night the sprinklers go on regardless. Would they do that if they had to drag out hose and sprinklers or move quick couplers? We have a tendency to overwater—in fact I find myself doing that in periods of stress during the summer months. You know the old adage, “If in doubt, water.” With our sophisticated, modern irrigation system that is so far superior to the “old days” we should try to use good judgment. Personally, I try not to be a creature of habit but check the clocks every day, changing the watering schedule as conditions warrant. When we installed our automatic watering system we left our old quick coupling system intact, so now I occasionally even use this system,

especially on Monday mornings when the course is closed—just to give a different pattern to watering on the course. We do not have central control, because I do not know what the grass is doing while I am sitting in the office, but have seven stations located around the course that are visited every day for changes in watering times and amounts. You know they say once you have automatic irrigation the Superintendent becomes the water man, which is true. But would you do without it? Not me!

I mentioned before that automatic irrigation systems are a labor saver, and so are a lot of our present day pieces of equipment that we did not have thirty or forty years ago—even ten or twenty years ago; such as aerifiers, top-dressers, sand trap rakes and even golf carts to the extent that they are used today. So I find that we are operating with a smaller crew than in “the good old days.” And it is not all because of wage increases because it is all relevant. Although we were only making 40 to 50 cents an hour forty years ago, beer was only a nickel a glass.

Labor has changed and I think for the best, although at times I wonder. You do not send the crew home with no pay on rainy days now; nor dock them for sickness; nor pay them straight time for a sixty hour work week. We can complain to the state labor board, or the equal rights commission, or the “Union,” even to the chaplain if mistreated. Gone are the days of the whip, the slave driver, the Sam McGees. Instead, now you have to be a manager—a manager of people. I have a lot of confidence in youth. They may be spoiled in demanding more than they are worth, but all they need is direction.

You know I was supposed to talk a little bit about chemicals, but I am sure that my time must be drawing to a close with my rambling on; and I know those other fellows are gnawing at the bit to say their piece and

(Continued on Page 18)

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we should save some time for questions so this is only going to be a little about chemicals.

Chemicals have been one area of dramatic change—from the days of sodium arsenite as our herbicide, lead arsenate as our insecticide, and Semesan and corrosive sublimate as our fungicide (of course we had a few other things as Diworm for earthworms and Antiant to control ants on the greens). What a contrast to the present day array of chemicals—that is providing EPA does not send them all down the drain. Two of the greatest changes were with the advent of 2-4D and DDT following World War II. I can remember when fairways were yellow with dandelions in bloom, and then you could not find your golf ball when they went to seed. 2-4D changed all that; and now with all of its cousins and combinations there are not many weeds that we cannot control these days. And DDT was the greatest of all insecticides until it went the way of Rachel Carlson. Of course I must comment on the pre-emergent chemicals especially those controlling crabgrass—what a Godsend. No more raking with crabgrass rakes to raise the seed heads to be mowed off and collected, nor the back breaking job of hand weeding. No wonder large crews were needed in “the good old days.” We do have many wonderful chemicals, perhaps too many, to work with these days; and if not abused nor used incorrectly can be a great tool in growing fine turf. A word of warning though, do not go throwing everything on your turf—remember it is a living thing. One fellow told me that the only trouble with the chemicals these days is that they all have to be applied at the same time—when the forsythia is in bloom.

With the loss of DDT the arsenates, the mercuries, and now chlordane and heptachlor; and with the appearance of new insects and diseases your job is not going to be any easier in the years to come.

Seriously, I think that it is a great period for the turf management profession—I am glad to be a part of it. I am also glad that this panel only had to talk about the past and the present, for I would hate to have to try and tell you what is in store for you. It is just great to be here today. Thank you.

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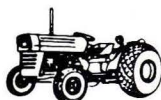
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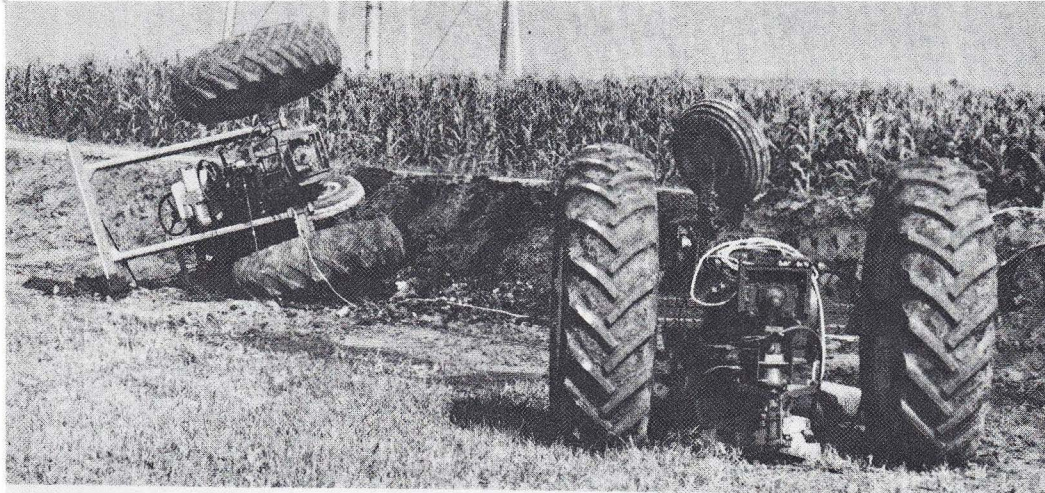
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Roll-over protective structures (ROPS) for tractors are sound investments for farmers for two good reasons: they provide operators with an extra margin of safety, and they are legally required for most tractors manufactured after October.

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OSHA defines an agricultural tractor as any two- or four-wheel drive type vehicle or track vehicle of more than 20 engine horsepower designed to furnish the power to pull, carry, propel, or drive implements designed for agricultural work. *All self-propelled implements are excluded.*

Some tractors, such as low-profile vehicles used in orchards or vineyards where vehicle clearance requirements of the protective structures would interfere with normal operation, will be exempt from the standards. Also exempted are tractors mounted with equipment such as corn pickers, vegetable pickers, and fruit harvesters or other similar equipment where ROPS would be incompatible. Employees may operate this equipment, but ROPS must be remounted prior to use in regular fieldwork.

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(Continued on Page 20)

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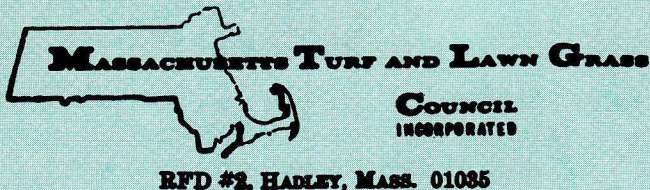
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FROM



(Continued from Page 19)

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It's the duty of the employer to provide instructions covering the nine points listed below before allowing the employee to drive the vehicle. The employer also must give refresher courses at least annually thereafter.

Employees must be instructed to:

1) Securely fasten seat belts on tractors equipped with ROPS.

2) Where possible, avoid operating the tractor near ditches, embankments, and holes.

3) Reduce speed when turning, crossing slopes, and on rough, slick, or muddy surfaces.

4) Stay off slopes too steep for safe operation.

5) Watch where you are going, especially at row ends, on roads, and around trees.

6) Do not permit others to ride.

7) Operate the tractor smoothly—no jerky turns, starts, or stops.

8) Hitch only to the drawbar and hitch points recommended by the tractor manufacturer.

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