1971

Spring 1971

James L. Holmes

Frederick G. Cheney

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O. H. Hammer

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See next page for additional authors

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TURF BULLETIN
 MASSACHUSETTS TURF AND LAWN GRASS COUNCIL INCORPORATED

SPRING 1971
CONFERENCE ISSUE

BETTER TURF THROUGH RESEARCH AND EDUCATION
Vol. 7, No. 3  Spring 1971

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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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Damage To the Golf Course

by JAMES L. HOLMES

This is the time of year when the golfing public should be made aware of the damage that golf courses and golf course turf suffers both because of their activities and the activities necessary for maintenance.

If "damage" is brought to their attention, it is hoped that most of this damage will remain as potential, rather than becoming actual. Perhaps the best way to approach this problem is to divide and discuss damage under the following headings: traffic, golf carts, vandalism, snowmobiles, flooding, desiccation, and ice sheet cover.

Traffic

Even though one type of damage to a golf course could be included under the broad heading of "traffic," it is broken down in order to expand upon various types. First, player traffic causes most extensive injury. Constant and heavy play on a given area frequently destroys turf. Teeing turf is most severely damaged, followed by turf on greens, and then fairways.

The one single factor of extracting divots, especially on tees and fairways, is an example. The United States Golf Association has steadfastly maintained that all divots die or are displaced by mowing equipment and many bare spots are left throughout the course. Even though divots may be replaced it is necessary to plug many divot scars or topdress such scars with soil and seed. That is done at the best maintained golf courses where the membership insists upon a complete turf at all times.

Foot traffic can be severely damaging to turf on putting surface and collars, especially when soil is overwet, or frost and ice is leaving the ground in spring.

The most important time to close the course to all play is when soil in greens is thawing and the upper one to three inches has melted with solid ice beneath. This will happen only on a few days in spring, but invariably occurs on a nice, sunny, warm weekend when the golfer, who has played very little during the winter, is ready to go.

Other serious foot traffic damage occurs in funnel areas such as between greens and trees and on collars between the putting surface and greenside bunkers. Any design or redesigning attempts take into consideration the necessity of dispersing foot traffic as much as possible.

Equipment necessary to maintain the golf course can be and often is excessively damaging to turf. Much of this results from the fact that mechanization is absolutely essential in order to effectively and economically operate and maintain a modern golf course. Much of this equipment is quite heavy, and even though wide flotation tires are regularly used, rutting and other heavy equipment-type damage occurs.

Even though heavy maintenance equipment

(Continued on Page 4)
is known to be damaging to turf it simply must be used. This type damage, along with player damage, simply must be lived with.

In the broadest sense, the other type traffic damage we must consider is temperamental or intentional—putters being driven into the putting surface, and litter, such as cigarette and cigar butts, bottles, cigarette packages, golf ball boxes, and various assorted discarded paraphernalia which is strewn over the golf course. Nonetheless, this is a serious problem and it is costing the golfing public dearly.

At some clubs, interested members pick up litter during a round. Golf carts, used by men of this type are frequently loaded down with litter and refuse at the end of 18 holes. If all members were as careful, or took as much pride in their own golf course, litter would be no problem. In any event, it appears that we must live with a certain amount of careless individuals who believe that the rest of the world must clean up their garbage. The litter bug must be included along with the temperamental or intentional damager of his golf course.

Snowmobiles

The use of snowmobiles on golf courses is relatively new. However, last winter numerous calls were received from interested club members requesting information on possible “snowmobile damage.” A study over the past couple of years leads to the conclusion that improper use of snowmobiles can be damaging to turf on tees and greens, and to Poa annua grass no matter where it exists. As a result of our observations, we have arrived at the following conclusion:

1. Do not allow snowmobiles to pass over greens or tees at any time.
2. Anywhere Poa annua is the predominant turf, restrict use of snowmobiles as much as possible.
3. Do not allow use under any circumstances in less than six inches of snow.
4. Never allow snowmobiles if snow is melting, or following a rain regardless of depth of snow.
5. Prohibit use completely when snow is melting in spring.

It seems obvious that restrictions must be placed on the use of snowmobiles on golf courses: that is, if you wish to eliminate serious damage which can occur in trail areas or at given times throughout the winter.

Golf Carts

A great deal has been said and published regarding turf damage resulting from the use of golf carts. It is recognized that golf carts can be excessively damaging to turf. Much has been done to reduce this damage, such as restricting cart use when courses are overwet or golf turf is wilting. At most courses cart paths have been installed in heavy funnel areas or where it is simply impossible to maintain turf because of “funnel” cart use. Further, it is becoming common to install cart paths throughout the playing areas. The trend actually is toward extending paths from the first tee to the 18th green.

Vandalism

Vandalism can be placed under two general headings: occasional or planned.

Occasional vandalism occurs where courses are not fenced in or otherwise protected. The unknowing public strolls over the golf course and occasionally takes a flag and flag stick, or a “pretty tee marker” simply because they are not aware of their place or value. This type of vandalism results from what you might consider the ignorant public and by people who have no desire to damage the golf course.

On the other hand, planned vandalism is of a vindictive nature and the persons responsible have a definite purpose. Regardless of precautions taken against this type of vandalism, such as installation of fencing or use of private policemen, such vandalism is relatively difficult
to stop. Fencing and the use of private policemen or “night watchmen” is a deterrent, and an increasing number of clubs, especially in urban areas, are resorting to this practice. Night watchmen and trained dogs are being tried in the East.

It would take the rest of the magazine to list all the types of destructive acts committed on golf courses, and no doubt every reader will have seen some vandalism and will be aware that this problem is real and increasing. It is advisable for those courses in areas where vandalism is a problem to include a reasonable amount in their budget to cope with this problem.

Desiccation

Desiccation is the one single factor which kills the most grass, especially on putting surfaces, in the northern part of the country. Death to turf through drying or desiccation occurs in late February or early March, shortly before watering systems are placed in operation. Desiccation follows three to five days of high temperature, occasionally in the 80s and high velocity southwest winds. Frequently wind gusts may exceed 60 miles per hour.

Most golf course superintendents have become aware of this problem and either have access to a large spray tank and water-down greens with at least 500 gallons of water per green, or will turn on watering systems, water all greens, then immediately drain back the system. Even if some breakage to the system results, in their opinion it is simpler to repair limited water system breakage than to re-establish anywhere from one to 18 putting surfaces. Desiccation must be closely watched for at times when it is known to occur, and every effort should be made to compete with this serious problem.

Flooding

A suitable golf course simply cannot be maintained in an area which regularly floods. If it has not been possible to control flooding, the club should be moved to a location which does not flood. If an area completely floods, turf will suffer and playing conditions will be poor, or else play will be impossible for a number of days during the season. There is nothing which more grossly damages turf or which places greater limitations on maintenance than flooding. Flooding does not refer to casual standing water or the flooding of a couple fairways because a creek overflows occasionally, but the regular overflow of any water contributory resulting in water or ice covering an extensive golf turf area for an extended period of time.

Ice Sheet Cover

The next greatest “kill” to golf putting turf results from a solid ice sheet cover. Just what happens, or the physiology of turf kill has yet to be determined. In order to be deadly this ice sheet cover must be solid from the soil surface up to and encompassing the entire grass blade. If the ice is rotten or has holes throughout, or there is loose snow beneath the ice, it appears that little or no damage occurs. Those who have lived with this problem limit an ice sheet cover to 25 days. Or, after it has been in place for 25 days it is removed. Re-

Flooding can damage turf as well as limit maintenance work.
moval is accomplished through topdressing with
a dark material such as a natural organic fer-
tilizer or a soil mix. This is the most widespread
practice and is quite effective. Also, mechanical
devices such as front end loaders or iron bars
are used to break up ice or punch holes
through the ice.

There is a definite trend by golf course super-
intendents to either topdress heavily or apply
a natural organic fertilizer at high rates in late
fall before ice formation starts. Application of
either of these materials tends to reduce the
formation of a continuous ice sheet. It may
be effective in that a "layer" which might be
considered similar to snow under ice is present.
In any event, this practice of heavy topdressing
or use of a natural organic fertilizer in late fall
is increasing. It suffices to say that if a solid
ice sheet is in place for longer than 25 days,
it should be removed or extensive damage to
turf will most likely result.

General

A number of things can cause damage to the
golf course: such as diseases, insects, nema-
todes, etc. But, by and large, these are of
biological nature and each individual one would
take a report of this size for comment. When
one is aware of the many things which can be
damaging to the golf course and the turf there-
on, it is quite amazing that golf courses have
been and are maintained at the high standards
and levels currently existing. Indeed, this is a
testament to the golf course superintendents or
the men who are responsible for the superb
playing conditions that golfers expect today.

Conclusion

Most damage to the golf course results from
players and player traffic. Obviously, without
golfers there would be no golf courses. But
courses would be much easier to maintain with-
out them. Most money is spent on and most
effort is put into competing with or overcoming
damage done to playing turf by the player.
Considerably less damage would result if players
were more conscientious and made an effort
to take better care of their course. Actually,
every single golfer pays for the damage he does
to the golf course through increase in daily
fees or dues. Damage from use of mechanical
equipment is an occupational hazard because
economy of operation dictates that such equip-
ment must be used.

Damage not directly related to traffic, such as
flooding, desiccation, and ice cover as dis-
cussed, are problems more pertinent to the
golf course superintendent. He must make him-
self familiar with them and take efforts to
overcome or circumvent them. It is a testament
to the turf-keeping profession that golf course
superintendents have been able to compete
effectively with the golfer as well as with
nature.

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RHODIA INC., CHIPMAN DIVISION
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EDITORIAL

Pollution — Where are we headed?

Many people do not realize the threat of pollution to the Earth. How does one convince a housewife that someday the supermarket may be empty? How many homeowners and golf course superintendents realize that much more air pollution will kill the grasses? Foods have been taken off supermarket shelves and species of grass have been killed — Why does the possibility of no grass left seem so absurd to some people when it is beginning to happen already?

Movie director Cornell Wilde believes the preceding incidents are inevitable if something isn’t done soon — very soon. He has made a movie with the hopes of convincing people of one of the possible outcomes of the pollution-ecology problem — a world-wide famine. The movie is entitled No Blade of Grass and is a shocker thriller.

The plot briefly — With little air to breath and no food and water, masses of people evacuate the most severely polluted areas. Chaos results and anarchy becomes the controlling power.

Many people will undoubtedly regard the film as science fiction and ignore its message. I see it as a film that should be taken seriously. The events in the movie were supposedly taking place just four years from now.

Even if the movie is considered far-fetched by some, the message is undeniable. How brilliant is man anyway? While he is going to the moon, he is killing himself on Earth.

A movie such as No Blade of Grass may educate people into believing the serious consequences of pollution. Hats off to Mr. Wilde and his sincere effort in combating pollution in the best way he knows how — In what way can you fight it?

Frederick G. Cheney

Turf Bulletin’s Photo Quiz

CAN YOU IDENTIFY THIS PROBLEM?
Can You Identify This Problem?
Date: September
Area: Golf Green
Location: Connecticut
Description: A double line scar protruding into the green.

Answer on page 16.

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Pesticide Waste Disposal

by

R. G. Novak*  
Q. H. Hammer†

INTRODUCTION

Many important factors must be considered and carefully weighed by everyone responsible for final decisions to be made and final actions to be taken in disposal of pesticide wastes. The discussion of this subject will be divided into Part I as presented here and in Part II which will be presented in a later issue of this publication.

A number of "tools" and a wide variety of resource information is available toward the desired goal of safe disposal of pesticide waste materials. Among other things, these include extensive literature reviews; conferring with resource personnel representing manufacturers, universities, state and federal experiment stations, public health officials, studying labeling literature and others. At the present time there are few who will claim to qualify as "experts" in all aspects of this important subject. However, by a pooling of all the information and resources, responsible Pesticide Waste Disposal can be accomplished.

Let us now consider some of the important factors and information as gleaned from available resources. The following discussion of pesticide waste disposal is in a context as it applies to the responsibilities and immediate practical problems encountered by the following:

1. The Transporter, Warehouser, Distributor and Dealer.
3. The Farmer and Grower.
4. The Home Owner.

Pesticide wastes considered here may be briefly identified as follows:

A. Spills which result from leaks caused by careless handling.
B. Empty used containers.
C. Surplus spray mixtures.

Such wastes result from the existence or occurrence of innumerable factors, both controllable and uncontrollable. They do point up a need to be as fully informed and as fully prepared as possible to do the jobs that must be done in the most responsible manner with the personnel, equipment and other resources available.

Experience has confirmed the fact that some waste will occur. It has further been determined that provision must be made to properly dispose of that waste. This must be as much a part of the total pest control procedure as is transporting, marketing and using the pesticides.

THE WASTE DISPOSAL AREAS

There are potentially several satisfactory pesticide waste disposal areas available for the various needs.

For the purpose of this discussion we are considering relatively small quantities of waste. It is natural to think first about disposal in terms of available public facilities, and many of these are suitable for this purpose. We need then, through various means, to determine those areas that are and those that are not suitable. Just any old dump or incinerator is not acceptable!

Disposal areas are available also on many private properties. The number and size of these areas is generally greater as the size of the private property is larger. The small home owner is the least likely to have suitable private waste disposal areas. However, this fact in no way reduces his obligation to dispose of such wastes responsibly.

What are some characteristics of a suitable disposal area for the purpose of burying or burning pesticide wastes?

1st: It should be on relatively high ground, flat, or gently sloping away from any water supply, either surface or subsurface that could conceivably ever be used for domestic purposes.

2nd: The soil should be deep—at least 8 to 10 feet from the surface to lower level of downward leaching or percolation of water before running into bed-rock or hard-pan where lateral movement of subsurface water takes place. It should be at least 50 feet and preferably 100 or more feet down slope from any water supplies.

3rd: The site should be selected where there is no chance for it to be used for any

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* Superintendent, Waste Control Department, The Dow Chemical Company, Midland, Michigan.  
† Registration Section, Agricultural Department, The Dow Chemical Company, Midland, Michigan.
other purpose such as growing of crops or for building sites—including sources of water, such as wells and ponds.

4th The site should be selected and prepared well in advance of any need for its actual use. Preferably it should be fenced and appropriately identified with signs that are carefully maintained, to advise interested parties or trespassers of its use.

5th The waste disposal site should be conveniently located to provide for easy access for all disposal needs, including burying, burning, and liquid waste disposal.

Basically, all four of the initially enumerated categories of handlers and/or users must be concerned with the problems of pesticide waste disposal. They all need to make these problems top priority in their consideration of the handling and use of pesticides. In order to make this consideration responsible, careful plans and preparations for carrying out the plans, should be made prior to the time the need for disposal occurs. A well-defined and fully understood plan of action by all personnel involved is a must.

Most labels on pesticide containers carry statements regarding disposal of pesticide wastes and of "empty" containers. These statements are important parts of the label; and, as with all other parts of the label, they should be read, understood and followed precisely.

Personnel responsible for disposal of pesticide waste must become familiar with the general information on the hazards of the various products being handled and/or used. This knowledge provides a basis for responsible performance including cleanliness, and safe work habits including familiarity with the use of various types of protective equipment that may be needed in the disposal process. This latter type of information is available on the product labels, and of course, manufacturers of the pesticides should be consulted with regard to unusual situations or problems.

**WHAT ARE THE WASTES OF CONCERN?**

A. Spills of undiluted product, as packaged for the user, may be of two types—dry and liquid.

Dry spills, regardless of the amount, should be cleaned up immediately and placed in suitable containers—preferably metal containers with tightly fitting lids—identified as to intended use and used for this purpose only. The size of these disposal containers should be such that they can be easily handled.

After collecting as much of the spill as possible, the contaminated area should be thoroughly scrubbed with copious quantities of water plus a liquid detergent and caustic soda (lye). The contaminated area should be further rinsed with clean water. Provision should be made that the runoff or "scrub" water does not flow into sewer systems or into water supplies, but rather that it go to a soil drainage pit away from water supplies. Or, where necessary, the excess rinse can be soaked up with absorbent material which is then disposed of with other pesticide waste. The washed area should not be used until dry.

Liquid spills should also be attended to immediately. They should be covered with an absorbent material such as clay, hydrated lime, sawdust, absorbent sweeping compound or other available material including rags. The resulting contaminated absorbent material should then be placed in suitable container for later disposal, and the initially contaminated area further scrubbed and rinsed in the same manner as described for dry spills. The scrubbed areas should not be used again until dry.

All spills that are not easily recoverable for use, all decontamination materials and all associated package materials should be placed in suitable waste disposal containers, later to be deposited in the final disposal area as previously discussed.

(Continued on Page 10)
B. Empty Used Containers

Until decontaminated, so-called “empty” containers are seldom completely empty. They must be handled with the same respect and caution as commonly so-called “unloaded” guns. Empty pesticide containers should never be reused unless of course there are specific instructions to return the container to the manufacturer. Pressurized cylinders commonly used for some soil, space and/or commodity fumigants are examples of recoverable containers.

Certain metal containers, particularly of the larger sizes such as 30 and 50-gallon drums, may also have enough economic value to be cleaned for reuse by the pesticide manufacturer or by professional drum reconditioners. These exceptions require special methods of handling, which are fully discussed in a publication by The National Agricultural Chemicals Association under the title “DECONTAMINATION AND DISPOSAL OF EMPTY PESTICIDE CONTAINERS” as cited in the attached literature references. For the purpose of this article we will consider all empty containers as unsalvageable and unfit for reuse. These are of two types as follows:

1. Combustible containers, subject to disposal by burning. They consist of paper, cardboard, cloth, other plant fiber and certain plastics. Most of these can and should be burned in the waste disposal area which is a safe distance away and downwind from residences and other human activity, animals, crops and other valuable plants, to avoid the possibility of harm to such. Personnel in charge of the burning should stay upwind from the burning area. The times for burning should be restricted to comply with the foregoing conditions and also in compliance with all local regulations on such activities.

It should be hastily and emphatically added here that not all combustible containers should be burned. Those which have contained products that are highly volatile or are highly toxic in the vapor phase to plants or animals, such as many of the herbicides, most of the organophosphate insecticides, and the explosively hazardous materials such as chlorates and aerosol containers should be buried in the waste disposal area.

2. Non-combustible containers, and therefore not subject to disposal by burning, consist of glass, certain plastic materials and metal containers. With these it is good practice to first decontaminate them as completely as practical by pouring all excess pesticide in the previously selected and prepared disposal site. Rinse them with a suitable solution and pour the rinse into the area. The accompanying table (pg. 14) presents generally accepted information on amounts of materials to use for rinsing these containers.

After the rinse solution is in the container to be cleaned, close tightly and rotate occasionally, allowing at least 15 minutes of rinse exposure time.

After rinsing and draining, break all glass containers and puncture the plastic containers in several places and bury them with the rinse. With all metal containers, after being rinsed and drained, remove bungs and puncture holes in top and bottom and further mutilate by crushing as completely as practical and bury with rinse and other wastes. An axe or a pick is a suitable tool for puncturing these containers.

Where public waste disposal areas are to be used, the operator of the disposal area should be advised of the character of the wastes so that proper disposal procedures can be followed. Aerosol container disposal presents a special problem because of the additional hazard from explosion if exposed to high temperatures or if carelessly punctured. Perhaps the best means of disposal of these containers is to wrap them in several layers of paper and send them, with their contents disclosed, to a commercial incinerator capable of handling that type of material, or send them also so wrapped to a public sanitary landfill where they can be crushed along with other refuse and buried with soil.

3. Surplus spray mixtures. These result from miscalculations in determining the amount of diluted spray needed to do the job at hand or from the inability to apply all of the spray mixture in
the available time or because of inadequate equipment performance. Such surplus spray mixtures should not be simply drained from the equipment onto the most convenient area, but rather they should be disposed of in predetermined disposal areas with disposal qualifications as described under the previously discussed subject "The Waste Disposal Area". They should never be allowed to get into sewage disposal systems nor drain into irrigation and drainage ditches.

In all cases, pesticide wastes and empty pesticide containers should be covered with at least 18 inches of soil immediately after deposit.

Concerned and responsible personnel in many states are rightly grappling with this problem of pesticide waste disposal. The responsibility resides with all of us and it is most important that all individuals, industry and institutions work cooperatively to provide the best possible solutions for these very real problems.

REFERENCES CONSULTED IN THE PREPARATION OF THIS ARTICLE
(Recognized as being by no means exhaustive)


5. Kennedy, M. V., Boris J. Stojanovic and Fred L. Shuman, Jr. Mississippi State University, P. O. Drawer BB, State College Mississippi 38772. Analysis Of Decomposition Products Of Pesticides. (To be published)


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   (b) Decontamination and Disposal Of Empty Pesticide Containers. June 1965
   (c) Prevention Of Cross Contamination Of Pesticide Chemicals.

10. Neumeyer, John, Donald Gibbons and Harry Trask. Reprints from Chemical Week, April 12 and April 26, 1969. Pesticides (Contains alphabetical listing of all pesticides, patent numbers, chemical names and formulae, other pertinent information.) Reprints are available at 95.00 each from McGraw-Hill, Inc., New York, N. Y.


# 1971 TURF CONFERENCE PROGRAM

March 3, 4, 5, 1971
Highpoint Motor Inn  Chicopee Falls, Mass.
(Exit 5 — Mass. Turnpike)

**WEDNESDAY, MARCH 3**

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<tr>
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<tbody>
<tr>
<td>11:00</td>
<td>Registration — Lobby</td>
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<tr>
<td>1:00</td>
<td>Welcome</td>
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<tr>
<td>1:15</td>
<td>Importance of Water Management</td>
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<tr>
<td>2:00</td>
<td>Irrigation Integrated with Pumping Systems</td>
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<tr>
<td>2:45</td>
<td>Break</td>
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<tr>
<td>3:00</td>
<td>Installation of a Complete Water Source and Automatic System</td>
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<tr>
<td>3:45</td>
<td>How SCS Can Help Golf Course Management</td>
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<td>4:30</td>
<td>Massachusetts Turf and Lawn Grass Council Membership Meeting</td>
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**THURSDAY, MARCH 4**

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<tr>
<td>9:30</td>
<td>The Shrinking Environment</td>
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<tr>
<td>10:15</td>
<td>The Pesticides Dilemma — Emotion vs. Science</td>
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<tr>
<td>11:00</td>
<td>Effects of Turf Grasses and Trees in Neutralizing Waste Water</td>
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**ALTERNATE SESSION** —
Those not interested in golf course maintenance can attend the Alternate Session on general turf management.

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**THURSDAY, MARCH 4**

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<th>Time</th>
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<tbody>
<tr>
<td>9:30</td>
<td>Maintenance of Grass Tennis Courts</td>
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<tr>
<td>10:15</td>
<td>Diseases of Ornamentals Growing in Turf Areas</td>
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<tr>
<td>11:00</td>
<td>Update on Approved Pesticides Relating to Turf Insects</td>
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<tr>
<td>1:30</td>
<td>Use of Lime for Turf</td>
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**THURSDAY, MARCH 4**

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<th>Time</th>
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<tr>
<td>11:00</td>
<td>Lunch</td>
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**ALTERNATE SESSION** —
Lunch
2:00   Turf Grass Seed Report
       Mr. Dale Kern
       Seed Technology, Inc.

2:30   Break

2:45   Broad Aspects of Turf Grass Maintenance —
       Other than Golf Courses
       Mr. James Holmes
       Agri-Systems of Texas

3:15   Maintenance of Buildings and Grounds
       in Nation’s Capital
       Mr. Alton Rabbitt
       Consultant Agronomist

       — Evening —
       Room ABC

7:00   Banquet
       ESP in Action
       Mr. Russ Burgess

FRIDAY, MARCH 5
— Morning —
GOLF COURSE SESSION
Hall of Fame
Chairman: Mr. Robert Grant, Supt.
Brae Burn Country Club

Panel: Maintenance of Golf Course Equipment
9:30   Mr. F. William Hazle
       Jacobsen Manufacturing Company

10:00  Mr. Charles Curry
       Ryan Equipment Company

10:30  Mr. Thomas Ames
       Toro Manufacturing Corporation

11:00  Mr. Walter Dickinson
       West Point Products by Hahn

11:30  Question Period

Adjourn

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TURF MANAGEMENT
A. J. Powell, Jr., Turf Specialist

Quackgrass (Agropyron repens L. Beauv.)

In much of Maryland's home, recreation, and commercial turf, quackgrass is a major pollutant. Control is difficult and sometimes impossible because it has similar growth characteristics to the desirable cool-season grasses. It is very persistent but has characteristics which make it undesirable for lawns and recreational areas. It is coarse textured, seldom has a dark green color and the blades grow somewhat horizontal forming only a thin, rough turf.

Before attempting to control any weed species, one must understand the plant and associated crop completely. Common names, e.g. quackgrass, are often misleading in their identity because some plants bear the same common names and others have several names when identified in different locations. Since many language differences exist, common names become more useless. For example, quackgrass has also been called 'couch', 'twitch', 'quick', 'scutch', 'quitch', 'witch', etc. With these problems it is important that systematic botanists use Latin in identifying and naming plants. Agropyron is derived from agros = 'field' or agrios = 'wild' and pyros = 'wheat'. Also, the Latin name is often followed by the authority that named the species. For example, in A. repens L. Beauv., the 'L' refers to Linnaeus who published Species Plantarum in 1753 and Beauvois who re-classified the species. To further identify our so-called 'quackgrass', it is a variable deep rooting cool-season perennial. It has long creeping rhizomes or underground stems. It flowers during the summer and autumn, germinates during spring, and has blades that taper to a sharp point. Aside from its long, white rhizomes with a diameter the size of a pencil lead and its bluish green color, it has another identifying characteristic which is uncommon in other turf species except small grains. That is, it has a long slender, claw-like, auricle. Auricles are appendages which project from each side of the collar located at the base of the blade.

Quackgrass may be found throughout Maryland, but is a much lesser problem on the Eastern Shore. It tolerates flooding and stagnant moisture and may be found on river banks, roadsides, waste places, paths, as well as on cultivated land or in turf. Quackgrass grows best in fertile, usually heavy soils.
Many soil sterilants are marketed which will kill quackgrass but their persistence make them unfeasible to use. If the herbicide is applied during spring or summer, the land must be safe to reseed by fall for turf. Allowing the soil to remain bare for a longer period of time would not be recommended since many weeds may re-infest the soil. An "ideal" turf weed control situation is to kill the weed and immediately re-establish or renovate the turf. A dense, healthy turf will help prevent re-infestation. For best control, a selective herbicide that only kills the undesirable grass is needed. Since the growth characteristics of quackgrass and desirable cool-season grasses are so similar, a selective herbicide has not yet been found.

Small turf areas can be spot-treated for quackgrass control. Non-residual soil sterilants are excellent and are available for experienced applicators but the cost is extremely high for large acreages. Dalapon is the best control presently available. It is not 100% effective but it can be used to control and decrease quackgrass incidence. Dalapon is not a selective herbicide and will kill turf species as well.

Dalapon applied at high rates has acute plant toxicity. However, quick killing of the leaves does not favor herbicide translocation to the extensive rhizome system. If the rhizomes are not killed, the plant cannot be controlled. With the more effective moderate concentrations of dalapon, the weed is killed very slowly and little or no effect may be noticed after the first treatment. For best results, chemical control should be used in conjunction with such cultural techniques as disking to help fragment the rhizomes and deplete their food reserves.

For best control apply 10 to 12 pounds per acre of actual dalapon during spring or early summer. After the quackgrass has reseeded, disk and allow the weed to re-establish. When regrowth is 3 to 4 inches tall, treat again with 5 to 6 pounds of dalapon. If re-sprouting occurs, a third application may be desirable. Time these applications so that at least 1 month to 6 weeks can elapse before reseeding with desirable species. Also to help dissipate the chemical, the area should receive $\frac{1}{2}$ to 1 inch of rainfall (or irrigation).

Better controls for quackgrass are badly needed. Dr. Wayne Bingham, Weed Specialist at Virginia Polytechnic Institute has recently embarked upon a long term project to test several new chemicals and methods that may have promise. In the meantime, however, we must make every effort to use the described method to decrease quackgrass incidence in Maryland turf.
A conscientious early spring maintenance program can improve the health of existing grass as well as its aesthetic value.

Proper lawn care should begin as soon as the weather permits. The lawn should be raked vigorously with a sharp-toothed lawn rake to remove leaves, dead grass, and other debris. In areas where roots have been smothered by the debris or plants killed by disease or winter injury, the soil should be raked down to remove all vegetation. Bare areas should be scarified to provide a seedbed or filled with topsoil if the surface is uneven.

Snow mold, a fungus-caused disease, often appears in irregular round patches of greyish, matted grass after the snow melts. These patches should be brushed to break up the mat and then fertilized to stimulate grass growth.

Grass plants heaved by frost can be pressed back into the sod by rolling. This is accomplished most effectively with a water ballast roller when the soil surface is dry and the soil below is moist—but not wet enough so that it seeps water when a weight is placed on it. A water saturated sod, especially a heavy clay sod, will pack when rolled, possibly injuring the turf. The compacted areas actually aid weed growth and eliminate desirable grasses, he says. Lighter sandy soils, if well drained, are less subject to packing from rolling.

After the lawn has been raked and rolled, it should be fertilized. Lime should also be applied if needed.

The application of limestone is essential in a lawn maintenance program. It corrects soil acidity and performs other functions necessary for healthy grass growth.

If applied in the limestone form (rather than as hydrated lime), it can be applied with the fertilizer. The amount needed can be determined by sending a soil sample to your county Extension agent for testing.

An important step in a spring lawn maintenance program is the application of a complete fertilizer—one which contains nitrogen, phosphorus, and potassium (expressed N-P-K). Fertilizer grades such as 10-6-4 or 8-6-4 should be applied at the rate of 15 to 20 pounds per 1,000 square feet.

To prevent burning the grass blades, fertilizer should be applied when the grass is dry. Both the lime and fertilizer materials should be applied uniformly without skipping or overlapping areas.

Bare or thinned out areas can then be seeded. The sod should be loosened with a rake in the bare spots, seeded with a good basic turf seed (Kentucky bluegrass or a fine leaf fescue), raked to cover lightly, and rolled to firm the seedbed.

If insect grubs and broadleaved weeds are a problem, chemical control of these pests should be included in a spring lawn maintenance program. Plantain, dandelion, and other broadleaved weeds are easily controlled by an application of the chemical herbicide 2, 4-D, especially during the period of spring when weeds are actively growing. Never apply 2, 4-D to a newly established turf, because it may kill young plants. Whenever chemicals are used, the instructions on the labels should be followed closely.
The Role of Shade Trees in Urban Arboriculture

BY MALCOLM A. MCKENZIE

Director of Shade Tree Laboratories
University of Massachusetts
Amherst, Mass.

(Presented at the New England Chapter, ISTC, Annual Meeting, 1969, and published with permission from the author.)

It is like old times to be on the program with you again. By way of recollection I guess “All the world (really is) a stage.” That is Shakespeare’s contribution. My contribution is that most of us are hopelessly unrehearsed. However, apparently Americans enjoy the stage and all other forms of recreation. They spend seven billion dollars a year on games of chance and this does not include going to meetings, getting married or holding elections. I am proud to be an honorary member of the International Shade Tree Conference and I am very pleased to have this opportunity to participate in the sixth annual meeting of the New England Chapter.

Shade trees and especially street trees in the kaleidoscope of the evolving complex of urban environments have succeeded well enough to encourage planners and engineers of our emerging megalopolises to visualize them as foolproof statuesque gargoyles, automatic for roles in all situations and under all competitive complexities of environment.

The modern arborist, however, has learned that shade trees have become increasingly vulnerable targets often mangled or otherwise virtually, but needlessly, destroyed in urban society. The triumvirate of traffic, pollution and construction is the tree penal corollary inherent in the population explosion and the associated population affluence. Accordingly, in the related spiraling city growth, the trees are often undermined below the ground level and almost hermetically sealed above it. In competition for space, it may be convenient to think that the solution of all of our conflicts of trees with utility problems in urban society is to bury all utility services underground. In this event, I suggest that underground space may be at a premium in urban areas unless, concerted effort is made to provide for tree roots, wires, gas pipes, telephone lines, electric cables, water pipes, sewer pipes in addition to transportation of all sorts, and any new services which are in prospect. And don’t forget the competition and priority for accessibility that may be needed for the same space at the same time to perform emergency repairs. All this, of course, is waiting for us if the world’s population of the future lives according to prediction. Of special immediate interest on complications for telephone lines is an article in Life magazine for December 5, 1969, entitled “What hath God rung?” The article advises you “For (calls to) Syracuse, New York contact your overseas operator,” and “Manholes are too clogged for man or cable.” Thus underground space overcrowding may already have arrived. In this age of prefabricated building materials and giant building machines, we have great pride in equipment that thinks and great suspicion of any man that tries it.

Harassed on all sides by competitive services and related status symbols, essential shade trees are indeed in need of searching inquiry in educational curriculums far beyond the pragmatic training and/or philosophy of the typical graduate of conventional teaching programs in forestry, engineering or environmental planning. The word “service” is used advisedly in association with the shade trees because that is the role assigned to them in the new society. This service role is unique to shade trees as contrasted with forest trees which are essentially crops grown for profit, or raw materials produced for forest products industries. The essential service of arboriculture cannot be relatively suppressed forever in university education even by the power, sanctity, gyrations, generalizations and mechanizations of the duped or uninformed.

Most all biological phenomena, will, like pregnancy, show at the appointed time, even as in the first arboretum in the Garden of Eden, And the new birth in the words of the philosopher is impelling. Victor Hugo said “An idea whose time has come is stronger than all the armies.” I have complete confidence that the time has come at long last for the predominating role of shade trees and arboriculture to assert itself in society. Somehow it seems that there

(Continued on Page 18)
is not much comfort in life until one is old enough to have the courage of his tenure. I am also almost sure that all of you heard that rhythmical voice "We shall overcome" from the crabgrass as you mowed your lawn last summer. But the plagiarized slogan has a place also in Arboriculature. The expanding role of shade trees in urban society and in meaningful education was never as compelling as it is today. Creative suggestions are needed from all knowledgeable professional groups. These organizations can render valuable guidance to direct new attention by accepted. In this student view, the halo has been become a mask of its moorings and has become a question of matter how important they are to public welfare. The halo no longer gives shining light, but excludes light. You meanful students report that they see all too clearly that the surviving trees prevails. The theme of your program today "Concerning our Tree Heritage" looms large on tomorrow's horizon.

On past horizons, the University of Massachusetts pioneered in the field of instruction and research on shade trees. The highlights of early work in Massachusetts were organized and published in the now famous Bulletin No. 170 entitled "SHADE TREES, Characteristics, Adaptation and Care," by Dr. George E. Stone in 1916. The environment was somewhat different back in those "good old days" at the turn of the century, but pollution was still a major problem as shown by the following quotation.

"Salt used on sidewalks, in gutters and on trolley lines in winter has been known to cause injury to the root systems of trees. In one instance we noted injury to several small maples growing near a sidewalk and gutter which had been treated heavily with salt. In some cases where salt had been used extensively on trolley tracks, injury to trees was observed. It should not be used near valuable trees."

The use of salt on trolley lines in winter as discussed by Dr. Stone, of course, is no longer a problem, but the use of de-icing chemicals in association with the modern counterpart of trolley lines in transportation is all too apparent in the northeastern United States. Dr. Stone also reported about the chronic nature of tree troubles associated with some atmospheric gases. Even in 1969, no one knows from adequately controlled research the benefits that disappearing shade trees formerly contributed in the replacing of healthful for the noxious atmospheric gases discharged from increasing sources of contamination in the urban environment. The role of shade trees in releasing oxygen in the environment has been identified, but reliable overall quantitative measurements are lacking.

The publication of shade tree inves-

**LOCATING CAUSE OF PRESSURE LOSS IN POWER SPRAYERS**

When a sprayer fails to maintain pressure, a systematic check of the outfit will usually disclose the cause of the trouble. Here are a few suggestions:

1. Is there sufficient liquid in the tank to cover the intake?
2. Is the strainer on the end of the feed line clogged?
3. Is the strainer in the sediment well clogged?
4. Are there any valves held open by solid particles — particularly intake valves?
5. Are there any valves which are stuck?
6. Have the discs worn so that there is too great a discharge from the nozzles?
7. Is there a possibility of an air leak in the feed line with suction feed outfits?
8. Are there plungers which are leaking?
9. Is the engine operation at the proper speed?
10. Is the pressure regulator out of adjustment?

FROM THE UNIV OF MASS.
tigation in progress at the University is aided nowadays by the preparation annually of "Proceedings of the Conference of Tree Wardens, Arborists, and Utilities." These publications constitute a virtual encyclopedia of current research and modern practices assembled by the interested groups on major activities associated with urban forestry.

The chairman of the Conference Committee is Professor Gordon S. King who heads the University Program of instruction in arboriculture and park management. He has a way of making sure that the entire University together with Tree Wardens, Arborists and Utilities participate in the Conference.

As previously mentioned, it is reliably projected that the world's population will soon live in and under urban conditions of crowded environment created by Man and in sequence reshaping his life. Shade trees have long been an important part of the environment of man in rural areas for beauty as well as other enjoyment. They may also have served notably in functions which previously were little, or not at all, understood, such as temperature regulation, air purification, noise control, wildlife protection and modifying shelter from the elements. Progressively the expanding needs of urban development can be met materially from the knowledge gained by arborists through education, experience, observation, and research in shade tree problems. In the meantime studies of genetics, including the exposure of shade tree seeds to thermal neutrons, have produced some surprising developments in hereditary patterns. I have some slides related to the program if there is time to show them later. The variety of changes attainable in this way may be almost without limit. But, so far, the development of individual shade trees selected for specific characteristics is extremely limited. Breeding and selection of trees resistant to fungus diseases and insect pests offer hope for future urban trees which may be very different from those currently planted on city streets. Natural selection of trees in areas of various conditions of stress under smog, salt or other pollution is already in progress and trees may be found that will survive in a polluted environment even beyond the endurance of man. Possibly still more important is the thought that certain selected trees may serve as indexes of pollution to guide man to survival.

The essential service of the familiar copyrighted "Tailored® Trees" is a conspicuous example of the need for other kinds of selection in shade trees. Thus, appropriate tree measuring is needed in relation to resistance to or tolerance of: diseases, insect infestations, high or low temperatures, excess or lack of moisture, type of soil, salt on foliage or when accessible to roots, restricted area for root development, propagation, pollution of all kinds above and below ground, phytoxicity of pesticides. Most shade trees now in service in urban communities are merely transplants based on suburban or woodland uses, with little or no thought given to possible limitations of the plant material. The so-called educational "brass" of most universities has been slow in responding constructively to assist in meeting society's obvious needs in shade tree management. The students on the other hand, are enthusiastic in their appeal for much deserved curriculum and research support in arboriculture. Fortunately the influence of student participation in educational affairs is now sharply in the ascendency. I look forward with great expectation to the revealing results of this youthful enthusiasm coupled with the equally intelligent support of professional arborists, municipal tree officers, park departments, public utilities and all urban oriented service agencies in a dynamic program of Shade Trees Unlimited.

Of course, right now, I must turn away from the temptation to speculate much further but you may be sure that I am aware that most of us keep one eye on the temptation we pray not to be led into. However, I won't press my luck more today because of an Italian proverb in a book I am reading "It is a good answer that knows when to stop."
TURF BULLETIN

How Soil pH Is Affected by the Fertilizers You Use

by DR. F. E. HUTCHINSON

Soil Science
University of Maine

Most crops can be grown in acid soils, BUT the lack of efficiency of such production is not acceptable to the profit-minded farmer. When lime is applied to land at a low pH level, yield increases can be astounding in such crops as alfalfa, wheat, and even corn.

The primary reason for this increase is the improved availability of nutrients in the soil. When you apply fertilizer, the plant nutrients are in a form which the crop can “take up” or assimilate through its root system. There can be no guarantee, however, that these nutrients will remain in this available form when they are incorporated into the soil, because they may be changed into “unavailable” forms if the soil is acid.

Phosphorus is the plant nutrient which is most seriously “fixed”, or made unavailable, in acid soils because it tends to react with aluminum, iron, and manganese to form extremely insoluble compounds. In fact, many times when farmers are told their crop has been damaged by toxicity of one of these elements, it may be that actually the plants are suffering from lack of a sufficient amount of available phosphorus. In either case, the problem can be corrected by liming.

Another important reason for raising the pH of soils is to promote more activity in the microbes (bacteria) which convert ammonia nitrogen to the nitrate nitrogen form.

Consider the reactions which occur in the soil when you add a nitrogen fertilizer such as ammonium sulfate, which has all of the nitrogen in the NH₄⁺ form. Before most plants can use this nitrogen effectively, the following reactions must occur:

\[ 2\text{NH}_4^+ + 3\text{O}_2 \rightarrow 2\text{NO}_2^- + 2\text{H}_2\text{O} + 4\text{H}^+ \]

Plant's find the nitrate nitrogen (NO₃⁻) preferable, and they will not grow well until it is in this form. Since these reactions are promoted by bacteria which prefer to live in a soil with a nearly neutral pH level, it’s obvious that nitrogen efficiency is increased when you lime an acid soil.

Excess hydrogen ions occur when nitrogen is converted in soils to a desirable nitrate form. This means that fertilizers which contain large amounts of nitrogen usually lower the pH level of soils, making them more acid.

Acid soils develop wherever hydro­gen ions have an opportunity to accumulate. Some of the conditions which favor this accumulation are areas of high rainfall, organic matter which contains a relatively large amount of organic acids, and acid forming fertilizers. Under these conditions, the hydrogen ions are held by the fine particles in the soil and unless lime is added to neutralize them, the soil will become very acidic.

When lime is applied to an acid soil, the hydrogen (H⁺) ions surrounding the soil particles are replaced by calcium (Ca²⁺) ions from the limestone, and hydrogen ions then combine with the carbonate (CO₃²⁻) ions to form carbonic acid. Since carbonic acid is a weak acid, and it breaks down to carbon dioxide and water, the soil is left less acid than it was before and the pH rises. This can be illustrated as

\[ \text{H}_2\text{O} \]

\[ \text{H-clay} + \text{CaCO}_3 \rightarrow \text{Ca-clay} + \text{H}_2\text{CO}_3 \]

Occasionally dolomitic limestone is recommended because it contains magnesium in addition to calcium, and the magnesium may be needed as a plant nutrient if the soil supply is low. In terms of decreasing soil acidity, magnesium carbonate is effective in the same manner as is calcium carbonate, because it can replace hydrogen ions also.

Fertilizers which contain a relatively high concentration of nitrogen may be very acidifying when applied to soils, depending upon the kind of nitrogen salts which are used to formulate any given mixture. You should be aware of this fact because a field may become much sooner than you expect if you are growing a crop such as corn which requires high rates of nitrogen. This problem can also develop when grassland is heavily topdressed, such as in one experiment here in Maine where timothy and orchardgrass plots were topdressed twice a year with 750 pounds per acre of 15-10-10 fertilizer. These plots dropped from pH 5.0 to 4.2 in three seasons. Although this example may have been extreme, it does show the problem exists.

Nutrient availability as it relates to soil pH is shown here.
Typical figures concerning the acidity of fertilizers are seen below. Note that an equal tonnage of 15-8-12 and 10-10-10 applied to a soil will result in a very different effect on soil pH.

<table>
<thead>
<tr>
<th>Fertilizer grade</th>
<th>Lime needed to neutralize one ton of fertilizer</th>
</tr>
</thead>
<tbody>
<tr>
<td>15-8-12</td>
<td>1219 pounds</td>
</tr>
<tr>
<td>10-10-10</td>
<td>378 &quot;</td>
</tr>
<tr>
<td>10-15-15</td>
<td>439 &quot;</td>
</tr>
<tr>
<td>0-13-39</td>
<td>0 &quot;</td>
</tr>
</tbody>
</table>

The important point to remember is that when high nitrogen grades are used, this usually hastens the drop in soil pH. You'll undoubtedly find that more lime will be needed over the years to maintain your fields at a desirable pH range than was required when lower analysis and rate of nitrogen was used.

Soil acidity is a natural condition in our region, and it must be continually combated if we're to grow healthy plants efficiently. Fortunately, this problem is easily solved by the application of lime, the amount required depending upon the soil in question and the fertilization program followed. Remember to soil test regularly to determine your need for liming.
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