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a partner with golfer Gene Sarazen.

Course Part of Community

In the case of these courses, Muirhead was especially concerned with the relationship of the golf course to the community. He stressed to Rossmoor planners the need to avoid the pitfall of surrounding the course with houses, or, at the extreme, surrounding each fairway with a double line of houses. Rather, Muirhead preferred to keep the golf course intact. In this way, the entire community could enjoy it. A road circumventing the entire course would provide the advantage of a park-like green area. This in turn would open up many handsome views for the benefit of the surrounding community.

The Rossmoor course in New Jersey has been built on 130 acres of gently rolling terrain. Muirhead designed both roads and course to insure efficient use of land. No large triangles of unused space are found in the final course plan. This flexibility enabled the best golf terrain and golf holes to be selected and incorporated in the final course area. Also, for the benefit of players, no holes face due west into the sun.

Muirhead was also involved with the landscape. A golf course should be beautiful, he believes, rather than a group of tees and greens coming to a point. A well-planned course, he says, is a thing of logic and sequence with a road around it. Then an entire community can benefit with a view of trees and lakes.

Landscape Design Emphasized

"A golf course should, in fact," Muirhead says "be treated as a large landscape design." For instance, although many trees have been planted, at Rossmoor Leisure World, gaps left at intervals allow fairways to inter-penetrate. This increases the sense of spaciousness and permits formation of vistas and panoramas for both auto traffic and golfers. Once the trees are mature a tour of each fairway, from tree to green, will unfold a variety of views.

Though stress has been placed on beauty in the Rossmoor courses planned and built by Muirhead, course design for benefit of players has been foremost.

For senior citizens, Muirhead felt, new criteria in specifications were needed. It is obvious, he says, that courses 7000 yards in length which are laid out with Jack Nicklaus and other touring pros in mind are not too popular with golfers more than 52 years of age. Generally, the drives of the latter players average well under 200 yards. Extensive studies were made and questionnaires distributed among prospective players to find what these senior golfers preferred. Results proved to be somewhat different than the normal conception of a golf course.

Thus, Rossmoor Leisure World's New Jersey course became a carefully tailored unit, built to match the hitting power of the players. Average drives, computed from other Rossmoor senior courses, also were found to be between 150 and 210 yards.

Length of the holes was adjusted accordingly. Par 4's and par 3's are genuine 4's and 3's for the players concerned and not par 5's and par 4's as they are on many championship courses. For instance, the par 3's run from 160 to 100 yards instead of 220 to 180 yards, which is average for so-called championship courses. "Any par 3 over 160 yards or par 4 over 410 yards are par 4's and par 5's for the ordinary golfer," Muirhead reports.

The total length at the Cranbury course varies from 6355 yards down to 4590 yards. This is effected by large tees and 2 or 3 tees per hole, which, together with changing pin position on the greens, gives the course infinite variety both in length and playing characteristics. Thus the course can be adjusted to the players or to the tournament. Playability can vary from an interesting challenge for a low handicap senior golfer to a relaxed frolic on "Ladies Day." A long, regular, and short set of tees avoids any stigma to the male golfer playing from the ladies' tees, and allows women

Elwood C. Tantum, general manager of Princeton Turf Farms, Inc., Princeton, N. J., left, and Field Foreman Vince Grubb, also of Princeton, discuss sod delivery schedules.

Rossmoor Leisure World's sod is carefully installed on this section of the 120-acre golf course. As summer drought cancelled hopes of the grass seeding on its own, 79 acres of turf was ordered to carpet fairways and greens. Only grass in the roughs will be left to rely on nature.

to play from the regular tees if they so desire.

Nine-Hole Courses Vary

Since many Rossmoor inhabitants like to play only 9 holes, the course has been varied so that each 9 is somewhat different. Care has been given to see that the overall unit for the 18 is maintained. Each 9, from the different tees, is also of a different length. The lengths range progressively downward from 3200 yards as follows: 3100, 2900, 2700, 2600, and 2400 yards. Most all tastes are catered to.

At every stage the New Jersey course is challenging, according to Muirhead. Holes are carefully organized to challenge a player regardless of whether he hits short, medium or long. For example, No. 3 hole is unique. A 4-fingered lake folds into the fairway with a tee against each fold, so that the hole plays from 160-180 yards per water, and for a championship senior tournament from 160-110 or 75 yards from the different tees. The green and rear trap are designed to increase the permutations by which the hole can be played.

Holes such as this obviously add great potential value to a course.

Hole No. 4 which will play around 500-400 for the average player, has lakes and traps placed to hinder only the long-hitting seniors. Other fairway traps have been reduced to a minimum. Each trap has been carefully placed to test the better golfer and longer driver. Traps near greens, and the greens themselves, are planned so they can be easily viewed from the hitting area, and in order to hold a long iron approach shot. Length of the hole is varied so most every club can be brought into play.

Grades around the greens are constructed for easy maintenance with a gang mower. Rolls are light and so placed that approaches close to the pin will produce even putts. Wilder approaches will putt over a roll or a rise.

The 2 large lakes on the New Jersey course cover 7 acres and are entirely lined with large strips of 10 mm. plastic sewn

(Continued on page 34)

In Brief:

Inland water management today demands the services of the professional aquatic biologist. Among the few in the business is Francis H. Bezdek, Lisbon, Ohio. In a WTT interview, he cautions the beginner about some problems of going into the business and indicates a need for a closer working relationship between government and private aquatic endeavors. Bezdek lists a number of areas where research is needed to help the field biologist solve problems encountered daily. Among these are: prevention of handling losses with live fish; determining why fish often die from sudden water temperature changes and prevention of such; how to economically and quickly add oxygen to water during a heavy weed kill; developing an economical means of removing and marketing organic wastes accumulating in the bottoms of lake and ponds; and development of less costly aquatic weed control methods.

Inland Water Management Creates Demand For

Aquatic Consultants

WTT interviews Francis H. Bezdek, Consulting Biologist, Lisbon, Ohio, and one of the few specialists available in the nation in this discipline

Question: We've been aware for some time of the need for aquatic weed control in the more tropical areas and in some of the heavily populated seaboard states. But management of inland waters appears to be a new problem for the non-crop vegetation control industry. Is it national in scope?

Bezdek: Yes, but especially across the eastern half of the U.S. You'll find the landscape honeycombed with ponds and lakes of all sizes. These are continually increasing in number. More and more city residents are seeking building sites near water for summer and permanent residence. Commercial use of inland water is also increasing.

Net result is more pollution of both new and established bodies of inland water. Lakeside living and use of water causes a build-up of pollution. This, in effect, fertilizes the water to the point that aquatic weeds thrive. Fish and wildlife are restricted and the water becomes practically worthless for recreation or other use. As this comes about, property values drop and owners become concerned. They seek help, and more often than not, find that qualified help is not available in their area. Thus, there has become a great need for the consulting biologist who understands aquatic problems and inland water management.

Question: Why the apparent shortage of consultants in this area?

Bezdek: Probably because the problem is relatively new. Some 25 years ago, when I was a young, government biologist, except for industrial and domestic needs, water was treated as a surplus and recreational resource. This included the fish. The question even arose in print as to whether wildlife management was a piddling profession for grown men. There were fewer people living near inland water, and less ground contamination from their byproducts. Thus there was less of a weed problem in waters.

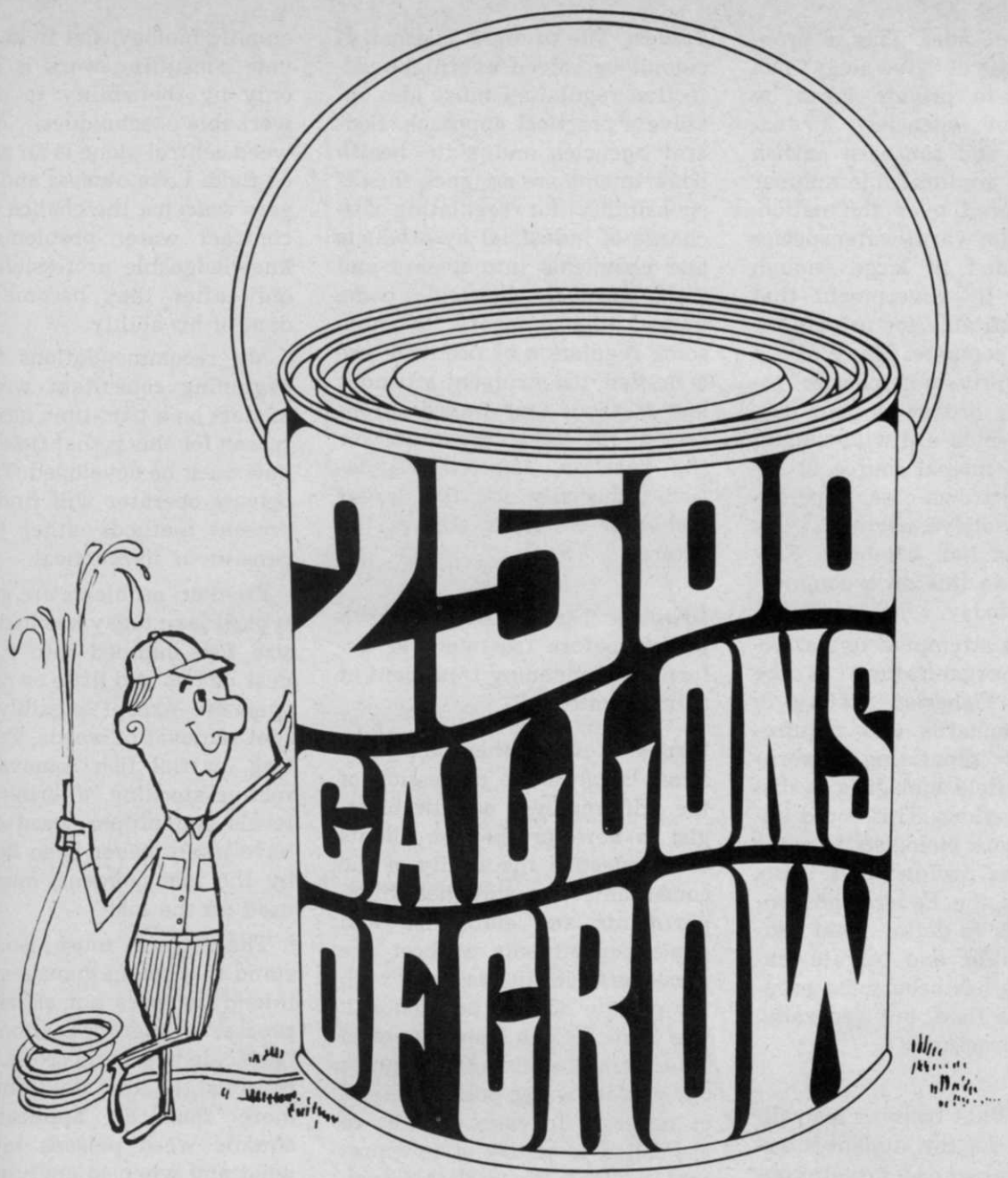
Young men in the field of biology and related areas were then being prepared for careers in state and federal agencies, or in the teaching field. This was logical. But accelerated aging of water impoundments has suddenly created the massive aquatic weed problem of today. More men are needed in private industry for inland water management. Yet the training available for the young biologist still favors government agency work. This will change because of the demand for the qualified aquatic consultant.

Question: You speak of the qualified aquatic consultant and the fact that few are available. What qualifies a man in this area?

Bezdek: To work in this area, a man needs to be trained and equipped to provide management and recommendations to lake owners. In travelling the eastern half of the U.S., I find no free-lance aquatic biologists. When I speak of management, I have in mind techniques which are within the financial limitations of private enterprise and individuals, and practices which have proved effective.

I think many biologists and aquatic research people will agree with me that field biology is often far removed from that in the classroom. Some so-called classroom biology just is not practical for the inland lake owner who is having problems.

Further, private fish culture has changed little during the



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past few decades. This is probably because of "give-away" fish programs to private lakes by government agencies. Trout, minnows, and southern catfish hatcheries are limited in number and scattered over the nation. The common warm-water species are provided in large enough quantities by government that it is unprofitable for private industry to compete. Many of the so-called "private hatcheries" today simply broker or haul fish, many of which are wild-caught, as their principal source of income. In my own case, I operate a private walleye, northern pike, and hybrid fish hatchery. Few operators do this on a commercial scale today.

We have attempted to encourage such organizations as the American Fisheries Society to set up standards and requirements for separating government and field biologists as distinct professions. This could encourage more biologists to enter the field as professionals. Also, we believe the Federal government needs to define what constitutes public and private waters. There has been some progress in this field, but generally, it is discouraging.

Question: What training is available today for the student interested in a career as a private consultant in aquatic biology?

Bezdek: Most courses in aquatic biology today, as I indicated earlier, are still slanted toward teaching and government agency careers. This must change and will as recognition of the needs become more common. Some corporations are now hiring full-time aquatic biologists, particularly those producing, testing, and applying chemicals for aquatic weed control.

Question: Much about water pollution is in the news. To what degree do you feel government regulation is effective?

Bezdek: The problem is great. It cannot be solved overnight. Effective regulation must also involve a practical approach. Federal agencies and state health departments are assigned the responsibility for regulating discharge of industrial by-products and chemicals into waters and the atmosphere. Pesticides come under this category. Though some regulation of pesticide use is needed, too stringent attitudes and methods may impede progress in the field. But to answer the question, effective regulation, especially for the larger bodies of water, is still in the future.

Question: Do you do your own testing before treatment or before recommending treatment of private waters?

Bezdek: Yes, but there are problems. Because the profession of the self-employed aquatic biologist is new, prospective clients often question the ability of the consultant. Also, state health departments and state fish and game departments at best are uncooperative in dealing with the private aquatic professional. The State Health Department of Ohio usually refuses to recognize our private water pollution tests as accurate in cases where we are called to testify or to represent a client. We find this even though we use standard Public Health guidance procedures. This I think points up the gap between public and private endeavors in the field of aquatic management. Time and the demands of the job will solve many of these differences.

Question: You have pointed up the need for professional aquatic consultants. Would you recommend this for the young biologist just out of school or with limited experience?

Bezdek: The future is unlimited for the courageous few. Armed with training in wildlife and aquatic biology, the field of private consulting work is limited only by the ability to develop workable techniques. Aquatic weed control alone is an unlimited field. Lake owners and managers welcome the chance to subcontract water problems to a knowledgeable professional, but only after they become confident of his ability.

My recommendations for the beginning consultant would be to start on a part-time basis. The reason for this is that field know-how must be developed. The new private operator will find many present methods either too expensive or impractical.

Further, problems are great. A typical lake today has had catch-size fish dumped into it every year or two and little or no management, except possibly some spot removal of weeds. Test-netting, partial fish removal, corrective stocking, altering water levels and proper weed control have likely never been heard of by the management, much less used on the lake.

The beginner must also understand that sound management of inland water is not as simple a process as the application of an herbicide to ground crops. A professional in the field must be more than an applicator of aquatic weed poisons to know what and when to apply to such a delicately balanced group of variables as found in water impoundments.

The private operator has to allow for time in the laboratory to iron out field problems with water, especially with the profit motive in mind. Some methods and tools are too expensive for some jobs. A chemical cost of $50 or more per surface acre plus application costs may be prohibitive. I frankly feel that more basic research must be slanted toward useable field biology. The industry today could stand less professional competition and a closer working relationship.

Question: You mention the need for more basic research aimed at the field level. What do you specifically have in mind?

Bezdek: There are a number of urgent problems. A few are: how to prevent handling losses with live fish; why do fish often die from sudden water temperature changes and how can this be prevented; how to economically and quickly add oxygen to water during a heavy weed kill; control of reproduction in fish such as sex-linked sterility, or sterility produced by certain feeds or radiation; an economical means of removing and marketing organic wastes accumulating in the bottoms of lakes and ponds; and how to produce warm-water fish to catch-size economically as has been done with trout.

Question: Can you elaborate on the problem of organic wastes which fill lakes and ponds? This seems to be a problem area which is largely untouched.

Bezdek: There is an unlimited market for the rich, organic detritus accumulating in the various lake and pond bottoms, if an economical or profitable means of removal can be developed.

For example, I recently visited a 1000-acre lake in Michigan. Engineers had found the clear-water depth to be only 10 feet. But below the clear water was a layer of soft organic muck 25 feet in depth. It would seem that a portable, barge-mounted, slurry pump, coupled with an attached baling device could be developed for removing this product. There would be no problem in marketing this material since it is excellent humus for building topsoil, if in a salable condition such as in 50-pound cakes.

Removal of this material would be the equivalent of returning the lake to its primeval condition, reduce the weed problem, and open an avenue to better gamefish populations.

how seedlings respond to

Phosphorus

By George McVey
Scotts, The Grass People, Marysville, Ohio

Phosphorus availability can be critical in the development and growth of Kentucky bluegrass seedlings. As little as 0.07# phosphoric acid (P_2O_5) per 1000 sq. ft. will cause a seedling growth response on phophorus deficient soils. In studies conducted by the Research Division, O. M. Scott and Sons, tests were run in the greenhouse to determine the phosphorus requirement of turfgrass seedlings for optimum growth and development.

Initial testing revealed that in the absence of phosphorus there was no response to added nitrogen or potassium during the first 14 days after application. In the following 92 days, growth occurred but yields were very low. In Fig. 1, you can see, also, that growth was excellent at both phosphorus rates during the first 14 days. However, final yields were greater at the higher phosphorus rate.

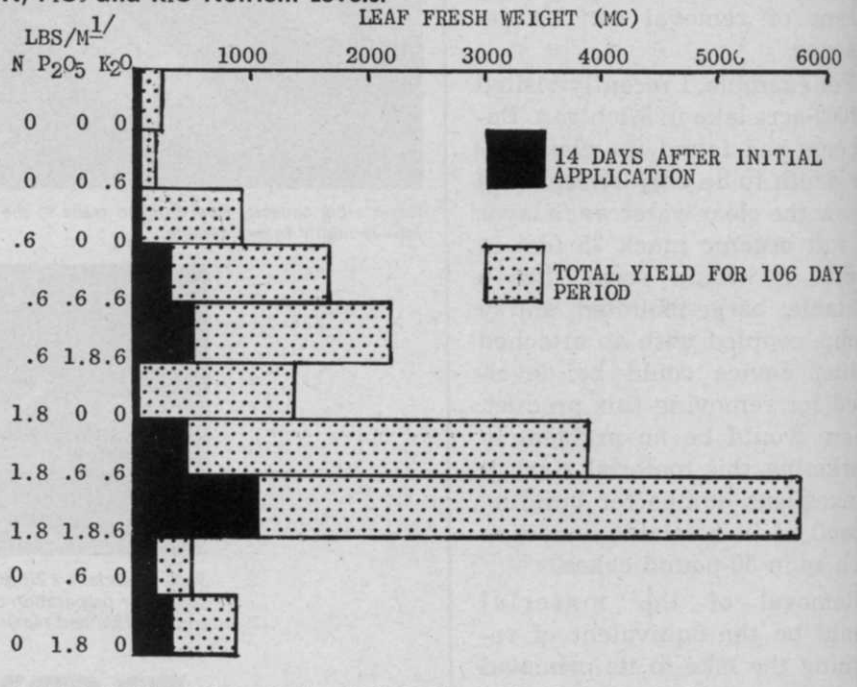
The first tests also showed that a 3-1-1 ration of N, P_2O_5 and K_2O produced much more growth for the 15 week test period than a 1-3-1 ration on a phosphorus deficient soil. The two ratios had given nearly equal results during the first two weeks.

Further tests were begun to discover the least amount of applied phosphorus that will stimulate growth in seedling bluegrass. The plants were grown in a phosphorus deficient sandy loam which had been treated with 0.035# to 0.60# P_2O_5/1000 sq. ft. Rapid growth occurred with the application of 0.07# or more.

The affect of KPO_3 (potassium metaphosphate) and KH_2PO_4 (potassium phosphate mono basic) as sources of phosphorus was examined also. Their citrate solubilities were 65% and 100%, respectively. The test showed that the phosphorus source had little influence on the pattern of seedling response, however, KH_2PO_4 produced slightly higher yields. (Figure 2).

Other experiments showed seedlings responding to added phosphorus on soils varying in phosphorus availability. (0.23 to 0.66# available phosphorus/1000 sq. ft.). Plants grown on soils with high levels of available phosphorus demonstrated a moderate response to additional phosphorus during the first two weeks of growth after applica-

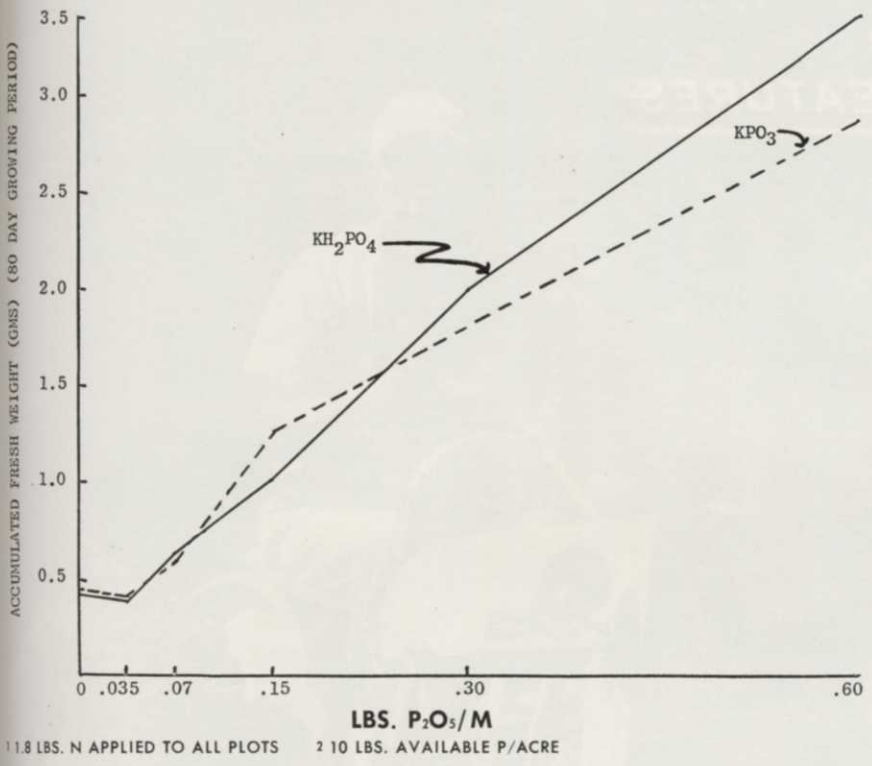
Figure 1. Fresh weight of Bluegrass Leaf Tissue As Influenced by Various N, P_2O_5 and K_2O Nutrient Levels.[2]



1/ P & K APPLIED 8-11-66, N APPLIED ON 8-11 & 11-11-66

2/ SOIL ANALYSIS: AVAILABLE P/A: 100 LBS, TOTAL P: 04%
AVAILABLE K/A 342 LBS, SOIL PH 7.0 FLORIDE: 0.35%

Figure 2. Phosphorus Uptake and Leaf Tissue Fresh Weight of Bluegrass As Influenced by Various Rates and Sources of Phosphorus.[1,2]



1 1.8 LBS. N APPLIED TO ALL PLOTS 2 10 LBS. AVAILABLE P/ACRE

tion. Later growth was not notably affected.

In conclusion, these studies indicate the optimum level of available P_2O_5 for the development of healthy, vigorous Kentucky bluegrass. Even on soils with relatively high amounts of available phosphorus, a positive growth response occurs when additional phosphorus is applied, and a sturdier stand of bluegrass may be obtained.

Fungus Can Kill Maple Leaf Tissue

Anthracnose, a fungus that kills leaf tissue on maple and other hardwood trees, has been detected in Minnesota, says Joe Vargas, University of Minnesota research assistant in plant pathology.

Dark spots—large, small, circular or irregular—or dead areas on leaves may indicate fungus injury. On sugar maples, anthracnose is detected by large green-brown or red-brown areas along leaf veins. Affected Norway maples display purple to brown diseased tissue along leaf veins. On Japanese maples, the leaf often becomes blackened and shriveled.

Vargas says anthracnose spreads rapidly after rains. While the disease does not always seriously damage a tree, it does mar its appearance. Anthracnose can also defoliate and weaken trees, making them more susceptible to winter injury.

Vargas recommends zineb, captan, and some mercurial compounds for control of the disease. The first spraying should be in the spring when leaves begin to unfold, the second 2 weeks later. In case of an unusually wet year, trees should be sprayed again in summer. Fertilizer used as a supplementary measure will improve the vigor of trees weakened by repeated anthracnose attacks.

For more information, ask your local county agent for U. S. Dept. of Agriculture Home and Garden Bulletin No. 81.

Meeting Dates

Symposium and Field Trip, Spring Dead Spot of Bermuda, University of Georgia, Tour begins at Capitol City Country Club, Atlanta, Ga., then to University at Athens at 8:00 p.m., June 11.

Turfgrass Sprinkler Irrigation Conference, University of California Extension Conference Center, Lake Arrowhead, Calif., June 21-23.

Purdue-Michigan State Weed Day, Purdue University Agronomy Farm, Lafayette, Ind., June 25.

Tri-County Chapter, California Landscape Contractors' Association, 17th Annual Convention, Ojai Valley Inn and Country Club, Ojai, Calif., June 25-29.

Landscape Seminar, Associated Landscape Contractors of America, Inc., for Michigan and Ohio, Dearborn Inn, Dearborn, Mich., July 13.

American Association of Nurserymen, Annual Convention and Trade Show, Chase-Park Plaza Hotel, St. Louis, Mo., July 13-17.

Georgia Seedsmen's Association, Annual Convention, Stuckey's Carriage Inn, Jekyll Island, Ga., July 14-15.

National Fertilizer Solutions Association, 1968 NFSA Round-Up, Regency Hyatt House, Atlanta, Ga., July 25-26.

Lawn and Utility Turf Growers Field Day, Rutgers University, College of Agriculture and Environmental Science Campus, New Brunswick, N. J., July 30.

Golf and Fine Turf Growers Field Day, Rutgers University, College of Agriculture and Environmental Science Campus, New Brunswick, N. J., July 31.

Indiana Association of Nurserymen, Summer Meeting, Imperial House Motel, Columbus, Ind., Aug. 7-8.

Midwestern Nurserymen's Summer Meeting, Zelenka Evergreen Nursery, Grand Haven, Mich., August 13-14.

1968 Turfgrass Field Day, Pennsylvania State University, Joseph Valentine Turfgrass Research Center, Campus, noon August 21-noon August 22.

Hawaii 4th Annual Turfgrass Management Conference, Punahou School Campus, Honolulu, Hawaii, August 21-24.

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