25TH ILLINOIS TURFGRASS CONFERENCE

North Central Turfgrass Exposition
December 11 - 13 1984

Arranged and conducted by

COOPERATIVE EXTENSION SERVICE
COLLEGE OF AGRICULTURE
UNIVERSITY OF ILLINOIS
AT URBANA-CHAMPAIGN

In cooperation with

ILLINOIS TURFGRASS FOUNDATION, INC.
CENTRAL ILLINOIS GOLF COURSE
SUPERINTENDENTS ASSOCIATION
UNITED STATES GOLF ASSOCIATION –
GREEN SECTION

TURFGRASS
INF

25TH ILLINOIS TURFGRASS CONFERENCE

North Central Turfgrass Exposition
December 11 - 13, 1984

This publication was compiled and edited by Thomas W. Fermanian, Assistant Professor of Horticulture, and John C. Fech, Assistant Horticulturalist, Turf, University of Illinois at Urbana-Champaign.

The Illinois Cooperative Extension Service provides equal opportunities in programs and employment.

CONTENTS

SUMMER PATCH AND NECROTIC RING SPOT: NEWLY DESCRIBED COMPONENTS OF FUSARIUM BLIGHT SYNDROME[a]

Richard W. Smiley

Fusarium blight is a patch disease that has caused much concern among managers of fine turfgrasses for many years. The disease was first reported in the Atlantic Coastal States (Bean 1966; Couch and Bedford 1966) and is now recognized throughout North America in nearly all regions where Kentucky bluegrasses are grown (Smiley 1980).

THE ENIGMA OF FUSARIUM BLIGHT

Many of the environmental conditions and management practices that adversely affect the growth of bluegrass plants (Sanders and Cole 1981; Smiley 1980) also predispose this grass to develop symptoms of Fusarium blight. Because there is considerable climatic diversity in the regions where the disease occurs, it is also likely that the stresses on the species and cultivars of grasses in each region are very different. Minor differences in the relative efficiency of disease control practices can be expected, but in the case of Fusarium blight, these differences have been very large not only among regions but also among affected turfs in local regions. For instance, certain varieties of bluegrasses were highly resistant to the disease in some areas but very susceptible in others. Water management practices that provided relief from the disease in some areas differed from those that worked best in other regions. The disease seemed to occur only in fully sunlit sites at some locations, but in shaded areas at others. The precise weather patterns preceding outbreaks of the disease seemed to differ from one site or region to another. With the development of more selective fungicides, it became even more apparent that very large differences existed among patches of "Fusarium blight," and that these differences could not be separated on the basis of visual symptoms. These patches were easily controlled by a particular fungicide at one site, whereas essentially identical patches at another site were immune.

Although none of these anomalies was understood, it was thought that they resulted either from differences in the species or isolates of *Fusarium* that were attacking the plants, or from changes in the interactions among plant cultivars and the environments and management systems in which they were being grown. Hindering research was the inability of scientists to experimentally induce the occurrence of the disease at selected field sites and in the greenhouse and to transfer the disease from one site to another so that they could critically examine its variant. In view of the strong but indirect experimental and observational evidence that the *Fusarium* fungi could not cause this patch disease, the original hypothesis was challenged (Sanders and Cole 1981; Smiley 1980), and

---

[a]Reprinted from the Proceedings of the New York State Turfgrass Conference. Volume 8. 1984.

R.W. Smiley is an associate professor in the Department of Plant Pathology at Cornell University, Ithaca, New York.

the uncertainties were noted by altering the name of the disease to Fusarium blight syndrome (Smiley 1983). Reemphasized study of the etiology of this syndrome has been especially productive in New York, Rhode Island, Wisconsin, Pennsylvania, and Washington. Research on spring dead spot of bermudagrass in California has also yielded very valuable knowledge.

NEW INSIGHTS

Research during the 1980s has led to the recognition of at least two distinct components of this syndrome, caused by two different pathogenic fungi that produce essentially identical symptoms. Additional research will probably reveal even more complexity within this group of patch diseases. The concept of "Fusarium blight" had become a combined name for these and other diseases. The *Fusarium* fungi were originally implicated because they are often the most abundant fungi in grass during the summer and are therefore usually present on plants that are unduly stressed by environmental conditions or by root rots caused by other pathogens. It is also quite true that the *Fusarium* fungi can cause leaf spots and crown and root rots very similar to those caused by *Drechslera*, *Bipolaris*, *Curvularia*, and other fungi; but the affected plants tend to be diffusely spread throughout the canopy or to occur in irregularly shaped patches. For instance, when *Drechslera poae* is known to be the pathogen, the disease is named Drechslera leaf spot or melting out. The crown and root rot stage of this disease has been given the descriptive name melting out. Fusarium crown and root rot--caused by one or more *Fusarium* species--is analogous to melting out but is caused by different pathogens. To avoid confusion with the distinctive patch disease that has been called Fusarium blight for several decades, the term preferred for this irregularly patchy to diffusely distributed disease is Fusarium crown and root rot. I have described these changes in terminology more fully in 1983, and in 1984 I proposed to turfgrass pathologists that the name Fusarium blight be rejected for well-patterned circular to arc-shaped patch diseases, where *Fusarium* spp. are secondary colonists of senescing tissue. *Fusarium* spp. should be recognized as causal agents only of diffusely distributed or irregularly patchy leaf spots and crown and root rots.

The preceding information serves as the background for describing the newly named patch diseases. The diseases are not new; they were just segregated out of a more complex system and then renamed to provide greater accuracy in our communications about their behavior and control. Likewise, these new findings have led me to question our ability to interpret most of the early research, including much of my own, where the identity of the primary pathogen was unknown. We must now determine which control measures are most appropriate for each newly identified disease. This work has just begun.

NEW FUNGI AND NEWLY DESCRIBED DISEASES

A constant association of two new pathogens with patches of the "Fusarium blight syndrome" in New York was recently reported (Smiley and Fowler 1984a). These fungi, *Leptosphaeria korrae* and *Phialophora graminicola*, may be present singly or in combination in any one patch. *L. korrae*, previously known to occur only in Australia, causes spring dead spot of bermudagrass. Diagnoses conducted in my lab by Melissa Craven Fowler, and simultaneously by others in other states, have now indicated that *L. korrae* is associated with "Fusarium blight syndrome" in many states, including New York, New Jersey, Connecticut, Rhode Island, Massachusetts, Pennsylvania, Michigan, Wisconsin, Colorado, and Washington. This fungus is now also known to cause spring dead spot of bermudagrass in California, but to my knowledge has not yet been associated with this disease in the eastern United States. *P. graminicola* had not been described as pathogenic, although it is a well-known inhabitant of grasslands and turfs throughout the world. Isolates of *P. graminicola* have been found in patch-affected bluegrasses that we have examined from Nebraska and many eastern and north central states, as well as from spring dead spot-affected areas in North Carolina. Neither the importance of this observation nor the geographical distribution of these pathogens is known; therefore, the list of areas in which isolates have been found must be considered rudimentary.

Both of the newly described pathogens are ecologically and taxonomically related to the take-all patch fungus, *Gaeumannomyces graminis* var. *avenae*. It is not surprising therefore that the diseases caused by these three fungi look alike. Patches on one bentgrass putting green in New York seem to be caused by *P. graminicola* rather than by *G. graminis* var. *avenae*. These two pathogens appear rather similar in their sensitivities to envrionmental conditions and control measures. Unfortunately, the same is not true of *Leptosphaeria*, so the diseases it causes must be approached somewhat differently. Therein lies the need to assign separate names to each of the components of the "Fusarium blight syndrome." The disease caused by *P. graminicola* is named summer patch, and that caused by *L. korrae* is named necrotic ring spot (Smiley 1984). These names were accepted by a concensus of plant pathologists during a meeting at Guelph, Ontario in August, 1984. Although specific characteristics have not yet been accurately defined, the following descriptions of these diseases contain the current state of knowledge.

SUMMER PATCH

This name is derived from the fact that the symptoms of the disease appear during the warm and hot periods of the year, presumably when the pathogen most effectively attacks the root system. *P. graminicola* grows most rapidly at 80 to 85°F, provided moisture conditions, pH, and other parameters are not limiting factors. Rates of root regeneration by the bluegrasses also tend to be lowest when the temperature is high. The net result of this interaction of host and pathogen is a fatal root rot, with or without additional infections by other common fungi, such as *Fusarium* species.

Symptoms. The affected areas of dead plants are small at first and grow into larger patches that may or may not have living tillers intermixed with the dead tillers. When the environmental conditions favor the growth of roots more than an attack of the pathogen, the affected area recovers: tillers that had not completely succumbed to the root rot often become rejuvenated by the production of new roots, and new tillers encroach upon the affected areas. The net result is that symptoms of summer patch sometimes completely disappear during the cool weather of fall, winter, and spring. When conditions again favor the pathogen, symptoms of the disease reappear. Because the pathogen tends to keep growing in an outward direction from the original site of infection, older patches often appear as rings of dead grass around tufts of apparently healthy grass--producing an effect variously described as a doughnut or a frog eye. Only the oldest patches attain this degree of development. Younger patches vary considerably in diameter and in the amount of dead tillers found in the affected area. (Refer to the *Compendium of Turfgrass Diseases* [Smiley 1983] for additional details and color photographs of the described characteristics of Fusarium blight syndrome.)

Time of occurrence. Summer patch occurs in New York during hot periods from June through September. Early outbreaks can remain active throughout the summer, become inactive during the remainder of summer, or go through a period of inactivity and then become active again. Each of these scenarios depends upon the balance of environmental and management conditions that presumably regulates the destruction of roots by the pathogen and their replacement by the plant.

Predisposing conditions. Summer patch often appears after hot, sunny days following very wet periods during the summer. Favored by very moist conditions, the pathogen apparently becomes most active during prolonged rainy periods or frequent irrigations--especially when the temperature is hot. Ironically, sudden droughts can also cause an abrupt development of the symptoms of summer patch, especially on irrigated turfs. In the case of drought, symptoms are probably not the result of recent pathogenesis; they come instead from the death of plants that were symptomless because the level of infection was insufficient to cause death under the conditions preceding the drought.

Infected grasses are also predisposed to early death when they are mowed very short, as on the fairways of many golf courses. But lawn grasses are also affected by this disease, so mowing height is only one of the known stress factors. Other stresses that encourage the development of summer patch include unbalanced fertility (especially low phosphorus and potash, or excessive nitrogen), some annual grass herbicides (such as chemicals for crabgrass and annual bluegrass control), very high or very low pH, and the accumulation of excess heat (as in fully sunlit sites, especially on south-facing slopes or on areas near roads, sidewalks, or buildings).

Disease control. The most important cultural disease control strategy on existing turfgrasses is to eliminate as much as possible stresses that amplify the expression of symptoms. A turfgrass manager can accomplish this by encouraging root production and by avoiding conditions favorable to the growth of the pathogen. This is particularly applicable to management of water, fertility, the pH of the soil, compaction, and herbicides. Light syringes of water during midday can also be used to reduce the accumulation of heat in turfgrasses.

Management options are broader when new constructions are planned in areas where summer patch is known to occur. Efficient drainage and irrigation systems should be installed in these areas. Wherever possible soils with favorable textural classes should be used, and the soil structure should be protected from compaction. The soil should be properly tilled for seeding or sodding, and adjustments made in fertility and pH. When attempts are made to construct artificial mounds or other terrain features, it should be recognized that these efforts usually create initially appealing views that are soon converted into eyesores because the turf on these features is often impossible to manage. Patch diseases are but one of the problems experienced on the artistic mounds and ridges placed in some commercial turf areas.

Much controversy often arises over the appearance of patch diseases in recently sodded turfs. It is very easy for the consumer to suggest that the sod was the source of the pathogen. This may or may not be true. When new sod is placed over poorly prepared sites that have a previous history of the disease, the disease may quickly reappear but not necessarily at other sites where the disease had not been known to occur, although they were covered with sod from the same source as that at the disease-affected site. Although the disease is sometimes first observed on an area only after new sod has been installed and may become evident sooner on a sodded lawn than on a seeded lawn, this is not evidence that the sod was the source of the pathogen because it could be equally true that the pathogen was present for many years on areas where previous grass cover was resistant to it. It is also possible, however, for sod to introduce new organisms into a turfgrass. To safeguard against the introduction of the disease through sodding, deliveries of sod should be rejected if they contain patches of poorly rooted grass. These patches are not likely to be visible in the foliage but will appear as circular areas where the soil does not adhere well to the turf mat. These areas on the underside of turfgrass sod may be an early signal that a patch disease will develop, especially if other stress factors also become present.

The most important long-term measure for genetically controlling the disease is using disease-resistant grass cultivars and species. On lawns and fairways, use resistant Kentucky bluegrasses or mixtures of bluegrasses and a perennial ryegrass or tall fescue. Do not try to use susceptible cultivars on areas known to be prone to summer patch. Although a registry of resistant grasses has yet to be developed in systems known to be affected only by *P. graminicola*, it appears safe to utilize the latest information obtained for resistance to "Fusarium blight" in experimental field plots. Turfgrass managers in New York can gain access to an extensive compilation of this data (Smiley and Fowler 1984b) by contacting the Ornamental Horticultural agent in the Cooperative Extension Association of their county. University turfgrass specialists or their agents in other states may request the publication containing this data directly from the authors. A tentative list of some bluegrasses thought to be resistant to summer patch is as follows: A-20, A-34, Adelphi, Admiral, America, Baron, Bristol, Challenger, Columbia, Eclipse, Enmundi, Georgetown, Majestic, Monopoly, Mystic, Nassau, Sydsport, Trenton, Victa, and Windsor. This list is considered tentative because screening procedures identifying resistant cultivars have not yet been conducted. In attempting three screening procedures, we have obtained three different sets of rankings for the relative tolerances or resistances of bluegrass cultivars to attack by *P. graminicola*. The results differed for each variation in the testing method. Establishing a reliable ranking scheme therefore is a high priority for investigations in the next few years. Current evidence also indicates that fine-leaf fescues, bentgrasses, and annual bluegrasses are susceptible to attack by this pathogen.

Fungicides that provide chemical control of the summer patch pathogen include Banner (yet to be registered), Bayleton, Chipco 26019, Cleary's 3336, Fungo, Rubigan, Tersan 1991, and their equivalents. Field experience indicates that these chemicals are also effective in the field. They should be applied on a preventative basis after the first year in which the disease appears. Efficient disease control can only be achieved by preventing extensive colonization of the roots, rhizomes, and crown by the principal pathogen before foliar symptoms appear. It is of little importance whether secondary pathogens are present in the ecosystem if the process leading to the development of a patch disease has been interrupted at this point. Rates, timing, and procedures for optimal disease control differ for each of the fungicides listed. Product labels provide the necessary guidelines for the best use of each product because they have been developed from extensive field research before the registration of the product and then modified to reflect the experiences of more widespread users. The first application of a fungicide should be made around Memorial Day in New York, and, depending upon the fungicide, it should be repeated as necessary.

NECROTIC RING SPOT

Derived from the description of a patch disease in Wisconsin, this name indicates that dead (necrotic) rings occur in well-developed patches. About the same time that the identity and pathogenicity of *L. korrae* were being described for a component of the Fusarium blight syndrome in New York and in several other states, it also became apparent that *L. korrae* caused the disease in Wisconsin. To avoid using different names in various regions, the name used in Wisconsin has become the accepted one for patch diseases of cool-season grasses caused by *L. korrae*. The term, "spot," was retained because of the similarity of this disease to spring dead spot of bermudagrass: these diseases look alike and are caused by the same pathogen.

Symptoms. This disease is visually indistinguishable from summer patch. The ecology of the pathogens is similar, and these root and crown rots cause the same patch and ring patterns in affected turfs. Even trained mycologists cannot distinguish the difference between summer patch and necrotic ring spot unless they are lucky enough to observe fruiting bodies of *L. korrae* in the dead plant tissues. These structures are evidence that *L. korrae* is present although it does not exclude the possible coexistence of *P. graminicola* in the same turf. Because *L. korrae* appears more difficult to control, it may not be very important to also determine if *P. graminicola* is also present. If no fruiting structures are present when a diagnosis is needed, laborious, prolonged, and expensive, greenhouse or laboratory diagnostic procedures must be used to determine the identity of the incitant. Guidelines for this diagnostic procedure are being prepared (Smiley et al. 1985). Although distinguishing between summer patch and necrotic ring spot is very difficult when symptoms first appear in the summer, it is possible to predict that a patch is necrotic ring spot if it first appears in the spring or autumn.

Time of Occurrence. Necrotic ring spot occurs in New York from midspring through late autumn. Patches at some locations appear only during midsummer and become inactive and recolonized by grass or weeds during the autumn. At other sites the disease more closely follows the behavioral pattern of a cool-season disease. For example, at some locations on Long Island the disease is most prevalent during July and August, while at other nearby locations the patches occur in May and June, heal over during the hotter months, and reappear when the weather becomes cooler in September and October. This anomaly presumably reflects the relative balance between the activity of the pathogen and the overall health and replacement rate of roots. This pathogen grows most rapidly from 60 to 80°F, a range that is considerably broader than that for *P. graminicola*. The pathogen for necrotic ring spot is capable, therefore, of infecting grass during mild to warm conditions, and its ability to cause a patch probably will depend upon the health of plant root systems. Our experimental work has shown that this pathogen is capable of killing circular patches of plant roots without causing symptoms in the foliage. If this were to happen in the field, the plants would look perfectly healthy until a period of increased environmental or management stress, and then the patch of rootless plants would suddenly die. The time of death would, therefore, be totally unrelated to the time when the pathogen was most active. It is interesting to note here that this scenario is precisely what is also thought to happen in the case of spring dead spot disease, the unifying factor being that the warm-season (C4) grass dies during the stress of winter, while the cool-season (C3) grass dies during the stress of summer.

Predisposing Conditions. Very little is known about the conditions that lead to the development of symptoms of necrotic ring spot. The disease occurs in a wide range of temperature and water conditions. The influence of water is not well defined, but it is clear that this disease occurs on both irrigated and non-irrigated turfs. *L. korrae* is well adapted to relatively dry soils as well as wet soils.

Disease Control. At present for cultural control strategies, it is best to follow the suggestions made for suppressing summer patch.

Genetic control of the disease is difficult because the cultivars of bluegrasses, bentgrasses, bermudagrasses, and fine-leaf fescues that have been examined thus far are all highly to very highly susceptible to attack by *L. korrae*. None can be recommended at this time to suppress necrotic ring spot, but this does not mean that some resistant cultivars will not be found during further investigations. The cultivars of perennial ryegrasses and tall fescues examined thus far have much higher levels of tolerance than any of the previously mentioned grasses. Wherever possible these grasses should be used in new seedings and on perennial ryegrasses in overseeding programs. Using large percentages of these grasses in mixtures with Kentucky bluegrasses, for instance, should mask or prevent the development of this patch disease.

For chemical control of the disease, fungicides that are highly toxic to the pathogen for necrotic ring spot include Banner (yet to be registered), Rubigan, and Tersan 1991, or their equivalents. Bayleton and Chipco 26019 have not been toxic to the pathogen in laboratory tests and have not controlled the disease in the field. This separation has proven invaluable in diagnostic procedures, in that, to my knowledge, *L. korrae* has now been isolated from all locations where Bayleton has proven ineffective for controlling "Fusarium blight" of Kentucky bluegrass. In New York, on the many sites where Bayleton gives superb control of patches, the disease appears to be caused by *P. graminicola*.

The proper timing of the application of fungicides for controlling necrotic ring spot is unknown at present. Because the pathogen grows actively over a broad range of temperatures, it is possible that applications in the autumn and spring could prove to be preferable to an application in the summer. But additional research is needed to examine this possibility as a control strategy. In any case, it is vital to interrupt the disease process early enough to prevent severe loss of roots at any time during the growth of cool-season species. If this interruption does not occur in time, then any high level of plant stress at any time of the year could cause a sudden appearance of foliar symptoms, even when the actual root damage may have occurred months earlier.

CONCLUSION

The recent recognition that there are two diseases masquerading as "Fusarium blight" has placed even more uncertainty into the already ambiguous picture of the nature of this disease complex. By separating summer patch and necrotic ring spot into two distinct components, scientists can now initiate studies specifically aimed at controlling each of them. Our ability to control these diseases will become much more precise as soon as the results of extensive new investigations in many states are released. The experiences of scientists working on take-all patch and spring dead spot now become very relevant to the studies of those working on summer patch and necrotic ring spot. These united efforts will undoubtedly hasten recommendations to the turfgrass industry about more adequate methods for controlling these diseases.

SELECTED LITERATURE

Bean, G.A. 1966. Observations on Fusarium blight of turfgrass. Plant Dis. Rep. 50:942-945.

Couch, H.B. and E.R. Bedford. 1966. Fusarium blight of turfgrasses. Phytopathology 56:781-786.

Sanders, P.L. and H. Cole, Jr. 1981. The Fusarium diseases of turfgrass. pp. 195-209. *In*: P.E. Nelson, T.A. Toussoun and R.J. Cook (eds.). *Fusarium*: Diseases, Biology and Taxonomy. Pennsylvania State Univ. Press, University Park, Pa. 457 p.

Smiley, R.W. 1980. Fusarium blight of Kentucky bluegrass: New perspectives. pp. 155-178. *In*: P.O. Larsen and B.G. Joyner (eds.). Advances in Turfgrass Pathology. Harcourt, Brace, Jovanovitch and Co., Duluth, Minn. 197 p.

Smiley, R.W. 1983. Compendium of Turfgrass Diseases. Amer. Phytopathological Soc., St. Paul, Minn. 136 p.

Smiley, R.W. 1984. "Fusarium blight syndrome" re-described as a group of patch diseases caused by *Phialophora graminicola*, *Leptosphaeria korrae*, or related species. Phytopathology 74:811.

Smiley, R.W. and M. Craven Fowler. 1984a. *Leptosphaeria korrae* and *Phialophora graminicola* associated with Fusarium blight syndrome of *Poa pratensis* in New York. Plant Dis. 68:440-442.

Smiley, R.W. and M. Craven Fowler. 1984. Turfgrass cultivars tolerant to Disease. Plant Pathol. Ext. Rep. 84-4. Cornell Univ., Ithaca, N.Y. 28 p.

Smiley, R.W., R.T. Kane, and M. Craven Fowler. 1985. Identification of *Gaeumannomyces*-like fungi associated with patch diseases of turfgrasses in the cool-humid zone of North America. *In*: F. Lemaire (ed.). Proc. Fifth Int. Turfgrass Res. Conf. (Avignon, France). (in press).

DIAGNOSIS AND MANAGEMENT OF PATCH DISEASES CAUSED BY *RHIZOCTONIA* SPECIES

Lee Burpee

Fungi belonging to the genus *Rhizoctonia* are common constituents of turfgrass thatch and soil. At least four species of these organisms are known to incite disease in grasses. Two of these diseases, yellow patch and brown patch, are observed frequently on annual bluegrass, Kentucky bluegrass, and creeping bentgrass grown in cool-humid and cool-subhumid climates. The following comments are designed to aid turfgrass managers in diagnosing and managing these two patch diseases.

YELLOW PATCH (*Rhizoctonia cerealis*)

Diagnosis. In Canada and in central to northern sections of the United States, yellow patch is usually observed during spring and fall. More than 14 hours of prolonged leaf wetness and temperatures less than 50°F (10°C) appear to favor the development of the disease. All northern grasses are probably susceptible, but this has not been thoroughly tested. Greenhouse tests indicate that Penncross, a cultivar of creeping bentgrass, is highly susceptible; that Pennfine, a cultivar of perennial ryegrass, and Kentucky 31, a cultivar of tall fescue, are intermediate in susceptibility; and that Merion, a cultivar of Kentucky bluegrass, is less susceptible than the other grasses tested.

I am most familiar with the field symptoms of yellow patch occurring on creeping bentgrass that is closely mowed to less than 1/2 inch. On bentgrass golf and bowling greens, *R. cerealis* causes a foliar blight that produces yellow to brown patches or rings of turf that range from a few inches to over a foot in diameter. Patches may become straw-colored after a day or two of dry weather. High temperatures and active turfgrass growth usually result in short-lived symptoms, lasting a week or less in the spring. In the fall, however, patches or rings may persist into the winter.

Symptoms associated with yellow patch and smaller, red-brown patches (usually less than 6 inches in diameter) caused by the pink snow mold fungus *Microdochinum nivale* (also known as *Fusarium nivale*), may occur simultaneously. The pink snow mold fungus seldom causes ring symptoms, but it may produce white or pink mycelium associated with a patch. Yellow patches usually have no visible mycelium associated with them.

Reports from Michigan and Ohio indicate that yellow patch can be quite severe on Kentucky bluegrass. Failure to observe the disease on this species in Ontario

---

L. Burpee is an assistant professor of Plant Pathology in the Department of Environmental Biology at the University of Guelph, Ontario, Canada.

has been caused by the difficulty of an accurate diagnosis. Symptoms (rings or patches) appear to be similar to those associated with necrotic ring spot and summer patch diseases (see other papers in these proceeedings). This is only a guess, but I think that yellow patch may be differentiated from these other diseases by observing the roots of grass plants removed from the outer edge of patches or rings. Preliminary tests indicate that *Rhizoctonia cerealis* does not cause severe root decay. In contrast, the fungi associated with summer patch and necrotic ring spot cause a significant amount of root rot. Therefore, it is possible that the presence or absence of brown or black roots on Kentucky bluegrass plants may be used as a diagnostic tool in attempting to separate yellow patch from other patch diseases. The presence of irregularly shaped lesions or spots on the leaves of Kentucky bluegrass growing at the edge of dead patches or rings is another diagnostic feature of yellow patch. Leaves may turn red after lesions develop.

Yellow patch seems to be easier to diagnose on creeping bentgrass than it is on Kentucky bluegrass. Some diagnostic characteristics to look for when yellow patch is suspected on Kentucky bluegrass are patches or rings that develop in cool wet weather, the absence of severe root decay, and the presence of irregularly shaped foliar lesions on leaves that may be partially red in color. Unfortunately, these symptoms are not restricted exclusively to yellow patch. Other fungi may cause similar effects. Samples should be forwarded to a diagnostic laboratory for confirmation.

Management. I have not conducted nor have I heard from anyone else who has conducted extensive research on the management of yellow patch; therefore, the comments made here are derived more from casual observations than from controlled experimentation. From the point of view of cultural management, it seems logical to assume that yellow patch will be less of a problem if the duration of turfgrass leaf wetness can be kept to a minimum. This may be achieved by pruning trees and shrubs to reduce shade and increase air circulation on turfgrass sites. Keeping thatch to a minimum should help to limit the growth and survival of all *Rhizoctonia* species as well as prevent nutrient and water stress that may predispose turf to more severe infections. Yellow patch may be more of a problem on lush growing turf that has received high amounts of nitrogen early in the spring. Therefore, the timing of nitrogen applications can be critical. Applying nitrogen later in the spring or fall on sites where yellow patch has been a problem may reduce the severity of the disease.

Yellow patch can probably be controlled by applying any one of a number of fungicides, with the exception of chemicals registered specifically for pythium blight. Laboratory tests indicate that *R. cerealis* is particularly sensitive to chlorothalonil (Daconil 2787) and iprodione (Chipco 26019 or Rovral). Preventative applications are recommended, particularly in the fall, because turfgrass recovery may be slow in cool weather.

BROWN PATCH (*Rhizoctonia solani*)

Diagnosis. Contrary to yellow patch, symptoms of brown patch are usually observed from July to September in Canada and in central to northern sections of the United States. More than 14 hours of prolonged leaf wetness and relatively high temperatures (75°F/25°C) are conducive to disease development.

All species of turfgrasses are susceptible to *R. solani*. Creeping bentgrass and annual bluegrass may be more susceptible than other grasses, but further testing is required to be certain of this hypothesis.

Field observations indicate that the severity of brown patch is inversely related to mowing height. This relationship is probably a function of the greater foliar density (number of leaves per unit area) at reduced heights of cut. Greater foliar density produces a warm and wet microenvironment, which is more favorable to fungal growth.

Diagnosis of brown patch is not difficult on turf mowed to less than 1/2 inch (1.3 cm). After several hours of leaf wetness, *R. solani* characteristically forms a patch or ring of brown turf that appears smokey grey at the outer edge. Close examination will reveal that this "smoke ring" is formed by the dark mycelium of the fungus growing on the leaf blades. Patches may increase in size from a few inches to several feet in diameter over a period of 48 to 72 hours. The "smoke ring" can easily be observed on turf in the morning, before the evaporation of dew, rain, or irrigation water from the foliage. After evaporation, the "smoke ring" is usually not visible, and the brown patches or rings that remain may be similar in appearance to symptoms associated with other patch diseases.

On turfs cut higher than 1/2 inch, brown patch will appear as light brown to tan patches or rings of turf that may be several feet in diameter. A "smoke ring" is seldom, if ever, observed. Grass plants growing at the periphery of the patches or rings may exhibit irregularly shaped lesions or spots on the leaves. On Kentucky bluegrass, the lesions are usually light brown in color with a darker brown border. As with yellow patch, brown patch appears to be primarily a foliar disease, not a root disease. This hypothesis must be confirmed by further testing. If it is true, the presence or absence of root decay may be of diagnostic significance in distingushing brown patch, which has little or no root rot, from summer patch, necrotic ring spot, take-all patch, and other patch diseases having severe root rot.

Management. Cultural management of brown patch includes practices that are similar to those described previously for yellow patch: pruning trees and shrubs to reduce shade and increase air circulation, controlling thatch, and manipulating the timing of nitrogen applications.

Many fungicides will provide acceptable control of brown patch with the exception of those registered specifically for pythium blight. In most areas of Canada and the northern United States, preventative fungicide applications are not necessary. Curative treatments usually cause rapid regrowth of symptomless turf.

RENOVATION AND SITE IMPROVEMENT OF ATHLETIC FACILITIES

Herbert L. Portz

Today I will give an overview of one approach to renovating and improving turf sites at athletic facilities. We must first identify the nature of the problem at an individual facility before we can select the proper method of correcting it.

Is the problem physical? Does it involve the quality of the site, the soil, or drainage?

Is it cultural? Does it entail the species that has been selected or the practices followed during establishment and maintenance?

Does it concern the amount a facility is used? Is there overuse, misuse, or underuse?

Is it a question of the amount or mismanagement of the money available for renovation and improvement of the facility?

Or is the key element of management the problem?

The nature of some problems can be observed in game conditions; for instance, playing a district football championship game on bare soil at Anna-Jonesboro High School in southern Illinois or playing rugby in the mud at Southern Illinois University in Carbondale, Illinois. Also at SIU-C the infield and scraped areas on which our baseball games are played constantly need to be resodded and dried; wet spots and weeds in turfed areas call for better drainage and maintenance. The effects of excess usage and wear are visible in the middle of a football field in Herrin, Illinois and are very apparent at Dodger Stadium in Los Angeles, where a mobile home exposition took place. The Olympic Stadium in Munich, West Germany seemed to have a good grassy turf in 1977, but during the 1976 Summer Olympics, its underused bluegrass/timothy turf was devastated in the first soccer game. The all sand field at Robert F. Kennedy Stadium in Washington, D.C. illustrates another problem of turf: it did not absorb the rain water fast enough because of a recently laid, thick mineral sod. Let us look more closely at some of these problems.

Site evaluations are necessary to clearly define the problems with turf at athletic facilities. Kent Kurtz at Cal Poly-Pomona, California has developed a form for evaluating turf sites for his classes. This form includes sections on evaluating present conditions and maintenance practices and on the procedures necessary for a workable turfgrass program. Another form, patterned after the one I have used in classes on turfgrass management at SIU-C, was also developed. This form appears on the following four pages.

H.L. Portz is a professor in the Department of Plant and Soil Science at Southern Illinois University, Carbondale.

SITE AND PROGRAM EVALUATION OF AN OUTDOOR ATHLETIC FACILITY

Date__________________ Evaluator____________________________________

I. Description of the Facility

A. Major Athletic Activity______________________________________

B. Other Athletic Activity______________________________________

C. Administrative Unit____

D. Address/Location____

E. Contact Person__________________________ Phone_______________

II. Site and Program Evaluation

A. Characteristics and Problems of the Physical Site

1. Site size______________ Description (sketch on separate sheet)

____

2. Physical properties of the soil

a. Type____

b. Texture____

c. Structure____

3. Chemical properties of the soil

a. pH____

b. P____

c. K____

d. Other tests (C.E.C., for example)________________________

4. Drainage

a. Percent slope (crown)____________________________________

b. Tile____

c. Other____

d. Current drainage problems________________________________

5. Compaction

a. Compacted layer______________________________

b. Problems with water infiltration______________________

c. Any soil modification______________________________

d. Modification needed________________________________

6. Condition of the playing surface (infield, outfield, etc.)____

____

____

B. Cultural and Maintenance Practices

1. Turfgrass species and cultivars if known (left) and percent of each (right)

______________________________________ __________%

______________________________________ __________%

______________________________________ __________%

Total coverage of desirable grasses __________%

2. Date and method of establishment__________________________

____

3. Condition of turfgrass (disease, wear, or other problems)

a. Past problems______________________________________

____

b. Present problems___________________________________

____

4. Renovation and reseeding practices_________________________

____

5. Fertilization program (liming history and present program)____

____

____

Fertilizer applied Date of application Rate of application

__________ __________ __________

__________ __________ __________

__________ __________ __________

6. Mowing schedule (Note variation in season or area.)

Season Height Frequency Equipment used

____ ____ ____ __________

____ ____ ____ __________

____ ____ ____ __________

____ ____ ____ __________

7. Cultivation (aerification, slicing, dethatching, topdressing)

Type Frequency Equipment used

________ ____ __________

________ ____ __________

________ ____ __________

8. Irrigation practices (type and frequency)__________

____

9. Pest problems and control (disease, insect, weed, rodent)

Type of problem Remedy (with rate and time of application)

________ ________________

________ ________________

C. Use (kind and intensity)

1. Major activity__________Intensity______

2. Other activity__________Intensity______

3. Use conditons (too wet, overuse)__________

____

4. General surface condition and repair______________________

____

D. Budget for Field Upkeep

1. Current budget__________________________________

2. Future budget___________________________________

3. Planned improvements_____________________________

____

____

4. Problems_______________________________________

____

____

E. Management

1. Site____

____

____

____

2. Program____

____

____

____

III. Recommendations (site and soil improvement, turfgrass culture, use, and management)_______________________________

____

____

____

____

H. L. Portz, 1984

Once the problems of a turf site at an athletic facility have been identified, there are several procedures for correcting them. The first involves improving the site and soil.

SITE AND SOIL IMPROVEMENT

The physical and chemical properties of the soil should be noted and corrected as far as possible. Because this aspect will be discussed by others during this conference, I will look at drainage.

Providing surface drainage. A crown is recommended for nearly all athletic areas as noted in Figures 1, 2, and 3. An 18-inch crown is recommended for a football gridiron, a smaller crown for a soccer field, and variable slopes for a baseball diamond (Byrd Stadium in Maryland has almost a 24-inch crown). Periphery tile lines, as illustrated in these figures, are needed to take water away from the playing area, coaches boxes, and other areas.

Providing tile and other internal drainage. The baseball diamond at SIU-C will be used as an example of a problem with drainage. Player positions, especially in the skinned area, were depressed and wet; basepaths were dished; and the very compacted infield had a thin stand of Kentucky bluegrass and weeds. With a medium stand of tall fescue and many weeds, the outfield was in somewhat better condition. The diamond was surveyed in 1974 and showed low areas that did not have runoff into the outfield, but the overall slope was adequate. Spring games were frequently cancelled because of "wet grounds."

Although an underground drainage system had been installed during the initial construction (Figure 4), no water was getting to the perforated tile buried 2 1/2 feet underground. A one- to two-inch compacted layer in both infield and skinned areas, along with a regular fragipan at 5 to 7 inches, did not allow water to move downward or laterally to the thirty-foot, spaced tile. The immediate steps recommended in 1974 and implemented in 1975 were as follows:

1. Remove the sod and dig slit trenches along the edge of the skinned area and outfield turf, and cross or connect them with existing tile.

2. Fill slit trenches with six inches of fine gravel, then sand, and top with a sand and soil mix (this type of drainage is often called a French drain).

3. Relevel skinned areas and basepaths for better runoff and incorporate calcined clay (Turface) or a sand and soil mix for better playing conditions.

4. Resod over slit trenches and in the areas of excessive wear in the infield.

Renovation was repeated in 1978 after a considerable migration and buildup of sand, soil, and Turface at the edge of the skinned area and the outfield and after a two- to three-inch drop from the edge of the infield edge to the skinned area had occurred. This renovation called for the following measures: removing the sod and lowering the inner edge of the outfield so that runoff water could move to the slit trenches or onto the outfield grass; replacing the turf with five strips of new sod; raising the area immediately adjacent to the infield grass with sand, soil, and Turface from the skinned area--thus reestablishing the original slope to the outfield; and lowering the outer edges of the basepaths to facilitate the movement of water off the paths.

A follow-up renovation and maintenance program was then outlined, including weed control, annual aerification, fertilizing, reseeding, verticutting, topdressing, and appropriate skinned area maintenance.

According to another tiling system designed in 1979 by Bill Daniel at Purdue University, narrow silt trenches, twelve to eighteen inches deep, are cut diagonally across a football or soccer field at ten- to fifteen-foot intervals. A two-inch slitted Turfflow drain tile is laid in the trench, which is filled with uniformly fine particle sand. Other steps to improve drainage might be appropriate, depending on the site.

Modifying the soil. Soil modification with sand or Turface is frequently proposed to improve internal drainage and to minimize compaction. Using 80 or more percent of sand is usually recommended, but one can use only sand, as in P.A.T., Purr-wick, HyPlay, and other sand-only systems. Topdressing with sand--especially after aerification--and brushing sand into the core holes prevents top sealing and keeps holes open for the penetration of air and water. Skinned areas and basepaths on a baseball diamond can be modified with crushed red brick, Turface, or even a clay soil with sand. All-Purpose Absorbent or Diamond Dry can be used to quickly absorb excess water.

Using artificial turfs. Alternative playing surfaces, like the artificial turfs found in many big league and college athletic facilities, are available. Astroturf or other artificial materials can be used for total field coverage, except on the bases and sliding areas of a baseball diamond. There are, of course, undesirable aspects of artificial turf: it causes bad bounces; it is slippery when wet; it is hotter to play on than grass; it is very expensive; and it is an additional source of injuries. Most players and coaches prefer to play on the real thing, but we are still using nonturf for the skinned area and basepaths. Even in these areas a novel approach has been tried at SIU-C. Basepaths to first and homeplate are actually grass paths. Little more wear is experienced by turf in this area than by turf in many parts of the infield, and similar irrigation and mowing to the adjacent infield area makes it easy to maintain.

Relieving compaction. In addition to reducing compaction by drainage, modifying the soil, and topdressing, one can aerify and use other mechanical means to relieve already compacted soils and to improve the penetration of air and water to plant roots. Equipment varies from aerifiers for small greens to large tractor-drawn or mounted coring machines. Various vibrators or deep-chisel plows fracture deeper compacted layers, but the results are not very long lasting. Two or more aerifications are recommended every year.

RENOVATION OR REESTABLISHMENT

After the site and soil have been improved, renovation or reestablishment may be necessary to correct the problems at a particular turf site. The selection of the grass to be established depends on its adaptation to the climate and its tolerance of wear. In northern regions, like Wisconsin and northern and central Illinois, Kentucky bluegrass should be grown. Use one or more of the improved cultivars, for instance, 'Vantage', 'Majestic', or 'Baron'. Although 'Touchdown' is good in northern Illinois, it is very susceptible to Fusarium blight (summer patch disease) in Carbondale. Perennial ryegrass is a good supplement for Kentucky bluegrass and can be used for overseeding areas that are heavily worn on football, soccer, and baseball fields. Select one of the newer cultivars, but do not be suprised if Dollar Spot or Pythium appears in late summer.

If one were to select only for durability, tall fescue, bermudagrass, and zoysiagrass would rate ahead of perennial ryegrass and Kentucky bluegrass, but they must be used further south in the Transition Zone. Tall fescue has good wear tolerance when it is mature, but not when it is juvenile. It is susceptible to brown patch, and being a bunchgrass, it needs frequent renovation. A small amount of Kentucky bluegrass could be used in the original mixture, however, to keep a tighter sod. Bermudagrass is excellent for football fields in the Upper South, like the football field in Commonwealth Stadium at the University of Kentucky or in Byrd Stadium in the East, but colorant is needed after a frost in the fall.

Zoysiagrasses can also be used in southern Illinois. Many golf courses, including Old Warson in St. Louis, make extensive use of 'Meyer' zoysiagrass for surrounding lawns, fairways, and tees. The baseball diamond in Seoul, South Korea, the site of the 1988 Summer Olympics, is in zoysiagrass. Germinable seed of 'Korean Common' zoysiagrass is now available; we have been very successful in obtaining good stands in one season and have tested a seeded mixture of tall fescue and zoysiagrass, that looks promising for athletic fields.

If the site has been improved considerably or if the soil has been modified extensively, one must consider reestablishment by vegetative methods or reseeding. Sodding, the quickest but also the most expensive method, is most frequently used in areas of heavy wear. Plugging or hydro-stolonizing is often used with zoysiagrass; sprigging is used with bermudagrass. If only renovation is needed, one can kill all existing vegetation with a glysophate (Roundup) and then seed and verticut, aerify, or use a flex harrow to incorporate seed. Another method is drilling with a Rogers seeder or sod seeder. The women's softball field at SIU-C was renovated in 1980. After using glysophate, tall fescue was seeded with a Turf Shaper or was broadcast and then worked in with Grounds Groomer or a Fuerst flex harrow. A Brillion seeder was then used to seed about one-half pound per thousand square feet of a Kentucky bluegrass blend. Results were very good. The two trips with the Grounds Groomer gave the best tall fescue stand.

MANAGEMENT

Reestablishment or renovation should be followed by good maintenance and management practices. Proper fertilization, mowing, pest control, and irrigation will keep the turfgrass growing. Along with aerification, topdressing, and other cultural practices to relieve compaction, these practices should provide a good playing field. Many publications from universities, commercial companies, and professional organizations are available to assist the managers of sport fields in their maintenance tasks.

A more difficult task may be to use limited funds wisely. With increasing costs and shrinking budgets, one must set priorities for essential maintenance, major improvements, and the replacement of equipment. Often improvements and the replacement of equipment are sacrificed.

Tough management decisions about regulating the use of facilities must also be faced because coaches and players want to practice regardless of the weather. When the turf area is soft and wet, practice fields and alternative sites should be used or Astroturf should be installed, like at SIU-C and at the University of Illinois. Other composition materials are frequently used for soccer pitches in Europe. One can also choose to have a completely controlled environment, like the Superdome in New Orleans.

Once the problems of turf sites have been corrected by improving the site and soil, renovating, reestablishing, or establishing good management practices, however, we can enjoy natural turfgrass fields at our athletic facilities.

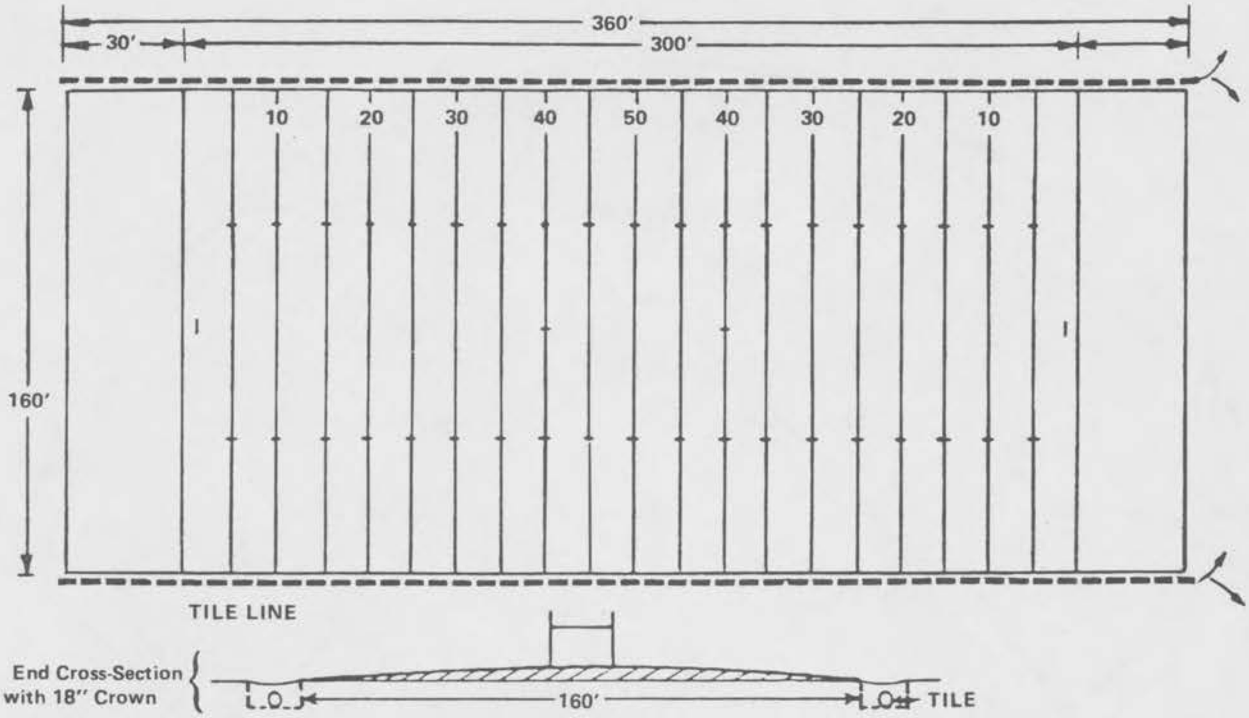

Figure 1. Field plan of football gridiron showing end section and tile lines.

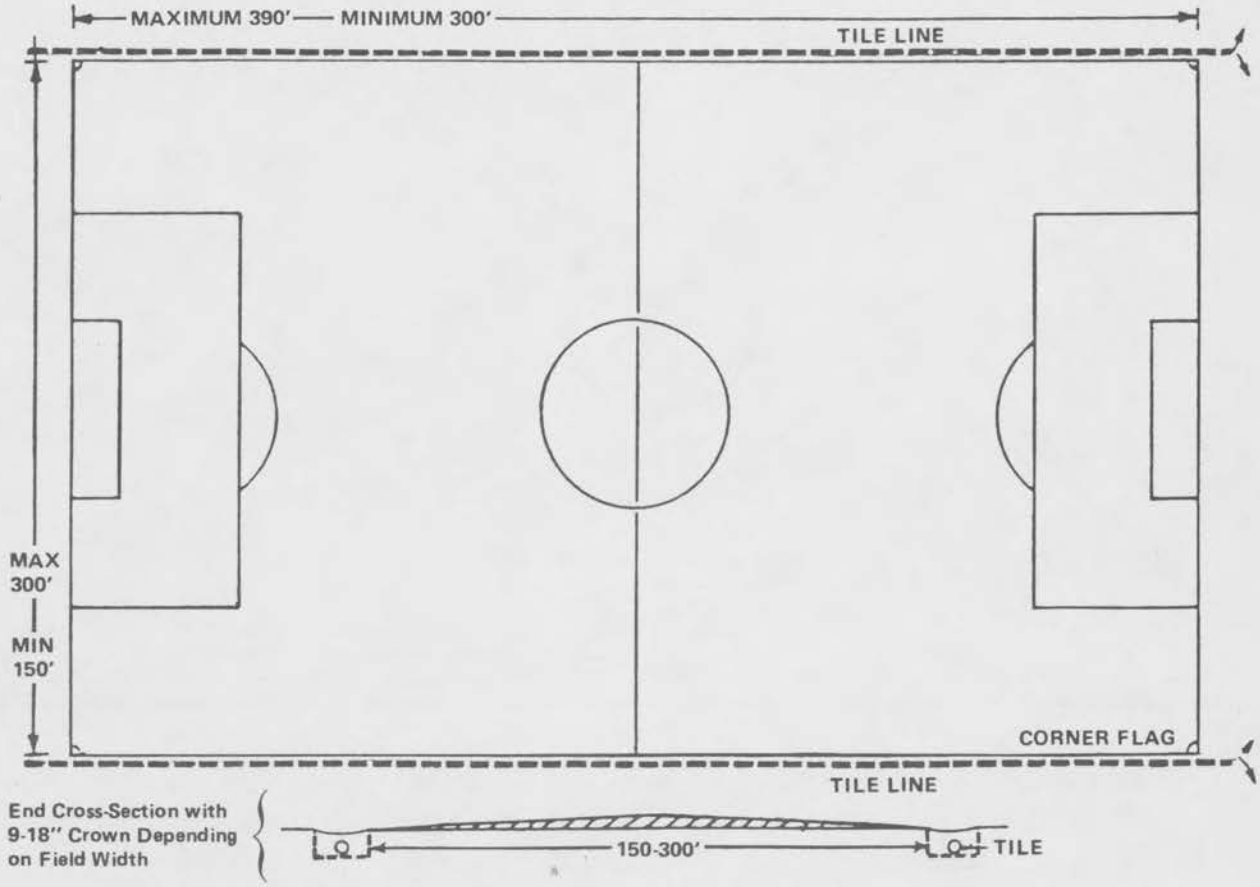

Figure 2. Plan of soccer field showing end section and tile lines.

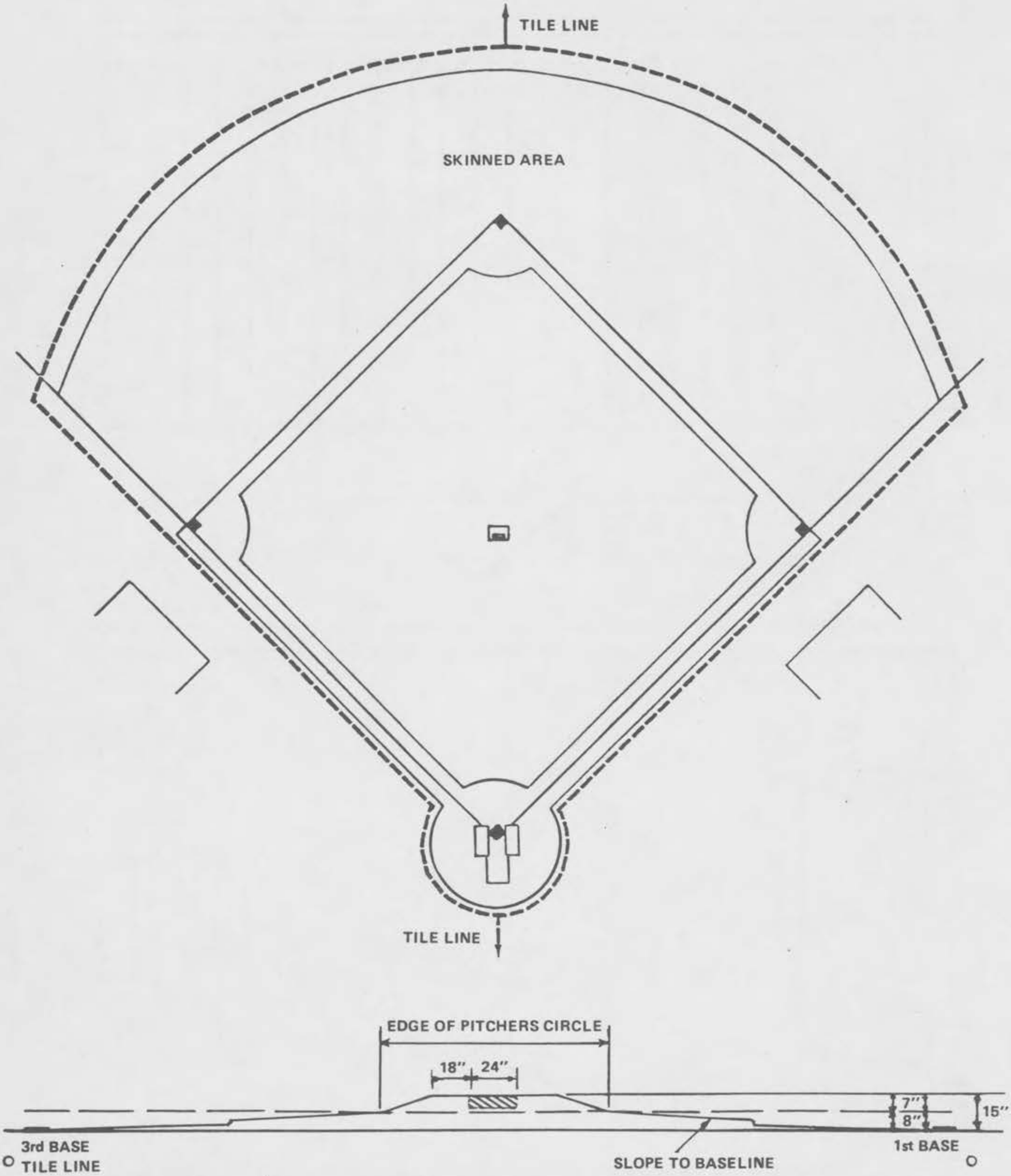

Figure 3. Field plan of regulation baseball diamond showing design of tile system.

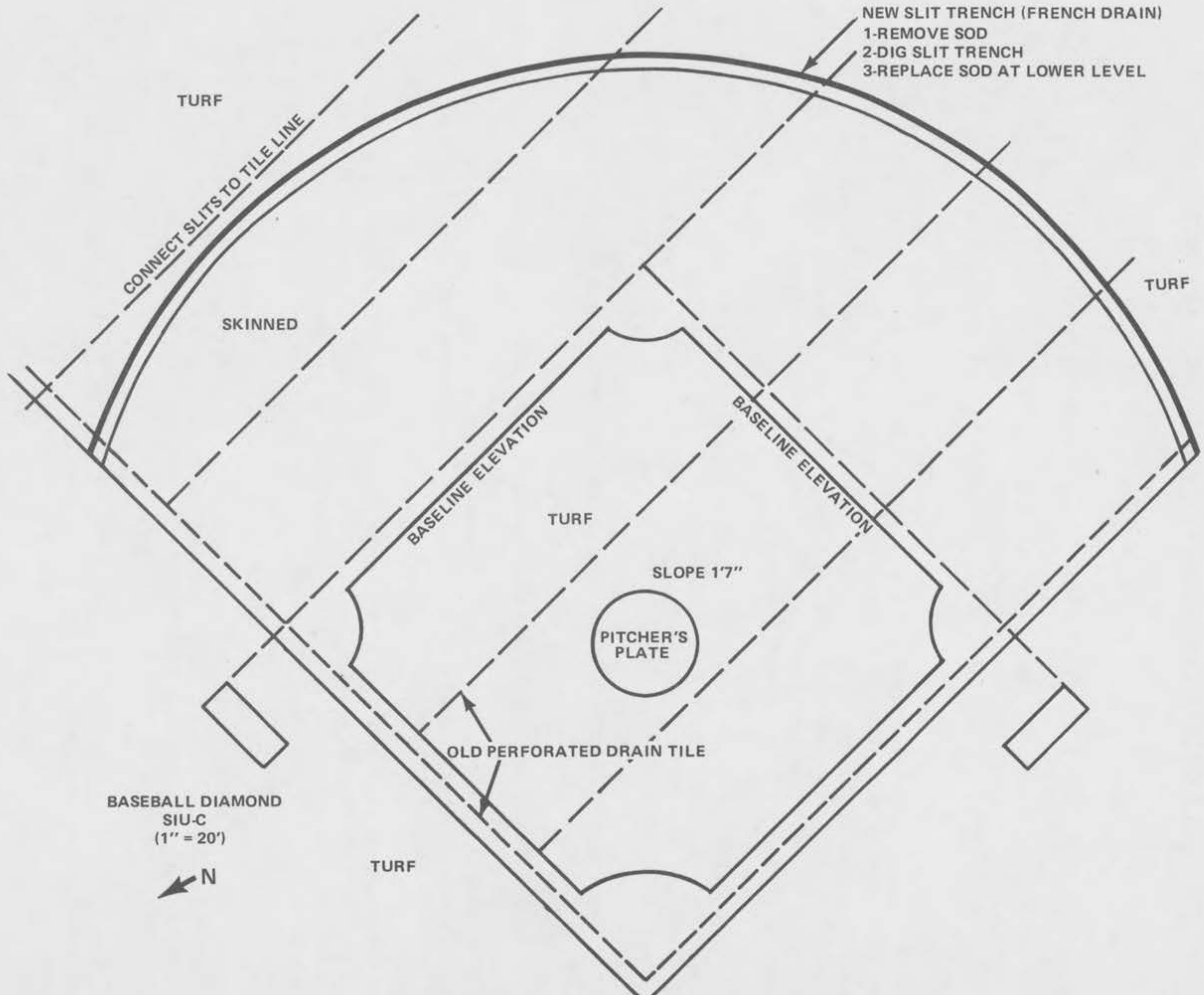

Figure 4. Baseball infield at SIU-C showing old drain tile and new slit trench.

SELECTING THE RIGHT BLEND FOR SEEDING

Thomas W. Fermanian

The primary objective in establishing and growing turfgrass is a beautiful, healthy, and functional turf. Frequently, however, our best intentions regarding establishment are frustrated in the first few years by problems with pests and the environment. All too often these problems can be so severe that they not only lower the quality of the site, but also necessitate replanting or reestablishing the turf.

The proper establishment of a turf involves selecting the seed, controlling perennial grasses, testing the soil, providing drainage, rough-grading the soil, adding soil amendments, smooth-grading the soil, planting seed or sod, mulching, and irrigating. The most important of these steps is selecting the proper blend of turfgrasses. If the wrong blend is selected, all other measures taken to establish a turf will be only temporary because the nonadapted turfgrasses will eventually succumb to pressures from the environment.

For general turfs or lawns in full sun, sodding permits the most rapid use of an area and is the method that landscape contractors often chose. If the sod bed is properly prepared and good quality sod is correctly installed and maintained to ensure good integration of the sod with the underlying soil, sodding can be a pleasant and useful means of establishing a turf. Unfortunately, sodding is often viewed as an easier approach to establishment, and improper preparation for it causes an early decline in the sod.

A certain amount of thatch is necessary for the proper handling of sod from field to installation, but often there is so much thatch in the sod that it has difficulty knitting properly to the soil. When excessive thatch is brought to a site, aerification and other procedures for reducing the thatch should be performed shortly after establishment.

Those who assume sodding is the only method of establishing a turf in Illinois miss a lot of potential uses for turf when sodding materials are not available. Perennial ryegrass, fine fescue, and tall fescue, for instance, are usually not available as sod. Those who choose only to sod limit their selection of the best species or group of species for a particular site and its use. The two most important factors in selecting varieties or species are their general adaptation to environmental and cultural conditions and their inherent resistance to the principle turfgrass diseases. Much of this information is available in reports on university research evaluating varieties and from turf managers in Illinois who have tried different species in similar conditions.

The intensity of management that will be applied to an area is crucial in the selection of a seed mixture or blend. The greater the activity applied to a site, the greater the need for a high performance turfgrass. Close mowing, heavy fertilization, and intense irrigation require the most rapidly growing turfgrasses. In

T.W. Fermanian is an Extension turfgrass specialist and an assistant professor of Turfgrass Science at the University of Illinois at Urbana-Champaign.

Table 1 this broad gradation of cultural intensity is broken down into low, medium, and high categories of maintenance. Depending on the use and cultural intensity of the site, a number of possible seed mixtures or blends are available in Illinios. (See Horticultural Facts TG-1-79 "Turfgrass Selection for Illinois," Department of Horticulture, University of Illinois at Urbana-Champaign, Urbana, Illinois 61801.) For a turf in full sun that requires medium to high maintenance, improved varieties of Kentucky bluegrasses can be used. These are available both as seed or sod. For turfs in full sun that require less maintenance, there are some alternatives.

Table 1. Maintenance Levels of Turfgrass

	Low	Medium	High
Mowing height (inches)	>2 1/2	1 1/2 to 2 1/2	< 1 1/2
Application rate for fertilizer (lb/1,000 sq ft)	< 2	2 to 3	4 to 6
Amount of irrigation	none	as required	regular intervals

FINE FESCUE

For areas that are partially shaded the selection of seed is very limited. Creeping red fescue usually provides the best turf in shade. The primary advantage of 'Pennlawn' and other red fescues is their ability to spread laterally through short rhizomes. Other fine leaf fescues, like hard fescue or sheep fescue, can provide an adequate turf, but the turf must be in full sun and under low cultural intensity. The varieties of fine leaf fescues that are recommended for use in Illinois comprise 'Pennlawn' and the following group of chewings and hard fescues: 'Waldina', 'Agram', 'Jamestown', and 'Scaldis'.

The suggested mixture for shade in "Turfgrass Selection for Illinois" includes Kentucky bluegrass, but many Kentucky bluegrasses tolerate shade very little or not at all. 'Touchdown', 'H-7', and some other varieties have shown varying degrees of tolerance to low levels of light.

TALL FESCUE

In finer-textured, cool-season turfs in northern Illinois, tall fescue has been considered a weed, but current evaluation of newly released cultivars has shown that it can be used as a turf in special situations. During the past two seasons, many new turf type varieties of tall fescues have been released. In general, they all exhibit a lower or more prostrate growth habit, a darker color than older forage types, and greater resistance to disease. When seeded at rates from 6 to 8 pounds per 1,000 square feet, they can also exhibit a finer texture for a period of time. Cultivars that are slightly better than other tested varieties include 'Brookston', 'Clemfine', 'Falcon', 'Galway', 'Houndog', 'Jaguar', 'Marathon', 'Mustang', 'Olympic', and 'Rebel'. Of these cultivars, 'Falcon', 'Jaguar', 'Marathon', and 'Mustang' are rated slightly higher, but all these varieties will provide an excellent tall fescue turf.

Turf-type tall fescues also show a good degree of resistance to diseases, which have otherwise minimized their use. One disease is pythium blight (Pythium spp.)--a serious disease of all cool-season turfgrasses. 'Brookston', 'Falcon', 'Jaguar', 'Marathon', 'Mustang', 'Olympic', and 'Rebel' resist pythium blight better than other tested varieties of tall fescues.

PERENNIAL RYEGRASS

Another alternative for turfs in full sun that will receive considerable wear might be a mixture of a Kentucky bluegrass and a perennial ryegrass. Like tall fescue, new varieties of perennial ryegrasses have been introduced over the past several years. In most cases, the new varieties have either finer texture or greater resistance to a turf disease. Those listed as turf quality in Table 2 are equal in quality and better than other tested varieties. When selecting a variety, the most limiting factor will be the availability of seed, but the mowing quality, resistance to disease, and drought tolerance of the variety should also be considered.

Table 2. Characteristics of Several Varieties of Perennial Ryegrasses

Varieties	Quality		Resistance to brown patch	Drought tolerance
	Turf	Mowing		
Allstar			X	
Barry	X	X		X
Birdie II		X	X	X
Blazer	X			
Cigil		X		
Citation		X		
Citation II			X	
Cowboy			X	
Dasher	X		X	X
Delray		X		X
Derby	X			X
Diplomat	X			
Elka	X	X		
Fiesta	X	X	X	
Gator	X	X		X
Manhattan	X			
Manhattan II		X	X	
Omega	X			
Palmer	X		X	X
Pennant			X	
Pennfine				X
Prelude	X		X	
Premier	X		X	X
Ranger	X		X	X
Regal		X		
Repell	X	X		X
Yorktown	X			
Yorktown II		X		

As with tall fescue, there can be mowing problems with a perennial ryegrass, especially when mowing equipment is poorly adjusted or not sharp. Common type perennial ryegrasses, which are no longer used, are stringier with extended leaf veins. Most improved perennial ryegrasses have minimal problems with mowing. The varieties having the best mowing quality under all types of conditions are listed as mowing quality in Table 2.

Brown patch (*Rhizoctonia solani*) can be a serious problem in perennial ryegrass and, along with pythium, limits its use. Consult Table 2 for varieties that show a greater resistance to this disease than other tested varieties.

Unlike Kentucky bluegrasses, perennial ryegrasses do not tolerate extended periods of drought well. Drought tolerance, therefore, is important in the selection of the correct cultivars. Varieties listed in Table 2 as tolerant to drought have shown greater tolerance than other perennial ryegrasses tested.

KENTUCKY BLUEGRASS

Although Kentucky bluegrass is available as sod, there are many instances when bluegrass seed offers advantages over sod. We have had the opportunity to examine the turf quality of Kentucky bluegrasses growing in two types of soil in Illinois. The varieties listed in Table 3 as suitable for medium-textured soil (Catlin silt loam) exhibited the best average quality for the season. They are broken down into groups: group A is slightly superior to group B, which is slightly higher in quality than the varieties listed in group C. Because many high quality varieties of Kentucky bluegrasses are available, selection is easier.

How do Kentucky bluegrasses perform in coarse or sandy soils? Unfortunately, many varieties that perform well in medium soils tend not to do as well in a coarse or lighter soil, and those that do poorly in medium soils sometimes do well in coarse soil. Those varieties listed in Table 3 as suitable for coarse soil were evaluated to be of higher quality than other varieties tested in coarse soil. Kentucky bluegrasses were grown in sand to evaluate their performance in drought conditions. The varieties listed in Table 3 exhibited greater tolerance to drought than other varieties that were tested.

We spent a lot of the first day of these meetings discussing summer patch,[1] a disease that can devastate a Kentucky bluegrass turf. Most varieties of Kentucky bluegrasses resist summer patch well, but all varieties under the right conditions can be stricken by the disease. The evaluation of Kentucky bluegrass varieties grown in central Oklahoma has shown that the varieties listed in Table 3 are more susceptible to summer patch than other tested varieties.

Pythium blight (*Pythium* spp.) is also a serious problem in Kentucky bluegrass, particularly where the turf is under medium to high maintenance or under additional stress. The varieties listed in Table 3 as susceptible to pythium blight are more vulnerable to this disease than other varieties tested but are very similar in other respects.

Insect problems can also be accelerated or minimized by the degree of resistance or susceptibility of a turf to their damage. The varieties listed in Table 3 have shown greater resistance to the damage caused by sod webworms than other varieties that were tested.

---

[1]See "Summer Patch and Necrotic Ring Spot," p.1.

Table 3. Characteristics of Some Varieties of Kentucky Bluegrasses

Varieties	Soil: Medium A	Soil: Medium B	Soil: Medium C	Soil: Coarse	Drought tolerance	Susceptibility to Summer patch	Susceptibility to Pythium blight	Resistance to sod webworm damage
A-20	X							
A-34							X	
Adelphi		X		X				
Admiral		X						
America				X	X		X	
Apart							X	
Argyle							X	
Aspen				X				
Banff		X		X				
Barblue	X					X		
Baron			X	X				
Bayside							X	
Birka			X	X			X	
Bonnieblue			X					
Bono							X	
Bristol					X			
Cello	X					X		
Cheri			X					
Columbia		X					X	X
Dormie					X			
Eclipse	X							
Enmundi	X							
Enoble				X				X
Escort		X		X	X			
Fylking						X		
Glade							X	X
H-7	X			X				
Harmony							X	
Holiday				X				X
I-13	X							
Kenblue							X	X
Kimono		X			X			
Lovegreen							X	X
Merion						X		
Merit				X				

(continued)

Table 3. Continued

Varieties	Soil: Medium A	B	C	Coarse	Drought tolerance	Susceptibility to: Summer patch	Pythium blight	Resistance to sod webworm damage
Midnight			X	X				
Mona	X			X				
Monopoly	X			X			X	
Mosa		X		X			X	
Mystic						X	X	
Nassau					X			
Nugget				X			X	
Parade			X	X				
Piedmont							X	
Plush		X		X			X	
Ram I			X		X		X	
Rugby	X							
Shasta	X			X			X	
Sommerset						X	X	X
South Dakota Common							X	X
Sydsport			X	X	X		X	
Touchdown		X			X			X
Trenton	X			X		X		
Vanessa		X		X			X	
Vantage							X	X
Victa					X			
Wabash							X	
Welcome				X			X	

STEPS IN ESTABLISHMENT

After a critical evaluation of the species or varieties of turfgrasses to be used at a site, these steps are necessary for successful establishment:

1. Control perennial grasses.

While controlling perennial grasses is important, to minimize the competition for the newly seeded or sodded turf, I suggest controlling all vegetation with a nonselective herbicide, like Roundup, which will allow immmediate establishment.

2. Test the soil.

The best time to add nutrients to the soil is during establishment, so a representative soil sample should be submitted for testing at this time. The primary tests in routine soil evaluation are for pH, potassium, and phosphorus. Secondary tests for salt concentration and secondary nutrients, for example, might also be helpful but are needed only when problems arise.

3. Rough-grade the soil.

Rough-grade and modify the soil as necessary. Proper grading of a turf site can minimize surface runoff and provide greater rates of infiltration. When grades of 25 percent or more are necessary, terrace the area or use nonturf materials because of the potential hazards of steep-slope mowing.

4. Provide drainage.

Drainage should be provided in poorly drained soils. Proper placement of drain tiles is imperative, so it is advisable to seek professional assistance in designing a drainage system.

5. Add soil amendments and smooth-grade the area.

After adding soil amendments, required fertilizers, and any adjustments to the pH, a final grade can be prepared. Thorough tilling and incorporation of all materials is necessary to prevent layers that would impede the movement of water. Either rolling with a weighted roller or raking or both should provide a smooth, firm, even seedbed.

6. Plant seed or sod.

When seeding or sodding, work off sheets of plywood to minimize the depressions from footprints. Although these small irregularities on the surface can be minimized or filled in with topdressing, attention to their elimination during establishment can minimize the need for further maintenance. After the seed bed is prepared, seeding or sodding may begin. Using a spreader for seeding is highly recommended. Regardless of the machinery, however, for maximum accuracy it is always best to divide the seeding rate in half and to apply each half on a ninety-degree section of the turf site.

7. Mulch.

After plant materials are distributed on the turf site, they require some degree of protection from erosion. One heavy rainstorm can seriously erode a soil that has not been previously mulched. Of the available mulching materials, wheat straw or other small grain straw--if clean from seed--provides one of the best mulches for most cool-season turfs. When used at relatively low rates, the turf can grow up through the mulch with little difficulty.

8. Irrigate.

After mulching, moisture management is necessary; irrigate frequently until the seedlings begin to emerge from the soil. Mow after the seedlings have grown one-third higher than the normal mowing height, taking care not to pull the seedlings from the ground.

I encourage you to attend Field Days at the University of Illinois or to see our varietal plots if you have further questions about selecting turfgrass. Current evaluation trials of cultivars are listed along with the results from previous years in the Illinois Turfgrass Research Report. At some locations, like the Rock Island County evaluation plots, field plans with clearly marked cultivars are available.

SUCCESSFUL LANDSCAPE PLANT COMBINATIONS

Justin "Chub" Harper

The concept of any landscape project is represented by a three-sided figure called a trimuvirate. The sides of this triangle are the functions of design, construction, and maintenance. The successful application of any landscape concept is directly related to the ease and cost of maintaining the design because landscape projects usually are built only once but may be maintained for centuries. Landscape gardening could be as relaxing and enjoyable for professionals as it is for others if the effort spent in maintaining landscape designs were considered when they are constructed.

Because the beauty and enjoyment of landscape gardening are lost when maintenance problems are created by the improper selection of plants, you should select attractive ornamental plants that require minimal maintenance. Selecting plants for the most pleasing combinations becomes a question of selecting the right plants for the right places, especially when space is a limiting factor. My special interest is in dwarf conifers and their companion plants. Selecting these types of plants significantly helps solve the problems associated with maintaining a landscape design.

The most important consideration in developing a pleasing combination of landscape plants, however, is hardiness. In hardiness zones 4 (Arnold Arboretum), and 5 (USDA), for example, our list of suitable plants is much shorter than the lists for hardiness zones 6 and 7. Gardeners and horticulturalists tend to try to extend the range of plants into zones of questionable hardiness. But my years of experience and experimentation have told me that Mother Nature will not permit this extension for long and that it is wiser to select plants that have shown hardiness in the zone where they will be grown as part of a design.

Although personal opinion--likes and dislikes--usually govern the selection of plants, the site and culture of the plants should be taken into account once the required space, scale, and hardiness of the plants have been determined. Shade, sun, moist soils, wet soils, dry sandy soils, pH, city conditions, and erosion control need to be addressed before specific aspects of design, such as type, color, and order of bloom. Then, for example, if ornamental fruit are desired, the size and color of the fruit should be considered. The change in the color of the foliage from season to season may be a deciding factor. Sometimes variegated foliage is preferred. The texture of the bark and the color of the stem can also be significant factors.

The final criteria for selection of any plant is its landscape value. Form as well as texture must fit the design; for instance, you will need to determine whether a prostrate, upright, weeping, or globe-shaped plant is appropriate in a given location.

J. Harper is the grounds maintenance supervisor at the Administrative Center of Deere and Company, Moline, Illinois.

Overriding the demands of form and texture in a design, however, is concern about disease and insect problems. If there is an inherent disease or insect problem, forget trying to use the plant. Good examples are a tubercularia canker in a tall hedge and honeysuckle aphids in tatarian honeysuckle. Some potential disease and insect problems can be tolerated because all plants suffer from one or more problems, but when they affect landscape value, it is time to think of an alternative.

While good landscape plant combinations can range from simple arrangements to elaborate botanical gardens and arboreta, in any successful planting the personal element of selection and design will always be a factor. But hardiness, site, and culture, along with disease and insect problems, need to be taken into account before aspects of design, like the form and texture of the plants. Success in combining landscape plants requires selecting attractive and appropriate plants that can be maintained with a minimum of effort. (For further reference, I recommend that you consult the third edition of Michael A. Dirr's helpful, comprehensive, and straightforward *Manual of Woody Landscape Plants*.)

IS THE LAWN CARE INDUSTRY AS PROFESSIONAL AS IT SHOULD BE?

William R. Fischer

As the recently elected president of the 650-member Professional Lawn Care Association of America (PLCAA), I have had the opportunity to observe many activities of the industry in this country. Before answering the central question about professionalism in the industry, which Dr. Wehner has asked me to address, I would like to provide some background and point out some of the natural enemies of professionalism and some of the positive forces at work in the industry.

The lawn care industry, as we know it today, has experienced phenomenal growth since it began in the mid-1960s. The size of the industry is estimated at $2.2 billion, and it is growing at a rate of twenty percent annually. Growth industries like ours historically attract an "element" that wants to turn a quick profit. Well-run, professional, small companies that grow quickly can turn into uncontrolled, poorly managed operations almost overnight because the controls and management systems that are adequate in a small operation generally fail under the pressure of rapid growth. Growth, as presented in this scenario, is a natural enemy of professionalism.

Another pressure that operates within the industry is competition. New participants in this growing industry have caused fierce competition in some markets. When competition heats up, new and "creative" marketing programs are developed, which can strain the image of the industry if they are not monitored and moderated. Competition is a natural and beneficial part of our economy and should not be discouraged, but it can become excessive and erode, instead of build, an industry.

To stay in business, industries must remain profitable. They are constantly tempted to reduce the quality of their services and products to generate a better bottom line. Employing this strategy is usually fatal because there is no such thing as a lasting profit formula that does not include quality. Unfortunately, in a growth industry, short-term profits can be realized without the quality that is essential to our profession. Thus, the pressure to be profitable can become another natural enemy of professionalism.

Opposed to the pressures of growth, competition, and profitability are the positive forces at work in our industry--the "guardians" of professionalism. Interestingly enough, one of these forces is another facet of one of the enemies of professionalism. Early in the life cycle of an industry, profitability can be increased by cutting the quality of services and products. As the industry matures, however, quality becomes an inescapable component of the profit formula and therefore ensures long-term professionalism.

W.R. Fischer is the president of Spring-Green Lawn Care Corporation, Naperville, Illinois.

Another contributing force to professionalism in our industry is the increasing activity of groups opposed to pesticides. Even though the diluted products we, as an industry, apply to lawns are classified as slightly toxic--the lowest rating possible on the toxicity scale--these groups are making a lot of noise. Because of their ability to deny facts and create emotional issues, the industry must respond to them. One of the most powerful responses is to maintain our professional standards. Professionalism gives the opposition less opportunity to carry on its crusade.

Is the industry as professional as it should be? Based on this review of the forces at work in our industry, my feeling is that, while there certainly is and always will be room for improvement, our industry is quite professional. Is it professional enough? No. But those companies that have entered the industry under less than professional charters are either gone or are in the process of rapidly cleaning up their act. This improvement bodes well for the future of the lawn care industry.

What can we do to increase our professionalism? We can adopt a professional attitude, and we can join our local, state, and national associations. These provide a forum for the enhancement of professionalism and the continuation of education.

I believe that the future of this industry is extremely bright and that we have the opportunity to control it, but we must be professional to ensure it. With eveyone's help, the professional lawn care industry can become one of the strongest services in the service segment of our economy.

GYPSUM IN AGRICULTURE

Theodore R. Peck

Gypsum ($CaSO_4.2H_2O$), hydrated calcium and sulfate, is a common mineral that is widely distributed in sedimentary rocks. In the United States commercial deposits are found in many states, but the chief producers of gypsum are located in New York, Michigan, Iowa, Texas, Nevada, and California. In semiarid and arid regions (receiving less than 20 inches of rain a year), gypsum accumulates in and beneath subsoil layers containing calcium carbonate. In Illinois, which receives about 30 inches of rain annually, gypsum crystals accumulate in the subsoil of some types of soil. In fairly pure form gypsum comprises about 20 percent combined water, 18.5 percent sulfur, and 23 percent calcium. Its solubility is 0.24 gram per 100 milliliters of cold water and 0.22 gram per 100 milliliters of hot water (equivalent to about 1/3 ounce per gallon).

Gypsum was used by the early Greeks and Romans. It came into widespread use in Europe in the early nineteenth century and was introduced to the United States by German immigrants, who used it extensively in Pennsylvania and Ohio. Benjamin Franklin applied gypsum on a prominent hillside in a pattern outlining the words: "This land has been plastered." The increased growth of the pasture in the treated area effectively demonstrated the value of gypsum as a fertilizer.

Before the advent of common commercial fertilizers, gypsum was a popular soil amendment. Successful results obtained while using gypsum were attributed individually to the calcium and sulfur that it contained, to combinations of these minerals, or to its "liberation" of potassium. The popularity of gypsum waned as it became less and less effective on soils that had been under cultivation longer. Quite possibly this decreased effectiveness was due to the tendency of these soils to become more acid. About that time, specific problems with the acidity and with the amount of phosphorus, potassium, and nitrogen in soils were being identified. Because none of these problems were ameliorated by gypsum, there was no apparent reason to use it, especially when super phosphate, which concomitantly supplied gypsum, came into widespread use.

Today gypsum is recognized for the plant nutrients it carries: calcium (Ca) and sulfur in sulfate form (SO_4). Because it is the most soluble mineral form of calcium and because it occurs in relative abundance, it is an economical choice for field application where large amounts are needed.

Gypsum can be used as a soil amendment when low levels of soil (media) calcium need to be increased without greatly changing the pH of the soil. Plants that may benefit from an increased level of calcium include potatoes growing in acid soil to control scab disease; blueberries and other acid-tolerant plants; and

---

T.R. Peck is a professor of Soil Chemistry in the Agronomy Department at the University of Illinois at Urbana-Champaign.

peanuts or tomatoes growing in a coarse soil, like sand, or in soil with a low capacity for cation exchange, which may have a relatively low level of calcium even though the pH of the soil is near neutral. Gypsum is also added when there is a need either to increase low levels of soil (media) sulfur in a form that is immediately available to plants or to reclaim soils damaged by salt. High levels of sodium (Na) cause poor tilth and adversely affect the growth of plants. Removal of excess sodium can be facilitated by an abundant supply of soluble calcium, which gypsum provides.

Gypsum has been incorrectly perceived as a general treatment for soils in poor condition. Compaction, poor tilth, low infiltration of water, and poor plant growth are evidence of the poor condition of soils affected by salt. Adding gypsum ameliorates these conditions by removing the offending salt, but in the majority of cases, the poor condition of soils is not caused by excess salts and soluble calcium. In these instances, ameliorative practices are more complex than simply adding an amendment.

HERBICIDE UPDATE

Bruce Branham

The agricultural chemistry industry is finally recognizing that the turfgrass industry is a potentially large user of herbicides and pesticides. Monsanto is marketing a plant growth regulator called Limit® that is used only on turf. Other companies are developing programs to actively research and develop new products for use on turf. Several new herbicides are available or should be available within the next two years for the turfgrass market.

POSTEMERGENT BROADLEAF HERBICIDES

One recently marketed new herbicide combination is Turflon D. This herbicide consists of 2 pounds per gallon of the butoxyethyl ester of 2,4-D and 1 pound per gallon of the butoxyethyl ester of triclopyr (trade name, Garlon). The most important feature of this herbicide is its effectiveness on some of the more difficult-to-control broadleaf weeds, particularly wild violets (Viola spp.). Two applications of Turflon D spaced four weeks apart have provided 60 to 70 percent control of wild violets. Data on the control of dandelions given by some common and experimental herbicides are shown in Table 1. Tables 2 and 3 show the control of yellow woodsorrel (Oxalis stricta) and white clover (Trifolium repens) provided by ten herbicides. The Amine formulation of Turflon D was tested in these trials, but it is not yet commercially available; the Ester formulation of Turflon D, however, was not tested. Another new herbicide that looks very promising is fluoroxypyr (the trade name in Europe for cereals and small grains is Starane). This broadleaf herbicide probably will not be on the market for at least three years, but it provides excellent control of yellow woodsorrel and white clover (Tables 2 and 3). Combined with 2,4-D, fluoroxypyr gave good control of dandelions (Table 1). Using fluoroxypyr in mixtures with 2,4-D and other broadleaf herbicides will extend the spectrum of control provided by fluoroxypyr.

POSTEMERGENT ANNUAL GRASS HERBICIDES

Postemergent control of annual grasses has been a weak point in weed control programs for turfgrass. The only materials used for controlling postemergent annual grass are the methanearsonate herbicides, which give adequate control only after two applications and have a high potential for phytotoxicity.

Two new herbicides that should be available in 1985 or 1986 and that show great promise for improved efficacy and reduced phytotoxicity are fenoxypropethyl (Acclaim) and tridiphane (Curfew). Acclaim is strictly a postemergent herbicide that is used at the rate of 0.08 to 0.35 pounds per acre, depending upon the maturity of the crabgrass or other annual grass plants. Acclaim has given excellent results on most cool-season species of turfgrasses at these rates. Curfew has also

---

B. Branham is an assistant professor in the Department of Crop and Soil Science at Michigan State University, East Lansing.

given excellent control of crabgrass in Kentucky bluegrass, tall fescue, red fescue, and perennial ryegrass turf. The rate of use must be between 1.0 and 1.5 pounds per acre to achieve effective control. Curfew is extremely harmful to creeping bentgrass and annual bluegrass. This herbicide offers the advantage of pre- as well as postemergent activity on crabgrass, but the period of preemergent control has not been determined. The results of applications of Curfew and Acclaim applied on July 26, 1984 and August 8, 1984 for control of crabgrass are reported in Table 4. These two herbicides represent a large advance toward effective, season-long, control of annual grasses. The lawn service companies and the turfgrass industry will benefit from their entry into the marketplace.

Table 1. Efficacy of Herbicides on Dandelion, Treatments Applied on July 12, 1984

		Percent of dandelions per plot[a]	
Treatment	Rate per acre	August 6	September 2
2,4-D + MCPP	0.75 + 0.75 lb	3.4 a	11.7 a
Trimec	4 pt	5.0 a	20.0 ab
2,4-D Amine	1.3 lb	6.7 ab	26.7 ab
Turflon Amine	0.5 + 1.3 lb	8.3 abc	23.3 ab
Starane + 2,4-D	0.25 + 0.75 lb	8.4 abc	21.7 ab
Turflon Amine + MCPP	0.38 + 1.0 + 0.5 lb	10.0 abc	20.0 ab
Weedone DPC	4 pt	10.0 abc	13.3 a
Starane	0.5 lb	10.0 abc	20.0 ab
Turflon D	0.38 + 0.75 lb	13.3 abc	25.0 ab
Turflon Amine	0.38 + 1.0 lb	15.0 abcd	26.7 ab
2,4-D Amine	1.0 lb	15.0 abcd	50.0 bcd
Turflon D	0.5 + 1.0 lb	18.3 abcde	38.3 abc
Turflon Amine + MCPP	0.25 + 0.63 + 0.5 lb	21.7 abcdef	46.7 bcd
Starane	0.25 lb	21.7 abcdef	41.7 abc
Turflon D	0.25 + 0.5 lb	23.3 abcdef	41.7 abc
Weedone DPC	3 pt	30.0 abcdefg	21.7 ab
Garlon 4	0.5 lb	33.3 bcdefg	65.0 cde
Turflon Amine	0.25 + 0.63 lb	35.0 cdefgh	61.7 cde
2,4-D Amine	0.5 lb	35.0 cdefgh	61.7 cde
Garlon 4	0.38 lb	40.0 defghi	61.7 cde
2,4-D Amine	0.75 lb	41.7 efghi	63.3 cde
Starane	0.13 lb	46.7 fghij	66.7 cde
Garlon 4	0.25 lb	53.3 ghij	63.3 cde
MCPP	1.0 lb	55.0 ghij	63.3 cde
Buctril	1.0 lb	60.0 hijk	60.0 cde
Buctril	2.0 lb	65.0 ijk	66.7 cde
MCPP	0.5 lb	70.0 jk	78.3 de
CHECK		81.7 k	85.0 e

[a]Means separation at the 5 percent level is determined by Duncan's Multiple Range Test.

Table 2. Control of Yellow Woodsorrel (Oxalis sticta), *Treated July 18, 1984*

Treatment	Rate of application per acre	Percent control[a] August 14, 1984
Starane	0.5 lb	100 a
Starane	0.25 lb	98 a
Weedone DPC + Buctril	3 pt + 0.5 lb	94 a
Weedone DPC	4 pt	91 a
Garlon 4	0.5 lb	74 ab
Butril	2.0 lb	59 bc
Turflon Amine	0.5 + 1.3 lb	41 cd
Turflon Amine	0.38 + 1.0 lb	19 de
2,4-D Amine	1.0 lb	1 e
CHECK		1 e

[a]Means separation at the 5 percent level is determined by Duncan's Multiple Range Test.

Table 3. Control of White Clover (Trifolium repens), *Treated July 11, 1984*

Treatment	Rate of application per acre	Percent control[a] August 6, 1984
Starane	0.5 lb	98 a
Weedone DPC	4 pt	75 ab
Turflon Amine	0.38 + 1.0 lb	72 b
Weedone DPC + Buctril	3 pt + 0.5 lb	72 b
Turflon Amine	0.5 + 1.3 lb	68 b
Starane	0.25 lb	64 b
Garlon 4	0.5 lb	63 b
Trimec	4 pt	54 bc
Buctril	2.0 lb	32 cd
2,4-D Amine	1.0 lb	19 d
CHECK		12 d

[a]Means separation at the 5 percent level is determined by Duncan's Multiple Range Test.

Table 4. Postemergent Control of Crabgrass in Annual Bluegrass

Treatment	Application		Percent of control[a]	
	Rate per acre	Date	August 16, 1984	September 12, 1984
Curfew	1.5 lb	8/8	0 b	99 a
Acclaim	0.35 lb	8/8	3 b	99 a
Acclaim	0.25 lb	8/8	28 b	97 a
Curfew	1.5 lb	7/26	89 a	95 a
Acclaim	0.25 lb	7/26	99 a	96 a
Acclaim	0.18 lb	8/8	23 b	97 a
Acclaim	0.18 lb	7/26	99 a	88 ab
Acclaim	0.12 lb	7/26	66 a	87 ab
Curfew	1.0 lb	8/8	0 b	68 bc
MSMA + Trimec	1.0 gal	7/26, 8/8	17 b	52 cd
Curfew	1.0 lb	7/26	73 a	68 bc
MSMA + Trimec	0.8 gal	7/26, 8/8	8 b	57 cd
Curfew	0.75 lb	8/8	5 b	58 cd
Curfew	0.5 lb	7/26	17 b	61 cd
Curfew	0.75 lb	7/26	13 cd	48 cd
Curfew	0.5 lb	8/8	0 b	44 d
MSMA + Trimec	1.6 gal	7/26	0 b	0 e
CHECK			0 b	0 e

[a]Means separation at the 5 percent level is determined by Duncan's Multiple Range Test.

FROM SUPERINTENDENT TO GENERAL MANAGER

James W. Brandt

To describe the transition from being the superintendent to the general manager of a golf course I can only give my personal experience. The president of the Danville Country Club told me that he would like to meet with me and the rest of the executive committee of the board of directors. It came as a complete suprise when the committee asked me to become the general manager of the club. My immediate response was, "Who, me?" After a few months in the position, I began asking myself, "Why, me?" I then asked the committee why they felt that I could succeed as general manager. Well-prepared for this question, they told me that the members of the club wanted me to succeed and that they had observed during my twelve years as superintendent of the course that I was honest, dedicated, and able to manage people and a budget. I told the board that I was honored that they offered me this important position but that I needed three or four weeks to think about it. On the negative side, I had to consider a previous offer--the position of superintendent at one of the major golf courses in the Midwest. Also I was in my third year as a director of the Golf Course Superintendents Association of America (GCSAA), and I felt that taking the position the board offered me might seriously impair my chances of being elected the vice-president of the GCSAA. On the positive side, I knew my family wanted to stay in Danville and supported my taking the position; I felt I was at the top of my salary range at the club; and the golf course had such great potential despite its inadequate budget. I knew that becoming general manager would be a great challenge because in my twelve years at the club we have had ten different club managers, but I was confident that I could improve its financial position.

After much soul-searching, I decided to accept the offer if the board agreed to the conditions that I thought necessary for the proper management of the club. Those conditions were as follows: that I would remain the superintendent of the course; that I would have complete authority to hire and fire all employees, except for the golf professional who had two years remaining in this three-year contract; that he would be responsible to me in matters pertaining to club-related activities; that the house committee would be an advisory committee and not involved in management decisions; and that the hours I spent in the clubhouse would be at my discretion. The board agreed to all my requests, and I was named the general manager in March 1965.

My first official duty was to call a meeting of all the employees. At this meeting I informed them that they would keep their jobs until their performance or attitude dictated that they were not working for the best interests of the club. My first official purchase was a time clock. I posted some rather stringent rules about its use and established shift hours for all nonsalaried employees. Any deviations from the regular schedule had to have my approval. Installing the time clock

---

J.W. Brandt is the golf course superintendent of the Danville Country Club, Danville, Illinois.

and constantly monitoring the help led to a 32 percent reduction in labor costs for the dining room and kitchen over one year.

The club had a cook, who was not really a qualified chef by education or experience. He agreed to assist the competent chef that I hired. When the members were notified that we had a chef who could plan any type of party menu, our dining room sales increased dramatically.

The next major decision was to departmentalize the operation of the club. In most cases existing personnel were moved into more responsible positions. Job descriptions were written for each department head, and their areas of responsibility and authority were enumerated. The head chef was in charge of purchasing and preparing the food as well as directing all the kitchen help. The head bartender was to purchase all spirits and direct the bar personnel, including the cocktail waitresses and day bartenders. The hostess was responsible for scheduling and training waitresses and bus boys, seating diners, taking dinner reservations, and seeing that food service areas were ready for business before opening the dining areas. The office manager was in charge of all club records and disbursements, payrolls, and accounts--both payables and receiveables. The supervisor of clubhouse maintenance was responsible for the physical plant as well as cleanliness, and the foreman of the golf course was in charge of directing the crew after the work program for the day had been discussed.

One of the most important decisions that I made was to budget my time. My work schedule on a typical day was as follows:

Be at the course about thirty minutes before the crew to make visual checks of the course.

Assign the crew their first tasks.

Program the rest of their activities for the day with the foreman, who reports about two hours later than the crew.

Go home, have breakfast with the family, do small tasks at home, shave, shower, and return to work about 11:00 a.m.

From 11:00 a.m. until 1:30 p.m. I would be in the clubhouse. Then I would again make my routine checks of the golf course.

When we have a special party at the club, I am there during the evening dinner hour and often remain until the end of the party. On the average, I am at the club about three of the six nights that we are open a week.

While I served in the capacity of both superintendent and general manager, the members seemed exceedingly happy with the operation of the club as we went from an average loss of $12,000 a year during the previous five years to an average profit of $16,000 a year for the next eight years.

I too was happy because the demands on my time were not excessive and I was elected vice-president and then president of the GCSAA while serving in my dual role. This was done while the foreman on the golf course continued to serve as my valued assistant but without the help of an assistant in the clubhouse.

More important to me, however, was that with a profitable club, I was able to upgrade our equipment and maintenance practices tremendously. In that eight-year period we were able to install a completely automatic two-row irrigation system; build a new 112 x 56-foot maintenance building; and purchase three F-10 tractors (with seven gang mowers), two riding greens mowers, a sand pro, and three Cushman trucksters.

After I served thirteen years as both superintendent and general manager, the board felt that we needed two full-time people, one in golf course maintenance and the other in clubhouse management. I was given the option of choosing my area of service. Because I am speaking to you as a certified golf course superintendent, you are well aware of my decision to stay in my chosen field.

FROM SUPERINTENDENT TO OWNER

Charles R. Meaker

The title, "From Superintendent to Owner," does not describe my experience of becoming the owner of a golf course. "From Superintendent to Superintendent with More Headaches" is a more fitting description of what happened to me when I bought a golf course.

Like most golf course superintendents I wanted to own my own golf course. I wanted to prove that a good golf course is absolutely essential to the other facilities at the club. I take care of the course in such a way that people will always come to Rogala Public Links to golf. As the owner I have to look after the mortgage, the insurance, the pro shop, the machinery--in short, everything that has to do with operating a golf course. My wife, Donna, who is half owner of the course, takes care of all the books and makes sure that the papers for the government are kept up to date. Besides being the bookkeeper, she manages the pro shop. Without her skillful help in these areas, there would not be enough hours in the day for me to do everything myself. As we all know, even a nine-hole course is demanding and will not wait when it needs attention. My children, therefore, also pitch in to help with the work. We do not have a big staff, so it takes all five of us to keep the operation going. I like to think that they are the owners too. Rogala Public Links is definitely a family-owned and operated business.

Like all superintendents of golf courses I am well aware of the cost of insurance and wages, as well as the total cost of operating a golf course. My head is on the line. The cash has to be there to meet expenses, and a lot of the time I wonder where I will get the money. This worry is the worst part about owning a golf course. The almighty dollar is the biggest factor in any business. Especially since the late 1970s when the economy was beginning to slip, I began to feel that instead of being an owner in business for myself, I was managing the golf course to keep everyone else in business. I am sure that other owners of businesses must feel the same way because we are all in the same boat. Rogala is situated in an area with a population of about 40,000 people. More layoffs and closings of factories are frightening because prices cannot be raised without a certain volume of business, and operating costs are skyrocketing. When I put everything together at the end of the year and find out that I can still carry on, I feel very good.

Whenever I hear someone using the title, superintendent-owner, I think of one occasion last spring at the breakfast table. As I was waiting to hear the sprinkling system on the ninth green come on, I realized that our plans for the education of our three children rely on our careful attention to just this sort of detail in the daily operation of this golf course. Next I thought of all the hours I have spent at work and missed with my children while they were growing up. But superintendents who do not own their own course can also get wrapped up in their work and miss these opportunities with their families.

C.R. Meaker is the owner of Rogala Public Links, Mattoon, Illinois.

I guess I have painted a gloomy picture, yet when the sun comes up over a line of our trees in the east, I can look out there and be proud to say that this eighty-acre golf course is mine. Looking at all the friends I have made in the business--professionals as well as customers, I know that money is not all-important after all.

My first love has always been taking care of a golf course, so acquiring the new title, superintendent-owner, seemed strange and unnecessary at first. Without careful golf course superintendents doing their job, however, a lot of people would not enjoy their recreation time. I try to tell people every chance that I get that without us, they would not be able to enjoy the beauty of the outdoors as much.

Good superintendents look at their courses just as I do. This golf course is mine and rightfully so. My heart and soul are in this patch of ground that I have made so beautiful. If I am lucky, by the time I am eighty years-old, I will be able to look at Rogala and say that it is all mine and have the deed to prove it.