A DIGEST OF APPLIED TURFGRASS SCIENCE

TurfGrass TRENDS

Volume 4, Issue 12
December 1995

IN THIS ISSUE

The Past, Present and Future of Turfgrass Improvement

by Kevin N. Morris

The genetic improvement and development of turfgrasses has always been a preferred avenue in solving turfgrass problems. In the past, almost all commercially available turfgrasses were *ecotype selections.* Ecotype selections are found on golf courses, parks, cemeteries, etc. and have performed well in that particular situation over a long period. In other words, nature was the mechanism for selecting the best turfgrass. Some of the most famous, landmark turfgrass varieties, including 'Merion' Kentucky bluegrass (commercialized in 1947) and 'Kentucky-31' tall fescue (commercialized in 1931), are ecotype selections. Both of these grasses were released to the general public when very few other varieties were available. Merion was considered the "Cadillac" of grasses for many years because of its appearance and superior disease resistance, when compared to the other varieties available at that time. Kentucky-31 was developed for use in pastures, but was soon recognized as a hardy turfgrass for areas with hot, humid summers and moderately cold winters.

Kentucky bluegrass

(Figure taken from Decker/Decker, LAWNCARE: A HANDBOOK FOR PROFESSIONALS, ®1989, Figure 3-11 p. 63. Reprinted by Permission of Prentice-Hall, Inc., Upper Saddle River, NJ 07458)

TurfGrass TRENDS

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TurfGrass TRENDS is published monthly. ISSN 1076-7207.
The annual subscription price is $180.00.

Turfgrass improvement and evaluation

Even though the natural selection of superior ecotypes is still probably the most reliable method used to improve turfgrasses, nature does take considerable time to do its job. With the increased demand for turfgrasses suitable for recreational areas, housing and commercial development, as well as the greater environmental awareness of the general public, faster breeding methods are often needed to produce improved grasses. The role of plant breeders, therefore, is to genetically manipulate plants to produce improved grasses in a timely fashion.

The improvement and development of new cultivars in the United States, although initially slow, has increased dramatically over the last twenty years. This increase is due primarily to the enactment of the Plant Variety Protection Act (PVP) by Congress in 1970. PVP allows for the protection of unique seed-propagated crop plants, thereby protecting a plant breeder's time and monetary investment in developing new germplasm and cultivars.

Evaluation of commercially available cultivars and promising experimental selections is essential to the various turfgrass consumer groups (golf course superintendents, athletic field managers, sod producers, lawn care operators, park and grounds managers, roadside vegetation managers and homeowners) in the United States and involves considerable time and resources to accomplish. Because of the need for a coordinated national approach to cultivar evaluation, the National Turfgrass Evaluation Program (NTEP) was initiated in 1980 (Murray, 1982). The NTEP is a cooperative program between the United States Department of Agriculture (USDA), the Agricultural Research Service, Beltsville, Maryland and the National Turfgrass Federation, Inc. (NTF).

Kentucky bluegrass

Since Kentucky bluegrass (*Poa pratensis* L.) is the most widely-used turfgrass species in the United States, the first NTEP test involved Kentucky bluegrass in 1980 (84 entries, 50 locations), followed by a perennial ryegrass (*Lolium perenne* L.) test in 1982 (47 entries, 40 locations). Since then, Kentucky bluegrass has been tested in 1985 (72 entries, 50 locations), in 1990 with two tests–medium-high maintenance (125 entries, 29 locations) and low maintenance (62 entries, 26 locations), and with a new seeding in the fall of 1995. Perennial ryegrass has also been tested in 1986 (65 entries, 40 locations), 1990 (123 entries, 40 locations) and 1994 (96 entries, 30 locations). Other species currently in tests include tall fescue (*Festuca arundinacea schrebi*; two tests were initiated in 1983 and 1987, with the current test established in 1992), fineleaf fescue (*Festuca* spp.; with two completed tests, and one current test), bentgrass (*Agrostis* spp.; with one completed test and one current test), bermudagrass (*Cynodon* spp.; with one completed test and one current test), St. Augustinegrass [*Stenotaphrum secundatum* (Walt.) Kuntze], buffalograss [*Buchloe dactyloides* (Nutt) Engelm] and zoysiagrass (*Zoysia* spp.).

Over the past fifteen years, NTEP tests have produced data that reveals definite trends in variety performance. In testing Kentucky bluegrass, we have seen varying cultivar performance in response to management level and different environments (Morris and Murray, 1986-1993). During the period of 1981-85, some cultivars, such as 'Aspen' and 'Merit', performed well only under high maintenance (2+ lbs. of nitrogen per 1000 ft^2/year and frequent irrigation) while others, such as 'Monopoly' and 'Vantage', performed well only under low maintenance (<2 lbs. of nitrogen per 1000 ft^2/year and no irrigation). During this same period, 'Enmundi' performed well under both maintenance regimes, while 'I-13' performed well under both maintenance levels at Beltsville, Maryland, but not at Ames, Iowa. In addition, some cultivars, (i.e. 'Ram-1', 'PSU-173'), performed well under low maintenance, without heavy traffic, but faltered under the traffic and compaction stress in Washington, DC. In recent, more extensive testing of various maintenance regimes, 'BAR VB 852' and 'Midnight' performed very well under high and low maintenance while 'Ram-1' and 'Caliber' performed well only under the low maintenance regime.

Using NTEP data, Kentucky bluegrasses can be identified that have either improved spring, summer or fall performance. This performance variability is due to differences in spring greenup (leading to lower early spring turfgrass quality scores), disease tolerance or susceptibility, amount of seedhead production (leading to "stemmy" growth and, therefore, lower quality), color retention and survivability during drought conditions, and fall color retention. The cultivar 'Midnight' was found to greenup slowly in spring, but performed well during summer. The common-type bluegrasses such as 'Kenblue' and 'South Dakota Certified' performed well under non-irrigated conditions such as those found in Ames, Iowa, but not in Beltsville, Maryland where they are susceptible to the leafspot (*Drechslera* and *Bipolaris* spp.) diseases common to the area.

It is most interesting to note that when comparing the overall performance of entries in the 1980 National Kentucky Bluegrass Test, 1985 National Kentucky Bluegrass Test and the 1990 National Kentucky Bluegrass Tests, several grasses performed consistently well over the fourteen years these tests were conducted (Morris and Murray, 1986-1993). The following table (Table 1) displays rankings of turfgrass quality for selected entries from each of the Kentucky bluegrass tests NTEP has conducted.

For various reasons, varieties such as Midnight, Eclipse and Glade have been consistent performers over the last fifteen years. While each cultivar has its different strengths, they all have some critical similarities. All possess good summer survival and leafspot resistance, a medium-dark to dark green color, medium to high density, good sod strength and medium to low seedhead production. While a pleasing green color and good density are obviously desired by most people and help a particular variety gain acceptance in the marketplace, summer survival and disease resistance (leafspot, in this case) are more important.

Table 1. Ranking of mean turfgrass quality ratings of selected Kentucky bluegrasses.

Entry	1980 Test [1]	1985 Test [2]	1990 Test [3]
		Rank	
Midnight	1	2	2
Bristol	3	23	NIT
Classic	5	15	61
Eclipse	6	11	6
Aspen	8	12	13
Glade	11	14	16

1 - Eighty-four entries; data from 1981-85
2 - Seventy-two entries; data from 1986-90
3 - One hundred twenty-five entries; data from 1994
NIT Not in test

Another important component of turfgrass quality in Kentucky bluegrass is the amount of seedhead production. Excessive seedhead production in turf (which happens to Kentucky bluegrass in late spring) causes grass plants to expend considerable energy on reproduction (preparing for seed production) and not on root, shoot or rhizome production. Thus, these plants are weakened and are more susceptible to damage from disease and drought. Grasses that do not expend as much energy on reproduction can, therefore, maintain higher quality turf in summer; however, these same grasses do not produce high seed yields. Low seed yields lead to inconsistent supply and very high prices. Many varieties such as Enmundi have either faltered in the marketplace or have never been commercialized because of seed yield limitations.

There are a few Kentucky bluegrass cultivars that actually performed better over time. For example, 'A-34' was ranked fifty-ninth out of eighty-four entries for turfgrass quality during the 1980-85 testing, but improved to a ranking of nineteenth out of seventy-two entries in the 1985 test. 'Wabash' was ranked thirty-eighth in the 1980 test, but climbed to a ranking of eighteenth in the 1985 test. Explaining this phenomenon is difficult, but it could be due to the fact that both A-34 and Wabash were originally selected and tested by facilities in the Midwest U. S. and that, possibly, more data from that area were collected during the 1985 test than during the 1980 test.

Table 2. Ranking of mean turfgrass quality ratings of perennial ryegrass cultivars over all locations tested.

Entry	1982 Test[1]	1986 Test[2]	1990 Test[3]
		Rank	
Gator	1	23	64
Repell	6	9	61
Citation II	8	20	86
Pennant	15	6	80
Pennfine	25	44	115

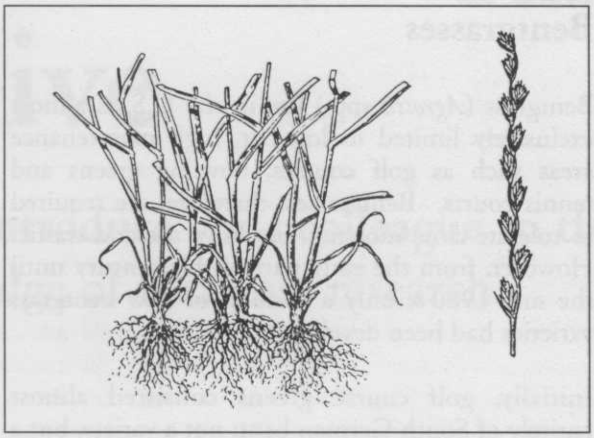
1 - Forty-seven entries; data collected in 1983-86
2 - Sixty-five entries; data collected in 1987-90
3 - One hundred twenty-three entries; data collected in 1991-94

Perennial ryegrass

Perennial ryegrass, used extensively in the northern U. S. for permanent turf stands and in the southern U. S. for overseeding dormant warm-season turfgrasses, has been steadily improved, over the last fifteen years, through plant breeding. The highest ranking cultivars for turfgrass quality in one test rank consistently lower in subsequent tests (Table 2) as improvements in genetic color, density and disease tolerance are expressed in newer cultivars (Morris and Murray, 1986-1993).

Much of the improvement in perennial ryegrass quality appears to be in genetic color. Two of the highest rated cultivars for genetic color in the 1986 test, 'Dimension' and 'Competitor', consistently ranked statistically lower than twenty-seventh and forty-eighth, respectively, in data collected during the four years of the 1990 test. Although most were not statistically significant, the density ratings collected on the 1990 test were, for many cultivars, also higher than Dimension and Competitor.

Resistance to the two major disease problems of perennial ryegrass in the U. S., brown patch (*Rhizoctonia solani* Kuhn) and red thread [*Laetisaria fuciformis* (McAlpine) Burdsall], have been increased, but at a much slower rate. In the 1982 National Perennial Ryegrass Test, 'Regal', 'Pennfine' and 'Pennant' were amoung the higher rated cultivars for red thread resistance. In the 1986 test, Regal had the highest red thread resistance rating over four years and was the only cultivar statistically better than Pennfine and Pennant. In the 1990 National Perennial Ryegrass Test, no cultivars performed significantly better than Pennfine and Regal for red thread resistance, while only seven performed significantly better than Pennant. A similar situation exists with brown patch resistance. The cultivars 'Premier' and 'Repell' performed at or near the top for brown patch resistance in the 1982 test, with one entry and ten entries, respectively, performing significantly better than Premier and Repell in the 1990 test.



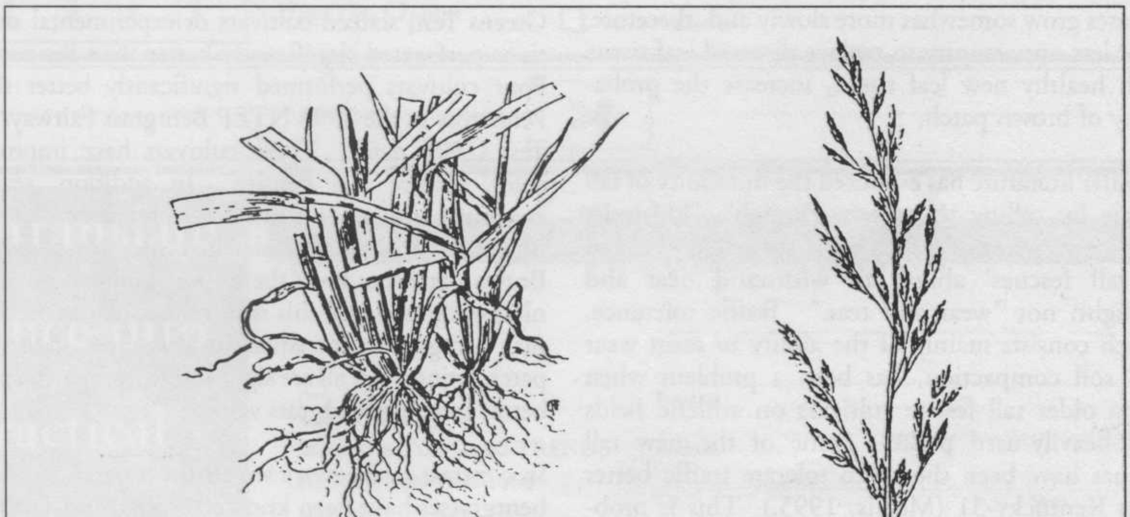
Perennial ryegrass

(This and following figures taken from Roberts/Roberts, *The Lawnscape... Our Most Intimate Experience With Ecology.* Reprinted by permission of The Lawn Institute.)

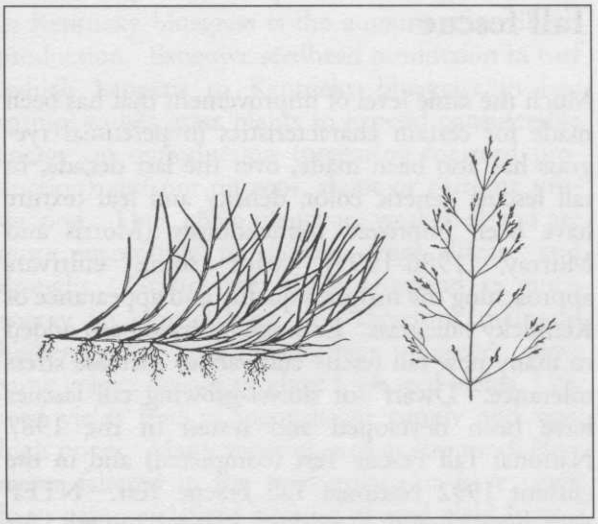
Insect resistance and stress tolerance have been improved with the addition of a fungal endophyte (*Acremonium* spp.) to many perennial ryegrass cultivars. This endophyte enables the plant to repel certain chewing and sucking insect pests (i.e. chinch bugs, sod webworms) and helps the plant to survive during severe summer stress periods. The consistent performance of 'Repell' and 'Pennant', in the 1982 and 1986 NTEP perennial ryegrass tests was most likely due to their high levels of endophyte infection.

Tall fescue

Much the same level of improvement that has been made for certain characteristics in perennial ryegrass has also been made, over the last decade, in tall fescue; genetic color, density and leaf texture have been improved tremendously (Morris and Murray, 1986-1993), with some cultivars approaching the turfgrass quality and appearance of Kentucky bluegrass. Endophytes have been added to many new tall fescue cultivars to increase stress tolerance. "Dwarf" or slower-growing tall fescues have been developed and tested in the 1987 National Tall Fescue Test (completed) and in the current 1992 National Tall Fescue Test. NTEP data have shown a reduced vertical growth, for some cultivars, when compared with older, taller (at plant maturity) varieties. In other instances, there is no significant difference between many "dwarf" cultivars and the older cultivars (Morris and Murray, 1986-1993). Marketing to consumer groups has increased greatly since the slower growing nature of these grasses enables them to be promoted primarily as labor-saving (requiring less frequent mowing) cultivars; however, these slower-growing cultivars are also generally slower to germinate and develop into mature plants. This particular characteristic often causes problems on sites such as athletic fields and roadsides where quick establishment is necessary.



Tall fescue



Colonial bentgrass

Resistance to the most important disease on tall fescue in the U. S., brown patch, has not been shown to have been improved on most newer cultivar releases. Data collected in 1993-1994 on the 1992 National Tall Fescue Test shows that brown patch resistance is not significantly increased over many older entries such as 'Kentucky-31', 'Arid' and 'Falcon'. In fact, many of the older entries exhibit better tolerance to brown patch than many of the newer cultivars. This appears to be due primarily to an increase in density with the new cultivars, which leads to higher canopy temperatures, higher humidity and less air movement. These factors, along with the fact that many of the new releases grow somewhat more slowly and, therefore, have less opportunity to replace diseased leaf tissue with healthy new leaf tissue, increase the probability of brown patch.

Popular literature has espoused the durability of tall fescue by calling the species "tough", "kid-resistant", etc. Most of these claims are actually related to tall fescues' ability to withstand heat and drought, not "wear and tear." Traffic tolerance, which consists mainly of the ability to resist wear and soil compaction, has been a problem when using older tall fescue cultivars on athletic fields and heavily-used parks. Some of the new tall fescues have been shown to tolerate traffic better than Kentucky-31 (Morris, 1995.) This is probably due to the increase in density and tillering of these new cultivars. It appears, however, that even these newer cultivars do not tolerate traffic well when incurred in the fall season.

Bentgrasses

Bentgrass (*Agrostis* spp.) use in the U.S. is almost exclusively limited to low-cut, high maintenance areas such as golf courses, bowling greens and tennis courts. Bentgrasses, therefore, are required to tolerate close mowing, intensive use and traffic. However, from the early part of this century until the mid-1980's, only a handful of new bentgrass varieties had been developed.

Initially, golf course greens consisted almost entirely of South German bent; not a variety, but a mixture of plant types. Improved cultivars such as 'Congressional', 'Cohansey' and 'Arlington' were selected from old greens, most likely South German bent greens. Unfortunately, all of these cultivars required vegetative establishment. In 1954, seed-propagated 'Penncross' creeping bentgrass was released and the bentgrass market worldwide has since been dominated by this variety.

In the last ten years, the development of new creeping and colonial bentgrasses has intensified. According to NTEP data, progress has been made in improving on Penncross. In data collected in 1990-93 from two completed NTEP tests (Modified soil and native soil greens), 'Regent', 'Providence', 'SR 1020' and 'PRO/CUP' had significantly higher quality ratings than Penncross. No cultivar performed significantly better than Penncross in the 1989 NTEP Bentgrass Fairway/Tee Test. However, in 1994 data collected on the 1993 NTEP Bentgrass Greens Test, sixteen cultivars or experimental selections performed significantly better than Penncross. Four cultivars performed significantly better than Penncross in the 1993 NTEP Bentgrass Fairway/Tee Test (1994 data). These cultivars have improved color, texture and density. In addition, several creeping bentgrass cultivars have shown, thus far, significantly improved resistance to brown patch. Brown patch has been the biggest problem on colonial bentgrasses and this is still the case. A few colonial bentgrasses are equal to Penncross in brown patch ratings, but all are significantly poorer than the better creeping bentgrass varieties.

In contrast to the story with brown patch, colonial bentgrasses have been known for their resistance to dollar spot (*Sclerotinia homeocarpa*). A few new creeping bentgrass cultivars (i.e. 'Providence', 'G-6' and 'Cato'), while not significantly more resistant to dollar spot than Penncross, have shown dollar

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TurfGrass TRENDS - 1995 Abstracts

January 1995

"Problem or Myth: New Uses for Compost Are Being Found" Christopher Sann, pp. 1, 14
Key Words: bioremediation, contaminates, microbial populations, spent compost, wastes

The use of compost materials in bioremediation involves the detoxification of contaminated soils or waters using the structural as well as the biologically active portions of compost to eliminate carbon based petroleum, pesticide, or mine wastes from the environment. In a demonstration project for the government, contaminated soils that were excavated from the areas around leaking underground petroleum tanks are mixed with uncontaminated soils from the same site and the mixture is then built into compost piles using spent compost. The spent compost is used as a bulking agent as well as a reservoir of carbon eating microbial populations. Once the soils have been properly composted, the remaining product is an excellent uncontaminated soil mixture.

February 1995

"Problem or Myth: Nitrate Leaching from Turf" Richard J. Hull, pp. 1-9
Key Words: ground water, leaching, nitrate release, nitrogen, soil, turf building

Even though turf, fertilized or not, is among the land covers most protective of ground water quality, it still can be managed so as to reduce its nitrate release to the lowest levels possible. Obviously if little nitrogen is used, little is likely to be leached from the turf-soil system. This approach, the practicality of which remains to be demonstrated, is only valid for established turf where large soil organic pools have accumulated. An annual nitrogen application of 3 to 4 lb./1000 sq.-ft likely will be necessary for new turf established on a site devoid of organic matter and most plant nutrients. For the first few months following turf seeding or sodding, nitrate leaching can occur. High applications of nitrate-containing fertilizers made during late summer or early fall if followed by heavy rain can also promote nitrate leaching. Thus, we cannot guarantee that nitrate will not leach from turf to ground water. However, if even casual precautions are taken to minimize the potential for leaching, turf is still one of the safest land covers available for ground water sensitive areas.

"Arguments Against Threshold Nitrogen Applications" Richard J. Hull, pp. 2-3
Key Words: ground water quality, nitrate, nitrogen fertilizer, threshold rate, threshold concept

A threshold rate of nitrogen fertilizer is the largest amount which when applied will not cause an increase in soil water nitrate and, therefore, will not promote nitrate leaching. It is stated that so long as the threshold rate is not exceeded, nitrate leaching will not occur and ground water quality is not endangered. It represents the amount of fertilizer nitrogen that can be absorbed by grass roots and soil microbes without causing excess nitrate to accumulate in the soil water. I do not like the threshold concept. There obviously was a threshold rate which when exceeded caused nitrate levels to increase. The problem I have with the threshold rate is that it is different for every form of nitrogen used and every grass to which it is applied. It also will change dramatically with the time of the growing season. I see little value in reporting threshold rates for nitrogen fertilizers because they are so unique to a given set of conditions and not of practical use to the turf manager.

"How to Minimize Nitrate Leaching" Richard J. Hull, pp. 5, 7, 9
Key Words: clippings, fertilization, nitrate leaching, nitrogen applications, organic

Many small applications (0.25 to 0.5 lb. N/1000 sq.-ft) will promote less nitrate accumulation in the soil and therefore, less leaching. Young turf, past the establishment stage, will require more nitrogen than turf that has been in place for many years. Injured and thin turf, especially late in the summer, is least able to absorb nitrate and thus is prone to nitrate leaching.

Although fall fertilization has been recommended for many years as the mainstay of turf fertility management, concern over nitrate leaching has promoted greater attention to early spring and early summer applications of nitrogen. Emphasizing spring fertilization will minimize nitrate leaching from turf. If clippings are retained on a well established turf, nitrogen applications may be reduced by one-third. Clippings are organic so their nitrogen is basically a slow release nitrogen source which has no nitrate leaching potential.

TurfGrass TRENDS - 1995 Abstracts

March 1995

"The Turfgrass Canopy and Its Environment" Loren J. Giesler and Gary Y. Yuen, pp. 1-5
Key Words: air movement, disease susceptibility, canopy density, cutting height, micro-environment, mowing

The turfgrass canopy is formed by overhanging foliage. The physical structure of turfgrass canopies is regularly altered by management practices, and therefore the canopy micro-environment is also changed. An obvious alteration is mowing, which affects the height of the canopy. As the height of a canopy is lowered, air mixing within the canopy extends to the soil surface. This results in drier canopy conditions in lower cut canopies. A more subtle change in canopy structure is turf density or canopy density. Canopy density refers to the total number of blades in a given area. As the density of a canopy increases, the air movement within the canopy becomes more limited. This limited air movement results in much different micro-environmental conditions as compared to a canopy with greater air movement (i.e. low density canopy). As canopy density increases so does brown patch disease severity. The turf canopy environment is caused to be more disease-favorable by increasing cutting heights.

"Integrate the Ideas on Turfgrass Canopy Management" Loren J. Giesler and Gary Y. Yuen, pp. 2-3
Key Words: brown patch, case study, cultivar, full canopy, seeding rate, tall fescue, watering techniques

The integration of these ideas into a management system is demonstrated in the following example. Mark is a turfgrass manager in the Great Plains. He will be establishing turfgrass into an area which has been known to have brown patch problems. He also anticipates that this turf will be maintained under high maintenance, and therefore, has a higher potential for brown patch in the future. He wants to plant tall fescue because he can reduce his inputs to produce a high quality of turf. He knows that by selecting a cultivar with a tall structure, a canopy with reduced density will be established. He can plant at a seeding rate of 6 lb./1000 ft. or less. While he may have to use slightly more weed control initially, because of the low grass population, the outcome will be a full canopy with lower density and therefore, will have reduced potential for brown patch. As tall fescue has a deep root system which is associated with drought tolerance, he can apply deep watering techniques at a lower frequency. This will help reduce moisture within the canopy and further reduce the risk of brown patch disease.

April 1995

"The Value of Lime in Turfgrass Management" Richard J. Hull, pp. 1-5
Key Words: calcium, fertilizer applications, lime, microorganisms, nutrients, root growth, soil pH, thatch accumulation

Increasing soil pH by adding lime increases the availability of several plant nutrients and makes fertilizer applications more effective. It also reduces the plant availability of toxic aluminum and manganese. Calcium added as lime is a plant nutrient that increases the efficiency with which grass roots can absorb other nutrients. Increasing soil pH favors microorganisms which are responsible for turning over organic matter thereby making residual nitrogen more available to grass roots and probably suppressing the growth of disease causing organisms. By stimulating microbial activity and favoring vigorous root growth, reduced soil acidity will minimize the opportunities for nitrate leaching into ground water.

Increased biological activity of the soil promoted by higher pH will contribute to improved soil structure with increased air and water penetration. Increased root growth promoted by soil conditions resulting from elevated pH will make grass less subject to injury from root feeding insects and from periods of drought. Maintaining a near neutral soil pH will speed decomposition of surface organic residues and help prevent thatch accumulation. These are some of the ideas of the broad range of benefits that have been linked to the use of lime.

"Soil Acidity and Fertilizers" Richard J. Hull, pp. 3
Key Words: acidifying, ammonium, fertilizers, lime, nitrification, nitrogen

Many fertilizer materials can have an effect on soil acidity. Some will make a soil more acid while other materials have a liming effect. Fertilizer materials which contain nitrogen in the ammonium form will contribute to soil acidity.

If ammonium is oxidized to nitrate by soil bacteria (nitrification), H^+s are released into the soil solution and that contributes to acidity. The amount of acid produced by the fertilizer is roughly proportional to the amount of ammonium-nitrogen in it. All organic sources of nitrogen will have an acidifying effect on the soil. Any nitrate containing fertilizer will have an acid neutralizing effect unless it is added along with ammonium, e.g. urea-ammonium solution or ammonium nitrate. If ammonium fertilizers are used regularly and in relatively large amounts, as would often be the case in turf management, lime applications may be required a little more often than if nitrate fertilizers were used.

"Which Kentucky Bluegrass Cultivars Are Best for You?" Bridget Ruemmele, pp. 6-11
Key Words: cool-season fescues, cultivars, Kentucky bluegrass, NTEP, perennial ryegrasses, *Poa pratensis* L.

Kentucky bluegrass, (*Poa pratensis* L.) is a widely grown cool-season turfgrass. Although you might surmise that this grass comes from Kentucky, it is actually native to Europe. This grass is usually mixed with two other cool-season turfgrasses: fine fescues and perennial ryegrasses. When selecting Kentucky bluegrasses, they may be grouped into improved and common types. The highest rated grasses for quality in the 1985 NTEP test include: Blackburg, Midnight, P-104 (Princeton 104) Asset, Chateau, Lifts 1757, Coventry, Freedom, America, Eclipse, Aspen, Estate, Glade, Classic, Able I, Wabash, A-34, Cheri, and Bristol. Due to changing availability of turfgrass cultivars, you should check with your county or university extension personnel for the most current information on common and improved Kentucky bluegrass cultivars.

May 1995

"Nontarget Effects of Fungicide Applications" Eric B. Nelson, pp. 1-8, 15
Key Words: biological control, "disease trading", fungicides, indirect effects, microbial, microorganisms, nontarget effects, pathogens

The relationship between microorganisms, soils, turfgrasses, and fungicides are quite complex making nontarget effects indirect. The nontarget effects of fungicide applications may present themselves in a variety of ways that include general effects: on microbial activities and biochemical processes in soil, on microbial populations leading to increased intensity of certain diseases and reduced natural biological control, on disease tolerance of host plants, and on the chemical properties of soils which influence, both directly and indirectly, the activities of turfgrass pathogens. The increase in severity of a nontarget disease following fungicide applications has been termed "disease trading". Nontarget effects also occur from the application of herbicides, insecticides, and growth regulators. It is important that particular attention be paid to the specifics of each application (e.g., chemical class, application rate, etc.) as well as to the intended target pathogens and the observed outcomes of the applications.

"Timing Is Everything for an Effective Weed Management Program" Joseph C. Neal, pp. 10-12
Key Words: application factors, herbicide, label, seedling, timing, tolerance, weed species

Optimum timing of herbicide applications are influenced by many interrelated factors including: Weed species and physiology - particularly time of emergence, development and seasonal variation in sugar translocation within the plant; climatic factors -- temperature and moisture primarily; turfgrass species and management -- warm season versus cool-season species, mowing height, irrigation, fertility, cultivation events, etc.; and herbicide chemical properties and mode of application -- each family of herbicides kills plants in different ways and they decompose in the soil at different rates. To reduce the potential for injury to established turf, avoid herbicide applications when turfgrasses are under stress (heat, drought, disease, etc.). When turfgrass safety decisions are being made, two aspects of seedling turfgrass safety must be considered: the interval from herbicide application to seeding and the tolerance of seedling turfgrasses to herbicides. As with any pesticide application, the label is the law.

June, 1995

"Nutrient Uptake: Some Turfgrasses Do It Better Than Others" Richard J. Hull and Haibo Liu, pp. 7-13
Key Words: cultivars, Epstein, genetic variability, nutrient concentration, nutrient uptake, nutrients, "saturation kinetics"

The kinetic description of nutrient uptake first described in the early 1960s by Emanuel Epstein recognized that when the rate of nutrient uptake by roots is measured over a range of nutrient concentrations, the resulting curve exhibits what is known as "saturation kinetics." That is, at low nutrient concentrations, nutrient uptake increases directly as concentration increases. However, at higher nutrient concentrations, the rate of uptake begins to fall off with further increases in concentration. Eventually, a nutrient concentration is reached where additional increases in nutrient cease to affect the rate of uptake. Turfgrass cultivars differ in their ability to absorb nutrients from the soil. This is an encouraging finding because it means there is genetic variability within the major turfgrasses, and this variability can be exploited to select or develop more nutrient-efficient grasses.

"What's New in Turfgrass Insect Pest Management Products: Focus on Biological Controls" M.G. Villani, pp. 1-6
Key Words: B.t., biological controls, chemical compounds, ecdysone, fungal, imidacloprid, insecticide, nematodes, pest management, pests

Merit (common name Imidacloprid) is a new-chemistry, broad-spectrum, long residual insecticide, registered by Miles to control soil- and crown-inhabiting insects in turfgrass. B. t. products (*Bacillus thuringiensis*) have been used to control insects for many years. B.t. has typically been used as a microbial insecticide for short-term control. Several chemical companies are developing artificial compounds that, by mimicking the action of the natural hormone ecdysone, interfere with the normal insect molting process. Entomogenous nematodes have recently received attention as alternatives to insecticides for turf insect control. At present, there are no commercial fungal products available for management of turf pests. The recent introduction of new materials for turfgrass insect control, both chemically-based and biologically-based, has increased the number and variety of tools available for turfgrass pest management.

July 1995

"Diagnosis of Turfgrass Diseases: The Art and the Science" Eric B. Nelson, pp. 1-10
Key Words: disease diagnosis, disease management, insect pests, pathogens, sampling, symptoms, turfgrass disease

Diagnosis of turfgrass diseases is a process of elimination of possibilities until one cause remains. Careful record keeping is essential. A ten step progression of elements to be considered, each of which cancels out potential diagnoses and gets closer to the actual disease is presented. This process considers on site observation, environmental consideration, and laboratory analysis. An appropriate strategy for disease management is possible after a correct diagnosis.

"Identification of Unknown Turfgrass Pathogens: Koch's Postulates" Eric B. Nelson, pp. 11-12
Key Words: disease diagnosis, disease identification, infections, Koch's postulates, microorganisms, pathogens, postulates, Robert Koch

Koch's postulates provide a medical method of establishing pathogenecy of specific microbes through scientific empirical means. These postulates are described in four steps. The specific difficulties involved with the adaptation of this technique to turf grass management are considered. The cumulative effect of multiple pathogens in a sample presents difficulties. Despite these problems Koch's postulates remains the most accepted tool for this purpose.

"Diagnosis of Root and Crown Diseases of Turfgrasses" Eric B. Nelson, pp. 13-15
Key Words: disease diagnosis, disease identification, root and foliage disease, crown disease, Koch's postulates, pathogens, sampling, symptoms

Root and crown diseases present their own specific difficulties in diagnosis. Such problems as the perennial nature of turf grasses, large number of present innocuous microbes, and difficulty of collecting good samples for analysis bedevil the diagnostician. The environmental impact on pathogens can make the application of Koch's postulates difficult in controlled laboratory conditions. Comparative microscopic analysis can assist in diagnosis. Abiotic factors must also be considered in diagnosis of these diseases.

"Yellow Nutsedge: Biology And Control In Cool-Season Turf" Joseph C. Neal, pp. 15-18
Key Words: application methods, application rates, bentazon, biological control, *Cyperus esculentus*, Disodium methyl arsonate, herbicide injury, nutgrass, preemergence herbicides, postemergence herbicides, weed control, weed identification

Yellow Nutsedge is a common weed that infests many crop and turfgrass areas. Its control is difficult as it can be mistaken for a grass, is prolific in tuber generation, and infestation can lie dormant for several years. Post emergent long term strategies are the only effective means of controlling this infestation, and multiple applications are necessary. Methane arsenate and bentazon type herbicides are recommended; however, overuse of these products may have an undesirable effect on turfgrasses. Methods of limiting grass damage while controlling infestation are considered.

August 1995

"IPM: What Does It Really Mean?" Jennifer A. Grant, pp. 1-2
Key Words: chemicals, IPM, Integrated Pest Management, monitoring, pest control, pesticide, scouting, strategies

Integrated Pest Management is a commonsense approach to using all available pest management tools and methods. Goals are effective pest management and minimal losses, costs, and negative effects on health, the environment, and pesticide resistance potential. Short and long term strategies and needs should be considered, and compromises must be made. The use of cultural, biological, environmental, and mechanical methods of control can minimize the use of chemicals. A two-phase implementation of this program has reduced pesticide use up to 75%. Monitoring and observation are critical in any management strategy.

"Integrated Pest Management of Insects" Jennifer A. Grant, pp. 3-7
Key Words: IPM, Integrated Pest Management, monitoring, scouting, observation, recording

IPM techniques can help detect, identify, and manage insect infestations. Frequent monitoring and sampling are essential, and means of effective sampling are presented. Information gained through sampling and monitoring combined with long term records of pest infestations, sample results, and applied control methods and results can greatly improve ability to manage insects, and catch small infestations before they become critical. While greater initial investment of time and effort are required to implement IPM, long term gains in quality improvement, reduced costs, and peace of mind result.

"Deciding On Control Of Scarab Grubs" Jan P. Nyrop and Dan Dalthorp, pp. 8-15
Key Words: beetles, economic threshold, golf fairway management, grubs, Integrated Pest Management, pest control, pest control decision rules, sampling, scarabs, threshold values

When scarab grubs reach a level of population, management action must be taken to avoid damage to turfgrass. When the cost of pest damage reaches the cost of pest control at a critical pest density, the economic threshold is reached. Intangible considerations include aesthetic and environmental concerns. Sampling for density indicates when and how pest control should be done. The authors describe three scenarios for fine, medium, and coarse pest control approaches depending on the physical size and scope of the area under control. Rules for considering the most appropriate treatment are discussed.

September 1995

"The Fate of Pesticides Used on Turf" Richard J. Hull, pp. 2-11
Key Words: absorption, compounds, groundwater, huma, insecticide resistance, leaching, metabolism, organic pesticides, pest resistance, photodecomposition, soil safety, soil fauna, sorption, surface runoff, turf-soil environment, volatility

The fate of organic pesticides applied to turf is reviewed with emphasis on the extent by which it is influenced by the physical and chemical properties of the compound. Mechanisms of pesticide loss through volatilization, runoff, and leaching are discussed in the context of features unique to the turf-soil environment. Environmental and human risks associated with pesticide use on turf are also considered as are management strategies designed to minimize such risks. The discussion centers around articles from the January/February 1995 issue of the *USGA Green Section Record.*

"Relationships Among Soil Insects, Soil Insecticides, and Soil Physical Properties" M.G. Villani, pp. 11-17
Key Words: environmental factors, insect pests, insecticide efficacy, insecticide resistance, insecticides, organic matter, pH, physical properties of soil, soil, sorption, thatch, volatility, water solubility

Since insecticides are not incorporated into the soil in turfgrass applications, the movement of insecticides into the soil is necessary to get the control to the pest. This movement is complicated by the tendency for surface applied chemicals to break down before penetration, breakdown due to chemical actions within the soil, or degrade due to environmental factors before the insect population is affected. In addition, the insecticide must reach the pests when they are vulnerable. No chemical program of insect control can be effective without consideration of these issues.

"How to Minimize Unintended Movement of Pesticides" Christopher Sann, pp. 17-20
Key Words: decisionmaking, environmental factors, groundwater, pesticides, pesticide residues, pesticide use, surface runoff, turfgrass management

A framework of steps and actions that can be undertaken to most effectively control pests while containing pesticides is presented. A decision is made as to whether some control action is required. Potential for movement of chemicals from the target area is analyzed. Given the information from both steps, a decision as to whether or not to use pesticide is made. If pesticide use is indicated, an appropriate one must be chosen considering the effectiveness in pest control and mobility. The action is then taken and monitored for effect. Not only does this process result in environmental protection, but it saves money by more efficiently using costly chemicals.

October 1995

"Nematode Disorders of Turfgrasses: How Important Are They?" Eric B. Nelson, pp. 1-16
Key Words: anguina, *Belonolaimus longicaudatus*, cool-season turfgrasses, *Criconemella*, dityle ectoparasites, endoparasites, *Helicotylenchus, Hemicycliophora, Heterodera, Hoplolaimus, Longidorus, Meloidogyne, Meloidodera*, nematode identification, *Paratylenchus, Paratrichodorus, Pratylenchus, Radopholus*, soil pests, *Tylenchorhynchus*, warm-season turfgrasses, *Xiphenema*

Knowledge of the biology, pathology, and ecology of plant parasitic nematodes affecting turfgrasses is limited, particularly for cool-season grasses. This review focuses on several aspects of the distribution, identity, behavior, and pathology of turfgrass parasitic nematodes, for both cool-season and warm-season turfgrass species, their interactions with other turfgrass pathogens, and the variety of control strategies available. The extraction procedures used for identifying nematode species and quantifying soil and plant populations are of considerable importance to the diagnosis of nematode problems in turfgrasses. These important procedures are discussed in the context of damage thresholds, which are used to guide the implementation of control strategies. Emphasis is also placed on the effective use of nematicides and the factors affecting their efficacy.

"Biological Control of Plant Parasitic Nematodes Affecting Turfgrasses" Eric B. Nelson, pp. 17-20
Key Words: biological control, endoparasitic microbes, heterodera, nematoda, nematode-trapping fungi, soil organic amendments, soil organisms

While many positive studies on crop plants have been conducted, the biological control of turfgrass nematodes remains poorly developed. Many organisms show promise for nematode biological control, but have not been developed for turfgrass application. This review covers some of the important concepts in nematode biological control, emphasizing the biology and ecology of specific microbial biological control agents and the use of organic amendments to enhance such natural biological control.

November 1995

"Intuitive Forecasting of Turfgrass Insect Pests" R. L. Brandenburg, pp. 1-7
Key Words: forecasting, insects, modelling, prediction, turfgrass

Insects commonly cause their most severe damage when they occur unexpectedly. The availability of reliable computerized weather stations and intuitive model programs can assist us in forecasting insect occurrence. This information is useful for predicting if an insect is going to occur earlier or later than normal. The use of such a system on golf courses in coastal North Carolina for mole cricket management has been a great asset for superintendents in this area.

TurfGrass TRENDS - 1995 Abstracts

"Winter Weed Control In Southern Turf - Early Detection, Recognition and Action Are Key"
Lambert B. McCarty, pp. 9-14
Key Words: bahiagrass, bermudagrass, centipedegrass, herbicides, lawns, St. Augustinegrass, turfgrasses, weeds, zoysiagrass

Winter annual weeds germinate in late summer or early fall when daytime temperatures consistently do not exceed the mid 70's. Control of weeds involves growing healthy, competitive turf and the possible use of selective herbicides. Weeds are opportunistic and will take advantage of neglected weak turf. Growing conditions favoring certain weed infestations and growth are discussed. The first step in control is proper weed identification and an understanding of its biology. This is supported by scouting to determine which weed(s) are present and at what density. If used, herbicides must be selected which will provide adequate control without harming the turfgrass. This decision is greatly influenced by the intent to overseed the turf with a cool-season grass for winter color. The article discusses the newest herbicides for selective weed control, some precautionary steps to follow before herbicide use, and a winter weed management schedule for warm season turfgrasses.

December 1995

"The Past, Present and Future of Turfgrass Improvement" Kevin Morris, pp. 1-10
Key Words: bermudagrass, cultivars, evaluation, fescues, NTEP, ryegrasses, stress, zoysiagrass

The development of new turfgrasses has escalated since the mid-1970's. The National Turfgrass Evaluation Program (NTEP) was initiated in 1980 to evaluate new turfgrass cultivars and experimental selections for their usefulness in different geographic areas and under varying management situations.

Through NTEP testing, many grasses have shown improved appearance and tolerance of various stresses. Several Kentucky bluegrass varieties have performed well in very low maintenance situations. Perennial ryegrasses, in general, have a darker green color, increased density, and better summer survival than old, standard cultivars. Tall fescue is generally more attractive and fineleaf fescues have better disease resistance. In addition, several warm-season grasses such as bermudagrass and zoysiagrass are now available as seed, thus reducing establishment time and costs.

Overall, turfgrasses have been improved greatly. However, with the increasing environmental awareness among the general public and the rising demand for turfgrass use, plant breeders will need to develop turfgrasses that better withstand disease, insects, drought, heat, cold, and traffic.

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TurfGrass TRENDS

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Robert Mitchell, Exec. Dir. of Golf and Grounds, The Greenbrier

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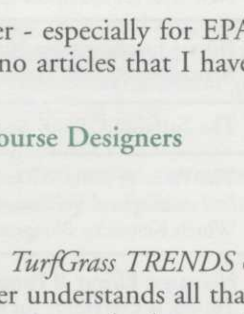


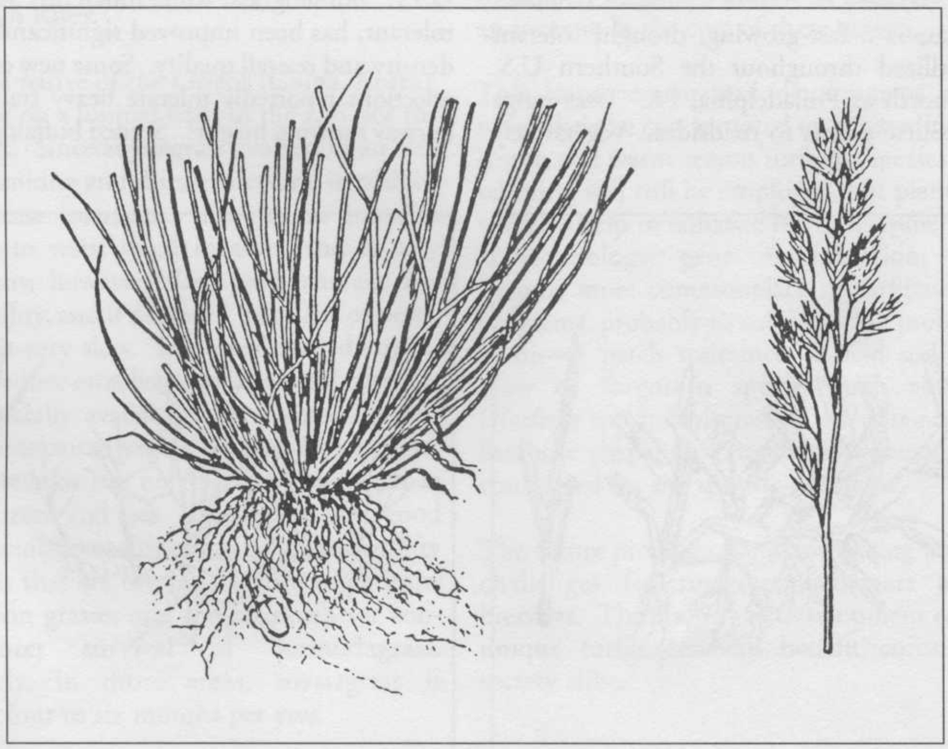
spot resistance statistically similar to the colonial bentgrass in NTEP fairway tests.

Fine fescues

Fine fescues are known for their tolerance of low fertility, acid soils, shade and minimal water. Development of new fine fescue (hard fescue, chewings fescue, creeping red fescue, sheep fescue) cultivars has therefore concentrated on improved survivability during summer stress periods and disease resistance, especially in the warm, humid eastern U. S.

Hard fescue (*Festuca longifolia*) and chewings fescue (*Festuca rubra commutata*) has been greatly improved over the last ten to fifteen years. The better cultivars have improved color, density and persistence. However, we seem to have reached a plateau in these areas with the best cultivars in tests from 1990-93 performing as well as new entries in 1994. More testing is needed as thatch production can severely affect these grasses and cause them to decline over time. Also, summer patch (*Magnaporthe poae*) is a severe problem on hard fescue and does not usually appear until after the turf is two to three years old and some thatch is present.

Creeping red fescue (*Festuca rubra*) is probably the most improved species among the fine fescues. Creeping red fescues are useful in very low maintenance mixes, but do not persist well in most lawns. For many years, 'Pennlawn' was the dominant cultivar in this group and was not improved upon until the mid-1980's with the release of 'Flyer'. Only two experimental selections performed significantly better than Flyer in NTEP tests during the period of 1990-93. In the current NTEP test (1994 data only), six grasses have performed significantly better than Flyer. Another consistent problem with creeping red fescue, leafspot, seems to be less of a problem on the newer, improved releases.



Fine fescues

Warm-season grasses

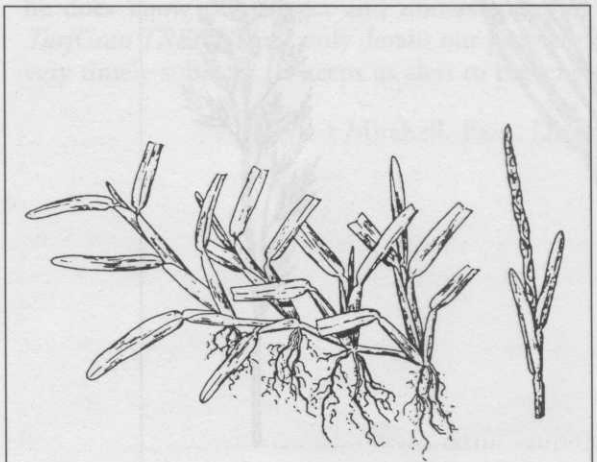
Much less NTEP testing has occurred on the warm-season grasses (St. Augustinegrass, bermudagrass, buffalograss and zoysiagrass) than on the cool-season grasses. This is because the cool-season grasses are more widely used throughout the U.S. and are almost exclusively seed propagated. Grass varieties that are seeded are much easier to improve than vegetatively established types, such as many of the warm-season grass cultivars. Nonetheless, significant breeding work has been done on the warm-season grasses and their usefulness is increasing nationwide.

St. Augustinegrass is grown in the lower southern U.S. states and across through Texas to Southern California. St. Augustinegrasses have been selected that are lower-growing, denser and finer textured than the standard cultivars 'Floralawn' and 'Floratam'. Cultivars such as 'Del Mar', 'Jade', 'Seville' and 'Sunclipse' provide a more attractive turf with good disease and insect resistance. 'FX-10' was developed for improved survival in nonirrigated turf areas. Some research is also being conducted on the development of seeded St. Augustinegrasses.

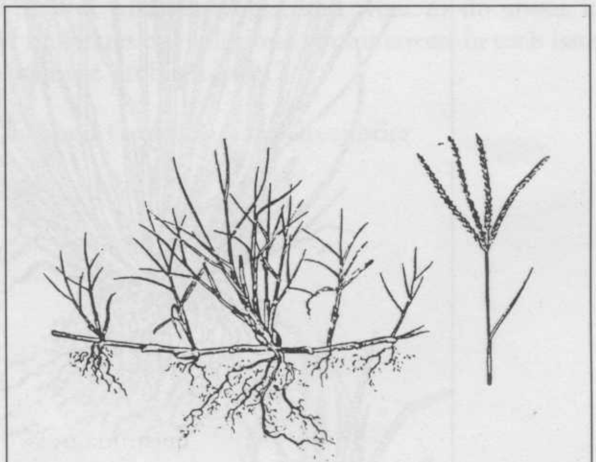
Bermudagrass is a fast-growing, drought tolerant turfgrass utilized throughout the Southern U.S. and as far north as Philadelphia, PA. Uses range from golf course greens to roadsides. Vegetatively propagated varieties such as 'Tifgreen', 'Tifway', 'Midiron' and 'Tufcote' have delivered the highest quality and, consequently, have had the most use. However, seeded cultivars developed in the last ten years are becoming more popular because of their reduced establishment costs. These seeded cultivars are improved over the 'Arizona Common' variety for appearance and winter-hardiness, but still rank below the quality and winter-hardiness of the better vegetative cultivars. Also, there is still much interest in developing vegetative varieties with improved cold tolerance and better disease resistance.

Besides working with the traditional grasses mentioned, plant breeders are actively seeking to improve grasses that have been under-utilized for turf. Two of these species, buffalograss and zoysiagrass, have great potential for providing functional turf on golf course roughs, parks, lawns and roadsides, while requiring less water and pesticides.

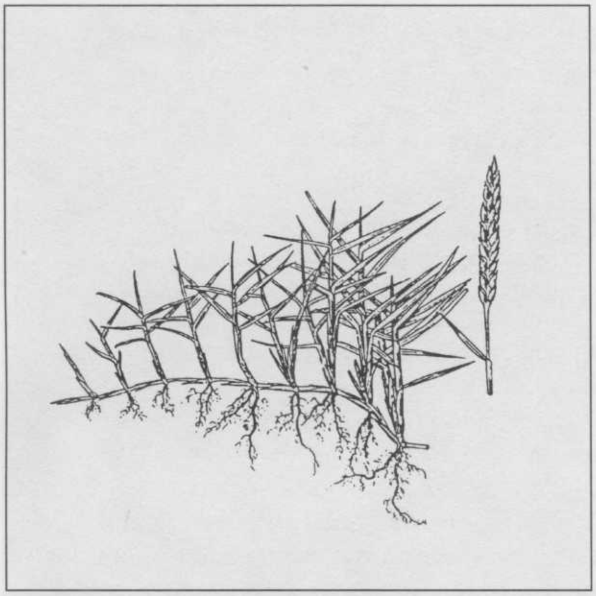
Buffalograss is native to the Great Plains of the U. S. (Montana south to Texas) and evolved mainly in areas of 15 to 25 inches (37.5 to 62.5 cm) of annual rainfall, hot summers with drying winds and, in some areas, winter temperatures of -20° to -25°F. Buffalograss, while inherently very drought tolerant, has been improved significantly for color, density and overall quality. Some new experimental selections reportedly tolerate heavy traffic and low fairway mowing heights. Seeded buffalograsses have



St. Augustinegrass



Bermudagrass



Zoysiagrass

also been developed, thus giving consumers another establishment option. Disease resistance and competition from other grasses and weeds has been a problem when growing buffalograss in the more humid, eastern U.S. Although this grass has been successfully grown on turf sites in such areas, its greatest utility, at this point, is probably west of the Mississippi River.

Zoysiagrass, a native of the Orient (China, Korea), has been used on a limited basis in the U.S. for the last fifty years. Since zoysiagrass evolved in an area with high humidity and disease pressure, it exhibits excellent disease tolerance. Zoysiagrass has also been shown to resist weed invasion and is very traffic tolerant; however, slow establishment has limited its utility, and if damaged by traffic or pests, its recovery is very slow. Improved seeded zoysiagrasses that reduce establishment time and costs are now commercially available. In addition, lower-growing, fine-textured vegetative type zoysiagrasses have been bred for use on fine turf areas such as golf course greens and tees. Zoysiagrass, with good to excellent winter-hardiness, has its greatest utility in those areas that are too far south to easily grow the cool-season grasses and too far north for consistent winter survival of bermudagrass. Unfortunately, in those areas, zoysiagrass is dormant for four to six months per year.

Future challenges

As water and pesticide use on turf is increasingly scrutinized by legislators and the general public, more pressure will be placed on turfgrass managers to provide acceptable turf with less inputs. As budgets continue to shrink, turfgrass managers will be asked to do more with less. Even as demand for facilities such as municipal athletic fields and golf courses increase, turfgrass managers will be asked to deliver the same safe, functional playing surfaces they now provide. Homeowners will still be seeking the "Holy Grail" - grasses that grow slowly and, thus, require infrequent mowing, stay beautiful despite heat, drought and cold, and tolerate damage from hordes of feet, paws, cleats, etc.

The perfect grass for every situation will never be found or developed. Yet, plant breeders will have to develop grasses that provide acceptable quality turf during prolonged drought periods with little or no supplemental irrigation. Grasses will need to be bred that better resist disease and insect invasion and, thus, reduce pesticide use. Compaction and traffic-tolerant turfgrasses will need to be identified and commercialized. Dense, weed-resistant grasses will be needed in response to concerns over herbicide use or misuse on turf. And all of this will have to happen without a decline in turfgrass quality or an increase in the cost of these grasses.

This improvement and development effort will most likely be concentrated on the traditional cool-season and warm-season turfgrass species. Ecotype selecting will still be employed, but plant breeding will also help to enhance the development process. Biotechnology, gene manipulation, etc. will become more commonplace in turfgrass breeding programs, probably to solve specific problems such as brown patch resistance or acid soil tolerance. New or forgotten species such as Junegrass (*Koeleria* spp.), Hairgrass (*Deschampsia* spp.) and Seashore paspalum (*Paspalum vaginatum*) will be considered for site specific problems.

The future promises many interesting and exciting challenges for turfgrass managers and plant breeders. The continued development of new and unique turfgrasses will benefit consumers and society alike.

MR. KEVIN N. MORRIS is the National Program Coordinator for the National Turfgrass Evaluation Program (NTEP). He received his degree in agriculture from the University of Maryland in 1981. Upon receiving his degree, he was employed by the Maryland Environmental Service for one year and then started with the NTEP, Beltsville, MD in 1982 as Technical Coordinator. He was named National Program Coordinator of the NTEP in 1988. His duties include administration and coordination of national tests for seventeen grass species at approximately sixty test sites across the United States and Canada. In addition, he coordinates research involving NTEP tests, low or reduced input management of turf and evaluation of promising new species at the USDA, Beltsville, MD. He also provides consultation to turfgrass managers at facilities such as Laurel and Pimlico Race courses. He also has eight years experience as co-owner of a lawn service company. His most recent contribution to *TurfGrass TRENDS* appeared in the September 1992 issue.

Terms to Know

Ecotype Selection - an plant found growing in nature that has survived and thrived despite long periods of exposure to stress, i.e. cold, heat, drought, traffic, disease, etc.

Endophyte - an organism that lives/grows within another plant; it is often, but not necessarily, parasitic.

Some useful references:

Morris, K. N. 1995. *NTEP Turfgrass Research Field Day.* NTEP No. 95-13.

Morris, K. N. and R. C. Shearman. 1994. *National Turfgrass Evaluation Program Progress Reports.*

Morris, K. N. and J. J. Murray. 1986-1993. *National Turfgrass Evaluation Program Progress Reports.*

Morris, K. N. 1992. *Turfgrass Variety and Experimental Selection Trials: 1991 Progress Report.* NTEP No. 92-1.

Murray, Jack. 1982. "NTEP to promote national testing concept." *Grounds Maintenance.* June, 1982. p.78-80.

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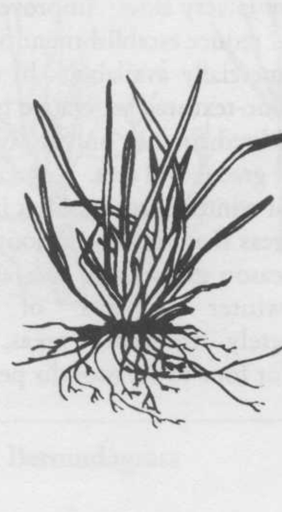

New Seeded Buffalograss for Turf Available

LINCOLN, Neb. -- Homeowners weary of constantly tending their lawns may find relief with Cody, a seeded turf-type buffalograss cultivar developed by the University of Nebraska and the Native Turf Group.

NU has released several other improved turf - type buffalograss cultivars in recent years, but Cody is the first available form seed, said Terry Riordan, Institute of Agriculture and Natural Resources (IANR) turf breeder. NU released Cody earlier this year and it is available this season for the first time.

Because Cody can be seeded, it costs less to plant than NU's two earlier Nebraska-adapted releases, "315" and "378," which are available only as sod or plugs, Riordan said.

"Compared to the standard buffalograss variety Texoka, Cody is denser, lower-growing, and with a darker green color," Riordan said. "Cody looks a little bit more like Kentucky bluegrass than other common buffalograss cultivars, but gets by with less water, mowing and pesticides."

Cody establishes more quickly and economically than other seeded buffalograss cultivars, said Dave Stock of Stock Seed Farms in Murdock, one of four companies in the Native Turf Group. The Native Turf Group's plan breeders used buffalograsses developed by IANR horticulturists as parent materials for Cody.

"Our first priority was turf quality," Stock said. "Cody forms a thick, dense turf."

Cody is adapted in southern and northern climates and will grow well in many different soils, Stock said.

Buffalograsses are warm-season grasses, beginning growth when the soil warms and going dormant with autumn frost. Cody should not be planted until mid- to late May.

Cody withstands hot, dry weather with little or no watering. It needs minimal fertilizer and is practically pest-free, Riordan said, "but if you give it a little bit of water and fertilizer, it really looks great."

Cody grows to 5 inches tall and is especially recommended for golf course roughs and institutional and acreage lawns, where it might not be mowed.

Cody is the latest result of IANR's ongoing effort to develop water- and chemical-efficient turfgrasses, Riordan said.

In Nebraska, Cody now is available from Arrow Seed Co. of Broken Bow and Stock Seed Farms. Farmer's Marketing of Arizona and Johnston Seed in Oklahoma, which make up the rest of the Native Turf Group, also carry the seed.

The United States Golf Association helps fund NU's turfgrass research, which is conducted in cooperation with IANR's Agricultural Research Division.

Contact:

Terry Riordan, Ph.D., professor of horticulture, 402-472-1143

In Future Issues

- Risk-taking and Pest Management
- Annual Bluegrass Management
- Herbicide Effects on Bermudagrass
- PGR and Annual Bluegrass
- Insect Pheromones
- Reduced Herbicide Usage for Crabgrass and Goosegrass
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