"You have to sell a school on a program," Brown maintains. "You have an uphill battle regardless of the merits of the endeavor. You have to buck the administration, and sell the deans and the business end of the university on the idea. So many programs are good, but the wheel that squeaks the loudest gets greased first."

Some employers don't understand the essence of co-op. Others may feel obligated to keep students who don't succeed. At times organizations are not able, or don't think themselves able, to accommodate the beginning student.

"If you have difficulty managing a business, you'll have difficulty managing a co-op program," says Bruce Braunstein, vice president of Environmental Industries in Calabasas, California. "A certain amount of consistency and credibility building is required. Co-oping is a long term program for the benefit of the student and the employer. The co-op is concerned with doing a good job. It's not just a one time experience. The successful co-op will often come work for the company."

● "I'm a 190 percent advocate of co-ops. You can eliminate problems due to prethinking, which can come from experience. But, the staying power of co-ops was not good after they graduated." . . . Wally SaBell, president, SaBell's, Inc.

Co-oping is essential because it allows a student to find out "early in the game" whether he likes landscaping or not, says Len Spencer. One graduate came to the Spencer Co., with a specialty in turf management. "During the summers he had worked in a factory because there was more money involved. He had a fine horticultural education, and asked for a complex job. He started as a probationary Crew supervisor. He decided after two weeks 'this is not for me, it's below my level.' He got a job as a dispatcher for Sears, after four years and $40-50,000."

Co-oping is the "nearest thing we have to old world apprenticeships," says Spencer. Students who are willing to spend an additional year in school and face the hassles of relocation and discontinuity in their education reap the rewards of experience, maturity, and greater marketability when they graduate. Schools that run the programs help bridge the undesirable gap between the ivory towers of the university and the soiled hands of the real world. As the Mississippi State prospectus explains: a regular graduate is a purchase—a co-op student, an investment. **WTT**

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Circle No. 112 on Reader Inquiry Card

CULTURAL PRACTICES TO DISCOURAGE POA IN KENTUCKY BLUEGRASS

By A. Douglas Brede, graduate research assistant, The Pennsylvania State University, University Park, PA.

A. D. "Doug" Brede is a graduate research assistant at Penn State, where he is currently finishing a Ph.D. degree in Turfgrass Agronomy. His doctoral research deals with the interaction of perennial ryegrass, Kentucky bluegrass, and *Poa annua*. He is a native of Pennsylvania and is a former golf course assistant superintendent.

How can two neighboring turfs, both of Kentucky bluegrass, contain such different amounts of *Poa*? You've probably read a list of the sins that result in *Poa*: overwatering, compaction, traffic wear, divots, etc., etc. It's common knowledge that these evils will open established turfs to *Poa*.

But have you ever noticed that some stands seem to contain *Poa* right from the start? It's as if the *Poa* came up at planting time. Although a great deal is known about *Poa* invasion of established turf, the problems of *Poa* in the seedbed are unsolved.

Recent studies at Penn State have confronted this dilemma. We've discovered several ways to limit the amount of *Poa* that comes up with a stand. I'm not talking about herbicides or seedbed treatments, but cultural methods that you can use to cut down on *Poa* when you plant.

Cultural methods

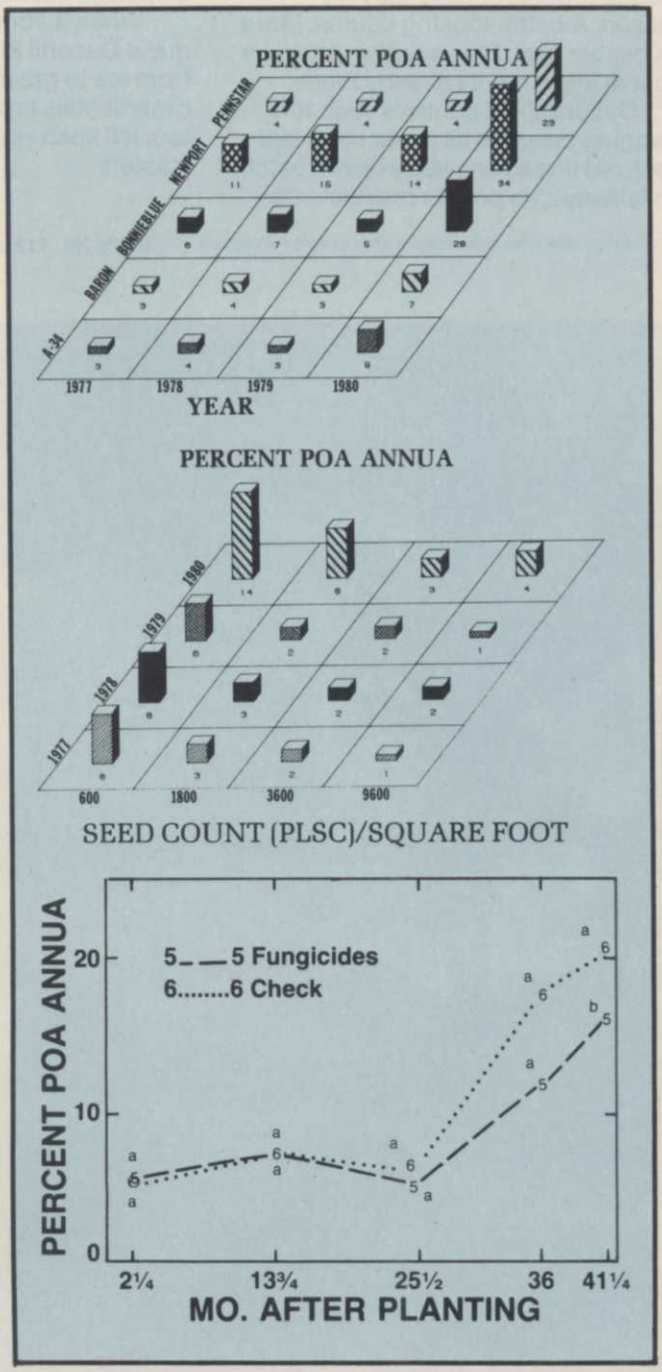
You've probably heard turf managers say, "Raise your cutting height; that'll cut down on your *Poa*." It's been known for years that Kentucky bluegrass fights *Poa* best at higher cutting heights.

We found twice as much *Poa* at ½" than at a 1" height. But the remarkable thing was that only a few weeks of close mowing were needed to let in the *Poa*. A two-month-old Newport stand, with only a month of mowing under its belt, had 88% more *Poa* at ½" than at 1".

Let's say you're planting a Kentucky bluegrass lawn in an area where *Poa* is a problem. And let's say that you want to mow it at 1". How can you best manage the mowing to limit *Poa*?

First, begin mowing as soon as the grass reaches 1½"; use a 1½" setting on the mower. Then, keep it at that height for about a month. Take an additional month to lower the height, a little bit each time you mow. This will give the desired grass a chance to establish itself. Remember, if you mow Kentucky bluegrass lower than an inch, you're asking for *Poa*.

One of the most important decisions you'll make in planning your new turf area is the cultivar (variety). In our study we tested five popular cultivars to see which ones limited *Poa* invasion. Newport, a less vigorous bluegrass, allowed a large invasion of *Poa* during the first few months after planting. It also kept that portion of *Poa* for more than three years. A-34 (BenSun) and Baron, on the other hand, prevented *Poa* in the first few months and never did let much in. A vigorous cultivar will not only look good, but it will also work to keep *Poa* out.



So, you've decided on your cutting height and cultivar. The next question is: How much seed to use? Textbooks tell you to seed bluegrass at

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*Apply Roundup to fairway; reseed 7 days after application. While Roundup goes to work, golfers keep playing over treated turf. RUP-SP1-113D

1-2 lbs. per 1000 square feet. But is this the right rate for keeping *Poa* out?

To answer this question, we established several plots with seeding rates of 600, 1800, 3600, and 9600 pure-live-seed count (PLSC) per square foot. With the PLSC method, we knew how many viable seeds we were planting per square foot of soil. These rates spanned a range from roughly ½ to 10 lbs. of seed per 1000 ft².

The results were surprising. Seeding rate affected the amount of *Poa* for more than three years after planting. Low seeding rates (1 lb. and less) let *Poa* invade during the early months of growth, before Kentucky bluegrass could take hold. After the damage was done, the *Poa* spread. *Poa* seldom relinquishes what it gains.

Vigorous cultivars seem more immune to *Poa* invasion than their weaker cousins, especially at low seeding rates. If they can put up a good struggle against *Poa* in the first few months, they've got it made. Weak cultivars tend to lose the benefit of higher seeding rates as time goes by.

Very high seeding rates (above 4 lbs.) can predispose turf to seedling damping-off diseases. Heavy rates only feed the fungi. Once damping-off hits, you're back to the same problem: A stand full of holes where *Poa* can invade.

We were lucky; damping-off wasn't a problem in our test. You might not be so lucky.

What's a good Kentucky bluegrass seeding rate? 2-4000 PLSC/ft² (see accompanying explanation of the PLSC method).

How do fungicides affect *Poa* invasion?

At the beginning of our experiment, we had equal *Poa* in each of two plot areas. We sprayed one area with fungicides, leaving the other area untreated. We made 5 to 9 applications per year of common turf fungicides in a disease-prevention effort.

Fungicides had a cumulative effect, holding back the amount of *Poa* that invaded the treated area. Maybe the fungicides had some beneficial effect on the Kentucky bluegrass or perhaps a detrimental effect on the *Poa*. In any event, 3½ years later, there was less *Poa* where fungicides were used.

Of course, fungicides shouldn't be used as a *Poa* control. It would cost you thousands of dollars for only 5% less *Poa*. But if you are using fungicides for disease control, less *Poa* is a side benefit.

Why Poa wins

Poa is botanically a sister of Kentucky bluegrass. The plants look similar. The seeds are about the same size. But if a few *Poa* plants get into bluegrass turf, they take over. This is especially true when the stand is young.

We tried to find some answers by seeding *Poa* and Kentucky bluegrass side-by-side and watching their progress. *Poa* seedlings broke ground two full days before Kentucky bluegrass. Ultimately, 90% of the *Poa* seeds produced seedlings, compared to only 45% of the Kentucky bluegrass, even though lab germination of the two was nearly the same.

In another experiment, we seeded a mixture of *Poa* and Kentucky bluegrass. Neither grass bothered the other during germination. The takeover by *Poa* came during the month after germination. *Poa* produced twice as many tillers as Kentucky bluegrass and four times as much leaf dry-weight from an equal number of seedlings.

Summary

Poa is a grass that never passes up the opportunity to get involved. In established turf, mistakes in management and wear and tear give *Poa* the chance it needs to get a foothold.

Poa can also be a problem in seedling stands, germinating with the desired grass and later taking it over. Cultural methods can be helpful in limiting *Poa* in a young stand.

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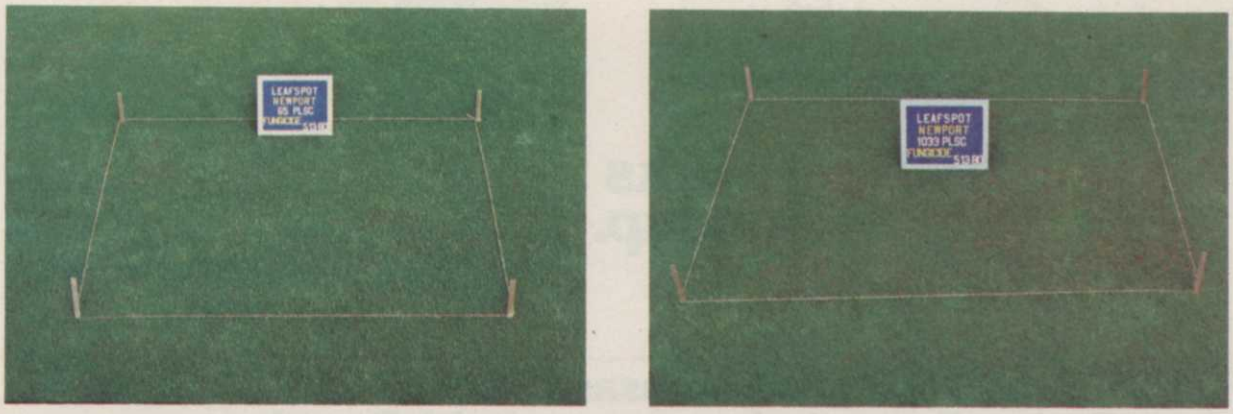

Newport Kentucky bluegrass shows the effect of seeding rate on Poa annua after three years. Photo on left shows seeding rate of 600 pure-live-seed-count per square foot. Photo on right shows rate of 9600 PLSC/sq. ft.

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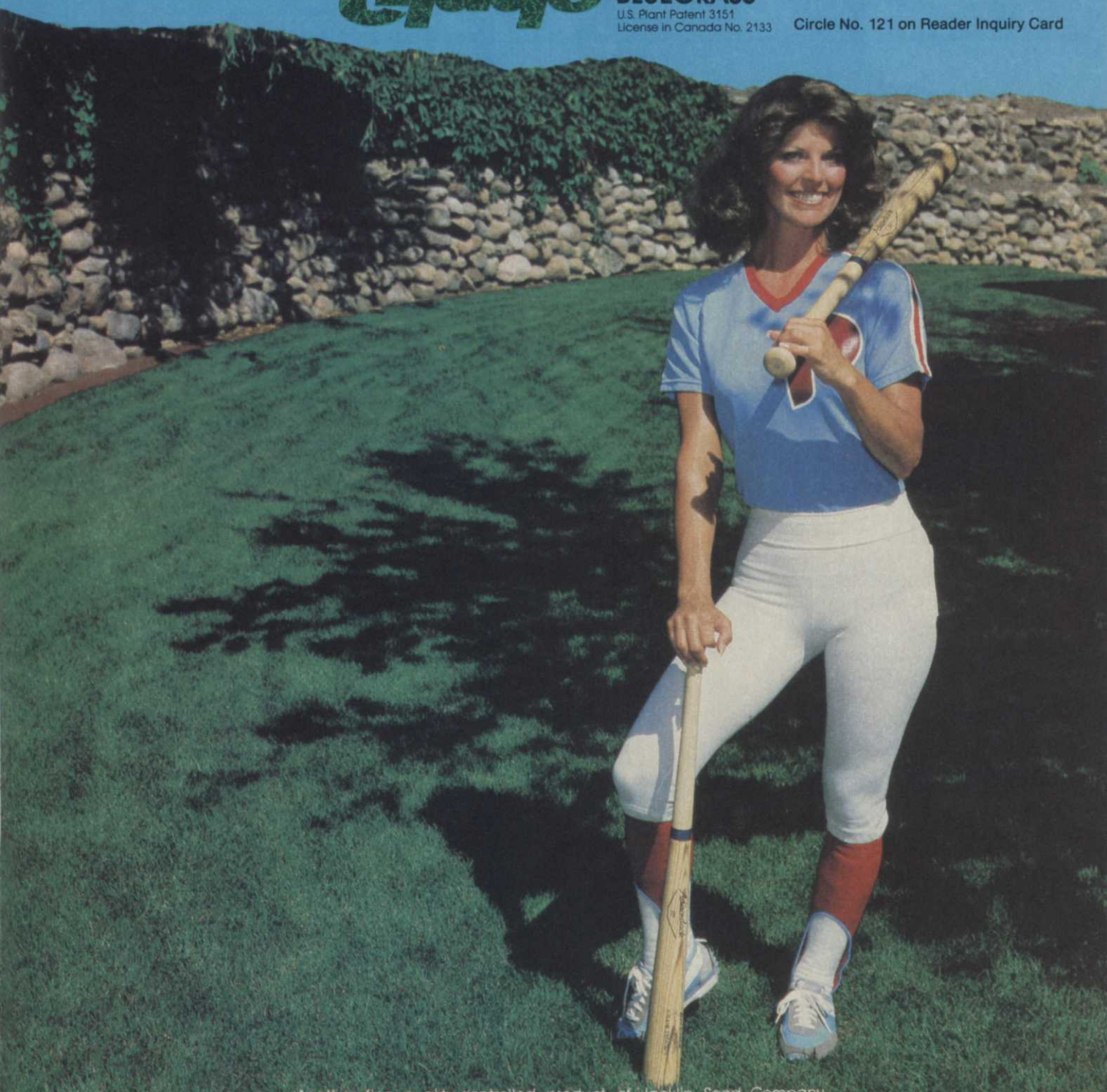

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Poa vs Kentucky *from page 34*

PURE-LIVE-SEED-COUNT

Seed quality is important, no matter what size area you're planting. If you're undertaking several acres, minor differences in seed quality can add up to major savings.

Many things go into good seed quality: purity, freedom from weed seed, germination percentage, and the number of seeds per lb. You can find that information on your seed label or tab, with the exception of the number of seeds per lb.

Modern bluegrasses vary considerably from the 2.25-million seeds per lb. figure often quoted for Merion. In fact, depending on the cultivar, they can range from 850,000 to 2,000,000 seeds per lb. — a 2X difference! That translates to a possible 2X savings on the cost of seed.

In the PLSC method, first enter the desired PLSC/ft² rate; a value of 2-4000 PLSC/ft² will work nicely. Next, multiply by the number of square feet to be seeded. Divide by the number of seeds per lb. (see list below). Divide by the purity listed on the tag (if the purity is 95%, enter 0.95). Divide by the germination listed on the tag (as a decimal again). Hit the = and you get the lbs. of seed needed to plant your area.

Here's an example. Say you want to plant a 10,000 ft² lawn to a 50-50 blend of Merion and Birka. And you want to seed at 4000 PLSC/ft². That means you'll need 2000 PLSC/ft² of each cultivar.

The seed tag on your Merion lists 99% purity and 92% germination. Your Birka has 95% purity and 80% germination. Thus, because of different seed qualities, you'll need quite different amounts of seed for a 50-50 blend: Merion 11 lbs., and Birka 31 lbs.

The following are seed numbers of several popular bluegrasses, from studies at Ohio State and Penn State:

Cultivar	Seeds per lb.
A-34 (BenSun)	1,500,000
Adelphi	1,300,000
Baron	1,100,000
Birka	850,000
Bonnieblue	1,100,000
Brunswick	1,600,000
Cheri	1,100,000
Delta	1,400,000
Fylking	950,000
Galaxy	1,100,000
Glade	1,200,000
Majestic	1,200,000
Merion	2,000,000
Newport	1,200,000
Nugget	950,000
Parade	1,200,000
Park	1,200,000
Pennstar	930,000
Touchdown	1,300,000
Vantage	1,500,000
Victa	1,000,000

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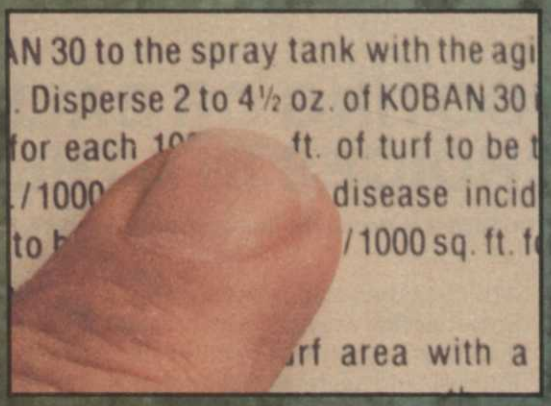

There's a new, approved label rate for Mallinckrodt's KOBAN 30 fungicide. On the basis of Mallinckrodt field research and the working practices of many golf course superintendents, the minimum label recommendation has been lowered to two ounces of KOBAN 30 to five gallons of water per 1000 sq. ft. for preventive treatment of Pythium. Now when you compare brands and prices—compare coverage. KOBAN is effective and economical for use on fairways as well as greens and, used with the recommended amount of water, control will be improved and tip burn all but eliminated.

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Circle No. 129 on Reader Inquiry Card

FOOTING OR BALL RESPONSE: CHOICES IN ATHLETIC FIELD CARE

By Dr. William H. Daniel and Dr. Raymond P. Freeborg, Purdue University, West Lafayette, IN.

Athletics is an important segment of our culture. Societies that are not actively at war need athletic activities to channel the enthusiasm, competitive interest, and aggressive tendencies of its citizens. People of many cultures are motivated by a "cause." The challenge of a contest plus the desire to be for something or to take sides is inherent in human beings. Therefore, the therapeutic value of sports within a society has deep roots in the nature of man. As a result, many games have evolved to challenge and test a player's skill, conditioning, and training.

Sports that demand physical contact have attracted society's plaudits for centuries. The voluminous sports coverage in newspapers, the variety of sports magazines, and the TV time dedicated to reporting sports is indicative of the extensive interest in athletics.

The turfgrass surface of athletic fields is designed primarily for the "footing" of the players with less emphasis on ball response. Football, rugby, soccer, field hockey and lacrosse involve running, falling and body contact, as well as some ball response. The games of baseball, softball, and cricket involve less player contact but increased emphasis on ball response and player footing. Areas for volleyball, deck tennis, badminton and playgrounds receive intensive wear, but the response of the ball is of less concern. The maintenance of polo grounds provide an additional challenge due to the stress on the turf area caused by horses' hooves. However, each of these intended uses creates similar problems of turf growing and management, due to the compaction of soil and intense wear.

The maintenance of athletic facilities presents the turf manager with three major areas of concern: Conditions or health of the **turfgrass,** the firmness and uniformity of footing for the **player,** and the color and grooming of the turf surface for esthetic value to the **spectator.**

Accumulated surface water weakens turf and causes unstable soil. Soil surfaces, even when the turfgrass cover is worn, need to remain smooth and stable (as in basepaths, infields, or the center of football fields). Wear-tolerant turf is necessary for safety and appearance and should be achieved in spite of intense use that reduces quality and quantity of existing turfgrass as the season progresses.

The turf surface is important to the player as he runs, stops, turns, twists, jumps, falls and gets up. The player seldom has a controlled fall, but more likely is tackled, blocked, pushed, piled onto, rolled or stepped on. He may slip, slide or twist. Many athletic injuries are due to body contact between players. As a ball carrier is tackled, there is often extreme pressure on his feet and legs as he tries to advance. The opposing forces create upper body twisting and cause extra stress on the knees. The inherent "give" of natural turf reduces some of this stress.

Derived from Turf Manager's Handbook, published by Harcourt Brace Jovanovich Publications, 1 East First Street, Duluth, MN 65802. See book ad in magazine.

Maintenance of Athletic Grounds

A dense, wear-resistant turfgrass cover on athletic fields reduces the number and severity of player injuries, provides good footing for better game performance, and presents a pleasing appearance. The use of agronomic principles and good judgement can contribute to a successful maintenance program.

Correct timing of all maintenance operations is of prime importance; each practice needs to be related to the state of turfgrass growth, to varying ground and weather conditions, and to the projected use of the area.

The following concepts of grounds management relate to areas used for football, as well as parks, baseball fields, playgrounds and multiuse areas which have similar demands and requirements. The football player spends many more hours working or playing on practice fields than in the stadium. Therefore, there is a need for the best turf possible on the practice fields.

There are three general levels of athletic field maintenance determined by budget, available equipment and technology. Timing is vitally important; nature's growth processes require time. In general it is better to be early rather than late with management procedures.

Wear Tolerance of Grasses

Currently the improved grass varieties provide increased resistance to wear. Both ryegrass and tall fescue have a high fiber content, which provides increased wearability. Because of seedling vigor, the overseeding of ryegrass can provide a continuous new growth during the playing season. In California pre-germinated seed has been spread on the athletic field prior to a scheduled game. Following the game the field is covered with clear plastic sheeting for 6-12 days, depending on the weather. The young grass is green by the following game time.

Vertical cutting of turf of bermudagrass cultivars, such as Santa Anna, should be done when the conditions are conducive to rapid re-

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