# Demographics for Sports Fields

CONTINUED FROM THE FRONT COVER

projected youth you then know whether or not there will be more youth playing or fewer youth playing soccer in that community.

By knowing the capture rates for various sports and plotting them over time one can also gain further insight into whether or not there will be an increase in the number of adults or females playing any particular sport in the future. For example, the trend over the past ten years of having more and more youth involved in soccer is having an influence on not only a shortage of fields for youth but also on the size and quality of the fields because more young adults having been introduced to the sport and now want to be able to continue to play. If the capture rate for adults playing soccer increases from a current 2.2% to 5%, the impact is enormous as the number of adult quality pitches then also needs to double. When one considers the fact that females are also now playing the game, you automatically double the population base to draw potential players from and therefore again know that there will be an increased demand for the number of playing fields required.

Techniques being applied to help cope with increased demands for playing fields include monitoring fields to ensure they are actually being used when they are booked, increasing the use of school facilities and trying to increase the quality of school fields, rotating fields to ensure proper rest periods, designating some fields for just casual play, increasing the soccer schedule from a historic four day to a seven day schedule, establishing "adopt-a-field" or home field approach, moving away from allocation based on past allocation to allocation based on actual needs, and last but most important – greater attention to turf management in order to protect this limited resource.

Examples were given of case studies in Waterloo and Mississauga of how demographics were applied community by community to predict soccer field requirements, quality of fields required and location of areas where opportunities existed to redevelop existing fields to other uses such as ball diamonds to soccer pitches or playing fields to shuffleboard/bocci courts or spraypad facilities to reflect the needs of specific areas.

From this brief summary, it is apparent that there is a need not only to concentrate on present demographics but also on future predicted trends. Hiring the proper expertise will help to anticipate and plan for the best possible use of sports fields. ♦

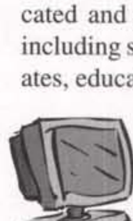
# Industry News

### CGSA Executive Director to Retire

Vince Gillis, National Executive Director for the Canadian Golf Superintendents Association (CGSA) since November 1989, announced recently that he plans to retire in early 2002.

Mr. Gillis said that as of November 1, 2001, he will have completed 12 years as the Association's Executive Director. He felt that it was time to give up full-time employment and pursue his personal interests.

Mr. Gillis expressed his satisfaction with things that have been accomplished over the years he has served CGSA and said that he considered it a privilege for him to serve the members of such a dedicated and professional group of people including superintendents, industry affiliates, educators, students, etc.



### Surfing for Turf

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# Turf News Briefs

## 2002 WORLD SOCCER CHAMPIONSHIP • REAL GRASS IN THE SKYDOME

### Canada Lands Worlds

The inaugural women's under-19 world soccer championship is coming to Canada.

The Canadian Soccer Association announced this spring that Canada had won the right to host the 2002 tournament over bids from South Africa and Ghana. The event will be centred out of Edmonton's Commonwealth Stadium with other games to be played at Winnipeg's Soccer Complex and either Burnaby's Swangard Stadium or Victoria's Commonwealth Stadium.

It is scheduled for late August-early September in 2002. Exact dates will be announced later.

Twelve countries will take part with Canada, as host, earning automatic entry. The tournament budget will be in the "multimillions," said Kevan Pipe, chief operating officer of the Canadian Soccer Association.

*—The Record, March 17, 2001*

### Jays' Field of Dreams

The Blue Jays will play on real grass at the SkyDome if Toronto wins the right to host the 2008 Olympic Games.

Gord Ash, The Blue Jays general manager, confirmed his organization has agreed to let the Olympic organizers place real grass in the Dome for at least the 2008 season if Toronto wins the Games.

"Their first suggestion to us was that they wanted to do it after the all star break (during the season)," said Ash, who is with the Jays in Florida. "But we insisted that if they wanted to do it, it needed to be in place for the whole season. And we've both signed off on that," Ash said. Marnie McBean of the TO-Bid also confirmed the deal.

Ash said the Jays are excited about the prospect of finally playing on grass. The team still plays on turf, which is very fast and springy and not as forgiving as grass in terms of cushioning athletes in falls.

"It's something we always talked about," Ash said. "The fans and the players want it and there are very few facilities that have Astroturf anymore. It's certainly going the way of extinction."

Howard Starkman, the Jays' vice-president of media relations, said that the existing turf at the SkyDome will have to be replaced in the next couple of years or so anyway and grass, if it can be maintained in a facility like the Dome, would be the way to go.

"We know it's do-able," Ash said.

There's a possibility major league baseball players could be competing in the Olympics by 2008, and the SkyDome would be a familiar venue to almost all of them. Minor pros took part in the 2000 Sydney Games.

Meanwhile, Craig Reedie, a member of the International Olympic Committee evaluation committee, raved about Toronto.

"It's a very special city," Reedie told the CBC. "There's something rather nice about cities beside the sea."

"And while it's not quite the sea, it's a very expansive piece of water."

Reedie, a member of the IOC and chairman of the British Olympic Association added he was very impressed with the job the Toronto bid group had done thus far.

*— Steve Buffery, The Sunday Sun, March 11, 2001*

**DEADLINE: JULY 14**
**Content for September issue**

**Please Note**: Opinions expressed in articles published in *Sports Turf Manager* are those of the author and not necessarily those of the STA, unless otherwise indicated.


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# The President's Desk

JANE ARNETT-RIVERS

It is amazing how we can go from winter weather to July temperatures in a week. In other words, we switched from winter control operations to turf maintenance overnight. It was the reverse in the fall. How many of you were caught in the middle of field renovations by that first snow fall? It has been quite a year for the dreaded snow molds. Fortunately, here in Oakville it has been more grey than pink, so with a fertilizer application and a few cuts, the damage is minimal. After listening to golf course staff talk about their mold concerns when the covers are lifted, I was quite relieved to find there was no increase in mould under our own tarps.

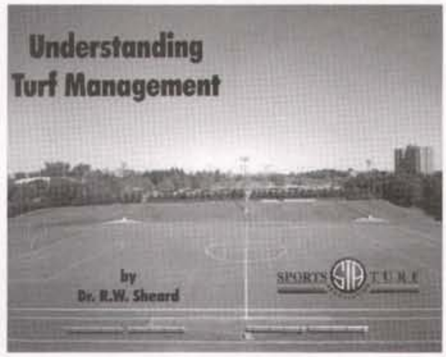
STM

Keynote speaker at this year's Annual Field Day will be ex-Hamilton Ti-Cat Henry Waszczuk, host of television's *Fins and Skins.*

In March I attended the Atlantic Turfgrass Conference in Halifax. It was a great show with an excellent educational program. This year they added a one day sports field session which by all accounts was very well received. Thanks go out to Hugh Yorke, chairperson, for organizing the day and inviting the Sports Turf Association to be a part of it. It would be tough to beat Halifax's hospitality. If the opportunity ever arises, I would highly recommend attending this three day event.

Pam Charbonneau, Gord Dol, Dwayne McAllister and I participated in the second joint educational workshop with the Ontario Recreation Facilities Association in Clarington, which also was held in March. With close to 50 in attendance, the day was very interactive and informative. There are a large number of people who work the winter months in arenas then come out to maintain sports fields in the spring.

Our Annual Field Day promises to be exciting! This year the event will be held on August 15 at the Waterloo Recreation Complex and RIM Millennium Park. Keynote speaker will be Henry Waszczuk, ex-Hamilton Ti-Cat and host of television's *Fins and Skins*. The day also includes speaker sessions on the latest seed choices, fertilizing, irrigation and topdressing materials and techniques plus a session on worker orientation. The day books up quickly, so do not delay in registering. A registration brochure is included with this issue of *Sports Turf Manager*.




STA Director Dr. Bob Sheard's new book *Understanding Turf Management* is available through the STA office. Fill out the form below to order your copy.

For further information, please contact Lee Huether at 519-763-9431, email sta@gti.uoguelph.ca. Suppliers wishing to participate should also contact Lee.

Good luck with the summer ahead. Remember, if there is any information or advice the STA can provide, please contact us. See you at the Field Day in August! ♦

"Proactive people can carry their own weather with them. Whether it rains or shines makes no difference to them. Their values are stronger than their moods."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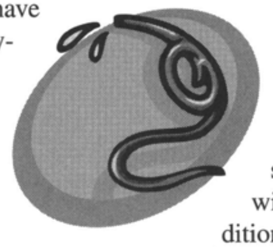
# Water Quality and Turfgrass

## THE IMPORTANCE OF A COMPLETE WATER QUALITY ANALYSIS

Not only is the quantity of irrigation water available for turf important but also the quality of the water. Most turf does not require the purity of water prescribed for in-house use. However, before using other sources of water, you should have a complete water quality analysis done. Some universities, private agricultural testing companies and water-testing laboratories offer water-quality analysis.



A water-quality analysis will indicate concentrations, in parts per million (ppm) or milligrams per litre (mg/l), of most of the substances listed in the adjacent table.

Private laboratory fees can be quite expensive per sample. Generally, an interpretation of the results is provided together with recommendations. You may request additional tests for heavy metals, such as aluminium and copper. It is also desirable to know concentrations of iron, manganese and total suspended solids (TSS) to assist you in designing appropriate filtration systems.

### Turfgrass Water Requirements

Turfgrasses consist of about 90% water by weight. It is an essential ingredient of all living cells. All nutrients taken into turfgrass roots from the soil are in solution. They are moved from roots to stems and leaves in solution and they function within all cells in solution. In addition, as water evaporates in spaces within the leaf, it cools the turf and its micro-environment. Eventually the water vapour diffuses out of the leaf through stomata, small pores spaced together on upper and lower surfaces.

Turfgrasses differ in both physical properties that influence water needs and physiological processes that determine water use. So, turfgrasses have a combination of structural and chemical characteristics that make them more or less efficient users of water as well as more or less drought tolerant. Naturally, the depth and extent of root development influences drought tolerance. A grass with a larger, more extensive and deeper root system has an increased volume of soil from which to obtain needed water. ♦

— *The Lawn Institute*

**WATER QUALITY ANALYSIS**

*Look for concentration levels of the following substances:*

Sodium (Na) • Phosphorous (P) Potassium (K) • Sulphate ( $SO_4$) Calcium (Ca) • Nitrate ($NO_3$) Magnesium (Mg) • Total Dissolved Salts (TDS) • Carbonate ($CO_3$) • Electrical Conductivity (EC) • Bicarbonate ($HCO_3$) Sodium Adsorption Ratio (SAR) Chloride (CL) • pH • Boron (B)

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# Irrigation Scheduling Principles: Tools for Dry Times

DR. KEN CAREY, RESEARCH ASSOCIATE, GTI AND THE ENVIRONMENTAL RESEARCH CENTRE

Climate change seems to be a fact of life. Whether or not it is due to global warming, parts of the world, including Ontario, have just come through two very warm, dry years with little likelihood of significant change in the near future. With the pressures of urbanization and demand on water in general, athletic fields share with society a prospect of a drier future. Many high schools no longer activate their irrigation systems. Keys to survival will include optimizing your irrigation decisions and keeping careful records of when, why, and how much irrigation water you are using. Whether you use a state-of-the-art computer assisted irrigation system, guns or raintrains or back-of-the-envelope calculations on a bowling green, a few basic principles of irrigation scheduling will give you a good grounding to help you develop and implement a successful water use plan.

## Water and Turfgrass Function

Turfgrasses are irrigated in summer in cool-season regions for a number of reasons, some having to do with the health and biology of the turf, and some with the function of the turf. The grass plants need water for most of their active metabolism and growth, taking up nutrients in solution from the soil and transpiring water in the course of photosynthesis. Turf managers need grass which is not dormant, tolerant to stresses such as traffic, and actively growing to maintain a playable surface and recover from injury – all of which requires water. Water is also important in the proper function of most management material such as fertilizers and pesticides.

## Irrigation Decision-Making

In practice, the decision to irrigate will take into account all of the reasons why turf needs water. The basic requirement will be to replace the water used by the plant and lost to the atmosphere in the course of its metabolism, referred to as evapotranspiration or ET. At the same time, the soil reservoir of water can be replenished so that water is maintained "in the bank." Turf which is stressed or recovering from damage may need extra irrigation. Syringing to control high temperatures or remove leaf wetness is an additional use of irrigation. Many management chemicals will also need to be watered in.

## Input Data and Decision Tools

The turf manager has a number of important sources of information to assist in irrigation scheduling. The better and more complete the information at your fingertips, the more successful your irrigation program will be. The first category is information about the water requirements for the different turf species being managed (creeping bentgrass vs. annual bluegrass vs. Kentucky bluegrass vs. fine fescues vs. fall fescues, etc.) as well as the effects of management regimes (fertility, height of cut) and season. This is probably the most difficult information to come up with precise values for, although rough estimates in mm of water per day are available for different species and they can be corrected, again very roughly, for management and season.

The second category is weather information, including insolation (sunlight), temperature, wind, relative humidity and precipitation. Records of past weather, current conditions and forecasts are all important in an irrigation program.

The third category of information is vital – records of your irrigation system. This includes not only how much water has been applied (preferably in terms of mm or inches rather than minutes) and when, but also an idea of how evenly your system delivers water to the turf.

The fourth category, good information about the rootzones that your turf is growing in, is one which is sometimes overlooked, but which is particularly important if you are scheduling irrigation on a water budget system. Soil texture, organic matter content, soil and root system depth, soil hydraulics and drainage will all affect how much water is available to the turf and how quickly a water deficit may develop.

The final special category of information is all the little peculiarities of your turf which lead to the need for "custom" irrigation. If localized dry spots or hydrophobic areas have developed due to underwatering or wet areas are present due to a spring or seep, you will need to fine tune your irrigation program to compensate.

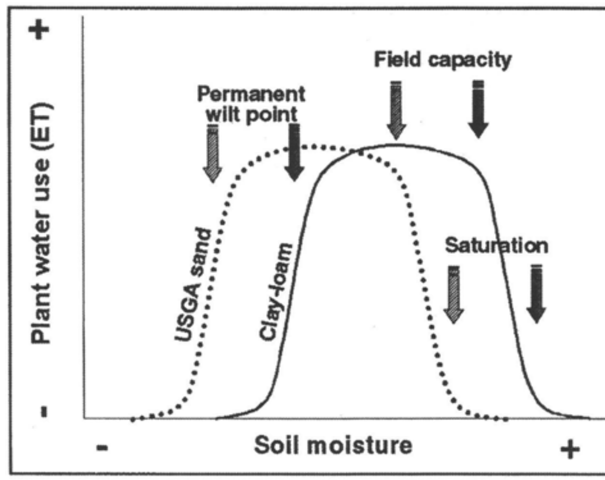



Figure 1. Relation between soil moisture and plant water use for two typical soils.

## Irrigation Scheduling Approaches

There are two approaches which are commonly taken to irrigation scheduling. They have some similarities and some important differences.

*Water deficit scheduling.* As the name suggests, this approach to irrigation primarily aims to deal with the deficit that turfgrass water use has produced, that is to replace the ET losses that have occurred. It relies heavily on estimates of the water use of the turf (mm/day) corrected for management, weather, time of year, etc. There are

**TABLE 1**

*Typical water balance features of two turf rootzones.*

1) USGA rootzone: 95% sand, 2% clay
   **Saturation**: 35% (water by volume)
   **Field Capacity**: 22%
   **Permanent wilt point**: 9%
   **Available water**: 13%
   In 30 cm of rootzone, 3.9 cm of available water.

2) Sandy loam soil: 50% sand, 15% clay
   **Saturation**: 45% (water by volume)
   **Field Capacity**: 23%
   **Permanent wilt point**: 11%
   **Available water**: 12%
   In 30 cm of rootzone, 3.6 cm of available water.

a number of very sophisticated computer models of ET which are used by some computer assisted irrigation systems and which integrate weather data with irrigation records to schedule applications to replace ET losses. Because this type of scheduling doesn't directly factor in the reservoir of water in the soil, it may lead to a tendency to overwater.

*Water budget scheduling.* This approach to irrigation scheduling is similar to water deficit systems in that the estimation of ET losses is calculated in the same way. However, the soil water is measured or estimated and the aim of the irrigation schedule in this type of system is not to replace ET losses directly, but to keep the soil water at an appropriate level.

Essentially the soil water is treated as a bank balance, with withdrawals (turf water use, evaporation, drainage) and deposits (irrigation, precipitation) recorded and irrigation applied to keep an appropriate balance at all times in the soil. Understanding the characteristics of the soil is critical to this approach. Figure 1 shows the relationship between soil water status and plant activity (ET) for two soil types. Regardless of the soil type, there is a water content level (saturation) when all soil pores are full of water. At this point, roots are shut down due to lack of oxygen and eventually the plant will die.

A normal soil will drain water until only capillary pores retain water, at which point the soil is at field capacity. Field capacity varies widely from soil to soil. Plant activity and water use is high and fairly uniform at water levels from field capacity down to the point at which the water that remains in the soil is too tightly bound to be available to the roots (permanent wilting point). The wilting point also varies widely from soil to soil – below the wilting point the plant will begin to shut down and, unless water is added, will eventually enter dormancy or die.

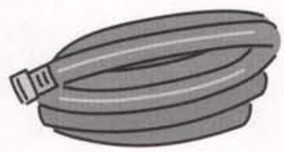
The trick to water budget scheduling is to be able to determine where the turf is on the scale between field capacity and wilting point, and at what point to irrigate back up to field capacity. Table 1 illustrates two typical turf rootzones and their characteristics in terms of water content at critical points.

**TABLE 2**

*Typical water budget calculations.*

| | |
|---|---|
| Soil water Day 0 | 15 mm |
| Deposits | |
| Irrigation | 0 |
| Rainfall | 6 mm |
| Withdrawals | |
| ET | 8 mm |
| Drainage | 0 |
| Runoff | 0 |
| Balance Day 1 | 13 mm |

Irrigation to field capacity (30 mm) will require 17 mm of water.



With the pressure of urbanization and demand on water in general, athletic fields share with society a prospect of a drier future.

We have been doing some research into water budget scheduling at the GTI. The typical budgeting is a day to day process as illustrated in Table 2. ET is estimated by a simple model from weather data and rainfall and irrigation inputs are recorded. The first experiments set the threshold to irrigate when soil water fell halfway between wilting point and field capacity. The budgeting approach was applied to several types of turf (creeping bentgrass greens, Kentucky bluegrass sports turf) on different rootzones.

A few interesting points have emerged:

- Water budget irrigation can significantly decrease the amount of water used to maintain some types of turf (by as much as 25% in Kentucky bluegrass sports turf in our simple experiment).
- We still need to improve our ability to identify the permanent wilting point, especially for lower maintenance turf – the bluegrass continued to grow without drought stress and the soil retained moisture long after the model predicted.
- Water budget irrigation needs to be used with care on sand rootzones on athletic fields. Because there is a tendency to underwater, the rootzone dries down more between irrigation cycles and localized dry spot may develop or worsen.

This research is ongoing. The future definitely holds a prospect of ever more careful use of irrigation water. The key to successful and responsible irrigation will be complete data and records about the components of the system (soil, turf, weather, irrigation) and an understanding of the principles of irrigation scheduling. ♦

*— Green is Beautiful, June 2000*

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# Bio-Engineering of Sports Turf Seed

LISA LEE, ERIC NELSON AND BOB HARRIMAN, THE SCOTTS COMPANY, USA

Turfgrass enhanced through biotechnology will soon be commercially available. The first wave of products that are set to radically change management practices for sports fields and golf courses are now making their way through development and regulatory review. This article was first published in *Stadia* magazine, January 2001, Issue 7.

Science and technology are providing us with wonderful opportunities to enrich our lives and improve the environment. It was through the continuous discovery of the basic elements of chemistry, physics and biology that impressive advances in technology have occurred. Is such a bright future in store for the common blades of grass that comprise our sports fields, golf courses, parks and lawns?

Grasses are too important and the needs are too great for us not to utilize the best advances in technology for turfgrass improvement. Biotechnology has contributed exciting new opportunities to improve turfgrass.

Turfgrass may be common but the positive impact it has on the environment and human health is anything but. Turfgrasses provide many functional, recreational, aesthetic and environmental benefits. For example, turfgrass helps reduce soil erosion and agricultural runoff and it absorbs carbon dioxide and ozone while at the same time releasing life-sustaining oxygen. Turfgrasses trap an estimated 12 million tons of dust each year and an average lawn has the cooling effect of about 10 tons of air conditioning.

Many outdoor sports and recreational activities utilize turfgrasses, including baseball, cricket, football, golf, soccer, softball, track and field, and volleyball. The surface on which the game is played contributes a great deal to the outcome of the contest, the safety of the players and the aesthetic enjoyment of the fans.

Turfgrass provides resiliency and durability that add to the quality of play as well as to the safety of the players. Natural turf provides good traction between the ground and the shoe sole. This means safe footing on sports fields, home lawns and playgrounds. In addition, turfgrass is cooler than artificial surfaces, thus it is more comfortable to play on. Injuries on natural grass and well-maintained playing fields are fewer and less severe than on other surfaces.

### Plant Biotechnology at Work

There have been many technological advancements in biology in recent decades that have been pivotal to the research into the genetic engineering of sports turf seed today. Although the structure of DNA was determined in 1953, the first transgenic plant was not developed until 1984. The world had to wait another 10 years to witness the release of the first plant enhanced by biotechnology.

So how does plant biotechnology work? Simply put, it is a three step process. The first is to develop an information-containing DNA cassette. This must be inserted into a single cell before it is grown into a whole new plant.

Three major components are present in a DNA cassette. At the beginning of the cassette, a promoter sequence is needed to instruct when, where and how much of the gene is expressed. The next DNA segment comprises the functional gene that delivers the trait, and finally, at the end of the cassette, a stop sequence is required to provide signals to end the gene expression. To introduce a DNA cassette into a single cell, state-of-the-art gene insertion technologies such as gene gun, protoplast transformation and Agrobacterium transformation are commonly used to produce biotechnology enhanced plants.

After the DNA cassette is inserted into the chromosome of a single cell, the growth of cells that did not incorporate the DNA cassette are selected against, while the cell with the new DNA is nurtured in tissue culture until a whole plant is generated. Only plants that show the influence of newly inserted information and good agronomic performance are advanced to future development and possible commercialization.

Turfgrass management is under constant pressure from biotic stresses such as weeds, insects, fungi and bacteria, and abiotic stresses such as heat, cold and drought. By protecting turfgrass from such

**EARLY TRIALS OF HERBICIDE TOLERANT TURFGRASS**

Herbicide tolerant creeping bentgrass callus is growing into a whole new plant in tissue culture.

Herbicide tolerant creeping bentgrass, unaffected by herbicide spray, continues healthy growth while the control creeping bentgrass is killed.

Herbicide tolerant Kentucky bluegrass continues healthy growth after herbicide spray has killed the control Kentucky bluegrass in a greenhouse.

stresses, it is possible to increase the health and performance of sports fields and golf courses.

Turfgrass biotechnology can produce transgenic plants with desirable traits to improve management practices. The tools are in place and development experts are busy at work. But what will be the first enhanced product?

### Herbicide Tolerant Creeping Grass

The first turfgrass product enhanced by biotechnology is likely to be herbicide tolerant creeping bentgrass (*Agrostis stolonifera*). Over 10,000 golf courses in the US use creeping bentgrass for their greens and/or tees and fairways. Effective weed control against the grass weeds *Poa annua* and Poa *trivialis* is not currently available. By introducing the glyphosate resistant gene into creeping bentgrass, a golf course superintendent may eliminate a severe problem by simply spraying the environmentally safe herbicide Roundup®.

Roundup, the brand name for glyphosate, is a broad-spectrum, nonselective, post emergent, systemic herbicide that offers users weed control of essentially all annual and perennial plants. It has been the preferred herbicide since its first introduction in 1974 because of its effectiveness. The mode of action of glyphosate is to inhibit the enzyme EPSP (5-enolpyruvoyl-shikimate 3-phosphate) synthase and prevent plants from manufacturing three essential aromatic amino acids. Animals and humans obtain these amino acids through their diet and do not use this enzyme, thus providing a basis for specific selective toxicity only to plant species. In addition to glyphosate's highly specific mode of action, it does not persist in the environment nor bioaccumulate in the food chain. Glyphosate is essentially immobile in almost all types of soils, where it is degraded by naturally occurring microbes.

The gene gun technology has been successfully used to introduce glyphosate resistance into turfgrasses. Glyphosate resistant turfgrass should provide a useful tool for controlling unwanted weed grass species, such as *Poa annua*, in the turfgrass of sports fields, golf course putting greens and fairways. When weeds occur in these areas, a quick herbicide spray will kill the weeds but not the glyphosate-resistant turfgrass. This useful tool will simplify turfgrass management practices and reduce the use of other herbicides. It will create a healthy stand of turfgrass with less environmental impact.

The use of herbicide-tolerant creeping bentgrass can, for instance, positively impact on current golf course management practices by:

- Offering golf course superintendents the ability to selectively control weeds which currently cannot be controlled in creeping bentgrass, such as *Poa trivialis*, *Poa annua*, quackgrass, velvetgrass, kikuyugrass and bermudagrass;
- Providing improved turf management, resulting in higher uniformity and quality of turf with increased aesthetics and playability;
- Allowing the use of an environmentally acceptable herbicide that also reduces workers' exposure to the more toxic herbicides;


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- Reducing herbicide usage through the increased flexibility to treat only as needed for weeds;
- Reducing fungicide, insecticide, water and fertilizer usage through the elimination of *Poa annua* and *Poa trivialis*;
- Eliminating the need for growth regulators to control *Poa annua*.

### Regulatory Review Process

Before the benefits from products enhanced through biotechnology can be enjoyed, they must be vigorously examined and pass a thorough review by the Environmental Protection Agency and the US Department of Agriculture. The process can be summarized by addressing the following five issues:

- To determine that the product exhibits no plant pathogenic properties;
- To show that the product is no more likely to become a weed pest than traditional breed varieties;
- To prove that the product is unlikely to increase the weediness potential for any other cultivated plant or native wild species with which the product could interbreed;
- To ensure that the product is unlikely to cause damage to processed agricultural commodities;
- To show that the product is unlikely to harm organisms beneficial to farming and agriculture.

Data to address the topics above is developed over several years and in multiple locations. The analysis determines if the enhanced turfgrass is substantially equivalent (except for the introduced trait) to other turfgrass cultivars currently on the market. Herbicide tolerant creeping bentgrass is currently being examined with over 50 tests in 19 states by scientists from several disciplines and universities. This product may reach the sports market as early as 2003, dependent upon additional product testing and review by the regulatory agencies.

### Better Turfgrass for Sports

Over 90 field test notifications have been acknowledged by the US Department of Agriculture APHIS since 1994. While most of the activity is focused on creeping bentgrass (75 notifications), a growing number of notifications are being submitted for Kentucky bluegrass (14 notifications), bermudagrass (2 notifications), tall fescue (2 notifications), and perennial ryegrass (1 notification). The traits being studied include herbicide resistance, modified growth rate, fungal disease resistance, drought tolerance and salt tolerance.

It is possible that one day soon, there will be a well-maintained stand of turfgrass that needs less watering, less fertilization, less mowing and no supplemental protection from insects or disease. The continued activity of turfgrass scientists, combined with the growing knowledge of gene function, provide great promise for impressive advances in turfgrass biotechnology to provide these valuable management tools. In addition to golf courses benefitting from these improvements, in five to 10 years biotechnology enhanced turfgrasses could provide a broad spectrum of impact on other sport turf fields such as football, soccer or baseball fields, or wherever natural turfgrass is used. ♦

*Lisa Lee, Ph.D. is senior scientist in Genetic Engineering, Eric Nelson, Ph.D. is senior scientist in Seed Development and Production and Bob Harriman, Ph.D. is vice president of Technology Development at The Scotts Company, one of the leading worldwide suppliers of professional turf management products.*

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