Turf Jargon

Soil Science Terminology from A-Z.

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There are many strange-sounding words used in the world of sports turf. Although most of these words may have originated from the 'Ivory Towers,' they often end up as commonly used lingo amongst practitioners. To ensure we are all speaking the same language, and as a means of refreshing our understanding of sports turf terminology, we will attempt in this article to define some of the more commonly used scientific terms.

Acids. Ions which lower the soil pH, such as hydrogen (H^+) and aluminium (Al^{3+}).

Acid soil. A soil with a pH below neutral (neutral pH = 7.0). Most turf soils are somewhat acidic.

Alkaline soil. A soil with a high pH, above pH 7.

Anaerobic soil. A soil lacking in oxygen. Under such conditions only some species of organisms, such as anaerobic bacteria, can function. Anaerobic soils often appear discoloured (mottled) and have a pungent (rotten eggs) odour.

Anion. A negatively charged ion or nutrient, such as chloride (Cl^-) and nitrate (NO_3^-)

Air-filled porosity. The proportion of a soil's volume that is filled with air at a given time; a low air-filled porosity indicates poor aeration and restricted drainage.

Amendment. Any substance added to a soil/sand medium for the purpose of altering the soil characteristics (e.g. peat or gypsum).

Base. Ions which raise the soil pH, such as calcium (Ca^{2+}) and magnesium (Mg^{2+}).

Base saturation. The extent to which the nutrient holding sites in a soil are occupied (saturated) by bases. Usually expressed as a percentage of the total cation exchange capacity. Total Base Saturation = Ca + Mg + K + Na/CEC.

Bulk density (soil). The mass (weight) of dry soil per unit volume of soil. A high bulk density generally means less pore space.

Calcareous soil. A soil with a high calcium carbonate level. These soils usually have a high pH that is difficult to lower.

Calcined clay. Clay/soil minerals that have been 'fired' at high temperatures to produce stable, granular particles.

Cations. Any positively charged nutrient, such as potassium (K^+), calcium (Ca^{2+}) or magnesium (Mg^{2+}).

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Cation Exchange Capacity (CEC). A measure of the exchangeable (potentially plant available) cations that a soil can hold against leaching. Sands typically have a low CEC, which means they have only a small nutrient supply store. CEC is generally expressed in milli equivalents per 100g of soil.

Cleavage plane. (*Sorry to disappoint here...*) A separation layer in a soil, often resulting from using topdressing material of different texture to the base soil.

Field capacity. The amount of water held in a soil at the point where drainage ceases; represents the upper limit of water available to the plant.

Gleying. The development of greyish colours and reddish stains (mottles) under anaerobic (poor drainage) soil conditions.

Humus. The stable organic fraction in a soil; it is an advanced stage of decomposition and is unrecognisable as being of plant origin.


Infiltrometer

Infiltration rate. The rate at which water enters the soil surface. The rate of infiltration can be measured using an infiltrometer.

Leaching. The removal of nutrients and other materials through the soil in drainage water.

Loam. A textural class of soil which has a relatively similar sand, silt and clay content, such that no one fraction dominates.

Macronutrient. A chemical (e.g. N or P) that is used in relatively large amounts (usually >500 ppm in a plant).

Mat. A tightly intermingled layer of roots, stems and other living and dead plant material at or near the surface.


Mat

Micronutrient. A chemical (e.g. Cu, Fe) that is used in very small amounts (<50 ppm in a plant).

Mineralisation. The conversion of an element from an organic form to an inorganic state, as part of microbial breakdown.

Mycorrhiza. Literally means "fungus root" and is a specific fungi associated with the roots of certain plants.

Nitrification. The biological oxidation of inorganic nitrogen (as ammonium) to form nitrate nitrogen ($NO_3 - N$). An important process in the production of plant available nitrogen.

Nitrogen and nitrogen cycle. Nitrogen is the most significant nutrient in the turf system; there are different forms of nitrogen in a soil system, including nitrate, ammonium and organic nitrogen forms. The nitrogen cycle refers to the changes that occur with the form of nitrogen as it moves between the soil, plant and atmosphere.

Nutrient. A substance required and taken up by the plant (or any other organism) for growth, such as the essential elements (N, P K, S, etc.).

Organic matter. Any matter in the soil system that is in the organic form, generally arising from the debris of plants or animal residues. Thatch and mat are major components of soil organic matter in turf systems.

Organisms. The living fraction in a soil, including fungi, bacteria, actinomycetes and larger groups such as earthworms.

Pan. Any layer or horizon in the soil that impedes downward movement of water, air or root development. Pans can be created naturally with fine-textured or layered profiles, or can be artificially created, such as cultivation or core pans.

Parent material. The relatively unaltered substrate located below the sub-soil from which the soil profile has developed by weathering and other processes.

Peat. A soil high in undecomposed (or slightly decomposed) organic matter, which accumulates under conditions of excessive moisture (no air for microbial activity and organic breakdown).

Ped. A soil aggregate or unit of soil structure (e.g. crumb nut or block).

Percolation. Another term for drainage, or the downward movement of free water through the soil profile.

Permeability. The ease with which water, air and plant roots can move down through the soil profile. Is a more subjective term for drainage than "hydraulic conductivity."

PH. A measure of the amount of hydrogen (H^+) ions in a soil, which in turn determines soil acidity or alkalinity.

Pores. The holes or voids in a soil that give rise to the soil drainage (macropores) and water retention (micropores) characteristics.

Porosity. The percentage volume of a soil that is not occupied by solid particles (will be occupied by water or air).

Rhizobia. Bacteria able to live symbiotically (in a mutually beneficial relationship) with roots of legumes and which are capable of using ("fixing") atmospheric nitrogen.

Rhizosphere. The biologically active zone of soil containing the bulk of plant roots and soil microorganisms.

Saline soil. A soil with a high soluble salts level. Under such conditions plants struggle to extract water and as such suffer "dry wilt."

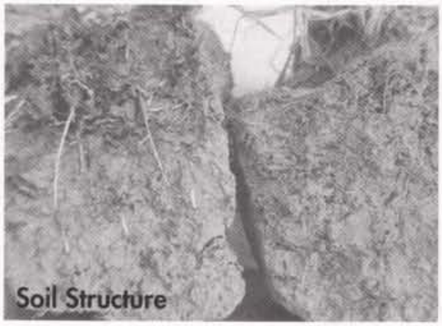
Self-mulching soil. A soil that when re-wetted tends to swell and break down to defined, stable aggregates. Applicable to clay soils and is relevant to cricket clay selection.

Sodic soil. A soil with a high sodium (Na^+) level relative to the level of divalent (++) cations, such that plant growth (and soil drainage rate) is impaired.

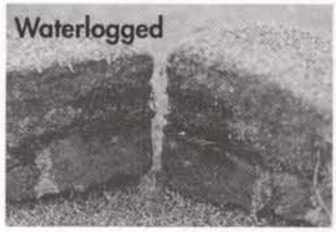
Sodium Absorption Ratio (SAR). An index to express the relationship between the level of sodium ions and the divalent cations in a soil..

$$SAR = \frac{\sqrt{Na}}{Ca+Mg}$$

Structure (soil). How the individual soil particles are bound together to form aggregates or peds. Structure is described in terms of aggregate shape, size and strength (e.g. moderately developed, fine crumb).


Soil Structure

Texture (soil). The relative proportions of particle sizes (sand, silt or clay) in a soil sample (e.g. silt loam, fine sandy loam).


Waterlogged

Tensiometer. A device for measuring the availability of soil water (or matric potential). It consists of a porous ceramic cup connected to a vacuum gauge.

Tilth. The physical condition of a soil as it relates to the ease of tillage (cultivation) and the impedance to seedling emergence.

Trace elements. Another term for micronutrients, or essential nutrients used in only small quantities by the plant.

Transpiration. Loss of water by the plant to the atmosphere via the stomata in the leaf.

Waterlogging. Excessive soil moisture to the point where the soil tends to an anaerobic condition.

Weathering. The aging of a rock or soil by natural processes, such as wind, rain and microbial activity.

Wilting point. The soil moisture content at which the plant starts showing symptoms of moisture stress. ♦

— Keith McAuliffe, CEO, NZ Sports Turf Institute, Palmerston North

Acknowledgement

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INDUSTRY PRESS RELEASES

NEWS FROM ZANDER, G.C. DUKE, MOUNTAINVIEW AND HUNTER

Zander Merges With M. Smilsky

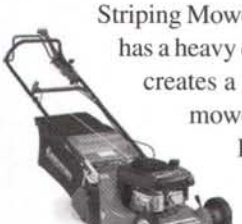
Zander Sod Co. Limited, Kettleby, Ontario, is pleased to announce its recent merger with M. Smilsky Limited of Cookstown, Ontario. Larry and Jim Smilsky, owners and operators of M. Smilsky Limited over the past 50 years, have contributed greatly to the sod industry and the community and plan on semi-retiring after the transition.

Zander Sod Co. Limited, with the addition of the Smilsky employees, acreages and equipment, will become the area's largest sod producer and distributor of Kentucky Bluegrass and golf course specialty grasses.

Both Zander Sod Co. Limited and M. Smilsky Limited were founded on the basis of supplying top quality products with excellent customer service. Through the transition and afterward, we will continue this tradition of ensuring that our customers are highly satisfied. For more information, visit www.zandersod.com.

Eastman 21" Infield Striping Mower Available From G.C. Duke Equipment

For beautiful striping, get the Eastman Model ST21K Self Propelled Rotary Striping Mower. This Eastman mower has a heavy duty steel rear roller that creates a 21" striping effect. The mower is powered by a 6 hp Kawasaki engine and has a shaft driven transmission. Standard with the unit is an "easy lift" 2.1 bushel nylon mesh grass catcher. This mower features blade brake assist and vacuum fan assist for superb cutting and collection. High lift steel blades adjust to seven positions providing 1/2" to 3" height of cut. Contact G.C. Duke Equipment Ltd. for more information at 905-637-5216, www.gcduke.com.



New Products From Mountainview

Mountainview is proud to offer a technology that uses *only super heated water* to non-selectively eradicate unwelcome vegetation. The extreme heat of the water immediately destroys the cellular structure in the vegetation *killing the plant on contact.*

The AQUACIDE™ process of vegetation control provides a dependable alternative to chemical herbicides while keeping in mind concerns for human and environmental safety with non-chemical vegetation management process. Available to buy or rent with or without operators.

New to the Mountainview fleet is 4700 XL Cherrington Beach Cleaner / Soil Screener. Our machine screens 6" deep and is perfect to remove lake weeds, dangerous debris, medical waste, glass, rocks and shells, litter, trash, animal droppings… even cigarette butts! Give your beach patrons a safe and pleasing recreational experience they'll tell their friends about! Screens fields or rocks and debris before seeding. A must for horse racetracks.

Lastly, Mountainview is now the proud distributor of Wiedenmann deep tine aerators. Wiedenmann has a complete line of aeration equipment. The extreme ruggedness and the innovative designs of the Wiedenmann machines guarantee a permanent and economic operation. Available to buy or on a custom work basis with operator.

Want to know more? Visit our website at mountainviewturf.com or call us toll free at 1.800.260.5922.

Hunter expands its legendary I-25 and I-40 rotor lines with new 6-inch models

As the market leader in worldwide sales of rotary sprinklers, Hunter Industries is expanding its legendary line by offering new six-inch models of its I-25 and I-40 rotors, offering a taller pop-up height for effective and efficient watering of landscapes with higher turf heights.

These new models, which provide all the features that have made Hunter's pop-up rotors the industry's best sellers, were introduced at the 26th Annual International Irrigation Show in Phoenix.

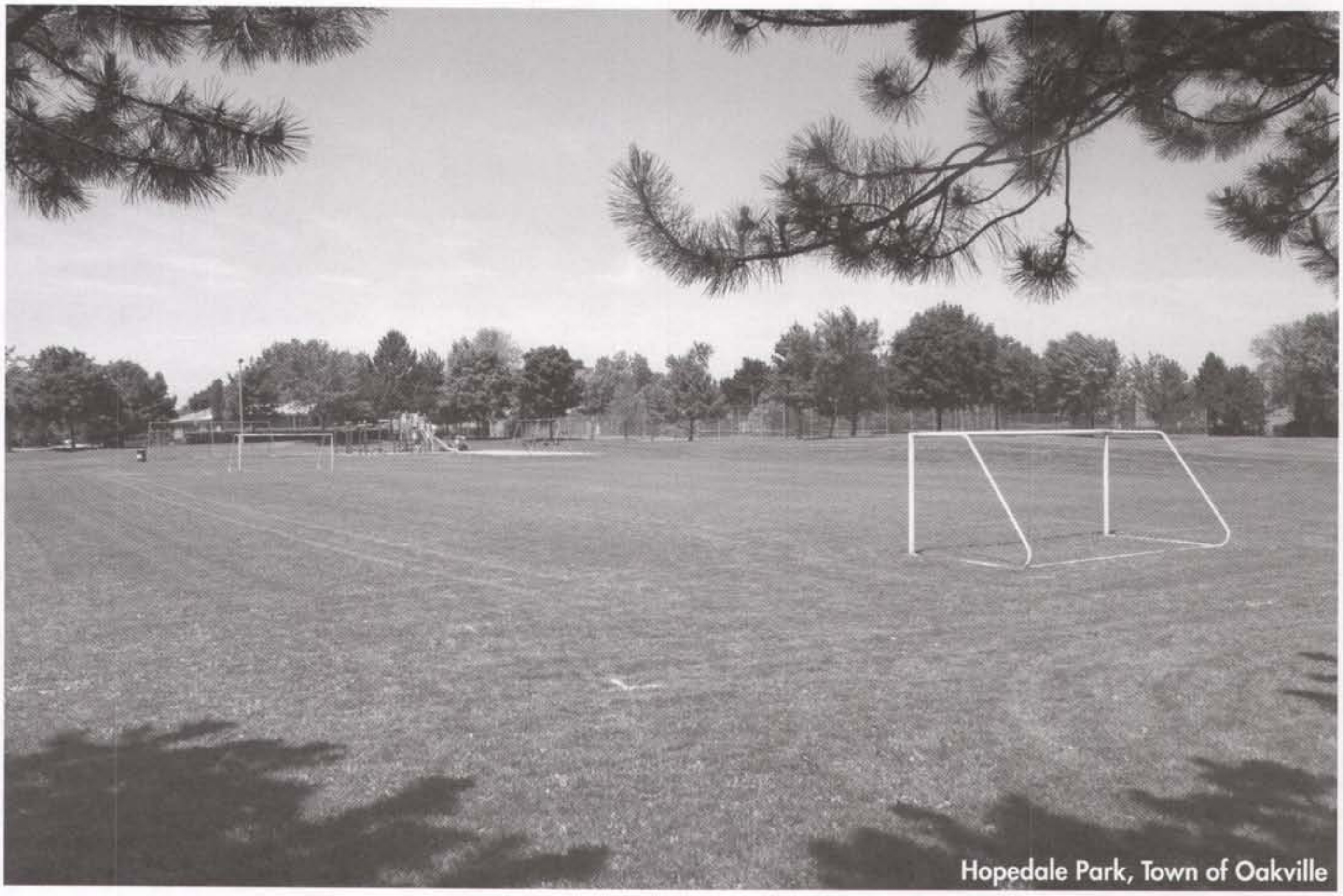
The new, tall pop-up versions are the perfect choice for grounds superintendents and athletic field managers who are now keeping their mow heights higher to promote stronger turf growth, especially throughout higher-temperature regions.

The addition of the new six-inch versions to the I-25 commercial-duty rotor and I-40 heavy-duty rotor portfolios join like sizes already offered in the PGJ and I-20 rotor, and the Pro-Spray and Institutional Spray lines.

The new six-inch versions have the same durable construction that has made the I-25 and I-40 the rotors of choice at sports complexes, parks, and campuses all over the world. Other notable features include:

- The ProTech™ safety system, with a small exposed cushioned rubber cover and boot to keep play areas safe, by keeping hard plastic away from the playing surface.
- Heavy-duty ribbed cap and body, to withstand tough turf traffic.
- Proven water-lubricated gear-drive, for years of service across a wide operating range.
- Factory-installed drain check valve, to save water and reduce liability.
- Optional opposing dual nozzles, a Hunter exclusive (standard on I40-36S-ON).
- Stainless steel riser, extends sprinkler life in coarse soils and provides a deterrent against sprinkler vandalism (standard on I-40, optional on I-25).
- Patented VStat® self-adjusting stator and heavy-duty retraction spring, for added dependability and durability.

Hunter is one of the world's leading manufacturers of irrigation equipment for landscape and golf. For more info, contact your local authorized Hunter distributor or visit www.HunterIndustries.com. ♦



Hopedale Park, Town of Oakville

ONTARIO Turfgrass SYMPOSIUM

Competitive Turf: Overseeding for Weed Management

EVAN ELFORD, M.SC. CANDIDATE, DEPARTMENT OF PLANT AGRICULTURE, UNIVERSITY OF GUELPH

Weed management on athletic fields and in municipal parks is becoming increasingly important as traditional weed control measures, such as herbicides, become unavailable due to municipal legislation and changing public perception. Currently, 90 municipalities in Canada have banned or restricted the use of herbicides affecting over 8 million Canadians. Turfgrass managers must turn to cultural practices and optimise their efficacy to develop an effective integrated pest management (IPM) program that decreases or eliminates the need for herbicides. IPM programs with a focus on weed management are important in delivering a good quality and safe playing surface for user groups.

Overseeding, the practise of seeding a desirable turf species into an established turfgrass stand, is typically used to fill in bare areas and stabilize soil to create a uniform playing surface for athletes. Current overseeding practices typically use perennial ryegrass and Kentucky bluegrass to create a vigorous, wear tolerant playing surface. However, due to time restrictions and increased use of facilities, the potential to manipulate overseeding for weed suppression is not being realised. Research aimed at optimising overseeding as a weed management tool is currently under investigation at the University of Guelph. Thanks to funding by the Ontario Turfgrass Research Foundation (OTRF), NSERC and partnerships with the Municipality of Oakville and Pickseed Canada Inc., a total of seven field trials have been implemented at the Guelph Turfgrass Institute, the University of Guelph, and in the Municipality of Oakville.

Perennial ryegrass overseeding into pre-existing Kentucky bluegrass is being evaluated under low and high-use conditions and in non-irrigated and irrigated situations. Perennial ryegrass is quick to germinate and establish which is important when competing with weed species for light, water, nutrients and space. All plants compete for these four main elements and overseeding encourages a desirable turfgrass species to compete and establish as opposed to undesirable weed species.

The trials include evaluating three different rates of overseeding at 2, 4 and 8 kg/100 m^2 in all combinations with overseeding timing of May, July and September. Weed species are evaluated in each plot in May before treatments are applied, and re-evaluated in June, August and October. The predominant weed species documented during the 2005 season were perennials which included dandelion, clover, broadleaf plantain and narrow-leaf plantain. Kentucky bluegrass and perennial ryegrass populations are also being monitored for the duration of the study to examine the effects of overseeding on the turfgrass stand. One field season has been completed to date and preliminary results indicate that overseeding in both the spring and fall at any of the tested rates assists in reducing weed populations. The study will continue in the 2006 growing season.

Overseeding investigations are essential in determining the best management practices for an IPM system. Through the investigation of the appropriate application timing and rates, overseeding, in addition to fertility and mowing frequency, will provide an alternative form of weed management to decrease herbicide use while maintaining a safe playing surface for athletes. ♦

Spring Overseeding at the GTI

Municipal Integrated Pest Management Lawn Demonstration Project

FINAL REPORT OF 3-YEAR STUDY SPONSORED BY THE ONTARIO PESTICIDE ADVISORY COMMITTEE

Objectives

1. To demonstrate the impact of conventional lawn care, IPM, no-pesticide and alternative herbicides on turf quality and pest infestations.

2. To document the results of maintaining turf without pesticides for a three year period.

Study Description

This study began in 2003 and continued on the same plot areas in 2004 and 2005. The study was established in three municipal settings: Guelph, Brantford and London. At Guelph, the plots were located at the Guelph Turfgrass Institute (GTI). There were 32 plots, 9x5.5 m each, with a total demonstration area of 1584 m^2 (Figure 1). There were four management programs and they include: conventional, IPM, alternatives and no pesticides. The conventional approach used pesticides exclusively for pest control (total of 6 applications). IPM plots were monitored for pests and treated with pesticides when thresholds were exceeded. The alternative management program used organic pesticides (corn gluten meal and Nature's Weed and Feed – beet juice extract in year 1 and 2 and Juicy Lawn in year 3) for weed control. Lastly, no pesticides were applied under the no-pesticide management program.

At Brantford, the plots were located at the Glenhyrst Art Gallery, near the Grand River. There were three management programs and they are as follows: conventional, IPM and no-pesticides. There were 24 plots, 7x5 m each, with a total demonstration area of 840 m^2. In London, the plots were located at Watson Park, near the Thames River. There were two management programs, IPM and no-pesticides, and the study consisted of 16 plots, 10x4.5 m each, with a total demonstration area of 720 m^2.

In all three municipal settings, the demonstration trials were set up on established, predominantly Kentucky bluegrass turf with an existing moderate level of weed infestation. The plots of each demonstration trial were divided into four lawn care management programs: conventional, IPM, alternative and no-pesticide. Within each management program, the plots were subdivided into three superimposed treatments including fertility (2.0 kg/100 m^2 of nitrogen annually vs. no fertilizer), mowing height (4 cm vs. 8 cm) and irrigation vs. no irrigation. The purpose was to demonstrate the effect that these treat-

Figure 1. Plot plan at the Guelph Turfgrass Institute, Guelph.

Irrigated 4 cm mowing height		Irrigated 8 cm mowing height	
Fertility	**No Fertility**	**Fertility**	**No Fertility**
Conventional IPM Alternative No Pesticides	Conventional IPM Alternative No Pesticides	Conventional IPM Alternative No Pesticides	Conventional IPM Alternative No Pesticides
Non-Irrigated 4 cm mowing height		**Non-Irrigated 8 cm mowing height**	
Fertility	**No Fertility**	**Fertility**	**No Fertility**
Conventional IPM Alternative No Pesticides	Conventional IPM Alternative No Pesticides	Conventional IPM Alternative No Pesticides	Conventional IPM Alternative No Pesticides

Figure 2. Influence of lawn care management on turf quality at GTI in 2003, 2004 and 2005.

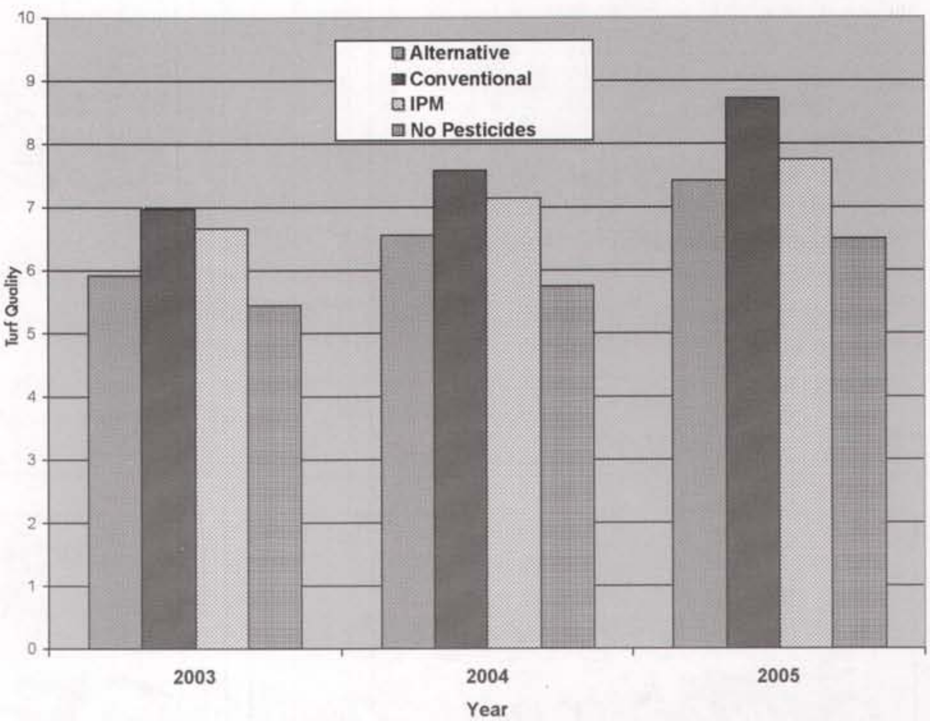
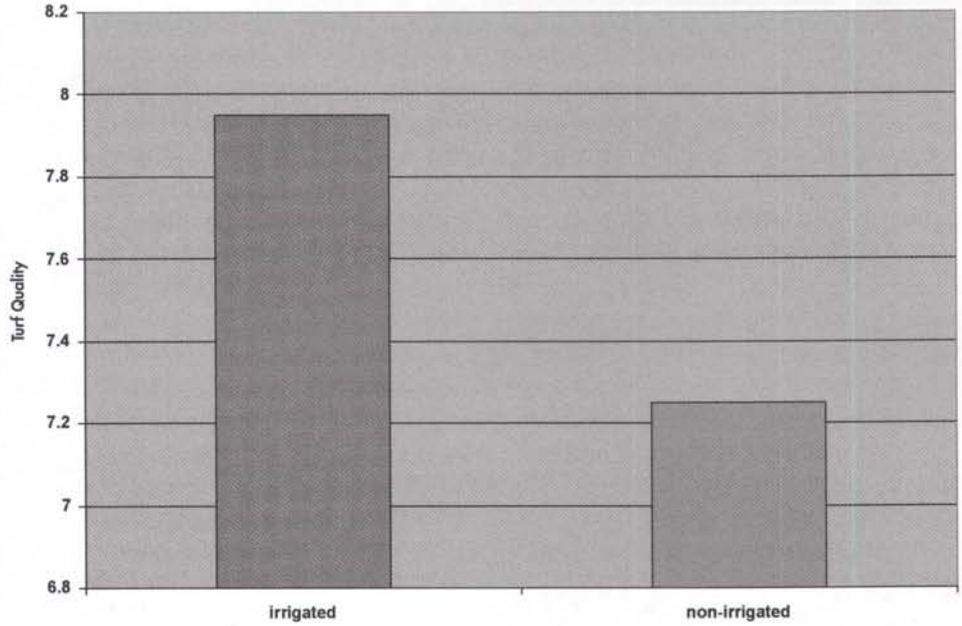


Figure 3. Effect of irrigation on turf quality at GTI, 2005.



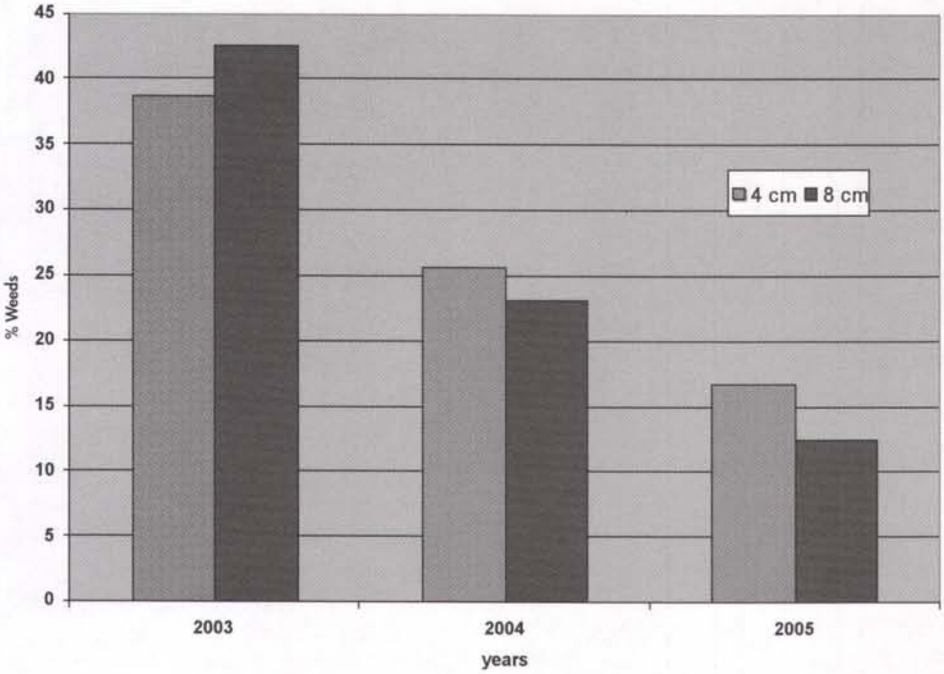
ments had on turf quality and pest levels. The amount of irrigation was based on rainfall values. If less than 2.5 cm of rain fell per week, the plots received irrigation to make up the deficit. However, due to the large amount of rainfall in 2003 and 2004, almost no irrigation was necessary and we were unable to demonstrate irrigation versus non-irrigation effects. For those two years, the irrigation and non-irrigation plot data were combined. In 2005, there were several weeks at each location that did not receive 2.5 cm of rain and irrigation was necessary. The trial started at all three locations at the beginning of June and continued until mid-November in all three years. Visual ratings and mowing were carried out weekly while the application of fertilizers, the monitoring of pests, and the application of pest control were carried out according to each of the four management programs and their superimposed treatments. The schedules of pest monitoring, treatments, pest monitoring techniques and amount of time spent monitoring is summarized in previous articles in the *Sports Turf Manager* (Summer 2004, Spring 2005 and Winter 2005). Results at all three sites were very similar. Results from GTI are presented here in an effort to save space. The full report will be available on line this spring at www.gti.uoguelph.ca/OPAC. In addition, it must be noted that this trial was for demonstration purposes only and was not set up to be analysed statistically.

Results – Guelph Turfgrass Institute

Turf Quality

The turf quality was consistently highest in the conventional plots, followed closely by the IPM plots, alternative plots and the lowest quality was consistently in the no-pesticide plots (Figure 2). Over the duration of this study, the quality of all

Figure 4. Influence of mowing height on broadleaf weed infestation at GTI, 2003, 2004 and 2005



management types increased with each successive year. There was very little effect of mowing height on turf quality over the three years of the study. The lower mowing height resulted in a slightly denser turf. There was a slightly larger effect of fertility on turf quality. The fertilizer treatment had an effect on turf density and colour which are two of the three parameters which are averaged to come up with turf quality. Uniformity is the third parameter that was measured and these three are averaged to determine an overall turf quality rating.

In 2005, we were able to demonstrate the influence of irrigation on turf quality (Figure 3). The overall quality of the irrigated plots was higher than the non-irrigated plots. The non-irrigated plots were fully dormant during June and early July.

Broadleaf Weeds

To determine the influence of mowing height, fertility and the alternative herbicide products on broadleaf weed infestation, only the no-pesticide and alternative plots were considered because both the conventional and IPM plots received broadleaf herbicides to control the weeds. Mowing height had a small effect on the percent broadleaf weed cover but it had less of an effect than fertility (Figure 4 and

Figure 5. Influence of fertility on broadleaf weed infestation at GTI, 2003, 2004 and 2005.

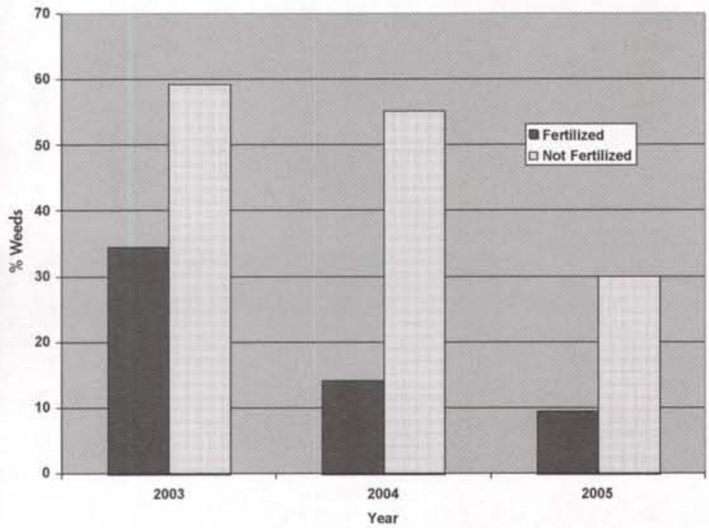
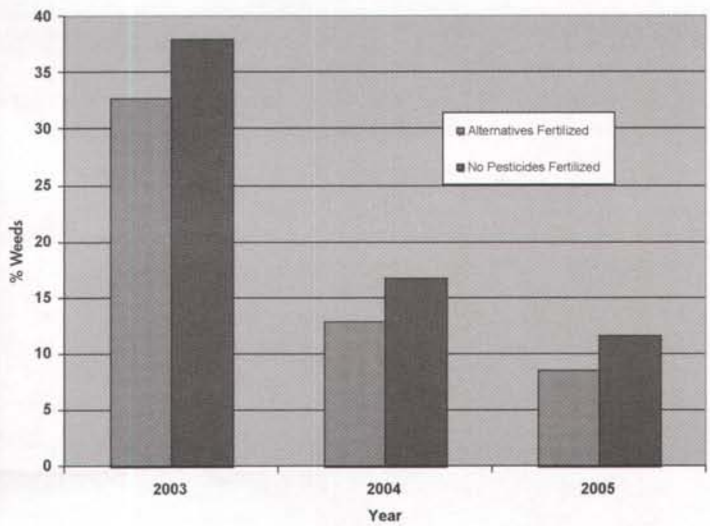


Figure 6. Effect of alternative herbicide treatments vs. fertility alone on broadleaf weed infestation at GTI, 2003, 2004 and 2005.



5). There were slightly more broadleaf weeds at the higher mowing height in 2003 and slightly fewer broadleaf weeds at the lower mowing height in 2004 and 2005. With the addition of 2.0 kg of nitrogen per season in 2004 and 2005, we were able to keep the broadleaf weed cover below the OMAFRA threshold of 10-15%. At this level of weed infestation, spot treatments alone can be used.

A comparison was made of the alternative plots and the no-pesticide fertilized plots (Figure 6). The purpose of this comparison was to separate the fertility effect of the alternative herbicide treatments (corn gluten meal contains 8% nitrogen and the beet juice extract products, Nature's Weed and Feed and Juicy Lawn, contain 7% and 15% nitrogen respectively) from the herbicidal effects. There was a slight reduction in percent broadleaf weed cover consistently each year with the combination of corn gluten meal and beet juice extract treatments. Because of the trial design, we are unable to determine which of these two treat-