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Turfgrass

MANAGEMENT

WETTING AGENTS
WORLD CUP GOLF
FROM STORMIN' TO NORMAN

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Melbourne Exhibition Center, venue of the Millennium Turfgrass Conference



special features

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There are a range of different wetting agents now available to turf managers. In this article John Illingworth discusses their chemistry and characteristics which should help you make the right choice.

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Remember the dramatic pictures of hail damage sustained at the Lakes Golf Course, featured in Volume 1.3 of ATM? Well, that was 10 months ago. Early this month, The Lakes played host to the Greg Norman Holden Classic and it came up a treat.

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Birds and other wildlife are a striking indicator of the environmental health of our golf courses. As such, Birds Australia are about to begin work with golf course managers to measure the effects of golf course construction and management on our native birdlife. This article by Susie Grant will give you all the information you need to become involved.

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Created from the largest open cut tin mine in the world is the Mines Resort Golf and Country Club, host to last years World Cup of Golf. Golf Course Superintendent, K. K. Ng discusses the course and makes special mention of the tremendous support he received from his peers.

in every edition

REVIEW - TRANSGENIC TURFGRASSES?

Genetically modified turfgrasses are just around the corner and they offer huge potential to turf managers. However, there are certain risks associated with this technology as discussed by Jyri Kaapro in this month's REVIEW.

TECH TALK

In the second of a series, Dr. Tim Colmer gets technical with Photosynthesis, 'the basis of life on earth'.

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Thankfully, for those who were flat out getting what water they had onto the turf over the Christmas / New Year period, the "Millennium Bug" has come and gone without so much as a whimper and 2000 looks set to be a huge year for the turf industry.

For many turf managers and contractors the Sydney Olympics will see years of hard work and dedication culminate in what is likely to be the highlight of their career?

The only event likely to rival the Olympics is of-course the Millennium Turfgrass Conference in June. Bringing the entire industry together for the one event will enabled the staging of the biggest ever turf trade show and will give you access to the finest collection of international and local speakers that this country has seen.

Australian Turfgrass Management magazine is the official publication of this event and will be your guide to what's new, what's on and who is going to be there?

In this edition of ATM, John Illingworth defines the huge range of wetting agents, Peter Brown from the Lakes Golf Club discusses how he has taken the course from 'Stormin' to Norman' and in REVIEW, Jyri Kaapro plays 'devils advocate' to transgenic turfgrasses.

Professor Robert Carrow, researcher from the University of Georgia discusses how water treatment can improve infiltration rates, we travel to Kuala Lumpur to visit the Mines Resort, home to World Cup Golf and in TECH TALK, Dr. Tim Colmer discusses Photosynthesis 'the basis of life on earth'.

All this and much more to 'kick off' what is going to be a great year.

Phil George
Editor

Differences between

WETTING AGENTS

in the Australian Turf Industry



By John Illingworth

Water repellence (failure to absorb moisture) has been observed in soils and intensively managed turf for many years. Investigations have shown that water repellence has increased in situations where there is a build up of hydrophobic organic content in the soil i.e. The soil particles become coated with a hydrophobic organic layer causing the following problems:

- Incidence and spread of dry patch and disease in Turf
- Poor seed germination
- High incidence of weeds that compete for limited moisture
- Poor nutrient uptake
- Enhanced erosion of top soils due to poor root establishment
- Increased water losses due to run-off and evaporation

One of the most successful approaches used to overcome the problem of water repellency in turf is by the application of wetting agents.

Development of high quality wetting agents for maintenance of intensively managed turf surfaces is a highly specialized and complex field. Outlined below is a summary of the most common types of wetting agents promoted throughout Australia.

ANIONIC SURFACTANTS

- Ammonium Lauryl Ether Sulphates
- Sodium Lignosulphonates
- Sodium alkyl sulphosuccinates

Understandably the earliest wetting agents utilized for improvement of water penetration in turf were based on the conventional general purpose surfactants found in agricultural and industrial applications. The simple premise was that water repellency could be overcome by reducing the surface tension of the water.

Anionics are generally very good at reducing surface tension and therefore improve initial water penetration. However, they tend to degrade fairly quickly and can

be phytotoxic at the application levels required to meet the demands of the turf industry. For this reason their recommended application rates tend to be far too low to achieve premium protection from water repellency. The electrostatic charge of anionics aids adsorption onto soil particles. This characteristic is beneficial for use as an agglomeration aid for fine compacted soils.

NONIONIC SURFACTANTS

- Nonyl Phenol Ethoxylates
- Alcohol Alkoxylates

Nonionic surfactant are widely used to assist the spray application of pesticides in the agricultural industry. They are quite efficient at reducing surface tension and therefore can provide short-term assistance for water penetration in a turf situation. However, they are small - low molecular weight molecules and therefore tend to have poor adsorption and retention properties in soil. As a result they are washed through easily and only provide a short term effect. They are also efficient

grease / wax stripping agents and can be highly phytotoxic to grasses. Nevertheless, some higher molecular weight Nonyl Phenol Ethoxylates which exhibit far lower phytotoxic potential have been usefully employed in non severe situations for many years under a frequent application program.

POLYMERIC NONIONIC SURFACTANTS

In the early 1980's a new class of surfactant was identified that produced a quantum improvement in the efficiency of water penetration into hydrophobic soils and in the maintenance of high quality turf surfaces.

The polymeric structure adsorbs strongly onto soil particles and is slow to degrade. These characteristics lead to good rewetting performance and long lasting effect. Adequate surface tension reduction also enables reasonable penetration efficiency. This group of surfactants are the most widely used in Australia and provide the longest term performance, usually requiring only 2 – 3 applications per year.

MEDIUM TERM POLYMERIC

Another recent adaptation of polymeric technology is a new medium term group of

polymeric surfactant. This group has moderately high molecular weight which, exhibits fair soil retention and water penetration. This surfactant class is well suited to large well resourced golf clubs. They are applied at low application rates which ensures very low phytotoxicity and are therefore very safe to use. However, they must be applied frequently under a strictly observed management program. In severely hydrophobic situations the penetration characteristics of this group of polymeric is often insufficient to achieve adequate performance.

ULTRA-PENETRANTS

Ultra-penetrants are new to the Australian Turf Industry. However, they are successfully used and are gaining appeal in the USA. This class of surfactant is radically different to all other classes mentioned above. They are nonionic in nature, yet exhibit outstanding water penetration ability at quite low application rates. They can penetrate any hydrophobic turf area, and quickly restore good water infiltration. They have medium soil adsorption characteristics so they must be applied at regular intervals

to maintain maximum effect. Their extraordinarily low application rate and requirement for frequent application makes them ideally suited to application by direct injection irrigation methods.

ECO-FRIENDLY WETTING AGENTS

Some European countries have adopted the use of eco-friendly wetting agents for maintenance of turf surfaces and they are beginning to appear in Australia. These products tend to be based on low molecular weight biodegradable surfactants. They exhibit excellent surface tension reduction properties and therefore provide very good water penetration. Their biodegradable nature necessarily means that they rapidly degrade in the environment. As such, I suspect that they would require frequent application to meet acceptable performance standards.

FAIRWAY WETTING AGENTS

A few low cost wetting agents have been gaining acceptance in Australia specifically for application to fairways. These products are specially formulated polymeric surfactants which provide good surface wetting and adsorption to the soil. They are not designed



The image shows the EcoWet logo at the top, with the text "Environment friendly wetting agent" below it. In the background, a golfer is visible on a green. In the foreground, two white plastic jugs of EcoWet product are shown on a grassy surface. At the bottom, the text "A NATURAL CHOICE" is displayed.

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to achieve the same performance standard as premium polymeric used on the greens and tees. For modest cost they can usefully be employed to pick up appearance of fairways by improving water and nutrient uptake.

HUMECTANTS

These products are used to supplement the use of wetting agents. Although they contain a small amount of wetting agent to assist initial water penetration, they cannot be used as an alternative to the conventional wetting agent program. Humectants are based on highly hydrophilic components that adhere to the soil particles and attract water to their many hydrophilic sites. In this way they can assist in reducing water runoff and minimize water leaching through the soil profile. However, they degrade rapidly and must be applied regularly to maintain effect.

GRANULES

There are a variety of granulated wetting agents available in Australia. Nearly all the above surfactant classes are available in granule form. Typically their active

surfactant content ranges from 10 – 20%. They are formulated with the surfactant adsorbed onto an inert carrier such as a clay or organic material. Granules do not need to be watered in as the surfactant is slowly washed off into the soil under irrigation or rain. This makes granules ideally suited to application on fairways or parks and gardens where watering in cannot be carried out.

CONCLUSION

The large range of wetting agents available to turf managers is no doubt very confusing. It is important that your supplier is able to identify which category the product fits into so you have some basis on which to judge its suitability to the particular environment under consideration. Before choosing an appropriate wetting agent, the turf manager must clearly consider several factors:

- Severity of water repellency (low, medium, high)
- Proposed frequency of application (weekly, fortnightly, monthly, twice per season)

- Application dilution strength (0.1%, 1%, 2%, 5%, 10%)
- Application water volumes (400, 1000, 2500, 5000 L/Ha)
- Phytotoxicity potential (low, medium, high)
- Watering in (immediate, within 1-3 hours, evening or next day, next rain)
- Other treatments applied (fertiliser, pesticides)
- Cost / quality (low, medium, high)
- Degradability (high, medium, low)

Once these questions are answered, the choice of product becomes relatively simple.

In my experience you get what you pay for. i.e. The best quality products deliver the best performance and can be viewed as offering the best value for money.

However, as conditions vary greatly around Australia no product consistently achieves ideal performance in every situation.



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TRANSGENIC TURFGRASSES - AN ENVIRONMENTAL HAZARD?

*"it could result
in major
weed control
problems."*

By Jyri Kaapro

There has been a lot of discussion recently on genetically modified plants. This may include the possible introduction of transgenic turfgrasses into Australia. These are grasses that have been genetically modified to give them a beneficial characteristic, for example resistance to a particular herbicide such as glyphosate. Other possibilities are resistance to particular pests or diseases or the modification of growth characteristics to create a superior plant.

There are obvious benefits for turfgrass managers through the use of these transgenic turfgrass varieties, but there are also some environmental concerns:

ESCAPE OF THE TRANSGENIC TURF GRASS

Bentgrasses are already a weed of Australian agricultural pastures. The introduction of a glyphosate resistant bentgrass to Australia would have to come with an iron-clad guarantee against its spread as a weed. This would mean that the gene carrying the resistance could not be carried in seed. It seems that there is technology to control spread by seed, but how can vegetative spread of transgenic grasses be controlled? Vegetative spread of the transgenic grass in corings/scarifyings from a golf course must be a concern.

What about vegetative spread from a turf farm when a flood moves across paddocks of transgenic turf?

ESCAPE OF THE GENE

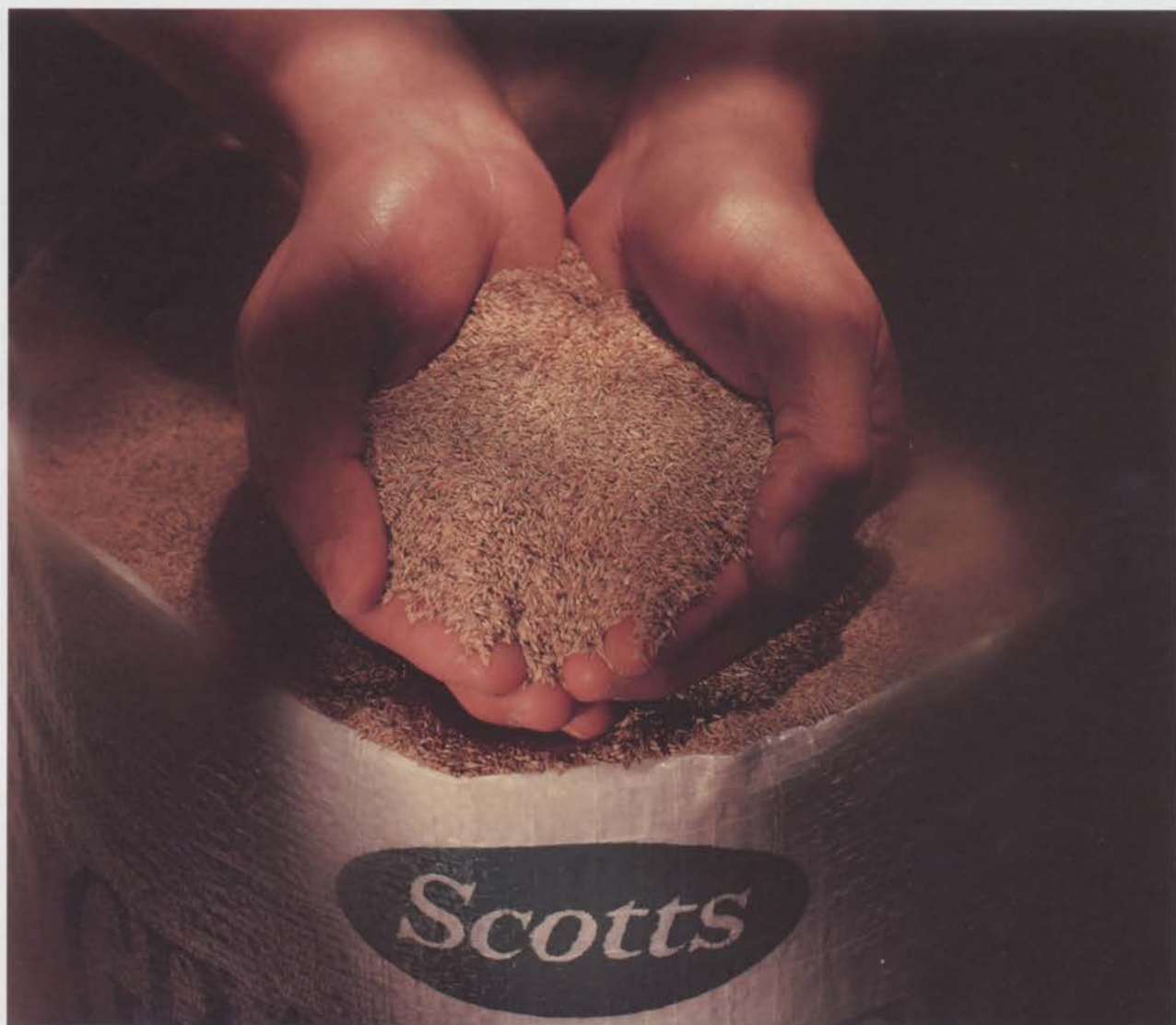
The escape of the gene into other related plants should not be possible through outcrossing. There are over 20 *Agrostis* species in Australia and if cross-pollination was to result in the development of other glyphosate resistant *Agrostis* species, it could result in major weed control problems.

CHEMICAL RESISTANCE

Plants genetically modified to tolerate certain herbicides are likely to initiate the increased use of that particular herbicide. If a turfgrass species on a putting green was resistant to a non-selective herbicide such as glyphosate, it would mean that all weed species on the green could be treated with that chemical. Therefore, glyphosate could be used all year round to treat weeds year after year. How long would it be before a glyphosate resistance problem developed in one of those weed populations? The development of chemical resistance in the weed population is a concern that must be addressed in an entire plan of management if transgenic grasses are to be introduced.

While the introduction of transgenic turfgrass species offers exciting possibilities for turf managers, opposition from environmentalists and the agricultural sector is likely to be significant and there are some major environmental concerns that must be addressed.





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Radiation Interception and Photosynthesis in Plants



by Dr T.D. Colmer

RADIATION - ENERGY FROM THE SUN

The sun radiates energy into space, some of which arrives at the surface of the earth. The electromagnetic radiation emitted by the sun covers a wide spectrum of wavelengths and includes x-rays, UV radiation, visible light, infra-red radiation and other wavelengths. Visible light is defined by the sensitivity of the human eye and it is composed of the colour spectrum from red to violet (400-700 nm wavelengths).

These wavelengths are also the "photosynthetically active radiation" (PAR) because the chlorophyll pigments in leaves absorb energy from this region of the spectrum to "drive" photosynthesis.

Chlorophylls absorb blue and red light very strongly, but only absorb weakly in the green part of the spectra, therefore the light reflected and transmitted through leaves is green. This is why plant leaves, including turf, appear green to our eyes.

Before considering the processes by which light is used in photosynthesis, it is important

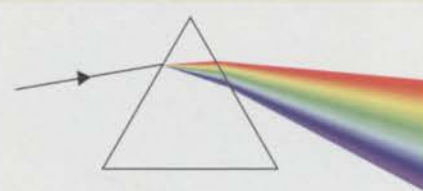
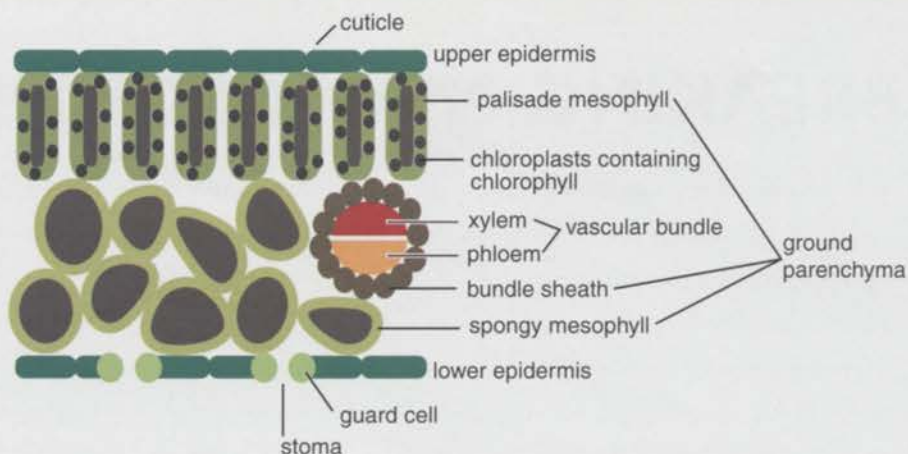


FIGURE 1 White Light is actually a mixture of different colours, ranging from violet at one end of the spectrum to red at the other. It is separated into its component colours when it passes through a prism.

FIGURE 2 Cross Section of a Typical Leaf

The inner tissues of a leaf are enclosed by transparent epidermal cells coated with a waxy layer (cuticle). Oxygen, carbon dioxide and water vapour are exchanged with the atmosphere via the stomates (singular, stoma). Water taken up by the roots enters the leaf via the xylem, sugars are exported in the phloem.



to note that light also has other effects on plants. For example, seasonal changes in day length are detected by many plants, and this can be the trigger for flowering. Germination of seeds can require exposure to light; some weed seeds can remain dormant in the soil until they "sense" that existing vegetation is damaged or removed providing enough light for successful establishment. Not all effects of radiation from the sun are beneficial. UV radiation can damage DNA in plant cells, resulting in mutagenesis. New mutants, however, are rare due to the efficient DNA repair mechanisms in plant cells.

THE STRUCTURE OF LEAF TISSUES AND CELLS

Leaf tissues are structures highly specialised for photosynthesis. Leaves are designed to; (i) intercept and "trap" light energy, (ii) take up carbon dioxide from the atmosphere whilst minimizing water loss, and (iii) transport sugars out of the leaf to other regions of the plant.

The role of the cuticle (a waxy, water impermeable coat) and stomates in minimizing water loss were discussed in the previous issue (Vol 1.6, page 14). Carbon dioxide enters leaves via the stomates, so if they are closed photosynthesis is reduced.

The vertically orientated palisade cells and the clumps of spongy mesophyll cells both contain large numbers of chloroplasts. Chloroplasts are sub-cellular compartments that contain the chlorophylls and accessory pigments such as carotenoids, membrane structures, and enzymes involved in photosynthesis. (Refer to figure 2).

PHOTOSYNTHESIS - THE BASIS OF LIFE ON EARTH

Photosynthesis literally means "synthesis using light". In photosynthesis, solar radiation is used by the plant as an energy source to convert carbon dioxide into sugar compounds. The series of reactions involved also consume water and release oxygen. The energy captured and stored by plants (primary producers) can serve as the source of energy for other organisms (eg. herbivores) which in turn may be food for other life forms (eg. carnivores) in the food chain.

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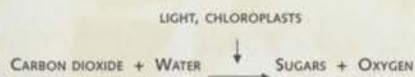
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The net result of the reactions in photosynthesis can be described by the equation:



Photosynthesis consists of two main groups of biochemical reactions, termed the "light reactions" and the "dark reactions". The light reactions involve the absorption of light energy by the chlorophylls and accessory pigments, the splitting of water, and a series of redox reactions to produce high energy intermediates. These intermediates (ATP and NADPH) are then consumed in the subsequent series of dark reactions (light is not required) in which carbon dioxide is used in the production of sugars.

Sugars produced by photosynthesis can be transported to other regions in the plant (eg. the roots) via the phloem in one of the vascular bundles (commonly called a leaf vein). The sugars are either converted to other compounds required to build new

cells and tissues or used as an energy source in respiration. These processes will be the topic of my article in the next issue.

FACTORS AFFECTING RATES OF PHOTOSYNTHESIS

The availability of light is a major factor that determines rates of photosynthesis in plants. Shading causes large decreases in photosynthesis and therefore limits the supply of sugars so that growth and eventually maintenance decline. However, plant species, differ in their capacity to tolerate low light environments. The most shade tolerant plants have evolved in the understorey of dense forests, and full sunlight can actually damage these plants.

Cool-season grasses are reported to originate from forest-margin habitats, and these are more tolerant of shade than warm-season grasses from more open habitats. Mowing heights will also influence the total amount of photosynthesis, as it will determine the leaf

area available for photosynthesis.

Other factors limiting photosynthesis in the field include; mineral nutrient deficiencies and water supply (water deficits cause stomates to close and therefore reduce carbon dioxide entry into leaves).

Photosynthesis is the basis of life on earth and understanding the process enable the turf manager to better predict growth responses to environmental changes which, may act as an early warning of plant health problems.



DR. TIM COLMER IS A LECTURER IN PLANT SCIENCES AT THE UNIVERSITY OF WESTERN AUSTRALIA. DR. COLMER CO-ORDINATES THE TURFGRASS RESEARCH AT UWA, A PROGRAM IN COLLABORATION WITH INDUSTRY.

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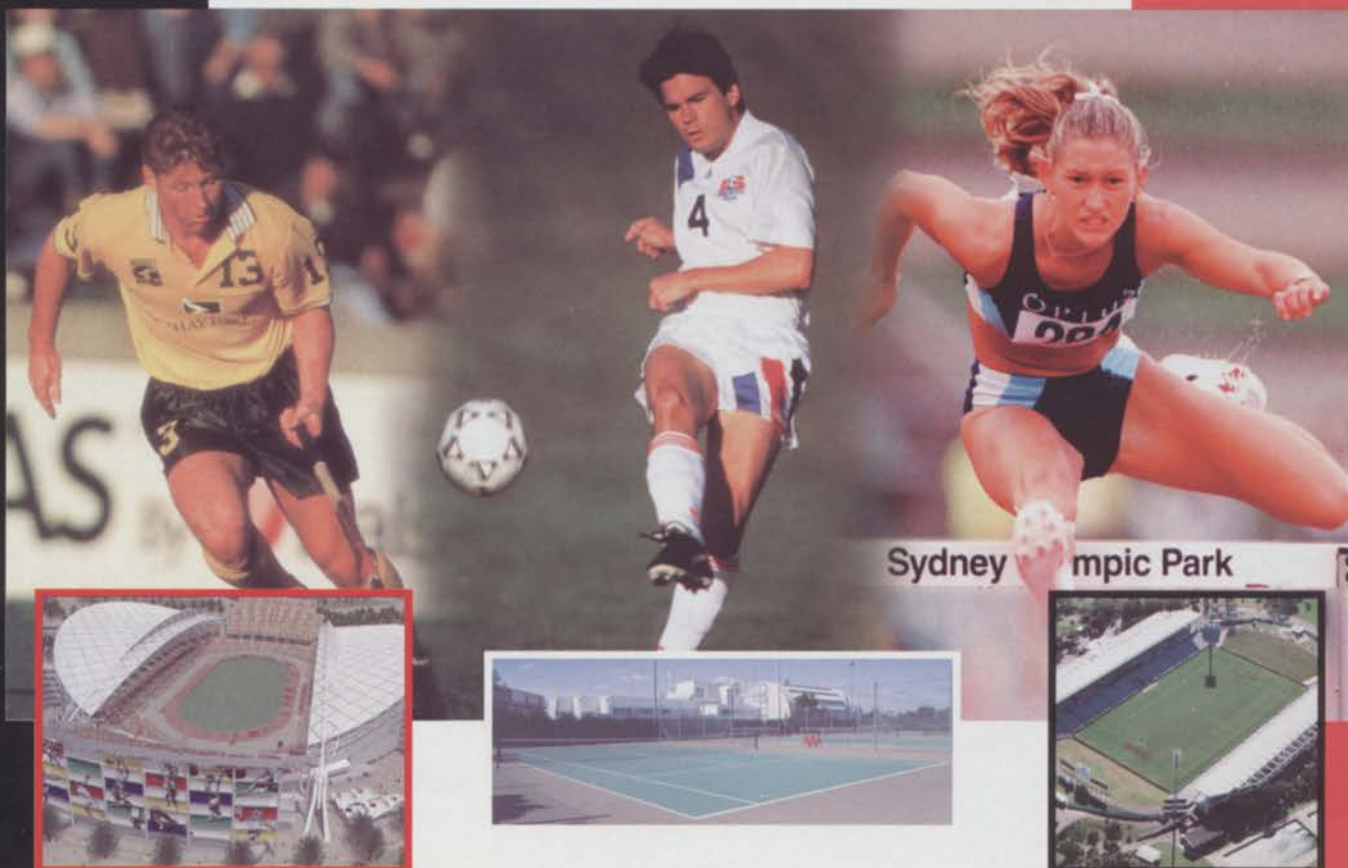
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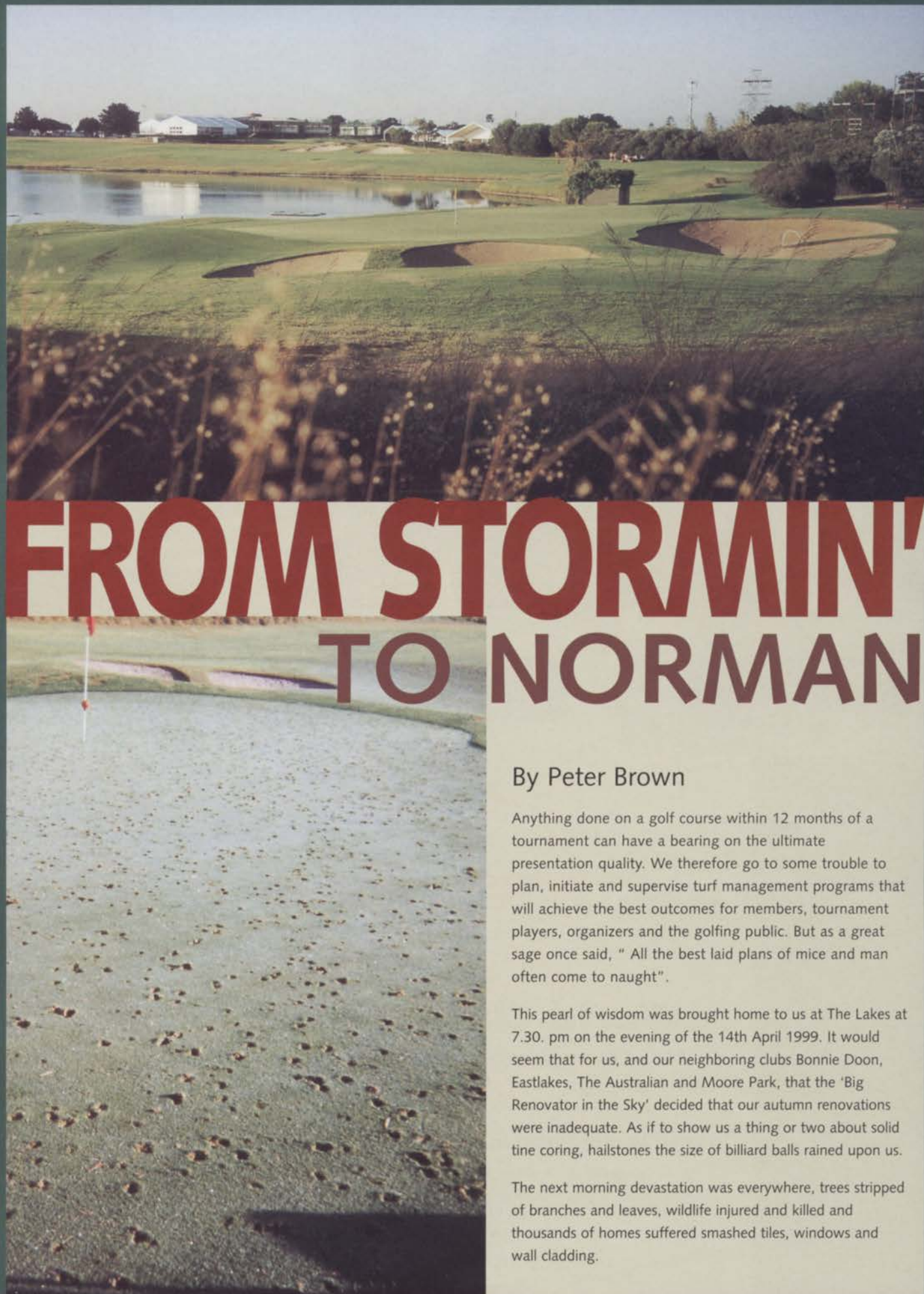
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By Peter Brown

Anything done on a golf course within 12 months of a tournament can have a bearing on the ultimate presentation quality. We therefore go to some trouble to plan, initiate and supervise turf management programs that will achieve the best outcomes for members, tournament players, organizers and the golfing public. But as a great sage once said, "All the best laid plans of mice and man often come to naught".

This pearl of wisdom was brought home to us at The Lakes at 7.30. pm on the evening of the 14th April 1999. It would seem that for us, and our neighboring clubs Bonnie Doon, Eastlakes, The Australian and Moore Park, that the 'Big Renovator in the Sky' decided that our autumn renovations were inadequate. As if to show us a thing or two about solid tine coring, hailstones the size of billiard balls rained upon us.

The next morning devastation was everywhere, trees stripped of branches and leaves, wildlife injured and killed and thousands of homes suffered smashed tiles, windows and wall cladding.

What I saw on the greens took my breath away. It was impossible to feel anger or disappointment at the damage to our surfaces. Instead the awesome power of nature was once again reminding us of the insignificance of our plans and efforts in the face of such events. I could not help but see the funny side of things when one of the wags on the crew, suggested that all we need do was to put out the signs ("Members are reminded to repair All Divot Marks") and the work would be done for us. I also contemplated replacing our smashed plastic rain gauge with one made of metal, but thought better of it as it may have tempted fate.

Fortunately (for lack of a better word), the impact of the hail completely decimated the turf surface on impact and the heavy rain and melting hail floated the material out of the depressions. If surface thatch had been plugged in the base of the holes, this material would need to have been scarified out.

As it was we were free to roll the greens and commence sand top-dressing. We were lucky enough to have 10 tonne of Hexxon sand stockpiled to go on with and after a

quick phone call to get our friendly sand supplier out of bed; reinforcements were on the way. The course was closed and sanding began at 7.30 am Thursday and continued until dark that day and all the next. We were able to open the course for play on Saturday thanks to the tremendous response of the crew in placing and thoroughly 'rubbing-in' some 40 tonnes of top-dressing sand.

The greatest difficulty was keeping the sand in the depressions as wind, rain and irrigation tended to wash it out. In all, four heavy top dressings ranging from 40 to 15 tonnes were applied over a 6-week period, followed by two light dustings to finish off.

With winter just around the corner, time was the enemy. Growth needed to be sustained to assist in closing the holes before cold weather slowed growth in June. The greens were fertilised on the Monday following the storm with soluble N & K using Potassium nitrate and Urea to provide 3g elemental nitrogen /m² and 2g elemental potassium /m². Weekly applications of this fertiliser at reduced rates were programmed until coverage had been

achieved. To monitor progress, measurements were taken of the average diameter of the initial hail damage and compared to subsequent measurements each week. This data helped to dispel the perception of a few impatient, well-meaning individuals.

Unlike many of the homes in the area, by mid June one needed to look closely to see any evidence of the damage.

Tree damage was tidied up as soon as the playing surfaces were attended to. The Radiata pines have suffered with secondary infections of shoot blight fungus diseases and some have died or are in deep decline. These trees are subject to an insurance claim.

The sand top-dressing has improved the firmness of the greens and in combination with a verti-drain fitted with needle tines it is continued monthly at rates of up to 1kg/ m² in the growing season. The last application of sand was made three weeks before the start of the Greg Norman Holden International held at the start of February.

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At The Lakes kikuyu predominates the fairways and Bill Bug is predictably troublesome in the lower, wetter sections of the course. These areas were treated with insecticide and in late November fairways were renovated using a 'Tracair' coring machine and scarifying heads fitted to our fairway mower. This was followed by fertilising with Urea to supply 1.5 grams of elemental nitrogen/m².

Following recovery from renovation in early December the fairways were treated fortnightly with a growth regulator. As the kikuyu growth rate was reduced and the turf density increased, the mowing heights were lowered from 14mm to 8mm in preparation for the tournament. During the tournament, the fairways were cut in the morning and at night in a stripe pattern running up the center of the fairway and aligned from tee to green. This method of mowing proves to be the most time efficient and following the flow and direction of play, seems to enhance the natural contours of the course. This I feel is important when extensive water is a feature.

The SR1020 bentgrass greens are mowed using walk-behind mowers and during the week preceding the tournament the greens were double cut daily in varying directions to bring the greens down to 3mm for tournament play. During the actual tournament, greens were double cut in the morning by mowing back over the initial cut. This technique reduces 'grain' and striping and requires the mowing operator to concentrate on straight, precise mowing. To enhance smooth ball roll and to provide additional pace and firmness, the greens were also rolled.

To avoid fungal disease problems, entering the humid Sydney summer, fertilising of greens is kept to a minimum and colour is achieved with a light foliar application of nitrogen and iron on the Sunday prior to the start of the tournament.

I may sound like a sadist, but its a shame that we need to present bunkers so raked and manicured that there is almost no chance of a competent pro-golfer dropping a shot from these features placed on the course to do exactly that. New bunkers

designed by our architects Newton, Grant and Spencer on the 2nd and 6th holes are examples of deep hazards designed to penalize the wayward shot. The Lakes is situated on the Botany sand dunes and the bunkers consist of the natural sand that occurs on-site. Rakes used by the members are wooden with a chamfered blade similar to a dummy rake. This provides a firm, flat surface to the sand and reduces the golfer's ability to do any 'gardening' in the trap. For tournament preparation, we use these rakes to smooth a flat surface each evening, which is then consolidated by any night irrigation. In the morning before play a light pattern is raked on the bunker base to allow the ball to sit up.

It is amazing to experience what nature serves up to you at times but when you are able to respond and eventually triumph along side a team that has trust and dedication it makes success even more worthwhile and rewarding.

PETER BROWN IS THE GOLF COURSE SUPERINTENDENT AT THE LAKES GOLF CLUB.



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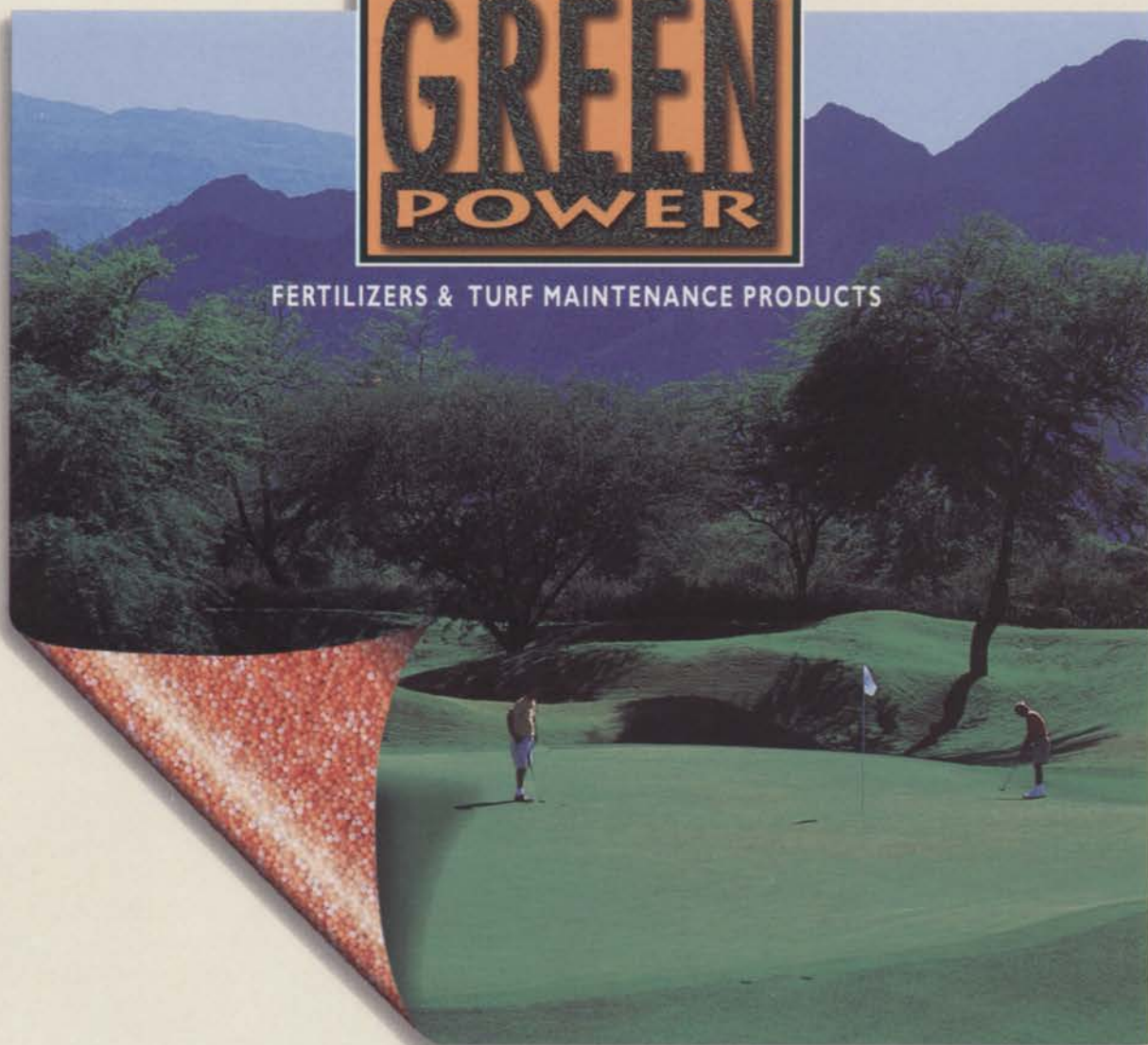
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BIRDS AUSTRALIA

on course with national survey

by Susie Grant

The environmental health of a golf course is under increasing scrutiny from members, managers and conservation groups.

In the coming year the country's native bird conservation group Birds Australia will begin to work with golf course managers to measure the effects of golf course construction and management on our native birdlife.

Queenscliff Golf Course, which sits on Swan Island in western Port Phillip Bay Victoria is the summer home to thousands of migratory wading birds from as far away as Siberia and Alaska and is part of an important wetland and marine ecosystem.

The course may seem an unlikely refuge for the endangered Orange-bellied Parrot, but between May and September each year its fairways are home to about 30 parrots – a significant proportion of the remaining population of less than 200 birds.

Thanks largely to the club's commitment to managing the golf course around the arrival and departure of the parrots, the number of parrots relying on the Queenscliff Golf Course for their winter food supply has remained constant for the past ten years.

In 1990, a fence was erected to protect the fragile Glasswort fringe from golfers and a local rule preventing retrieval of any ball entering the area was adopted. There is no spraying of fairways while the parrots are present, the Club has initiated pest

control programs for feral cats and rabbits, and any construction is only undertaken after agreement with the Victorian Department of Natural Resources and Environment (NRE).

The parrots do not disrupt the golf, the many birdwatchers visiting each year to see the parrots are welcomed by the club.

The environmental management of Queenscliff is primarily the work of Golf Course Superintendent Rodney Fenton, who in 1996 was awarded the inaugural Australian Golf Course Superintendents' Association Claude Crockford Environmental Award.

Like Fenton, 1999 Claude Crockford Award Winner Mick Russell, Superintendent at Victoria's Werribee Park Golf Course (Australian Turfgrass Management Vol 1.5), has managed to convince committees that environmental initiatives will ultimately benefit the club and its members as well as the local environment.

Motivated by a speech given at the 1995 AGCSA National Conference in Adelaide at which Ms Penny Figgis from the Australian Conservation Foundation branded golf courses as purveyors of "environmental vandalism", Russell has transformed Werribee Park Golf Course into a haven for native birds and other wildlife.

Mick Russell, the AGCSA and the Australian Golf Union are now assisting Birds Australia with a survey to determine use of individual golf courses by native bird populations.

While it is known that golf courses with indigenous flora provide corridors of habitat and welcome refuge, little is known of the overall impact on Australian native bird populations.

The data collected in the planned surveys will be used to map distribution of birds and habitat. Breeding trends will also be examined in native birds on golf courses.

Birds Australia will work with superintendents and committees to compile existing data and hold workshops for participating golf courses. Staff, committee members and club members will be provided with basic identification skills and be trained in the survey methodology.

The survey methods are based on the Atlas project, which was conducted by Birds Australia for the first time between 1978-1981 and is currently being repeated.

With a volunteer workforce in the thousands, the Atlas project maps distribution of birds and their habitats in every corner of the country. The golf course surveys will be supported by the wealth of project experience and existing infrastructure, and also contribute to the database for the national project.

Birds on Golf Courses is designed to be conducted by willing individuals as they play the course. Sightings are recorded on scorecards and there is no interruption to play. Above all, members will enjoy the experience of participating in the survey and learning about the native birds on their course.

This type of involvement has proven to be an excellent club-member relations activity at courses like Queenscliff where the members take a real interest in the conservation of the course and its wildlife.



NATIVE DUCKS

As discussed last year at a workshop series run by the AGCSA in partnership with Greening Australia, more and more golf course managers are finding that cost effectiveness comes with creating native habitat.

Native vegetation is well suited to local soils and climates, and it is often a resource that is already present. Use of native vegetation may also reduce the need for chemical use and landscape modification, and there is no doubt that for many, a native landscape is more aesthetically pleasing.

Andrew Baker, Superintendent of Sanctuary Cove Golf Course, when asked about the impact of construction and ongoing management of the Arnold-Palmer designed

golf course, made the following statements:

"There was not only an expectation of maintaining the existing ecosystem but real potential in exploiting it in a very positive way".

"In the process and as a result of the development of Sanctuary Cove we have seen an increase in numbers of Cormorants, native swans and ducks. As a result, there is no doubt that there is an increase in awareness of Australian native birds amongst visitors".

Built 10 kilometres from Surfers paradise, Sanctuary Cove is a haven for many native birds such as the Jabiru, spoonbills, kites,



ORANGE BELLED PARROT

lorikeets, cuckoos, honeyeaters and Magpie Geese.

Management has introduced a number of environmental programs such as the introduction of slow-release fertilisers and biological insecticides.

Interest in these types of programs prompted Birds Australia to look into the effects of golf course construction and maintenance on native populations.

National Research Coordinator Dr Janey Jackson sees the project as a great opportunity to collaborate with the environmental managers of such important habitats. 'Golf courses are in a sense an



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unknown quantity. Intuitively we know the rehabilitation of native habitats leads to an increase in the bird species present. However, this increase has yet to be quantified and we don't yet know what effect rehabilitation has had on a broad scale'.

Werribee Park's Mick Russell has a very positive outlook and some advice for other superintendents who have to face stiff opposition from within their club committee structure. 'Clubs are about membership and at the end of the day are a business competing in a crowded marketplace. When committees see the financial benefits of sound environmental management they don't look back'.


LEFT: MAGPIE GESE

RIGHT: QUEENSLAND GOLF COURSE



Birds Australia is a non-profit organisation with over 6,000 volunteers Australia wide participating in research and field activities to conserve our native bird populations, a contribution that is worth over \$10 million per annum. It is a member based organisation with information on birds, access to activities, free entry to observatories and reserves around the country, discounts on optical equipment and subscription to the quarterly magazine Wingspan amongst the benefits of association.

FOR FURTHER INFORMATION ON BIRDS AUSTRALIA, CALL 03 9882 2622, VISIT THE WEBSITE AT WWW.BIRDSAUSTRALIA.COM.AU OR WRITE TO BIRDS AUSTRALIA, 415 RIVERSDALE ROAD, HAWTHORN EAST, VIC 3123.



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speaker profiles



DR. MICHAEL J. HURDZAN



Heading an impressive list of international and local speakers at this years Millennium Turfgrass Conference is renowned Golf Course Architect, Environmental Plant Physiologist and Author, Michael J Hurdzan.

Dr. Hurdzan holds a Bachelors Degree in Turfgrass Management from the Ohio State University and a Masters Degree in Turfgrass Physiology as well as a Ph.D. in Environmental Plant Physiology, both achieved at the University of Vermont.

Dr. Hurdzan has been a Golf Course Architect for over 25 years and with partner Dana Fry has designed some of golf's greatest courses, including Devil's Pulpit and Devil's Paintbrush in Caledon, Ontario.

These two masterpieces were named 'Best New Course' in Canada in 1991 and 1992 by Golf Digest.

As well as being an internationally recognized authority on golf course environmental issues, Dr. Hurdzan is an accomplished author. His book, *Golf Course Architecture: Design, Construction & Restoration* was described by Links Magazine as being "so complete, it is probably all you'll ever need on this topic".

Dr. Hurdzan will present two sessions on environmentally sustainable design and construction.



DR. KARL S. KRUSZELNICKI



Whenever the announcer gives out the phone number for Karl Kruszelnicki's famous Science Talkback show, Great Moments in Science on JJJ, on Thursday mornings – so many calls come in that the ABC switchboard crashes!

Karl's media career began in 1981 but in addition to popularizing the world of science on the Midday Show, Good Morning Australia, Quantum and ABC radio, Karl has worked as a Cab Driver, Medical Doctor, Labourer and a Roadie for rock'n roll bands (including Bo Diddley and Chuck Berry).

In fact, Karl believes that if you did a Venn Diagram of all his jobs you would see that they do not overlap, thus proving that he does not actually exist!

Dr. Karl will give the opening 'key note' address at the Millennium Turfgrass Conference. In what is sure to be an interesting and entertaining presentation, Karl will give us an in-site into what we can expect science to deliver in the new Millennium.



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TREATING THE CAUSE

Irrigation water treatment for better infiltration

BY R. N. CARROW,
R. DUNCAN, and M. HUCK

Some constituents found in irrigation water can influence water infiltration into the soil. Whether chemical treatment of the irrigation water is required depends on the specific problem and in many cases soil-applied treatments can be equally or more effective.

There are four situations that can limit water infiltration into soils and the type of chemical treatment required is dependent on the nature of the problem. These four situations are discussed below.

HIGH Na, LOW HCO_3/CO_3 :

Irrigation water treatment is not necessary, but amendments to alleviate sodic conditions can be delivered through an irrigation system or they can also be directly applied to the turfgrass. Possible amendments for water treatment include gypsum, soluble Ca materials, or a S-based acid to combine with soil-applied lime to form gypsum.

HIGH TO MODERATE Na, HIGH HCO_3/CO_3 :

Acidification of the irrigation water to remove excess HCO_3 is strongly preferred.

ULTRA-PURE WATER:

Gypsum injection is an option, and other soluble salts could be added to the irrigation water to raise ECW. Alternatively, salts can be directly applied to the soil. If soil application is the chosen method of treatment, a light and frequent approach is suggested to avoid leaching all the amendment beyond the surface.

HIGH Ca/mg, HIGH HCO_3/CO_3 :

If sufficient calcite forms at the surface to decrease infiltration rates, acidification of the irrigation water is an option. Cultivation, use



POOR WATER INFILTRATION INTO A SODIC SOIL

of acid fertilisers, and direct S application to the turf can produce similar results. These four situations are discussed in greater detail in the following sections:

SITUATION 1:

HIGH SODIUM, LOW HCO_3/CO_3

Irrigation water high in sodium (Na) but low in HCO_3/CO_3 (bicarbonate/carbonate) content will create a sodic soil. In a sodic soil, Na causes the soil structure to deteriorate, resulting in poor water infiltration and percolation. To assess the potential for Na to cause the deterioration of soil structure, the sodium adsorption ratio (SAR) is used.

In this situation, irrigation water treatment is an option, but is not essential as soil-applied amendments can be effective. Many turfgrass managers use the irrigation system as a means of adding amendments. Calcium (Ca) amendments applied into the irrigation water are most effective where the irrigation water SAR is high and/or the salinity is low to moderate ($\text{ECW} < 1.0 \text{ dSm}^{-1}$). The Ca amendments in the irrigation water would increase ECW while reducing SAR, which can improve water infiltration.

If amendments are added through the irrigation system, the normal choices would be: (a) gypsum injected as a fine particle

size in a suspension (sometimes other more soluble Ca materials are used in addition to the gypsum, such as CaCl_2 , $\text{Ca}(\text{NO}_3)_2$ or other water soluble Ca forms; or (b) SO_4 as one of the acids or generated from a SO_3 generator. In this case, lime would need to be present at the soil surface to react with SO_4 to create gypsum. In either of these situations, high Ca levels result, replacing Na on the soil CEC sites. The Na is then leached as Na_2SO_4 , a soluble salt.

SITUATION 2:

HIGH TO MODERATE Na, HIGH HCO_3/CO_3

High bicarbonate (HCO_3) or carbonate (CO_3) in irrigation water reacts with Ca and Mg to precipitate insoluble lime (CaCO_3 , MgCO_3). Even if the irrigation water contains little Ca or Mg, the HCO_3/CO_3 will react with any soluble Ca/Mg in the soil to precipitate lime. This greatly reduces the effectiveness of applied gypsum or S-source + lime (to create gypsum) by reacting with soluble Ca/Mg released from these amendments to form less soluble forms.

This leaves excess soluble Na to increase the ESP (exchangeable sodium percentage) on the soil CEC sites without soluble Ca or Mg available to inhibit this process. Under these conditions, even moderate levels of

Na can cause sodic soil formation resulting in a reduced infiltration rate.

Treatment of the irrigation water with acid to evolve the HCO_3 and CO_3 off as CO_2 gas plus water is highly desirable since: (a) it allows any Ca and Mg in irrigation water to remain soluble so they could displace Na from the soil CEC sites, and (b) it allows soil-applied amendments to be more effective in producing relatively soluble Ca, rather than being precipitated as lime.

When irrigation water is acidified with a SO_4 -based acid or by SO_3 generators, it is important to effectively utilize the S to form gypsum. This can be achieved by adding lime to the soil surface periodically. Calcareous soils have free CaCO_3 that can serve as the lime source. However, over time the free CaCO_3 at the surface may become depleted.

SITUATION 3:

ULTRA PURE WATER ($\text{EC} < 0.50 \text{ DSM-1}$)
Pure water usually originates from snowmelt sources or from continuous rains during the monsoon season, but some groundwater sources may have low ECW. Very pure irrigation water has a low electrical conductivity (ECW) of $< 0.50 \text{ dSm-1}$. Prolonged use of this water can strip cations and salts from the soil surface resulting in crusting at the soil surface and reduced infiltration as clay particles become dispersed after drying. Reduced infiltration is especially noticeable on a site with

limited turfgrass coverage, such as during establishment or on areas thinned by traffic, since direct raindrop or irrigation water impact enhances crusting.

The management choices for this problem are to: (a) increase the salt concentrations at the soil surface with soil application of gypsum, phosphogypsum, or a S-source plus lime; or (b) increase the salt concentration in the irrigation water to above 0.50 dSm-1 . Increasing dissolved Ca in low-salinity water by 1.0 to 4.0 meq CaL-1 in turn also raises the ECW by approximately 0.075 to 0.30 dSm-1 . This can increase soil infiltration, by as much as 100 to 300 percent.

SITUATION 4:

High Ca/Mg, High HCO_3/CO_3
In this situation, the water contains unusually high Ca/Mg and HCO_3/CO_3 concentrations, but Na is absent or at low levels. As the HCO_3/CO_3 reacts with Ca/Mg, insoluble lime (often called 'calcite'), precipitates, usually at the surface 1 cm of soil.

On sands in particular, which have a low surface area, calcite coatings can form on particles and start to bridge between particles and fill the pores. This could create conditions where sealing of the surface would be possible, resulting in reduced water infiltration.

When the above combination of conditions favor calcite accumulation, is acidification



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of irrigation water a solution? The answer is yes, but it may not necessarily be the best choice. For example, often on a golf course only the sand-based greens may show a decrease in infiltration, while more fine-textured areas do not. Treating the irrigation water for the whole golf course would not be necessary.

Additionally, a calcite layer is essentially a physical barrier to water infiltration; it could be broken by periodic cultivation. Alternatively, the use of an acidifying fertiliser such as $(\text{NH}_4)_2\text{SO}_4$ or the application of elemental S to the turfgrass surface will aid in dissolving the calcite layer by changing it into more soluble and mobile forms such as gypsum (CaSO_4) and MgSO_4 .

OTHER CONSIDERATIONS

It is not implied and should not be assumed that water and soil treatments to improve infiltration can be substituted for decompaction and aeration. Cultivation will need to remain an important part of the overall soil management program. Water and soil chemical amendment treatments are methods to improve infiltration where water quality problems cause deterioration of soil structure.

What type of irrigation water treatment is required and whether or not it is necessary for improved water infiltration will depend on the specific situation as identified by chemical analysis.

When water versus soil treatment is being considered, the pros and cons to take into account include those of costs, convenience, and safety. For example:

PROS

- Water treatment eliminates dust associated with granular soil applications of amendments such as lime, gypsum, or sulfur. This can be an important consideration where strict air quality regulations exist or residential developments surround a golf course.
- Water treatment can reduce labor requirements and eliminate course downtime when compared to granular soil applications.
- Water acidification can reduce the burn potential associated with soil sulfur applications, especially on low-CEC soils such as sands, lava rock, or decomposed granite.

CONS

- Pound-for-pound of active ingredient, liquid amendments generally cost more than dry products.
- Equipment for water treatment can be expensive.

- Where acidification is required, products must be evaluated and selected carefully, as some options are dangerous to handle until diluted in the irrigation water.
- Application uniformity of water treatments is only as good as the distribution uniformity of the irrigation system.

DR. ROBERT N. CARROW (turfgrass stress physiology and soil physical and chemical stresses), and DR. RON R. DUNCAN (turfgrass genetics/breeding, stress physiology) are research scientists in the Crop and Soil Science Department, University of Georgia, Georgia Experimental Station at Griffin.

MIKE HUCK is an agronomist in the USGA Green Section's Southwest Region, where irrigation water quality and quantity issues are always at the forefront. He finds these subjects more challenging than most other turf-related matters.



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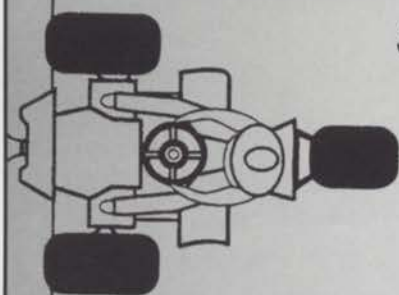
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TIGER WOODS "LAUNCHES" AT THE 6TH IN FRONT OF A PACKED HOUSE

Located at Jalan Sungai Besi, only 15 minutes drive from Kuala Lumpur, Malaysia is the Mines Resort & Golf Club that in November last year played host to the 1999 World Cup of Golf.

Completed in August 1994, the course was created from the largest open cut tin mine in the world and covers an area of 240 acres of natural, rugged terrain with breathtaking lake views. Designed by Robert Trent Jones Jr. the golf course is the main feature of the Mines Resort City which includes a theme park, business park, 2 hotels, exhibition centre, commercial zone and residential belt.

With only 200 members recruited by invitation only, the Mines Golf Club is the most exclusive club in Malaysia.

Construction of the Mines Golf Course commenced in January 1992 and the nature of the site ensured that it was a difficult and challenging task. Being examining land, the site originally contained slime ponds, some of them 100 feet deep. Filling and rehabilitating these proved to be an engineering nightmare but it was achieved using a revolutionary technique known as 'Vertical Draining'. Throughout the construction process a total of more than three million cubic meters of earth was moved.

With heavy tropical showers common in an environment like Malaysia, drainage is the most critical aspect in the construction of a golf course. Greens and tees all have a

subsurface drainage system that sits under a 'washed' gravel layer 100mm deep and a 300mm layer of 'greens mix' tested at Texas Laboratory, USA to meet USGA specifications. We call this a 'layering' technique and it seems to perform well under our conditions.

The greens at The Mines are Tifdwarf hybrid bermuda (couchgrass) which is well adapted to perform in the hot and humid climate. Greens are mowed daily in opposite directions and are maintained at a cutting height that varies between 3.8 and 4.5mm. The couchgrass greens are groomed three times per week to reduce surface grain and are also 'verti-cut' and dusted once per month to control thatch and maintain surface firmness. A verti-drain fitted with 5/8 tines is used twice per year to relieve soil compaction and the greens are 'spiked' regularly during rainy

periods to help remove surface water.

Weeds are removed manually and although not usually a problem, outbreaks of fungal diseases are controlled when symptoms appear with a combination of systemic and contact fungicides.

A 60% slow release nitroform type fertiliser with an analysis of 18-3-18 is applied every two weeks to supply 275g N/100m². Potassium is applied monthly at a rate of 675g K/100m² and doses of calcium and magnesium are applied as indicated by soil tests done twice per year.

Fairways and tees are both grassed with *Cynodon dactylon*, variety Greenlees Park and are mowed three times per week to heights of 11 and 9mm respectively.

Fairways are renovated at least once per year and are fertilised every 45 days to supply 450g N/100m². The tees are subject to virtually the same cultural practices and nutrient regime as the greens.

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WHAT'S THE STAFF?

- Golf Course Superintendent
- Secretary (1)

Golf Course Maintenance

- Assistant Course Superintendent (1)
- Store Supervisor (1)
- Landscape Supervisor (1)
- Gardener (7)
- Turf Supervisor
- Mechanic (2)
- Operator & General Worker (22)

Resort Landscape Maintenance

- Assistant Manager (1)
- Horticulturist (1)
- Landscape Supervisor (2)
- Truck Operator (1)
- Gardener (22)

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Hosting World Cup Golf 99 was the highlight of my career so far. Although we successfully completed significant drainage works to many fairways and replaced the sand in all bunkers in the months leading up to the tournament, one of the most rewarding aspects of the event was the tremendous support we received from volunteer staff during tournament week.

Approximately 20 Superintendents arrived from other golf courses in Malaysia to attend a meeting held the Sunday before the tournament to discuss job assignments and the weeks schedule.

The scheduled start time for the week was 4.00 a.m. to 9.00 a.m. and resumed at 2.00 p.m. to around 8.00 p.m. Monday morning arrived with all volunteers in the maintenance facility before 4.00 a.m.

The morning routine was discussed and the crew went to work in the dark to prepare the course prior to the start of play at 7.30 a.m. at two tee points (Hole 1 & Hole 10). The two tee point start at

7.30 a.m. was mainly to avoid the heavy shower forecast for the afternoon.

Monday, Tuesday and Wednesday were practice rounds for the golfers, which allowed the staff and volunteers to practice their duties and to record the timing of each task. Volunteers were assigned with different tasks ranging from supervising on green, fairway, tee and rough mowing to bunker preparation, green speed measurement, cup placement and coordination between maintenance operations and tournament set-up personnel.

The tournament ran very smoothly and due to the presence of stars like Tiger Woods and Mark O'Meara of America, Scotland's Colin Montgomerie, David Frost of South Africa, Mark James of England, Jarmo Sandelin of Sweden, Mark McNulty of Zimbabwe and 1997 World Cup's team Champion Padraig Harrington of Ireland, it attracted an average of 16,000 spectator each day.

I had the chance to talk to few of golfers like Padraig Harrington, Colin

Montgomerie, Mark James and Mark O'Meara about the condition of the Golf Course. They were impressed with the course, and found it to be both picturesque and challenging.



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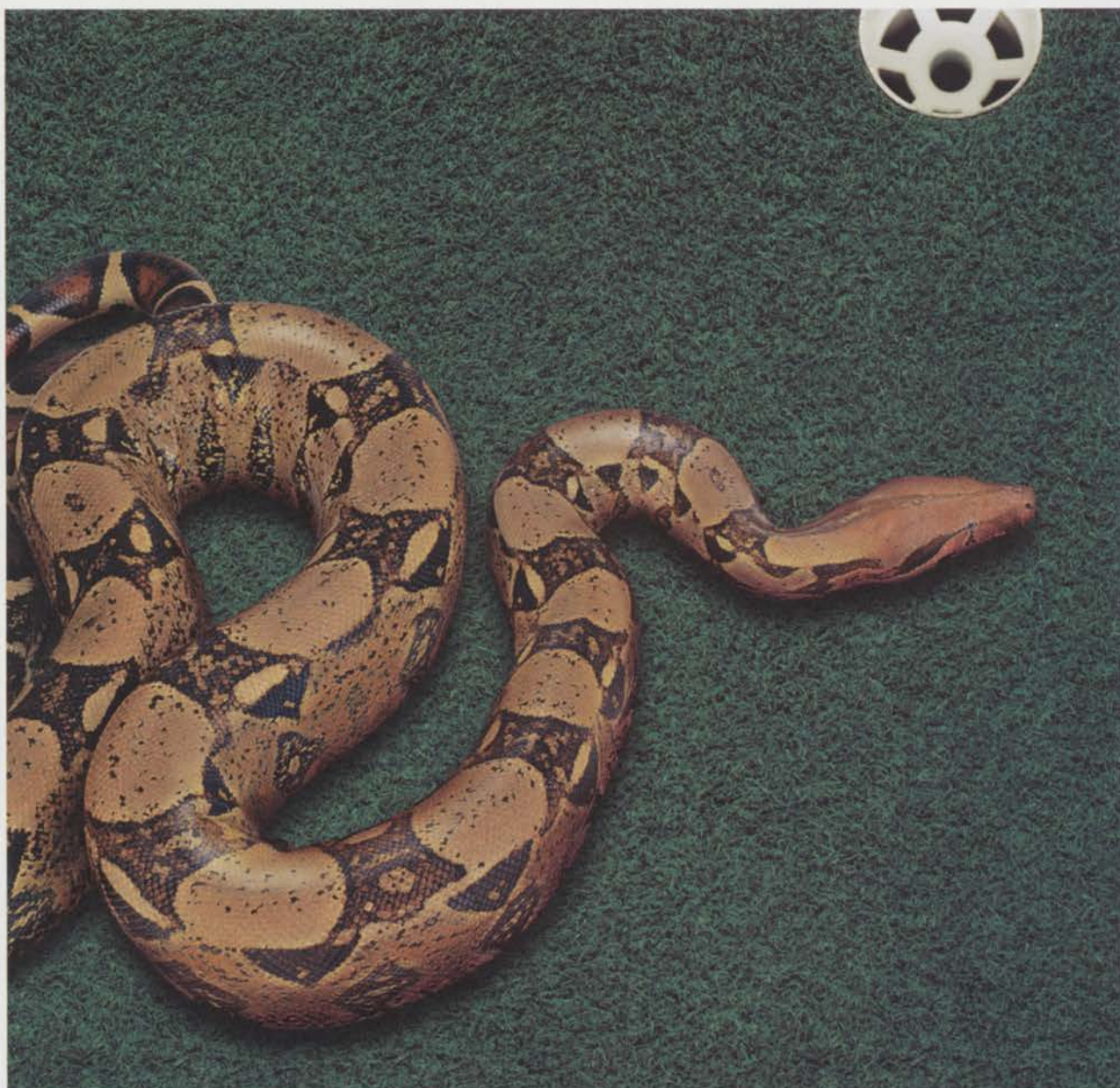


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SYDNEY GARDENS

TRIAL EN NEMATODES AGAINST BILLBUG



DAVID NICKSON (LEFT) WITH THE TURF CULTURE TEAM (MARTIN HOLMES, CENTRE)

Faced with recurring Billbug damage to their couchgrass and kikuyu lawn areas and a desire and need to be as environmentally aware as possible, the Turf Culture team at the Royal Botanic Gardens in Sydney has been investigating the possibility of achieving control using entomopathogenic nematodes.

The nematode species chosen to control the coleoptera sp (beetles and weevils), *Heterorhabditis bacteriophora*, is a cruiser nematode (0.5mm long) that detects the host larvae by carbon dioxide emissions and movement and then enters via the mouth, anus or spiracles of the grub.

Once inside, the nematode releases a symbiotic bacteria which kills the grub. The nematode then multiplies, using the grub as a food source before the juveniles then leave the host in search of other larvae.

In late November last year the nematodes were applied to the effected turf using a boom spray at two different rates and although the trial was not replicated and no actual 'counts' were done, the areas of damaged turf have recovered. The absence of foraging birds in these areas would indicate that the investigative trial was a success.

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GRASS MUTATION WORK TO ASSIST IN SELECTION

A novel approach to providing more grass types from which to select is being adopted by the Hong Kong Jockey Club. The Club has contracted the services of the Plant Biotechnology unit of the University of Melbourne to provide several thousand mutants of each of three selected grass species. The aim is to speed up the natural process of mutation to provide a large range of different types of grasses that can then be assessed for suitability.

Kikuyu, one of the selected grasses is a proven performer on racecourses in similar environments but performs badly in Hong Kong (probably because of the low light intensity). It is hoped that a wide range of Kikuyu types can be formed through mutation so that there is a chance that a type more suited to the low light intensity

of Hong Kong can be found.

The actual process is highly complex, but essentially it involves applying treatments such as radiation to the plant in a non-structured form (callus), then regenerating the individual cells into plants growing in test tubes (tissue culture). These small plants will be tested for growth in simulated conditions in the lab and the best performers will be taken back to Hong Kong for further on-site evaluation.

This project will be watched with interest and success could see the same approach adopted by other users searching for different characteristics in other plant species.

Ian Chivers



HONG KONG JOCKEY CLUB

LOKSAND FINDING A NICHE IN GOLF

Continuing to find applications in the golf industry, the Auckland Golf Club has recently installed the product to repair two frequently used access ways that had become compacted and virtually devoid of any turf cover at all.

An area 10m x 10m was excavated to a depth of 100mm and sand pre-mixed with the 'crimped' LOKSAND fibre was then brought on site and spread to level with a bunker rake. Seed was then drilled into the new surface and according to Course Superintendent Warren Mann, the project has been a success.



WARREN MANN, DIRECTING TRAFFIC



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DINT Australia Pty. Ltd, leading manufacturer of golf course equipment, has recently appointed Mr. Shane Symes as the distributor of their product range for the State of Victoria. Shane

has been involved in the Golfing industry for 24 years and for the past 5 years has been the Superintendent at Geelong Golf



Club. Shane's complete knowledge of Golf Course Management and maintenance is immense. Dint's commitment to Victoria is service and quality with a warehouse in Clayton and a fully equipped van with stock on board. Please do not hesitate to contact Shane direct on 0417 350 236 or toll free 1800 443 468 for any information you may require

AGCSA ROVING WORKSHOP

US turf expert, Dr. Ali Haravandi is heading "Down Under" to headline the AGCSA March 2000 Roving Workshops.

The topic of the workshop is "Water Management on Golf Courses".

For further details please contact the AGCSA on phone: (03) 9886 6200, fax: (03) 9886 6400 or on email: info@agcsa.com.au

WELL DONE DARREN

Darren Moore, Golf Course Superintendent at Manilla Southwoods in the Philippines who was featured in Volume 1.3 of ATM "The Audubon Experience" has recently been announced as the winner of the GCSAA Environmental Steward Award (international category).

Darren will be recognised at the GCSAA's 71st International Golf Course Conference & Show in New Orleans and will be featured in the February issue of Golf Course Management magazine.



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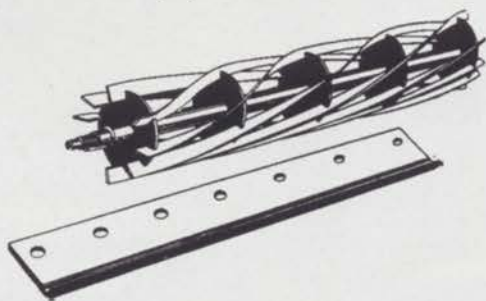
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Maurice is pictured holding the 1999 world cup which has travelled under full security to every state in Australia, visiting several regional centers



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President's Pen

I hope the transition to the Year 2000 has passed 'bug free' for everyone involved with the turf industry and if you were lucky enough to get some time off or better still rain! I hope you enjoyed it.

With the New Year comes a new way for AGCSA members to have their existing skills recognized in a more formal manner with the introduction of the AGCSA Skills Recognition Program. By now you should have all the information you require and I urge you to become involved as a way of making sure that your skills are formally recognized.

Event wise, the Year 2000 is set to be huge. The AGCSA will run a workshop series in March, sponsored by Toro. "Water Management on Golf Courses" – Dr. Ali Haravandi, and in June, the Millennium Turfgrass Conference will surely be the highlight of the year. Remember, 'early bird' registrations close on Friday 7th of April.

As you can see from the cover of this edition, Australian Turfgrass Management

is the official magazine of the Conference and it will be strongly promoted to our 6000 readers.

Early in February the AGCSA board met to discuss the possibility of broadening the activities and level of service provision to the turf industry. Hopefully, by the time you read this, further details will be available but I would like to take this opportunity to thank AGCSA Golf Course Superintendent Members for the tremendous response we received to the survey sent out earlier in the year. The information received allows the board to ensure that the policy decisions made have the support of the membership.

The AGCSA is committed to moving with the times and staying in touch with the changing needs of the turf industry.

Have a great 2000!

Peter Frewin
President, AGCSA

FNQGCSCA

On the 27th October, our AGM was held at Paradise Palms Golf Course. This was an important meeting for FNQ with the voting for the committee to run the newly established FNQ chapter of the GCSAQ. With the distance between Cairns and Brisbane being the same as the distance between Brisbane and Melbourne, it seemed a logical step to be able to set up our own chapter. The FNQGCSCA will be run the direction of the GCSAQ with no extra fees being introduced to FNQGCSCA members.

The elected committee is as follows,
President: Paul Earnshaw
Vice President: David Poulsen
Secretary: John Trezise
Treasurer: Stewart Poole

Our first field day is set for Saturday 19th February at Paradise Palms Golf Course, and is kindly sponsored by Globe, JFB, Toro Irrigation and The Water Connection. This

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is a membership drive as well so all prospective members are urged to attend. It should be a great day.

Paul Earnshaw
President, FNQGCSA

GCSAQ

Queensland has had some extreme weather since the start of the New Year with high humidity and temperatures inland soaring into the high 30's. Meanwhile, courses around the south east of the state have had plenty of rain.

In news from the Gold Coast region sources close to the Arrundel Hills Golf Club indicate that course quality has suffered since appointing a contractor.

From south of the boarder into northern NSW Barry Cox from Ocean Shores reports that rain continues to limit income and delay works programs.

In the Brisbane area, long serving committee man and superintendent of Keperra Country Golf Club, Chris Giles has parted company with the club to pursue other interests. Chris was on the GCSAQ committee for many years and has been a regular attendee of most conferences around the country. He is sure to pop up in some arm of the industry soon.

On the sunshine coast last year's highest achiever in the Golf Industry, Pat Pauli is due back from the USA after his study tour of the States with John Deere after being named the AGCSA Fellowship Award winner for 1999. Pat also managed to win the Queensland Golf Industry Superintendent's Achievement Award at the Sheraton Hotel in 1999, a fine effort and welcome back to Pat.

Up coming events in QLD include a field day at Gatton Golf Club in February and a roving workshop is on the cards, good luck to all our members.

Jon Penberthy
President, GCSAQ

GCSAWA

The Swan Valley supa golf complex was the venue for the Annual GCSAWA Christmas Party. Members and their families enjoyed a quick 9 holes followed by a terrific meal on the very first "supa golf complex in Australia".

Using oversize clubs and balls on a shortened course even some of our best golfers came unstuck and failed to return their score card. The highlight of the evening was a visit from a rather red-faced rotund gentleman handing out gifts to the children - Well Done Mr. Kirk.

Golf Course Superintendent Dion Warr and staff at the Vines can now breathe some relief after again hosting another successful Heineken classic. The extreme WA summer conditions certainly put everyone to the test during the tournament but Dion and staff were able to present the course in pristine condition.

Further funding from the HRDC and the GCSAWA have contributed to Digby Shorts' research, at the Shenton Park turfgrass and water research site. Digby is measuring the turf response to watering frequency and the use of fly ash as a soil amendment at various rates between 0,75,150,300 T/hectare. Nutrient leaching rates and turfgrass establishment is also being monitored. The plots were planted out in the first week of December 1999 using wintergreen couch and results will be forthcoming.

From all of us in the west all the best for 2000 and we look forward to catching up during the year.

Rob McDonald
President, GCSAWA

NSWGCSEA

Cold conditions were experienced across the majority of NSW leading up to Christmas, which restricted Couch growth.

For this reason, it was amazing to see the wonderful condition of Royal Sydney Golf Club during the Australian Open in late 1999. John Odell produced a magnificent course, his only regret being the lack of grass in the rough. The playing surfaces were in superb condition and were a credit to all involved in their preparation.

The NSWGCSEA have approved funding for research evaluating some of the many organic products being pushed as 'cure-alls' for disease, nematodes and insects. The product is an extension of the one commenced in Victoria and is jointly funded by the NSW Golf Association and HRDC.

The NSWGCSEA Championship Day was held at Castle Hill Country Club on Tuesday 7th February on the recently completed layout that was enjoyed by all in attendance.

Mark Parker
President, NSWGCSEA

VGCSA

Having survived the ravages of Y2K, I am pleased to be able to write this the first report for the Year 2000. Our 2000 calendar and diary has been distributed to all members and once again we are pleased with the quality of photography, capturing

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some magnificent golf holes at our 6 meeting venues for 2000. The 12 calendar sponsors have been generous in their support and without them such a quality product would not have been possible.

The final meeting for 1999 was held at Geelong Golf Club and was one of the final duties for host superintendent Shane Symes. Shane has taken on a role with Dint in Victoria and we wish him well.

Owen Browne, formerly a VGCSA member and now golf course superintendent at the Dukes Course St Andrews Scotland was our speaker. Owen detailed some of the construction maintenance and environmental issues confronting him in management of the Dukes course. Owen's presentation generated a number of questions and was well received by 60 VGCSA members and guests in attendance.

It was good to see a strong attendance with several Metropolitan members making the journey to Geelong. Chemturf provided a magnificent pancake breakfast to get golfers off to a good start. The 3 man Ambrose event was taken out by Bruce Stephens prompting the committee to look at appropriate measures to allow others in the field to have a chance. Textron provided the golf prizes and we thank them for their sponsorship throughout the year. Thankyou to Geelong Golf Club, Textron and Chemturf for making the day a success.

Our first meeting for 2000 will be at the Heidelberg Golf Club on 21 February with Mark Burchell host superintendent.

Richard Forsyth
President, VGCSA

SAGCSA

Now we are well into summer, lack of winter rain is impacting on many courses.

held at Belair National Park. It was a great day weather wise and the crayfish supplied by Brian Cooper which went down extremely well.

Events for 2000 will be Flagstaff Hill in March, bus trip to mid north in May and Kooyonga in June for the AGM.

In closing we must congratulate Steve Newell for the way he and his team presented Kooyonga for the Ford SA Open probably the best condition it has ever been in.

Hope everyone achieves their aims in the new millennium.

Bob Dellow
President, SAGCSA

TGCSA

The TGCSA held the annual Machinery and Industry Day at Port Sorell Golf Club on December 1st 1999 and all major and minor dealerships need to be commanded for their support. I am sure everyone appreciated the quality and quantity of turf machinery exhibited on the day. Thanks also, to Harry Skledar (Port Sorrell Golf Club) for his help in organising the venue.

With the formal part of the day concluding, nine holes of golf proved to be entertaining! Some valuable trophies were donated for the day, and Steve Lewis and Ian Young were the lucky winners of two all expenses paid cricket holidays donated by (Southern Turf) Eric Roth and Scotts Australia.

With the millennium year upon us I hope everyone has made the transition without any bugs. The other factor upon us is the heat of summer, which leads me to reminding everyone to "Slip, Slop, Slap".

The TGCSA would like to wish Wayne Porter (Ulverston Golf Club) all the best in preparing his course for the upcoming TAS Open on 18th February 2000.

Phil Hill
President, TGCSA

TGAA

(VIC)

How time flies! Already into the second month of the year and the Summer Season is almost over.

We are waiting in anticipation for the opening of the Colonial Stadium. Most grounds have undergone some form of renovation, which will enhance the turf sward, and help with wear tolerance for the coming winter. Couch is thriving under present conditions.

Our next activity is an OH&S Morning at Sandown Racecourse on Wednesday April 5th.

Following this is the one we have been waiting for "Turfgrass Millennium Conference". The Conference Committee encompassing members from all Streams have worked tirelessly to present a professional, informative and entertaining Conference. Support your industry and return your Sportsfield Stream entry to the AGCSA Office ASAP. Don't forget the Conference Dinner in your registration.

Not far away and not to be missed. Don't be the one to say, "I didn't make it". Early bird rates expire on April 7th

Robert Savedra
President, TGAA(Vic)

TGAA

(ACT and Surrounding Region)

One of the biggest changes to effect turf managers in the New Year, not only in ACT but nationally, is the extensive reorganisation of the training curriculum for apprentices. It will result in there being more emphasis on the employer and the workplace to assess the apprentice's progression. These changes have been brought about by the limited funding received by registered training organisations. Lets hope this is in an effort to refine the quality of training.

The TGAA in conjunction with the Turf Management section of the Canberra Institute of Technology (CIT) are discussing the establishment of the Austep Trial. One item already available to students and members is an infra-red thermometer kindly given by the TGAA to the CIT.

May I take the time to mention that the TGAA is only here today due to support

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from sponsors, members and good management. It is imperative that the turf industry help support associations and organisations such as the TGAA. It is essential for the progression of quality in the industry and the recognition deserved by the turf managers.

The TGAA (ACT Region) mid year seminar is to be held on the 26th of July. For further information please contact Bruce Davies. Ph: (02) 6207 4623 Fax: (02) 6207 4605.

'Till next time, Agrostologists.

Justin AK Haslam
Committee, TGAA (ACT and Surrounding Region)

VGA

With the new millennium well under way, and the VGA season near completion, our objective is to see more registrations for the Millennium Turfgrass Conference.

The VGA Christmas Party was held on 2nd December, on a very warm summers night. Although numbers were down, those who turned up, all had a good time, with plenty of festive spirit in the air. We thank Lulu for an entertaining night, and trust that Gary will have some long lasting memories.

In contrasting conditions a week later, we played our Oasis Turf 100-Up Singles Handicap at Kew Heights. After the Handicappers had done their job, we got down to the nitty-gritty of bowling. Bowling on Andrew's new Pennncross greens, was a little tricky for some, but Keith Fleetwood and Allan Elliott soon mastered it. The final will be played between the two with Allan going for back-to-back titles. Thanks to Scott Bolton from Oasis Turf who was our sponsor for the day.

Don't forget about the two awards the VGA are announcing this year, The Green-keeper of the Year and The VGA Distinguished Service Award. Both these will be announced at the Millennium Turfgrass Conference in June, and you must be a paid up member to win.

Applications can be sent to:
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Toby Lumsden
Vice President, VGA

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