Keeping it Green

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AUSTRALIAN GOLF ENVIRONMENTAL INITIATIVE NEWSLETTER

The Barwon Heads Golf Club ~ Par 3 Course ~ Is it Australia's Most 'Sustainable' Golf Course Design?

By Paul Mogford, Principal, Crafter + Mogford Golf Strategies Golf course architecture

Editor's note: Paul is Chairman of the Environmental Sub-Committee for The Society of Australian Golf Course Architects

How we measure such a question is difficult. We contend that the principles adopted for the design and construction of the new Par 3 course at Barwon Heads, opened in 2008, come close to achieving such lofty claims. Striving for 'sustainability' can be argued by some as 'an exercise in futility ~ as to be truly sustainable surely eliminates human intervention'. However sustainability in the real world is not only a measure of minimal impact on the environment but also a question of access and playability for all including the young, elderly and those new to the game. It also equates to minimizing the dollar cost to run the course ~ this being a measure of economic sustainability, So sustainability comes in many forms. The following is a brief description of the key principles we have incorporated into our design in our quest to design a 'sustainable' golf course.

Ease of Play

The course is free of bunkers, improving playability for the many elderly players that grace the links at Barwon Heads. Juniors are also encouraged as they are not deterred by bunkers which can be a great form of discouragement and frustration for beginners. Contour hazards (humps, hillocks and hollows) are widely used to add interest and teach the young and new exponents the joy of bumping and running the ball.

Figure 1: Barwon Heads G.C. – Par 3 Course 6th Green in foreground

Length of Course & Time to Play

Increasingly we are time poor and with an 18 hole round taking up to 5 hours, this is not always sustainable. The Barwon Par 3 is made up of nine Par 3 holes. The holes vary in length from 70 to 130m, however the wind can add 2-3 clubs on any given day. This of course equates to a quick round with an hour to whip around not uncommon.

Figure 2: Barwon Heads G.C. – Par 3 Course 5th Green in the foreground with the 3rd and 4th holes in the background

Playing Surface Areas

The area of maintained turf is minimal. Green areas range between 250 and 320m2. Construction is 'push up' of site sands with no drainage beneath. Such an approach has eliminated the use of imported materials such as those requiring large amounts of energy to produce or raw materials sourced from afar or environmentally sensitive areas.

Figure 3: Barwon Heads G.C. – Par 3 Course 8th Dell Hole Homage

Figure 4: Barwon Heads G.C. – Par 3 Course 4th Green side

Minimal Turf Areas & Inputs

The philosophy is to produce 'lean and hungry' turf surfaces promoting firm and responsive ground which compliments the core design element of 'bump and run' golf. Turf selections also play an integral role in this approach with Wintergreen couch being used on the greens and Conquest on fairways. The couch greens, needing only around 50% of the water Poa greens require, provide a surprisingly true putting surface and with the generous contouring of the greens the speeds are still challenging to negotiate.

Figure 3: Barwon Heads G.C. – Par 3 Course 1st Hole

Water Management

The course houses a flood detention basin with the capacity to temporarily store 7-8 megalitres, serving an important role in the management of local residential stormwater management. Excess water is pumped into the Club's main water storage dams to supplement other sources of irrigation water. The basin also houses a permanent wetland home to indigenous flora and fauna.

Figure 3: Barwon Heads G.C. – Par 3 Course Wetland with 2nd Green in background

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SUSTAINABLE GOLF

Golf courses in Australia have never been better conditioned and presented than they have been over the past 5 – 10 years. The high quality of the playing surfaces and the golf course in general has created a demand and expectation that the golf course will always be in 'perfect condition'.

At the same time, climate change, weather extremes, the global economy and environmental pressures are creating new challenges for clubs to maintain these standards. It is a time when the term sustainability has never been more apt. With the pressures of diminishing resources and in particular water, more extreme weather conditions and tightening budgets, golf clubs are having to assess what is sustainable. Sustainability is defined as "*capable of being maintained at a steady level without exhausting natural resources or causing severe ecological damage*". This is a very appropriate definition of managing a golf course in Australia today.

The challenge of maintaining a golf club that is economically, socially and environmentally sustainable is an international issue. To discuss these issues the AGCSA has invited Steve Isaac, the Director - Golf Course Management of The R&A to participate in a series of seminars on sustainable golf.

Steve spent 18 years with the Sports Turf Research Institute, which included acting as the consultant agronomist at three Open Championships, before taking up a full-time role at The R&A in 2003. Steve is responsible for helping to develop and enact the R&A Golf Course Committee's sustainability programme. This is serviced by the best practice website, www.bestcourseforgolf.org, and involves extensive travel, mainly in Europe but also to Africa, Asia, New Zealand, South America and the USA. Steve also provides secretarial support for the European Golf Association Golf Course Committee, whose remit is to monitor developments in EU legislation which may affect golf courses in Europe and to build relationships with appropriate contacts in Brussels.

Steve will be with us in September 2009 to share The R&A's philosophy of sustainable golf which includes the key areas of playing performance, environmental stewardship, economic performance and social responsibility – the four parameters in The R&A's definition of the sustainable golf course.

The programme will cover;

- The R&A's role in SE Asia, Australia and New Zealand.
- Sustainable golf and the R&A.
- Golf course benchmarking as a management tool.

The seminars will have wide appeal and superintendents, general managers, club professionals and committee members are encouraged to attend.

The proposed dates are as follows:

Melbourne – Tuesday 8th September
Sydney – Thursday 10th September
Brisbane – Monday 14th September
Adelaide – Thursday 17th September
Perth – Monday 21st September

Cleaner recycled water increases climate risk

The following article was recently published in the Melbourne Age newspaper and poses an interesting quandry. By improving the quality of recycled water have governments and water authorities taken into account the full environmental costs.
Written by Peter Ker
May 25, 2009

IMPROVING the standard of recycled water threatens to push up Australia's greenhouse emissions, and governments must consider if better quality waste water can be justified under a low carbon future, water companies have warned.

In a report released today, the Water Services Association of Australia (WSAA) — a national body representing water retailers – has highlighted the environmental catch 22 of recycled water, saying recent improvements to treatment standards "didn't adequately consider the impact on the water sector's greenhouse gas emissions".

The report said a four-fold increase in energy consumption had been experienced at water treatment plants forced to lift their filtration of sewage from "secondary" to "tertiary" standard.

Waste water can be recycled to different standards, and the lower standards — water suitable for sports fields — require less energy and create lower emissions than water recycled to tertiary standards, which can be used around the house for non-drinking purposes.

As Melbourne faces record water shortages, recycled water is increasingly being adopted for non-drinking purposes.

Melbourne recycles more of its waste water than any Australian city, yet still pumps most waste water out to sea.

Despite the warnings over emissions, most experts still consider recycling waste water to be less greenhouse and energy-intensive than desalinating sea water.

Melbourne is expected to be drinking desalinated sea water from Wonthaggi by late 2011.

The WSAA report said cities would move away from sending all waste water to one or two large treatment plants, and instead were likely to have several small, local facilities for recycling water.

Almost all Melbourne's waste is treated at two large plants — Werribee on the city's western fringe, and Carrum in the south-east.

WSAA said it was "imperative" that recycled water should be supplied without the need for long pipelines and large-scale pumping.

Aqua-Phyd
Water Solutions for a Greener Planet

US water solution company Aqua-Phyd are currently seeking 4 Australian golf courses who would like take part in a 6 month testing trial here in Australia.

Aqua-Phyd facilitates a non-chemical water and soil treatment technology and service for golf courses and agriculture.

Aqua-PhyD treated water claims to reduce soil compaction, salinity and sodicity, to create optimum growing conditions for plants and turf, as well as contributing to the reduction of water and fertilizer usage on Golf Courses.

Aqua-PhyD will manage the onsite analysis, design, material management, certification, installation and maintenance of the Aqua-Phyd unit for the duration of the testing period.

If you would like to register your interest and find out more, please email Jeff Gambin at jeff.gambin@hotmail.com

Check out www.aqua-phyd.com for more information.

Plant Health and Pest/Disease Resistance by Phil Ford

The paragraph below summarises the crux of the article. I'm putting it first to encourage you to keep reading, as it's an extremely important and interesting topic:

Turfgrasses can produce resistance compounds (phtyoalexins and alkaloids) to provide resistance against pathogens and insect attack. These work very well, but are expensive for the plant to produce, so only healthy plants have good resistance.

Hopefully you'll now read on. We are familiar with the fact that our own best defence from disease is to maintain our health. Humans (and the higher animals) have an immune system that attacks foreign invaders such as bacterial, fungal and virus pathogens. The white blood cells, for example, are scavenging cells that engulf and destroy foreign particles in the body. Specific antibodies are also produced in response to pathogens. Poor health reduces the efficiency of the immune system, and we will be much more susceptible to the diseases that go around, like colds and flu. With very poor health we may also be susceptible to commonly encountered organisms that normal people resist, such as Pneumonia and Legionnaires disease. To demonstrate how effective the human immune system is, compare a living body to one that has just died. The dead body will start to decompose immediately due to bacterial growth. These bacteria were kept under control while the body was living, but the minute the body dies the bacteria start to attack the tissues and multiply.

Most people are only vaguely aware that plants also have defence mechanisms to combat pests and diseases. It's not an immune system (they do not have scavenging cells like our white blood cells, for example) but a simpler system involving the production of inhibitory chemicals. These inhibitory compounds (summarised as phytoalexins to inhibit fungal pathogens and alkaloids to inhibit insects) are complex, and quite draining on the plant to produce. So they are only produced on demand, in response to an attack. When not under attack the production of the compounds is switched off. The acronym for this resistance mechanism is SIR, Systemically Induced Resistance. Systemic, because the compounds circulate around the whole plant, and Induced because the compounds are only produced in response to an attack.

We can demonstrate the effectiveness of these plant defence mechanisms in a similar way to the dead body story above. A living plant leaf can be free of disease, but within minutes of being cut off the plant the leaf will start to decompose due to fungal and bacterial growth. So obviously the living tissue had some defence mechanisms at work. Let's look at them in more detail:

Insects and Stress

Insect senses are adapted for them to locate a suitable host or food source. Imagine an insect pest such as a Stem Weevil, Cockchafer beetle or Cutworm moth flying over your golf course at an altitude of 200m. The insect spots two golf greens down below. One is healthy (good irrigation, good nutrition, good root depth etc.) and the other is stressed for water and nutrients, with a short root depth and excessive thatch levels. The insect can 'see' the Infra Red sign of Heat Stress and 'smell' the ethylene and other stress compounds being given off. If you were the insect, which green would you target? You might expect the insect to zero in on the healthy green, as there is more food to eat. But in fact the insect will target the stressed green. There may be less food on offer, but the stressed turf will not put up resistance to attack, and the insect will have a greater chance of success for it and the eggs it will lay.

As an interesting mind exercise, imagine that it was looking at just the one green that had an area along one edge that dried out faster than the rest of the green due to a poor uniformity of the irrigation system. It will target that area, which leads to two things. First, you will need to spray the whole green, even though the attack was only on one drier section. And second, the small section that was attacked was like leaving the back door open – the insect enters that one area, and later offspring will spread across the whole green. Is the CU of an irrigation system important? You decide. In a Victorian Golf Association project it was found that the average CU of ten greens audited was only 76%. Modern technology should result in a CU above 90%. I've tested one green at 94%.

The drier, stressed turf may not look any different from the healthy turf, by the way – at least not in the early stage. Tools like a hand-held Infra Red thermometer (eg: the RayTek Ranger, for around $400) and the Stress Detection Glasses (around $150, probably) allow you to see stress much earlier than normal, and both are highly recommended.

What are Alkaloids and Phytoalexins?

Alkaloids are nerve toxins and affect anything with a nervous system (eg: insects, nematodes, mites, sheep, humans). In mild doses they can have unusual stimulatory effects (eg: caffeine, nicotine, cannabinol, opiates, all of these come from plants). But they are not made for our amusement, they designed to paralyse nerves and kill things with a nervous system. Modern insecticides are synthetic copies of alkaloids, and kill their targets by a similar mode of action. But plants invented them first. Some fungi (eg: endophytes) and bacteria (eg: Bacillus

thuringiensis) also produce alkaloids and can be found associated with plants in a beneficial way.

Phytoalexins are compounds with fungicidal and antibacterial properties and are produced in response to a pathogen attack. Plants may also contain, or make on demand, various other biochemical compounds (eg: tannins, chitinases, glucanases, pectolytic enzymes, cyanides, phenols and a group called the pathogenesis-related proteins) with fungitoxic or fungal inhibitory properties.

Plant alkaloid and phytoalexin defences are usually kept dormant, and are only triggered by an attack. This may give rise to cross protection - an initial attack by one pathogen may activate the defences, and subsequent attacks (maybe from an even more dangerous pathogen) are resisted because the defences are already in place. This can be exploited if a weak pathogen is allowed to exist, or even encouraged, to keep the plant's defences active for more dangerous pathogens that may be out there. There is some research (Deverall, 1997; Reid and Wong, 2005) looking at mild or non-pathogenic parasites such as Psuedomonas flourescens and Bacillus megaterium that trigger the defence mechanisms and provide cross protection from other pathogens. Percy Wong is currently working with the Masters program at the Sydney University Plant Breeding Institute, and has a lot of experience in this field.

Other research is looking at synthetic compounds that can be sprayed on to activate or enhance the plant defence mechanisms. Phosphonic acid (also called Phosphorous acid or phosphonate) is thought to work in this way, rather than (or as well as) by direct fungicidal action.

There is a theory that takes this one step further, that says plant protection using pesticides removes the need for the plant to use its own defences, and the plant may be even more susceptible to the pathogen when the pesticide loses activity. In other words, pesticide protection makes the plant lazy and dependent on ongoing pesticide protection. Whether this is true or not is arguable, but I personally advocate the use of preventative fungicide programs on greens (insecticides is a different matter, for a different discussion).

Some summary points:

1. Plants have resistance mechanisms, particularly alkaloids to fight off insect attack, and phytoalexins to fight off fungal pathogens.

2. Some of these resistance chemicals are in play on a day to day basis, but some of them are expensive for the plant to produce, so they are kept in reserve until they are needed (these are the Systemically Induced Resistance chemicals).
3. Healthy plants are more able to produce the SIR resistance chemicals, and so have better resistance to nematodes, insects and fungal pathogens.

4. How to make healthy plants? That's a book on its own and encompasses irrigation, variety selection, soils management etc. But there is one 'no brainer' in all this. Most of your problems with bent and/or Poa greens are summer problems, agree? Stem Weevil, Pythium, Brown Patch, Nematodes, Dollar Spot and so on- they are all strongly related to Heat Stress. Inadequate irrigation leads to plant moisture stress, which causes the leaf temperature to rise (eg: from 25° to 35°), which is Heat Stress. The natural resistance of these areas is dramatically reduced, leading to outbreaks.

5. How to manage Heat Stress? Good irrigation uniformity (or a lot of hand watering), good water penetration, plus syringeing are the keys, along with early detection of hot spots.

6. Superintendents routinely place plants under stress to generate green speed, which is fine but be aware that the turf resistance to pest and disease will be reduced.

Further Reading:

Agrios, Plant Pathology. p 97

Deverall, B.J. (1997): Disease control through natural plant defences. In International Turfgrass Society Research Journal, Volume 8 (Sydney Conference), 1997.

Reid, R. and Wong, P. (2005): Soil Biology Basics: Soil Bacteria. NSW DPI fact sheet http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0017/41642/Soil_bacteria.pdf

e-par Update

e-par has recently been chosen to lead a **Climate Smart Business Cluster for the QLD Department of Environment and Resource Management**.

e-par's Business Cluster is called **Turf Sustainability** and the program involves promoting sustainable activities which are occurring within the Turf Industry and **is available to all e-par and non e-par users.**

Turf based facilities that have initiated sustainable practices in the past or plan to in the future, will be the focus of the program.

Examples of what will be recognised are as follows:

- Developing an EMS
- Water Savings, such as
  - ~ waste water recycling plants installed in wash bays
  - ~ Rainwater Tanks
  - ~ Use of moisture retaining amendments
  - ~ No Flush Urinals and water saving devices within clubhouses
- Energy Saving, such as
  - ~ soft starters on pumps
  - ~ Variable Speed Drives
  - ~ Energy Efficient Lighting
  - ~ Using Growth Retardants on Turf to reduce mowing.
- Waste
- Recycling
- reusing composts
- Waste Oil recycling and so on.

To make the program successful and to promote the Turf industry as leaders in environmental best practise e-par need 20 businesses to register with the Cluster Program.

The program **will be at no cost to participants** and the workshop will be co-ordinated and conducted by e-par and the department.

The workshop will be held for the participants so we can discuss strategies to Action Plan and report in accordance with the program.

So, what does the Club/ participant get from the Cluster?

Publicity via the QLD Department of Environment and Resource Management.

A closer relationship with the regulator that demonstrates your business is proactive towards environmental management.

Recognition of work to be more sustainable for your business by a government agency.

If you are interested **in taking up this valuable opportunity at no cost to your organisation**, then please complete the attached form and reply as soon as possible.

Click here

If you have any questions please don't hesitate to call either Dean Scullion on 0412 294 504 or Terry Muir on 0412 294 514

Keeping it Green Editorial Enquiries

If you have any editorial or photos you would like to submit for publication in Keeping it Green, please contact AGCSA environmental agronomist John Geary jgeary@agcsa.com.au or phone (03) 9548 8600

AGEF SUPPORTER PACKAGES

The Australian Golf Environment Foundation (AGEF) has a range of supporter packages to suit corporate, club and individuals that may wish to contribute to fostering future research and knowledge into golf and the environment. For more information on how to become involved with the AGEF, contact John Geary at the AGCSA on (03) 9548 8600 or email jgeary@agcsa.com.au

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