How do the team at Burghley Park Golf Club cope with hundreds of caravans – and dogs – on their fairways when the world famous horse trials roll into town? Steve Castle found out, and also heard how the greenkeepers and their vertidrainer helped save the equine event this year

PROFILE

Name: Gary Salisbury
Role: Assistant Greenkeeper
Born: Burton upon Trent
Handicap: 28
Favourite sports team: Stamford AFC – Gary writes the match reports

The team: Stuart McCrossan, Dave Salisbury, Gary Salisbury, Steve Hopkins. Missing is Simon Bosett

"We just stood there for about an hour, I certainly had a tear in my eye. It was total devastation".

Dave Salisbury was in full flow as he recalled the horrific condition some areas of Burghley Park's golf course were in days after the Land Rover Burghley Horse Trials on an unforgettable Monday morning in 2008.

The club allows hundreds of caravans and motor homes to park on certain fairways during the world famous event, usually with manageable disruption. However, a perfect storm of very wet weather five years ago left parts of the course reminiscent of a particularly damp Glastonbury festival.

It's clearly still fresh in the memory for Course Manager Dave. He recalled: "We had very heavy rain at exactly the wrong time and we were pulling motor homes out of the mud throughout the week. There were huge ruts and a foot of sludgy mud everywhere. I've spent the majority of my working life at this course, so to see it in that state was heartbreaking. "

But the club soon swung into recovery mode. It was agreed that external contractors would be hired to assist the four-strong greenkeeping team in getting the course back in play as soon as possible. Dave hurried across the country, visiting various turf nurseries to choose the perfect fescue dominant turf before selecting County Turf in Scunthorpe.

The team knew that with the trials ending in early September, they had little growing time left in the season.

Dave said: "We closed the back nine immediately but within three or four of days we had a short course open on the back nine by cutting temporary tees and greens and using three short holes. We employed a landscaping firm, checked the specifications with the STRI and laid the turf and had completed the work by the end of September."

You may think the team curse the prestigious trials – but in fact it's an ideal time to complete maintenance as Dave's son Gary explained.

"We're closed for eight days which is a godsend because we're a very busy course, we must average 150 rounds a day and we're rarely closed because the course is built on a limestone hill which offers superb natural drainage.

"Also it's a tight course so when you've got 100 golfers out there's very little room to work on the course.

"So this week we've vertidrained all the tees and greens in two days and now we're moving on to vertidraining the aprons.

"This year we've got 550 caravans parked on the course. So that's 1,000 people and they seem to average three dogs each, and you can imagine what the dogs sometimes leave behind in the rough! We've also had problems with tent pegs being left behind – you don't want one of those going through your mowers but they can be very difficult to spot deep in the ground.

"Visitors can only park on designated areas on four fairways (the 10th, 17th, 18th and practice) and some of the rough in between. We rope the areas off before they arrive where we think there's a danger someone driving along at night might accidentally cut across a green or tee."

As well as dealing with the aftermath of the trials, Gary – who first helped his dad rake bunkers on the course aged just five - revealed how he came to the rescue in dramatic fashion ahead of this year's event.

He said: "I received a phone call late one night from the Clerk of the Course, Philip Herbert, sounding extremely worried. It turned out a lorry driver had accidentally driven onto the soft grass in the main arena where they hold the dressage, and its wheels had sunk in six inches deep. Phillip said "Somebody told me you've been out vertidraining – is there any chance you could help?"

"Early the next morning I went to check it out and the fieldgrass in the arena was a mess. They'd watered it to a depth of eight inches because they wanted the going to be soft, so a huge articulated lorry delivering dozens of horse jumps in had left it in a terrible state.

"I put the vertidrain across it on full heave – which dad had never seen before - and drove as slowly as I possibly could. When I'd finished you couldn't see where this lorry had been. Philip was very grateful. In fact it did such a good job we've been vertidraining our tees on full heave since – but it's always good when you can trial it somewhere else first!"

The 16th century Burghley House is the centrepiece of the large estate in Stamford, and over the last few decades has capitalised on its commercial potential. As well as the equestrian event it now holds regular concerts, exhibitions, markets and the 'Rat Race' – an adventure sports weekend. The golf course itself, which uses a separate entrance, has undergone

TOP: The 18th fairway, September 2013
TOP RIGHT: The course minus the caravans
MIDDLE LEFT: The practice fairway in September 2008
MIDDLE ABOVE: At least the visitors have taken heed of the sign!
MIDDLE RIGHT: Relaying turf in September 2008
LEFT: The horse trials

MACHINERY LIST

John Deere
2x 2030 Pro Gators
2x 2500A Greens Mowers
2x 2653A Surrounds Mowers
1 x 2653B Precision Cut
1 x 3520 Compact Tractor
1 x 7400 Terrain Cut
1 x 1445 Out Front Rotary
1 x 3245C Semi Rough Mower
1 x 3235C Fairway Mower
4 x Hand Mowers

1 x Kubota Compact Tractor
1 x Wiedenmann Terra Spike XF
1 x Dakota Turf Tender
1 x Massey Ferguson Tractor & Backhoe
1 x Ryan GA30
1 x Ransomes HR6910 Rough Mower
1 x Bantam Sod Cutter

huge changes since Dave's arrival in 1980.

He said: "When I joined it was a blank canvas – literally a field with 18 holes laid out with no trees, bunkers or ponds – in fact it had no distinguishing features whatsoever. It was managed by two greenkeepers – myself and Stuart McCrossan who's still here today.

"There were hundreds of sheep allowed to graze on the course with electric fencing around the greens. So we've planted hundreds of trees and built the ponds and bunkers in-house, and we're still making changes and continuing to progress now."

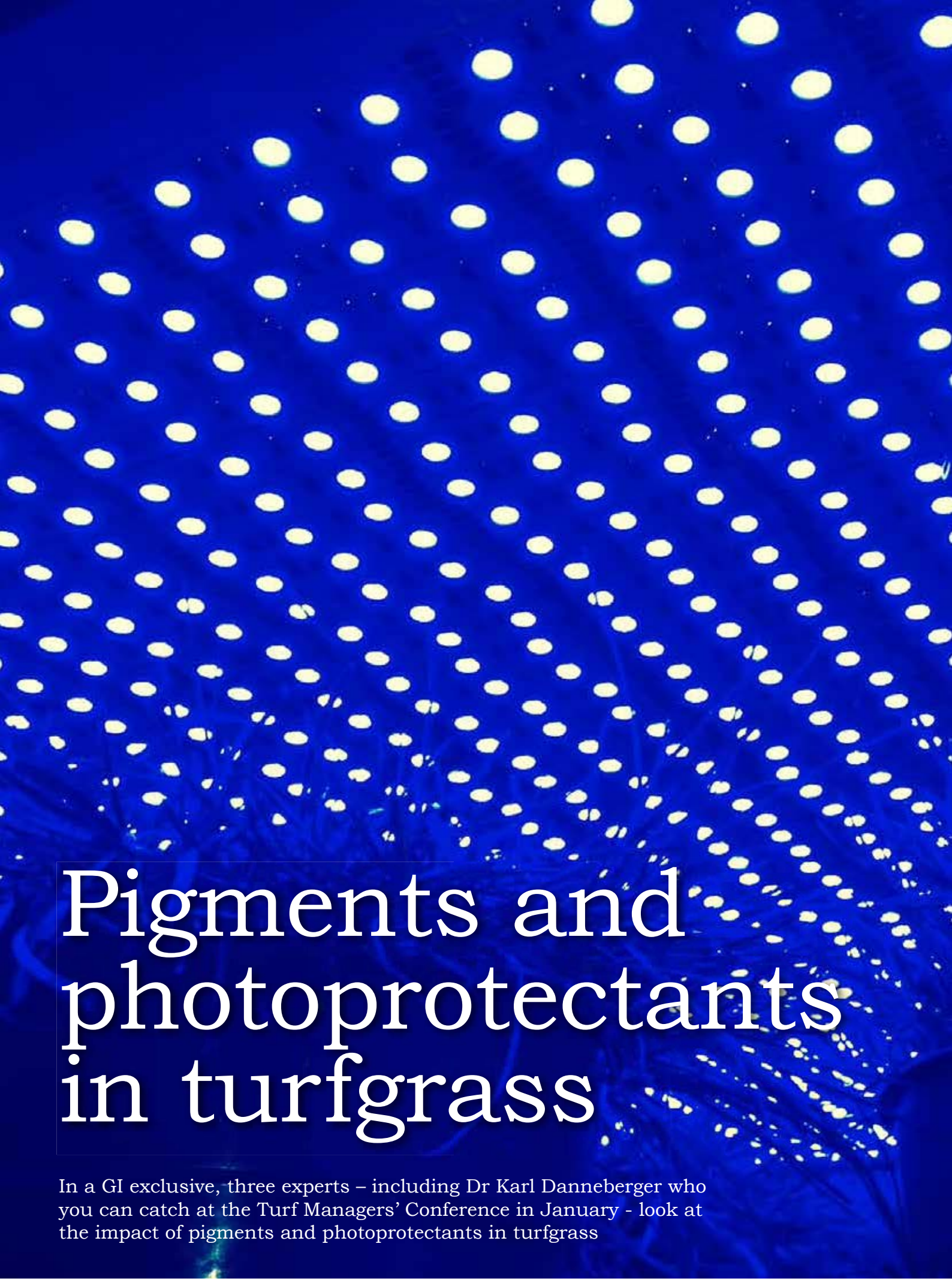
In 2010 the club employed golf course architect Tom Mackenzie to conduct an audit, and they've adopted some of his ideas including adding new bunkers and reshaping existing traps.

It's clear that the small team at Burghley Park have a difficult balance to strike. With a small budget in a rural area, and with plenty of courses nearby, they face constant competition for members.

They also require a busy course to keep funds coming in – but naturally this restricts their ability to work on the course as Gary explained earlier.

But Dave concluded: "The changes made after the Mackenzie audit prove we're constantly evolving. If we'd have stood still people wouldn't have wanted to play here – and I truly believe we're the best course in the area.

"Our greens are 75% bents and fescues cut to 3mm. I like perennial grasses – annual meadowgrass is too unpredictable for me. I love this course, if I could wrap it up and take it home with me every night I would. "



Pigments and photoprotectants in turfgrass

In a GI exclusive, three experts – including Dr Karl Danneberger who you can catch at the Turf Managers' Conference in January - look at the impact of pigments and photoprotectants in turfgrass

We are able to induce plant pigments that serve a protectant role through manipulating temperature and light.

about the authors

Dr Karl Danneberger

Dr Karl Danneberger is Professor of Turfgrass Science in the Department of Horticulture and Crop Science at the Ohio State University. His research focus is turfgrass ecology and physiology and has received numerous awards.

David Gardner

David Gardner is an Associate Professor at Ohio State. He concentrates on Turfgrass Stress Physiology and weed control in turf.

Dominic Petrella

Dominic Petrella has concentrated on Pigments and Dyes and their impact on turf at the same university.

As a brief review, solar radiation can be a two way street. In one direction the sun's energy is converted, by the plant, into a useable form of energy such as carbohydrates.

On the other hand, excess light energy can also overload the same photosynthetic system leading to physiological stress and decline (Demmig-Adams and Adams III, 1992). Therefore, light stress can ultimately impact turfgrass performance, wear tolerance, and even disease resistance. By limiting abiotic stress due to excess radiant energy, cool season turfgrasses may be better fit to withstand other biotic and abiotic pressures. From a light perspective, it's fairly well known that ultra-violet (UV) wavelengths of light are damaging to organic tissue, but plants visible light (PAR) also has the potential to be an abiotic stress (Hakala-Yatkin et al., 2010).

Light energy as a Stress

Cool season turfgrasses are photosynthetically limited by the quantity of carbon dioxide (CO2) in the atmosphere. Because of this, turf species like Agrostis stolonifera and Poa annua can only utilise a given amount of light at a given amount of CO2 (and temperature). Typically the amount of "useable" light intensity is around 400-500 µmols m2 s-1. When light intensities exceed these levels, plants are said to be photosynthetically saturated (Sharkey et al., 2010). To put it into perspective, light intensities during summer months will exceed 2,500 µmols m2 s-1 around midday. When levels of PAR exceed saturation, there is a high probability that the excess light will initiate chain reactions of oxidative stress leading to proteins, enzymes, membranes, and other molecules being degraded (Hakala-Yatkin et al., 2010). By relieving some light stress, we can potentially reduce physiological stress. The question is how can we decrease UV and visible light stress?

In theory, light stress as a whole can be mitigated by the application of photoprotectants (Kullavanijaya and Lim, 2005). These compounds have the innate ability to filter, absorb, and reflect damaging or excess light energy. Photoprotectants mimic the function of naturally occurring compounds that plants produce to filter and reflect light. Both the waxy cuticle layer and leaf hairs (trichomes) are constituent structures that function in reflecting UV and PAR light. However, when levels of light stress become excessive, many plants will induce the synthesis of extra quantities of carotenoids, anthocyanins, and flavonoids. These molecules are natural plant pigments that function in dissipating UV and PAR light that isn't blocked by the cuticle or used for photosynthesis (Demmig-Adams and Adams III, 1992).

Pigments

As of now, most products containing a photoprotectant that are used on turfgrass contain a class of compounds termed pigments. By definition a pigment must meet two criteria: it must be insoluble in its solvent, and it must absorb/transmit a given wavelength of light and reflect back a different wavelength(s) (Zolinger, 2003). What we see reflected by the pigment is "colour". The ability that pigments possess can be taken advantage of by serving as a physical barrier or screen to UV and PAR. When applied to the surface of a leaf, a pigment layer still allows for the transmission of PAR; however, PAR intensity will be decreased and the majority of UV light will be absorbed or reflected. A layer of pigment applied to a turfgrass surface will essentially serve as a shade, and in most cases this can be a good thing. For example, Poa annua is naturally a shade adapted species. Under full sun and low moisture, this turf will tend to show decline come summer (Beard, 1978). However, the application of a pigment may serve as an option for managing Poa annua outside of its adaptive range.

Several companies are promoting products that contain pigment. How do they differ? As far as the green pigment goes, there is no difference. The synthetic pigment used is a chemical derivative of a phthalocyanine (PC) molecule. These molecules are related to both porphyrins (chlorophyll) and hemes (hemoglobin), but structurally are considered to be more stable (Dahlem, 1939). Chlorinated-copper phthalocyanine, more commonly known as Pigment Green 7, is responsible for all of the green pigmented products currently in the turf market. However, Green 7 is widely used in many other fields. Organic photovoltaic solar cells take advantage of PC chemistry by using them to convert sunlight into electricity (Djurisic et al., 2002). The properties of PC's that allow it to convert light into electricity are termed photosensitization reactions. These chemical reactions are

purposeful in some fields, but may impart problems when the pigment is applied to plant tissues.

When a pigment is photosensitive, it undergoes chemical reactions that either results in its oxidation (loss of electrons) or it will pass along high amounts of energy to nearby molecules (Abramcyzk et al., 2004). If placed on organic tissues many times this same process will result in the creation of reactive oxygen species (ROS). At this time, ROS production due to Green 7 applications has not been reported in plant tissue.

Green 7 is the only source of "colourant", but there are additional pigments being used in many products. For example, both titanium oxide (TiO) and zinc oxide (ZnO) are listed as active ingredients in TurfScreen®. Both of these compounds are true pigments. However, their optical properties are different compared to Green 7, and their ability to reflect and absorb light are more dependent on the size and quality of the particles (Diebold, 2003). Even though these oxides are known for their high UV (and PAR) reflective capabilities, these properties will decrease as the size of the particle also decreases (Serpone et al., 2001). Kaolinite, a clay mineral, has been sold under the label Surround WP® as product to prevent and decrease sun scald on fruit/vegetable crops. Kaolinite can also be found in Daconil Ultrex®. Like both metal oxides, kaolinite is known to be able to reflect solar radiation; however, when compared to pigments like TiO and ZnO, less kaolinite is needed and the particle size is less important (Glenn et al., 2002).

Besides the type of pigment used, the other aspect that differentiates many pigment products is the deposition aid or sticker. These additives spread the pigment on the leaf and allow it to last for a longer period of time under variable weather conditions. Some common deposition aids that are combined with pigments include: silicon emulsions, synthetic latex, resins (plant terpenoids), silicon dioxide, metal oxides, and even oils (Hazen, 2000). Not only do stickers stick, but they also can physically decrease evapotranspiration (ET). Many superintendents claim less watering when certain pigment products have been applied. Decreased water use is not a property of the pigment, but instead is caused by the deposition aid physically blocking water loss (Gale and Hagan, 1966). In the short term lower ET rates can be helpful, but in the long run it could lead to other physiological dysfunctions.

And now for the most important question, do photoprotectants/pigments reduce turfgrass stress? Well – yes and no. One of the major factors in this decision is how we measure stress. The problem is many researchers measure stress in different fashions, and with different equipment. However, current research is showing that when Pigment Green 7 is applied in higher concentrations, it has the ability to slightly decrease light stress. Whether or not this decrease has any overall benefit is still questionable, but the research is starting to catch up and soon more answers should come available.

MAIN ABOVE: Pigments are being increasingly used as a replacement for winter overseeding warm season turfgrasses

LEFT: Besides being used to possibly protect turf or to decrease inputs, pigments can also be effectively used in late winter or early spring. For example, when coming out of winter Poa annua may be discolored or injured. Spraying a pigment can help provide green cover prior to new growth taking over.

INSET LEFT: A factor overlooked when discussing pigments and light protection is leaf coverage. Looking at this image, less than approximately 20% of the leaf in focus is coated in pigment. If the pigment provides some photoprotection, without adequate coverage (approx. ≥50%) more than likely there will not be a whole plant benefit. Pigment products may need optimized in terms of chemistry and application technique before any true decrease in stress can be measured.

BELOW MIDDLE: Some pesticides have the potential to cause unwanted discolouration. Many of these products may be essential, but the associated phytotoxicity will cause some superintendents not to use them. Applying a pigment before, mixed, or shortly after the pesticide has been sprayed can prevent the discoloration from showing through. The pigment doesn't have any effect on the efficacy of the pesticide, but using pigments in this fashion allows more options when choosing pesticides.

BOTTOM LEFT: Many pigment products produce vastly different colours when sprayed. The final colour on the turf can be affected by a variety of factors. The concentration of pigment green 7 and the type of additional additives in the product both play a role on how the pigment will look when sprayed. It's important to spray the pigment over a test area to determine if the rate you're using provides the colour you're looking for. Many pigments only have a suggested rate, so the rate should be adjusted to reach the desired colour.

BELOW: Rather than overseed bermudagrass in the fall, may superintendents have turned to painting. Painting dormant warm season turf can decrease costly inputs, while still maintaining a visually appealing turf. However, many question if pigments should be applied to warm season grasses outside of dormancy. The answer is no. Warm season plants rarely, if at all, are stressed by high light intensity. UV light may still be damaging, but these grasses are more adapted to handle UV light. The shade the pigment provides could end causing more harm than good on warm season turf. Using pigments outside of dormancy should be avoided at all costs.

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Askernish

Lost and found

Malcolm Peake tells the fascinating tale of how an enterprising group of greenkeepers helped regenerate a 'lost' golf course in the Outer Hebrides

The story of Askernish Golf Club on the west coast of South Uist in the Outer Hebrides began in 1891 when Lady Cathcart invited Old Tom Morris, keeper of the green at St Andrews and the first known course architect, to lay out a golf course. Old Tom described the land as "second to none in the various elements which go to make a very good golf course."

In the spring of 2006 I took a call from Gordon Irvine MG. Gordon told me what seemed an unlikely story of finding a lost Old Tom Morris golf course that had fallen into disrepair while on a fishing trip. He convinced golf course architect Martin Ebert, Adam Lawrence, editor of Golf Course Architect, and Chris Haspell, Head Greenkeeper at Castle Stuart, to go to this isolated island, where they found the course.

They identified the probable routing through the dunes, and the sites of tees and greens. The club was still in existence, and played golf on nine simplistic holes on the edge of the dunes, but they had little money, facilities or machinery.

Gordon asked me to help raise funds and to promote the restoration of the golf course, but I needed to see this site for myself. On arrival I saw the towering dunes above the white sand beach.

I walked the incredibly fertile Machair, which is naturally reclaimed land from the beach. It was early summer and the floor was a carpet of rich and diverse colour containing, over 200 species of wildflowers.

I could identify buttercup, daisies, gentians, harebells, numerous orchids, ragged robin, and red clover amongst the profusion of herbage, and on the beach there were gulls, lapwings, oystercatchers, and ringed plover.

I approached friends for practical help. Amongst others, JHS carpets donated spike proof carpet for the proposed clubhouse, and the Berkshire GC donated redundant furniture.

The R&A provided initial financial support, and Ransomes Jacobsen supplied machinery for maintaining the golf course, seven years later RJ are still generously supporting the project.

When Gordon started the restoration of the golf course in 2006 the biggest challenge was the weather. The Outer Hebrides suffers from some of the most extreme weather in the UK, with severe gales and storms regularly battering the Western Isles. He began the restoration with the help of Allan MacDonald, now Head Greenkeeper at Askernish, and Euan Grant, then Head Greenkeeper of the Old Course, which was a nice link with Old Tom.

During the restoration, construction materials were frequently blown away and at other times sand from the beach was blown onto the previous days' work.

The 11th green sitting just above the beach was a particular challenge, and a temporary four foot turf wall was eventually built around the green to protect the area whilst work was underway. Seaweed was sourced locally which stabilised the sand, adding organic material which also helped moisture retention.

Rabbit damage was another huge problem. When repairing a rabbit hole a whole warren would often be revealed, and the area then had to be totally restored and turfed. In the early days some of the local crofters did not support the restoration of the course, and when work started in a new area, the next day they discovered cattle had been moved to graze on the new turf.

Now these issues have been resolved and crofter and golfers work in harmony in this wonderful environment.

Allan MacDonald said: "I cannot stress enough how grateful we are to Ransomes Jacobsen for their help, we would not have been able to produce the course we have without the use of their machinery." The course has been developed in the most sustainable way using the native fescue grasses.

All greenkeeping activities are aimed at promoting these species, which are slow growing, disease and drought resistant, which is vital with no irrigation system.

Askernish is situated in one of the wettest parts of Europe with 1800mm annual rainfall, but there have been two six-week periods without rain, yet the deep rooted native species have survived.

The original contouring of the green surfaces requires a height of cut that would not be playable on greens not dominated by native fescue.

The course not only gives immense pleasure to golfers, but has been used as a fine educational tool funded by The R&A with students from all over the world having the opportunity to see how golf evolved. The Student Sustainability Project is hosted by Askernish, and welcomes six greenkeeping

RIGHT: Head greenkeeper Allan MacDonald with Gordon Irvine