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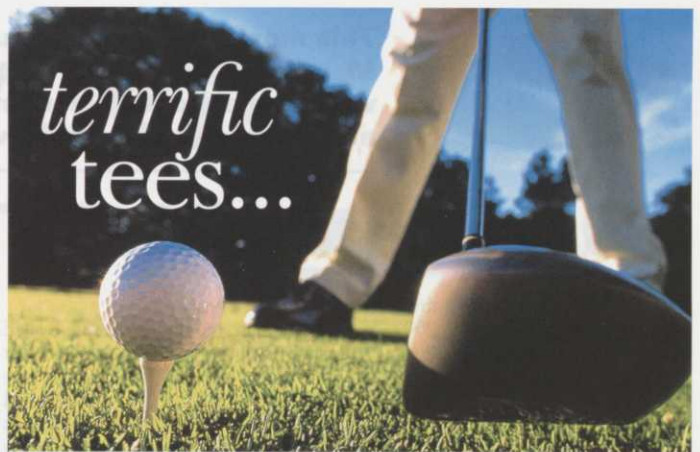
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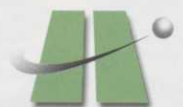
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This month, Tracey and Susannah from BIGGA's Membership Services Department, would like welcome almost 60 new members to the Association and update you on the new Membership Card

It's never too late to renew!

If your membership expired in December 2001 or January 2002, it is still not too late to renew. Just return your form with confirmation from your Golf Club that you are still a Greenkeeper, payment and a photograph of yourself and we will process your renewal as soon as possible. If you have not yet got a photograph just send us your old membership card already containing your photograph and we can use that.

If you have retired from greenkeeping or are about to retire, your membership doesn't have to retire with you. Why not apply for retired membership and keep in touch with your friends and the industry and carry on receiving your valuable copy of Greenkeeper International. Just ring Tracey at BIGGA HOUSE.



Good News ...

After last month's successful BTME show in Harrogate, BIGGA joined over 60 new members to the Association, and renewed over 130 at the show. It was a pleasure to meet so many new and existing members face to face. At this very busy time of the year for Membership we endeavour to process your requests as quickly and efficiently as possible, however, should you have any queries please don't hesitate to contact us.

Sad News ...

On Friday 15th February, BIGGA's Membership Department will be saying a sad goodbye to Susannah Sweeney, Membership Services Assistant. Susannah is leaving the Association to join her husband RAF Sgt Mark Sweeney, who has been posted to Kinloss. I would personally like to thank Susannah for all her hard

work and on behalf of all the Staff and Members, would like to wish Susannah and Mark all the very best in their new posting. News of Susannah's replacement will be printed in a future issue of Greenkeeper International.

Membership Photocard update

The new Membership Photocards are now in circulation. We would appreciate any feedback on the new type of card, please send your comments to tracey@bigga.co.uk

Today, almost all ID cards or Membership cards carry a photograph of the member, your Association is no different. For many years each greenkeeper member has had to place their own photograph on their card, to save each member from repeatedly doing this each year, we are now producing plastic cards with your photograph pre-scanned. You only have to supply us with one photograph and this will be re-printed each year on to a new card. The new cards will continue to promote the professional image that the Association has achieved.

February's Monthly Membership Draw Winner



Just introduce one or more new greenkeeping members to BIGGA and your name will be placed into a draw to win a fantastic BIGGA Clock/calculator/calendar and alarm. Our congratulations go to February's winner, Michael Frappell of Lamerwood Golf Club.

International welcome

BIGGA has almost 300 international members situated throughout the world in as many as 31 different countries. This month we would like to welcome our members from the bordering countries of Austria and Switzerland.

Austria

- Jovan Antunovic, Golf Club Linz
- David Baker, Ernegg
- Sean Baxter, Colony Club Gutenhof
- Wayne Beasley, Golf Club Adamstal
- Simon Cooper, Colony Club Gutenhof
- Martin Dumbrell, Golf Und Freizeitpark
- Julian Farrimond, Golf Club Linz
- Tryggu Gunnarsson, Oddfellow
- John Jackson, Colony Club Gutenhof
- Nicholas Lush, Colony Club Gutenhof
- Paul Marsden, Gut Altentann
- Jason Mitchell, Colony Club Gutenhof
- David Shaw, Golf Club Ottenstein
- Adam Turner, Colony Club Gutenhof

Switzerland

- Robert Beeby, Gstaad Saanenland
- Kevin Caples, Niederburen Golf Club
- Steve Elms, Golf Club Blumisberg
- Viviane Lalandre, Syngenta Crop Protection AG
- Richard McGlynn, Golf Club Ybrig
- Jose Milan, Syngenta Crop Protection AG
- Jean-Bernard Mittaz, Lausanne Golf Club
- Nicolas Morlet, Delavaux
- Austen Sutton, Syngenta Crop Protection AG
- Steven Tierney, Golfpark Nuolen AG
- Arne Van Amerongen, Harradine Golf
- Rolf Von Avx, Golf Club Nuolen AG
- Mark Zajac, Syngenta Crop Protection AG

A BIGGA welcome...

A warm welcome is extended to the following new members ...

Scottish Region

- Mark Cummine, West
- Graeme Latto, West
- Martin Smith, East
- John Thorburn, West
- Wallace Wilson, West

Northern Region

- Robert Drake, N West
- Jonathan Gable, N Wales
- Mark Heald, N West
- Max Hedingham, N West
- John Lea, N West
- David McCormack, N West
- James O'Neill, N West
- Gary Parker, N Wales
- Mark Shuttleworth, N West

- Jamie Swallow, N West
- Graham Swarbrick, N West

Midland Region

- Justin Bygrave, Mid Anglia
- Kevin Mills, Mid Anglia
- Richard Padbury, E of England
- Wayne Smith, Midland
- Gary White, Midland
- Gary White, Midland
- Barry Wright, Midland

South East Region

- Chris Dawson, London
- Jon Goodman, Essex
- Christopher Gurton, Essex
- Richard Linnen, Essex
- Gavin Mason, Surrey
- Trevor Ockenden, Kent
- Trevor Ockenden, Kent

S West & S Wales Region

- Mark Fowler, S West
- Peter Havard, S West
- Paul Long, S Wales
- James Mason, S Coast
- Roger Roberts, S West

Northern Ireland

- Steven Henry
- Brain McConway
- Allister McEwen
- Chris McIlroy
- Robert Patterson

International Members

- Jason Mitchell, Austria
- Bajarni Hannesson, Iceland

Associate Members

- Vincent Gregory, Sheffield
- Robin Snow, Sheffield
- Jean Jegard, Mid Anglia
- John Murray, BB&O
- Lawrence Dennis-Smith, Sussex
- James Edwards, Essex
- Matthew Fowler, Surrey
- Andrew Creed, S Coast
- Henrik Hansen, Denmark

Student Members

- Stephen Blackwell
- Dean Talbot

YOU'VE GOT MAIL!

If you've got an email account why not send an email to the membership department, where we can place you into our exclusive members email address book. We can then keep you up to date with membership news and events as they happen.

Send an email to: membership@bigga.co.uk
tracey@bigga.co.uk

Take a time-honoured look back through the pages of Greenkeeper International from a decade ago



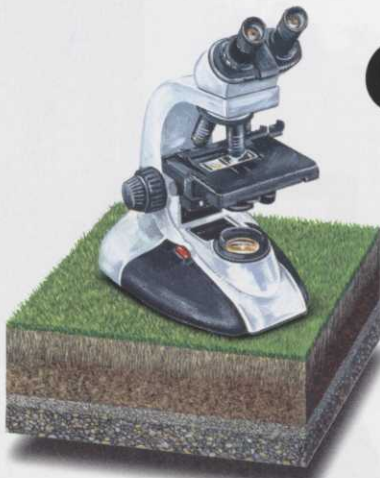
FEBRUARY 1992

'Greenkeeper International' reported that if ever proof was needed that the greenkeeping profession is in a very healthy state - along with the industry it services - the undeniable evidence was to be found in Harrogate at the fourth and best ever BTME. From the opening ceremony, when a relaxed and smiling Viscount Whitelaw announced the launching of the new Greenkeeper Education and Development Fund, offered congratulations to Laurence Pitthie on his Master Greenkeeper achievement and praised all members of the greenkeeping profession for having "arrived and come of age" in no uncertain measure, the feeling throughout was one of upbeat optimism. The show refused to lie down in the so-called doom and gloom of current business fashion, whilst one informed wag likened the letters BTME to Brilliant Times, Magnificent Enthusiasm!

The magazine reported that at the launch ceremony at the BTME, there were three worthy recipients of somewhat special awards. In 1987, when the former greenkeeping associations amalgamated to form BIGGA, the British Golf Greenkeepers Association placed its funds in trust for the very purpose of promoting greenkeeper training. Now those trustees, Alan Gamble, Alan Kite and Ivor Scoones had begun to wind-up the trust and to transfer monies held to the new Education and Development Fund. It was for their selfless service as trustees that Viscount Whitelaw made the awards.

It was announced from Somerset's Cannington College that a Higher National Diploma in Golf Greenkeeping with European Studies had been developed and would commence in September 1992, coupled with the revelation that a new resource, a full length nine hole golf course, was to be built with stunning views overlooking the Quantock Hills and within sight of the Bristol Channel.

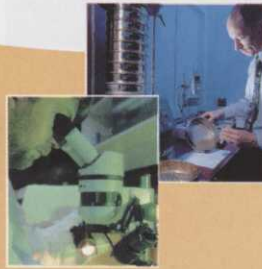
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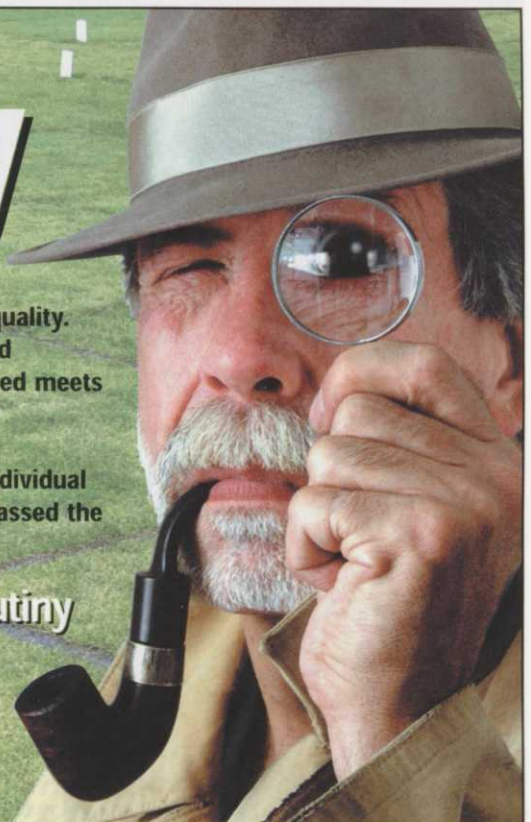
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This month, Tracy and Hannah from BIGGA's
test your
test your
test your

Emma Beggs, STRI Turfgrass Agronomist for the North West Region, gives some handy tips on how you can encourage Barn Owls to your golf course

BIRDS OF PREY

Barn Owls are fantastic, mystical creatures and their behaviour and appearance has intrigued humans for centuries. Most people do not necessarily link the activity of barn owls with local authority amenity areas or, for that matter, golf courses. The fact is that this species, protected under European law, can be intimately associated with both, particularly when

grassland management favours their hunting activities.

Populations have declined dramatically over the last century with most recent figures putting numbers at 3750 pairs in England and Wales and 650 pairs in Scotland, a drop of approximately 90% since the 1830's. Barn owls are under serious threat and as a consequence they are protected by The Wildlife & Countryside Act 1981.

These are such fascinating creatures that I am certain many people would wish to do something to help reverse this trend. How can you help? Well, if you are involved in a local authority or a golf course then you can do something.

Barn owls are mainly nocturnal and if you are out at dusk and are fortunate you may see one hunting, flying slowly and silently only one to two metres above the grassland. They have hearing only slightly more sensitive than our own, however the facial disc of loose feathers that gives barn owls their distinctive appearance acts to collect and amplify the faint sound of their prey. Cleverly their ears are offset, allowing them

to accurately pinpoint the source of the noise and make highly effective strikes on unsuspecting mammals. Their main food source is the short-tailed vole although mice and shrews are also favoured food. These mammals live in unmown or ungrazed tussocky grassland and this is where the barn owls hunt.

If we are going to increase barn owl numbers then suitable grass habitats need to be developed to increase the food supply. As custodians of large areas of grassland, local authorities and golf courses can change the way they mow areas to develop suitable grassland habitats. This work will also have additional environmental benefits, encouraging a wider variety of plants and animals. An extra bonus may be a reduction in your mowing bill!

Whether looking at cutting existing grassland areas or developing areas from scratch, we need to develop the field margins or alternatively dedicate whole fields to this practice. On recreational areas it will probably be most practical to develop wide grass margins, ideally five to six metres, along woodland edges, streams and perimeters, although in some circumstances it may be feasible to set aside whole fields to substantially increase the available ground for hunting.

For those of you who wish to try this, the target is the equivalent of 4 hectares of suitable tussocky grassland within a 1 kilometre circle around a nest. Observations indicate that barn owls need this amount of grassland to provide sufficient food to support successful breeding.

Grass margins can be developed

from existing grass areas by reducing mowing frequency to once every three years or so. Even better if you can sow a native grass seed mix, these are becoming more widely available through the main seed companies. Choose a grass mix which most accurately resembles original grassland in your local area and try to include grasses such as false-brome (*Brachipodium* spp.), field brome (*Bromus* spp.), and tall or false oatgrass (*Arrhenatherum* spp.). Newly seeded areas would probably need to be mown annually during the first two years to keep down weed populations, however after this initial establishment phase one cut every three years or so should be appropriate. A suitable height of cut for these areas would be approximately 100 mm.

If you are planning a mowing regime based on these principles, avoid cutting all of the grassland strips in the same year - cutting needs to be staggered to maintain the food supply.





Some thought also needs to be given to connecting your grassland corridors with those on adjacent land. This has a dual purpose, both in joining suitable feeding habitats across wider areas as well as reconnecting isolated pockets of barn owl communities. Intensive farming methods, the increasing spread of urban areas and development of road networks continue to chop up the country into smaller pieces across which barn owls and other wildlife find it increasingly difficult to travel. Unless young birds can explore further afield to find new territories and mate, the population will suffer further decline. Indeed, only about one in four young barn owls survive to become breeding adults and at best will reach their fifth birthday, hence the need to help them becomes that much more apparent.

When you have developed the grassland, all that remains is to pro-

vide the owls with somewhere to live and some hunting posts.

Barn owl numbers have declined in part due to the loss of nesting sites as agricultural buildings have been converted or demolished and old trees have been removed. The good news is that barn owls happily use man-made nest boxes if these are placed in the right spots, adjacent to their favoured habitat. Wooden, waterproof boxes on poles situated in pairs along woodland margins prove successful, as do nest boxes sited within suitable buildings. When constructing new buildings adjacent to grassland areas you could consider including a barn owl nest box within the design.

Barn Owls also need the occasional post along the grass margins to provide places for post hunting on wet and windy days. Although the cleverly designed feathers allow for silent flight, the minus is that they are not waterproof!

If you are able to provide favourable habitats it is likely that you will be successful in attracting barn owls, fortunately they are capable of rapid population expansion once the conditions are right.

If you are interested in these initiatives there are many local groups across the UK who will be happy to advise local authorities, golf courses and other landowners on appropriate habitat development, including the design and siting of nest boxes. Here on the Wirral we are fortunate to have the Wirral & Ellesmere Port Barn Owl Group who can be contacted through PO Box 114, Hoylake, Wirral CH48 8BX or via email WEPBarnOwlGroup@aol.com. The Barn Owl Trust, Waterleat, Ashburton, Devon TQ13 7HU, www.barnowltrust.org.uk or Chris Green, Barn Owl Project Officer at Cheshire Wildlife Trust, email: cgreen@cheshirewt.cix.co.uk are also worth contacting for further infor-

mation. In addition, there are grants available to assist in this work, contact the Farming & Wildlife Advisory Group; telephone 01203 696699 and The Wildlife Trust; telephone 01636 677711 for up-to-date information.

You can make a difference and what could be more worthwhile than assisting one of our most impressive native species. It will take some thought, planning and a little effort yet users of these recreational areas, be they footballers, golfers or families out enjoying a late afternoon walk, could then be lucky enough to see one of these superb creatures.

Emma Beggs is an STRI Turfgrass Agronomist covering the North West. Emma and the rest of the STRI team can be contacted on 01274 565131, email info@stri.co.uk or visit their website at www.stri.co.uk

Colin Denny, Assistant Greenkeeper at Prestbury GC, in conjunction with Anthony Davies MG, Course Manager, describes the work that went into the new 17th hole

HEAVEN 17



Above: The 17th collapses due to adverse weather conditions

Below right: The dumpers begin their task of rebuilding

Far left, top: Working out the new gradient

Far left, middle: Showing work well underway

Far left, bottom: Nearly 2000 tonnes of soil was excavated from the 13th fairway

The weather in the year 2000 had taken its toll at Prestbury Golf Club as at many golf courses. The constant rain, which seemed not to subside, had forced the land to slip in front of the 17th green at Prestbury. In its wake it left behind a huge cavity big enough for a new style bunker.

After much deliberation the club decided not to reinstate the collapse but to take the chance of creating a more subtle, lesser gradient face with a banking which would offer the greenstaff the opportunity to maintain it to a higher standard than before.

Ken Moodie, of Hawtree Ltd, who had worked on redesigns at Royal Birkdale in 1991, was asked to draw up plans, taking on board the club's views regarding the gradient. Once plans were agreed, a contractor was sought and a fixed price obtained. The hole was closed for play so that work could commence and be open in time for the first competition of 2001.

Griesley Ltd, was contracted to reconstruct the bank and on March 13, 2001 heavy machinery consisting of a hi-mac and two large dumper trucks moved in. The job of excavating and transporting the soil from the site on the side of the 13th fairway commenced and resulted in moving nearly 2000 tonnes of soil.

Before the grading of the soil start-

ed, the greenstaff dug trenches along the lower half of the hollow, to intercept any water which ran down the bank.

Original drains were found and connected to the main drain. Also a 100mm drain was dug to a depth of 1.5 metres along the front of the green. Small laterals were also dug connecting into the newly installed main-drain. Soil was now graded layer-by-layer using the tracks of the

dumper. While the dumpers were in action, work started at the top of the bank in front of the green. First the turf was lifted and placed close by. Three by one metre boards were placed side by side creating a makeshift road for the hi-mac to run along. In doing so it allowed the digger to excavate soil to a depth of 1.5 metres.

With the trench dug 5-10mm gravel was used as a base to which a 75 metre length of 150mm plastic pipe could be laid and back filled. When the last of the pipe was laid and back

filled, 1-2mm grit was used as a blinding layer then topped off with top-dressing, consisting of 70/30 sand soil mixture. Meanwhile the dumpers carried on with the job of transporting the soil tonne by tonne from the pit site and at the same time consolidating the soil in layers. After a few days, the bank face began to change shape. Within two short weeks of constant activity the dumpers finished their task. All that remained was for the hi-mac to grade the top soil at the 13th fairway from which all the soil had been taken. The greenstaff then started work on the final touches.

Large stones and debris were removed from the area and then the entire surface raked creating a fine tilth, still removing any stones which were disturbed. As soon as the area was raked, a pre-seeding fertiliser was applied, the area left until the fertiliser had broken down and was repeated on the excavation site. The top section of the 17th bank was partly turfed to present a sense of maturity to the new hollow.

A drop zone-area was provided which did not incur a penalty. In the interim period the hollow was once again raked in readiness for seeding, and this was repeated on the 13th fairway. Once the seed had germi-





nated it was clear to see any thin patches and these were promptly reseeded and also both areas were given a further application of fertiliser. The new hollow was classed as play "prohibited" and a no entry zone in order to protect it from players walking onto the newly seeded area.

Golf balls were provided by the club inscribed with the "17th hole" and these were presented to the members playing on his hole. The reason was for safety towards players: If players landed short the ball was left and a free shot from the drop zone allowed, thus protecting the seeded area and adding to the golfers safety. The first duty for the groundstaff each morning was to collect the balls which had landed in this area, wash and return them to the professional ready for the day's play. A further improvement to

the 17th was that trees were pruned back to the existing wood line on the left hand side of the hole.

Broom which had grown tall and brash, consisting mostly of brambles etc were cut using a strimmer with a blade attached and the entire area cleared, opening up the whole area and creating the illusion of a longer more strategic hole.

The 17th hole is now fully open and was ready for the first competition in April 2001.

Golfers, greenstaff and Ken Moodie are pleased with the results. And so we should be. A lot of planning and hard work went into the project with the club boasting a hole that has much improved.

The 17th hole at "Prestbury Golf Club" has certainly changed.

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RECYCLE

The modern Christmas is the time of the year when one realises just how much we have become a packaging society. It is little wonder that local authorities are faced with an increasing problem of what to do with waste. Landfill sites are quickly disappearing and yet there seems little sign of any diminishing use of cardboard, paper, polystyrene and a host of other materials all designed to make an item attractive. What has this got to do with course management? Nothing directly, but it does highlight an important issue that addresses every one - recycling. If a recycling programme is to work effectively every department within the club has to be involved and inspired.

For many clubs modern demands have increased the need to collect grass on areas such as fairways that in the past have simply had the clippings left where they fell. Golf courses have in fact been recycling grass since their inception - rabbits and sometimes sheep were often used as mowers. These naturally converted the grass into nutrients. With the introduction of gang mowers the clippings were left in the turf. What is this, if it is not recycling?

Research has shown that over 80% of grass plants consist of water plus a percentage of nutrients, especially nitrogen. By returning this to the soil, moisture retention is increased, some plant food is also provided. The secret of recycling is to produce a turf where thatch build-up is contained so that the clippings can reach the soil, and decompose there.

During the last few years there have been a number of rotary machines introduced onto the market under the recycling banner. While these are new models, the recycling concept has been around for well over 25 years. One of the main incentives for this present higher profile has come from the USA where a number of States have closed their landfill site's gates to organic waste, so the pressure has been on to recycle as much as possible.

For the recycling rotary mowing system to be successful it requires a specially designed cutting deck. The housing has to retain the cut material long enough for it to be chopped into small enough pieces that will pass down into the sward where they can then decompose. Another major factor of this form of mowing is that the height of the grass needs to be left longer than is generally considered

usual in this country. Each cut should only remove one third of the growth, so in some cases the grass will have to be mown on a more regular cycle.

Where collection is being carried out disposal can become a big problem. The clippings do not decompose well in a compost heap, and the end result is usually a stinking heap of gunge.

On a small scale the answer is to mix other matter such as leaves with the grass; this produces more satisfactory compost.

The rotary blade units consist of a disc with small replaceable knives. This system is found mainly on domestic machines and has slight disadvantage compared with the others. Because the chopping chamber is fairly small it can easily become congested with material, especially when there is high moisture content. While access to clearing it is usually relatively easy it can become tedious this operation has to be carried out too frequently. The noise this shred-

ding process creates may also be a problem. A far quieter method is the second system. The material passes between a cylinder with a series of knives that chop the material against a static blade. On the electric versions of this type of unit reversing the rotation of the blades will easily unblock the cutting mechanism.

The third system is commonly found in commercial units. It is made up of a blade carrier such as a drum to which are attached a number of either hammers or flails. Some large models have a conveyor that automatically feeds the material in to the shredder where it is pulverised.

Whatever type of shredder is used it is important in the interests of safety

that the blades are sharp and balanced. Damaged ones should be replaced immediately. If they are not then the machines will become highly dangerous. Most shredders will tackle saplings but for larger diameter branches a chipper is required. These, generally consisting of a large disc with replaceable blades that do exactly as the name implies - convert the wood into chips. The size of these can be controlled within most chippers to match the area where they are going to be used. Shredded material can be used as mulch on ornamental areas such as flowerbeds or under shrubs. When well composted the result is an ideal soil conditioner. Chips are ideal for making natural paths

Whilst not exactly recycling the use of biodegradable oil in hydraulic systems and two-stroke engine mixtures reduces the risk of damage through spillage to turf and also benefits the environment by reducing pollution.

Most machinery manufacturers recognise the importance of recycling and many components they now use are recyclable, a point worth taking into account when considering buying a particular piece of equipment.

There are numerous other things that can be done and no doubt readers have their own schemes. Here are a few others worth considering. Persuade players to place any empty drink cans into special containers out on the course. The clubhouse generates a lot of glass bottles; these can be disposed of in bottle banks. Paper and cardboard are easily dealt with in the same manner.

One scenario, which might happen one day; is using vegetable oil from the kitchens as fuel in a converted diesel engine. Some road vehicles in the USA are already running on this substitute. But be warned, any greenkeepers who decide to go down this route will leave a trail of fumes around the course similar to the smell from a fish and chip shop.

For any recycling schemes to be successful it will require all the people working in or visiting the complex to be receptive to the schemes.

A recent piece on a local radio station illustrated the problems the country is facing regarding the disposal of unwanted rubbish. Cambridgeshire is a flat county and two of the only hills in it are the result of waste material. Perhaps your course needs some new bunkers?



When it comes to heavier material such as brushwood, a shredder is the best solution. These reduce the volume of material by a ratio of up to 10 to 1 which means that the space required for dumping is drastically reduced, as are the number of trips to a disposal site. There is another advantage; the action of the cutting or chopping mechanism exposes larger fibre areas that enable the decomposing micro-organisms to gain easier and faster access to carry out their work.

There are three cutting systems now available; horizontal rotary blades, cylindrical blades cutting against a static knife or a drum unit with hammers or flails.

With our variable climate one of the greatest challenges facing every golf club is efficient and environmentally-sound water management. Good drainage on a course is vital during wetter periods and sound irrigation systems make their mark during drier spells. Can more be done to create harmony and greater stability between the two? Nigel Wyatt suggests how.

DECENT DRAINAGE



Collecting water from your golf course in the rainy times, for use in the drier times, is an extremely sound proposition for most clubs. If a drought does set in serious and expensive damage can occur very quickly. Grass roots are unable to obtain sufficient water to make up for transpiration losses and the grass becomes stressed.

Circulating water which you have collected provides an insurance policy - it is there when you need to protect the fine playing surface of your course. It is by collecting water and transporting this vital liquid in sufficient quantities from A to B around the course, plus the timing of when this happens, that will ensure the sward will flourish. There is no doubt today's members are highly critical of playing conditions and expect them to be as good as, if not better, than those next door. Clubs cannot afford to neglect this.

Basically the scheme involves collecting ground water and surface water run-off, channelling this into a piped drainage system and feeding that into a storage reservoir in the ground - which need or need not be lined.

Tightening water controls by the Environment Agency and new regulations which examine borehole extraction help to make an on-course water storage system a highly viable proposition. Water licences, issued on a five year basis, will mean those applying will have to show they are making responsible use of this valuable resource - otherwise their abstraction licence could be revoked. New water laws, currently going through parliament, will make water recycling even more beneficial. The Environment Agency recommends greenkeepers water efficiently by:



Developing a water system maintenance programme. A routine inspection should be organised for all plumbing fixtures, appliances, pressure regulators, water lines, valves and pumps for leaks. Arrange replacement immediately when leaks are detected.

Training staff to work on increasing levels of awareness of water efficiency.

Eliminating irrigation on areas such as the rough.

Watering at night or early in the morning to reduce evaporation losses.

Utilising drought-resistant turfgrasses that require less irrigation and maintenance.

Inspecting sprinkler nozzles to ensure they are not clogging, are operating properly and distributing the water uniformly.

Employing mulches wherever possible.

Recycling water for other purposes wherever possible.

Upgrading, replacing or computerising your irrigation system.



Any ground water abstraction will require consultation with, and ultimately licensing from, the Environment Agency.

For general information and technical advice contact the Environment Agency, National Water Demand Management Centre on 01903 832073.

It is not inconceivable that ground water/surface water collection systems could provide an adequate amount of water to operate an irrigation system throughout the summer. If not, it could provide an economic supplement to the existing supply.

The benefit of this approach is twofold - an economic supply of water for irrigation and, of course, the benefit of drier fairways in the winter months.

Primary drainage

Planning is the first all important stage of any drainage scheme.

Use a reputable contractor to assist with planning design and costing of the works. Obtain a number of quotations, normally three. Contact the Land Drainage Contractors Association Sports Turf Division.

Their members are individually vetted on their ability to carry out such works. Ask the chosen contractor for references of a similar project and take them up.

Alternatively engage the services of a Consultant. You will be given unbiased advice and design, at a cost. Charges are generally between 5% and 15% of the contract cost.

The level of drainage required is dependent on the course structure. Courses built on naturally free-draining soils are likely to require only a basic drainage system. Heavier soils

will require much more work and expenditure to give satisfactory drainage.

For best results, systems should be installed when the ground and weather conditions are reasonably dry and firm.

A piped drainage system forms the basis of the construction and consists of a main drain installed at a depth of 600-900mm at the edge of a fairway within the semi-rough. Pipes are typically 100-200mm diameter and are laid within trenches on a formed trench bed.

The pipe is then surrounded and the trench filled to within 150mm of the surface with an approved, clean stone which is generally blinded with grit.

The trench is then filled level with an approved coarse sand. It is important to ensure no migration of fines through the gravel. A capping mix of rootzone is then commonly used to dress the trenchlines. This provides a medium in which grass seed can grow, helping to ensure quick establishment.

Golf clubs are keen to ensure works are completed as quickly as feasible to protect their revenue streams.

Lateral drains typically 60-100mm diameter connect into the main at 5-10m spacings in a grid formation. They should be laid within trenches excavated cleanly to a minimum depth of 450-750mm and backfilled in the same manner as the main drains.

Lateral drains should always cross the natural slope of the land so they can intercept ground water moving naturally through the soil profile. If ground levels demand it, the main drain may be installed within a fairway with lateral drains connecting

into the main in a herringbone formation.

Natural settlement is likely to occur over the trenchlines and continued work may be necessary in order to maintain the correct surface levels.

There is no doubt that installing a piped drainage system for the transportation of soil water can dramatically improve conditions - either on very wet sites with heavy soils or where there is a high water table in more permeable soils.

Timing of works

Drainage works are likely to affect at least one fairway - which will need to be closed during the installation of the system. For this reason it is common for a Golf Club's calendar of events to dictate when works can be carried out.

Clubs need to be fully aware installing drainage systems in the winter months is a risky business and works may have to be delayed. This could result in the benefits of the works being lost for a further year.

Installing land drainage systems within a new or established golf course requires a combination of the correct experience coupled with the correct installation equipment. Much of the machinery is specialised and developed specifically for its purpose by the contractor and machinery manufacturer over a number of years.

Working in fine turf situations means trenching machinery, whether tracked continuous chain or tractor mounted continuous wheel should be fit for excavating on the course.

To prevent contamination of the playing surface, trenchers often include soil loading conveyors so excavated soil is put directly onto dumpers. All wheeled equipment,

including soil removing dumpers and gravel fill discharge trailers, should be fitted with low ground pressure tyres fit to use on turf.

Secondary drainage

Another important issue is the quick removal of surface water. This often causes puddling because of the impermeability of the subsoil or topsoil. Secondary operations include:

Gravel/sand slitting

Narrow trenches, typically 50-65mm wide are excavated to an average depth of 250mm.

Slits are installed at 1-2m spacings, perpendicular to the primary lateral drains. Trenches are filled with gravel to within 50mm of the surface, and topped off with coarse sand.

Gravel banding

Narrow bands of grit are installed, typically 20mm wide to an average depth of 200mm, at 0.4m spacings, perpendicular to the primary lateral drains.

These secondary systems intercept surface water, conveying it and discharging to the permeable fill within the lateral drains.

Top dressing should form part of an ongoing maintenance programme, especially on very wet sites. This will ensure the continuing effectiveness of the drainage systems.

Water storage

Having designed and installed your land drainage system, it will be necessary to direct all water into a reservoir.

Gravity pipework alone is unlikely to be sufficient to take the water to the right place so it is not inconceivable water will go through pumping systems into a series of reservoirs. The Belfry is a good example of this.