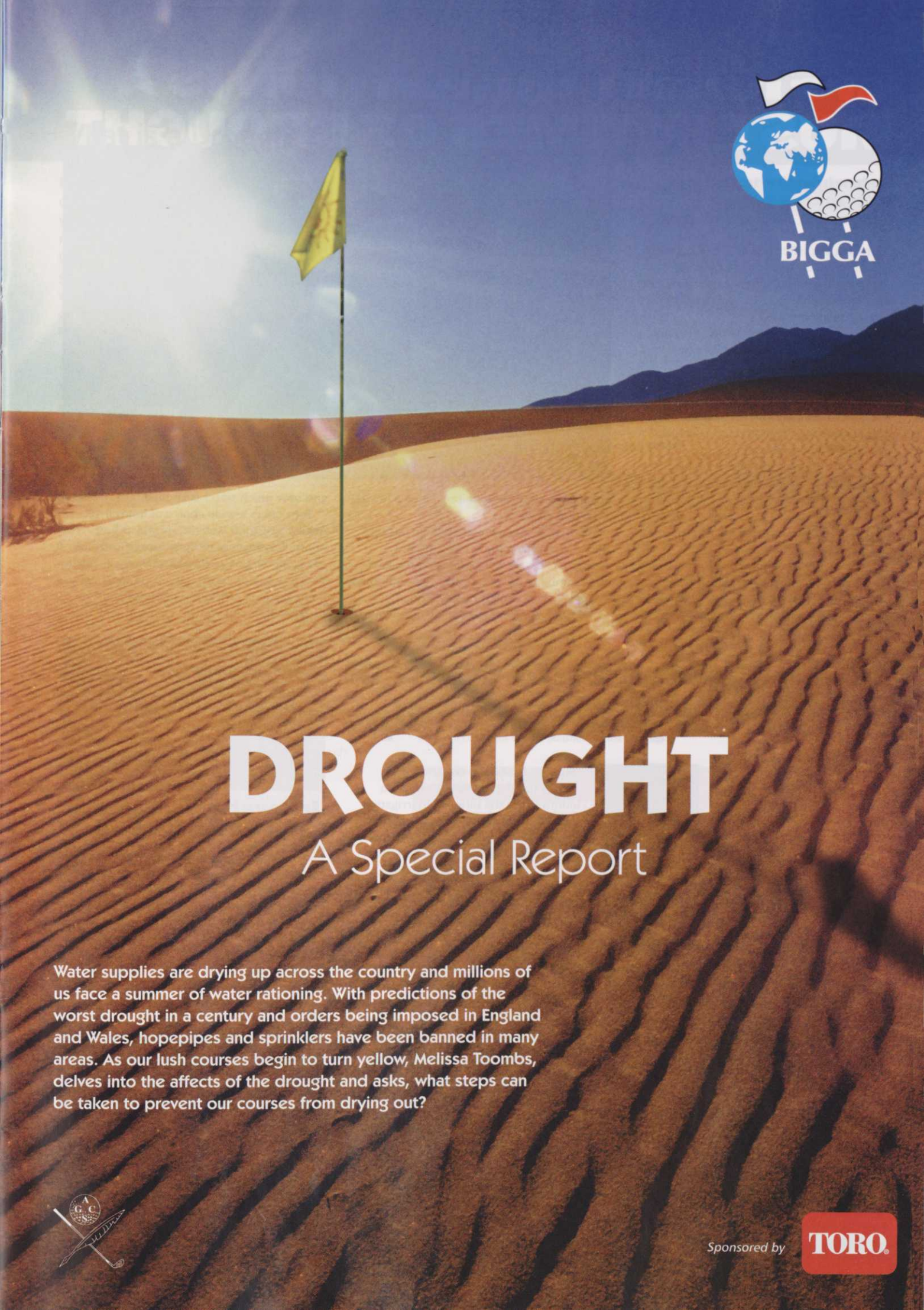


DROUGHT

A Special Report

Water supplies are drying up across the country and millions of us face a summer of water rationing. With predictions of the worst drought in a century and orders being imposed in England and Wales, hopepipes and sprinklers have been banned in many areas. As our lush courses begin to turn yellow, Melissa Toombs, delves into the affects of the drought and asks, what steps can be taken to prevent our courses from drying out?

BIGGA

Sponsored by TORO.

What is a Drought Order?

Drought orders apply only to water providers. An order from the Environment Agency, means a water board can restrict their output to conserve reservoir stocks. It also means, they can ban local authorities from watering parks, gardens, golf courses, cricket pitches and other sporting venues. It makes no difference to what consumers are allowed to do when an area has a hosepipe ban.

Water Woes

More than 13 million people in London and south east England are already under a residential ban on using hoses or sprinklers to wash cars or water lawns. South east England will be the worst hit by the drought, but the south west, Midlands and Wales are vunerable too.

Although there has been a lot of rain over the past few weeks, that won't make a significant difference to the drought. The Met Office say it's the winter rains that are needed to replenish the water aquifers and the last two have been dry. Winter rain allows water supplies to recharge. Rain in December seeps into the ground, but rainfall in spring and summer tends to evaporate or be sucked up by trees, plants and flowers.

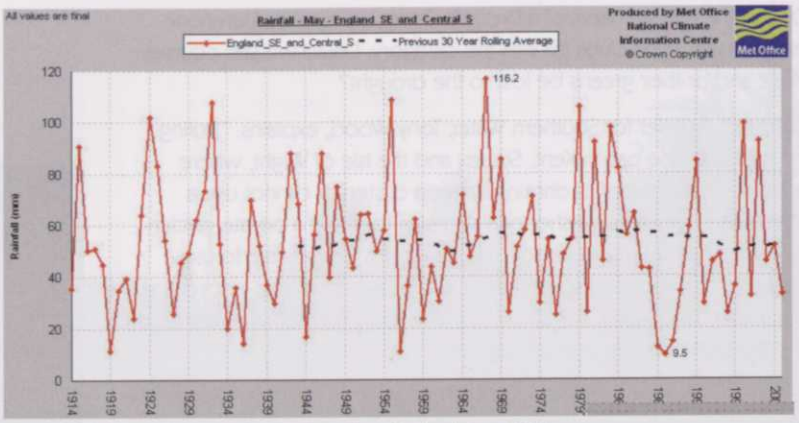
Parts of southern England have had the two driest consecutive winters since 1920-22.

Figures released by the Met Office show that south east and central southern England have had:

- The driest November 2004 to January 2006 in over 80 years, with just 724mm of rain;
- November 2004 to January 2006 was the second driest 15 month period on record;
- 13 of the last 15 months have recorded below the 1961-1990 long-term average, having only 72% of the average, which is 1001mm.

May rainfall figures (up to May 22)

- UK 83.4mm, 26% for this period in the month but not record-breaking - the wettest May was 1967 with 128mm.
- South east and central southern England (where the main issue is) 68.6mm, 31% above average.



May rainfall for south east and central southern England since 1914
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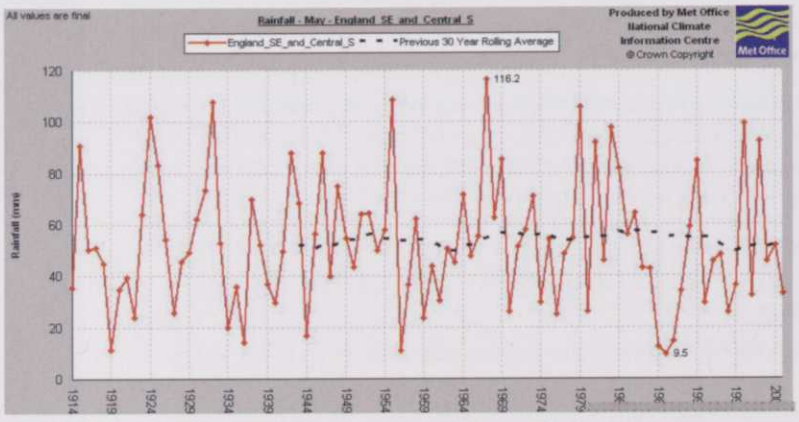


Annual rainfall for south east and central southern England since 1914
© Crown copyright 2006, Published by the Met Office

For comparison -

THE WORLD'S DRIEST PLACES

Place	Location	Rainfall in Millimetres/Inches	
Dry Valleys	Antarctica	None in 2000 yrs	
Death Valley	California, USA	3·0	0·1
Arica Desert	Chile	3·0	0·1
Gobi Desert	Central Asia	5·0	0·2
Sahara Desert	(parts of) North Africa	25·0	1·0
Lake Eyre Basin	Australia	101 to 152	4·0 to 6·0

AND SOME OF THE WETTEST

Mount Waialeale	Hawaii	12,344	486
Cherrapunji	India	10,874	428
Mount Cameroon	Cameroon	10,160	400
Sprinkling Tarn	Cumbria, England	6,528	257
North-west Washington State	USA	2,997	118

Prospects for rainfall across the UK through the summer months is uncertain, however, it is likely that rainfall will be sufficient to alleviate the water shortages affecting some regions.

What the water companies have to say -

One of the requirements of a Drought Order is a total ban on non-essential use - golf clubs fall into this category. Could we see courses close and/or their greens be lost to the drought?

Customer Adviser for Southern Water, Tony Wood, explains: "During the full hosepipe ban in Kent, Sussex and the Isle of Wight, where Southern Water supplies drinking water, a customer cannot use a hosepipe, a pressure washer or a sprinkler, to water a private garden or wash a private motor vehicle. However, it is permissible to use a watering can or bucket to perform these activities; to use a hosepipe to transfer used water from a bath or sink, or to transfer rainwater from a water butt.

"Southern Water applied for a drought order from DEFRA on March 20, to enable us to ban non-essential water use. This application was approved by DEFRA on May 25. However, due to average rainfall in April, and above average rainfall in May, Southern Water shall not be implementing any further water restrictions at this time, but will closely monitor the situation.

"However, if further restrictions are required, these may affect all natural or artificial surfaces used for sport and recreation (including golf courses). A possible restriction on the watering of golf courses may be to reduce the period watering can occur (eg 19:00 - 07:00).

Golf courses with their own water supply are not affected by the hosepipe ban or by any future water restrictions implemented from the non-essential use order.

Anyone flouting drought orders can face a fine of up to £5,000 in magistrates courts or an unlimited fine in the Crown Court. Seven water companies, all in the south east - where shortages are most severe - already have hosepipe bans.

Sutton and East Surrey Water have also been granted a Drought Order by DEFRA. Their non-essential use ban came into effect on May 27, prohibiting sprinkler and hosepipe use for the watering of golf courses and other sports grounds.

At present, the drought problem appears to remain in south east England. However, most of England and Wales has had a dry winter and only northern England has approached average rainfall.

The drought is starting to affect Norfolk and Suffolk, with low groundwater levels and low river flows. Water companies in the east of England are monitoring the situation and preparing to take further steps, to manage supply and demand if the drought intensifies.

With hot, dry weather the drought will spread into other areas. The east of England and the south Midlands are most vulnerable, but reservoir levels in Wales and the south west, could also drop quickly this summer. Northern England is at no higher risk from drought than normal.

Yorkshire Water say there is no water shortage in Yorkshire and their reservoirs are very healthy for this time of year. They are not planning any usage restrictions this year.

Scottish Water say there are no concerns about water levels in Scotland and no plans for water measures. They are currently experiencing between 95 to 100% capacity at their reservoirs. Geoff

Apex Bewl reservoir, in Sussex, remains 85% full, which is low for this time of year

Aitkenhead, Scottish Water's Asset Management Director, told me: "There is currently no issue in Scotland with regard to water levels in our reservoirs. Water stocks are at acceptable levels and are of no current concern for Scottish Water. But this does not allow us to become complacent as water users. Water is a valuable resource and it is still advisable to use water wisely and conserve stocks whenever possible throughout the year."

Northern Ireland Water Service have no water shortage and are not planning any restrictions.

Thames Water, who introduced a hosepipe ban in April and supply to 14.5 million customers in the UK, applied for a Drought Order on June 13. Should this go ahead, it could threaten some of this year's major sporting events such as the cricket test between England and Pakistan at the Oval, in August. Thames Water lose 201 million gallons of water through leaks every day, this is enough to fill 366 Olympic swimming pools.

Orpington Pond in Kent

What the Environment Agency has to say -

The Environment Agency is responsible for protecting the environment by minimising the impact of drought, while ensuring there is enough water for people. The agency ensures that water companies have effective plans in place to maintain public water supplies during a drought, without damaging the environment.

Stuart Sampson, Drought Coordinator for the Environment Agency, told me: "Golf courses need to contact their local water company to find out if restrictions apply (if water is being taken from the public water supply). Or, at the moment there are no formal abstraction restrictions in place (eg if you are using an abstractor licensed to take water from the environment)."

Stuart gave this advice for greenkeepers:

- Is irrigation confined only to crucial areas of play? Set water priority areas to identify those requiring little or no supplementary irrigation i.e. water greens but not fairways and certainly not roughs!
- Introduce regular checking and repair system for leaks, faulty sprinkler heads etc.
- Choose irrigation times carefully; for example avoid irrigating in windy conditions and during daytime.
- Consider harvesting rainwater from car parks/ buildings for watering plants.
- Check for and mend dripping taps and water leaks.
- Use drought-tolerant plants and mulch in landscaping areas.
- Grass is very hardy and even if it turns brown it will recover quickly when the rain arrives. Also consider drought tolerant grass varieties for playing areas/course.
- Consider stopping vehicle washing.

Greenkeepers wishing to take more than 20 cubic metres of water a day from an underground source, for example a borehole or well, or from a river or stream, need to obtain an abstraction licence from the Environment Agency. Stuart Sampson said: "There are no abstraction restrictions in place. Most abstraction licences have conditions that will mean the abstractor must stop taking water once a certain level or flow has been reached. - this is to protect the environment. The abstractor should be aware of the conditions."

What the R&A say -

The R&A is responsible for the running of the Amateur and Open Championships, and provide best practice guidance on all aspects of golf course management. What are their thoughts on the drought?

Steve Isaac, Assistant Director of Golf Course Management, R&A, said as far as facts and figures are concerned, then best practice suggests:

Golf should be played on firm and dry surfaces, so over watering is to be avoided.

Turfgrasses can withstand a period of drought without the need for irrigation, i.e. sprinklers are not, generally, switched on at the first sign of dry weather. Some grass species are better than others in this regard.

During prolonged drought, irrigating golf turf should only compensate for evapotranspiration losses, i.e. around 30 mm a week. This equates to approximately 4 mm or 40 cubic metres of water per hectare a day.

The average golf course covers 60 hectares. The vast majority of courses in the UK only water their greens, green surrounds and teeing grounds, approximately four hectares. How much water is used to a 60-hectare field of crops?

Established and mature turf absorbs and retains moisture in its organic profile. Mature turf acts like an insulation blanket, reducing water loss to evaporation from the soil.

Golf course irrigation is, usually, carried out through the night when evapotranspiration losses are at their lowest and accuracy of coverage tends to be least affected by wind.

Irrigation systems should be designed and installed to apply water as efficiently as possible, thus minimising waste.

Automatic irrigation should be used merely to keep grass alive and to keep the soil to naturally receptive areas suitably moist. This minimises the risk of wastage through run-off.

Watering by hand is recommended to top-up areas that may shed water applied through the sprinkler system.

The combination of sprinkler use and hand watering minimises water wastage and produces consistent playing surfaces.

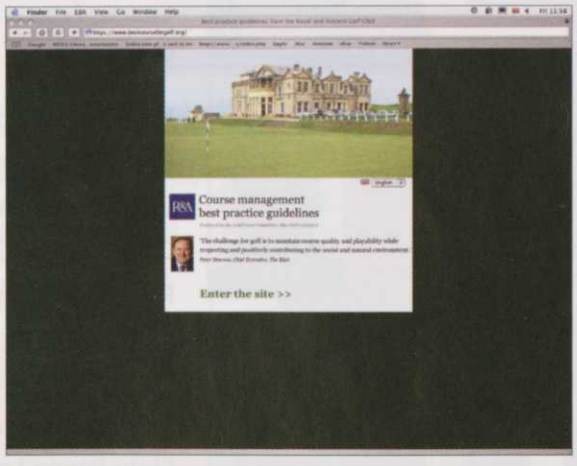
Maintenance practices such as aeration and use of wetting agents are employed to encourage deep rooting grasses and ensure penetration of any water applied, thus minimising the amount of water required.

Course Managers should routinely monitor the health of the turf and moisture content of the rootzone to ensure they only water when it is necessary. Weather stations are often employed to more accurately determine when irrigation is needed.

Properly constructed modern golf greens work on the principle of the perched water table, which retains moisture in the profile to minimise irrigation needs.

Globally, golf clubs and their Course Managers are well aware of their responsibility to use water as efficiently as they can and there are many examples of this in relation to turfgrass selection to minimise water consumption, or to facilitate the use of alternative sources, to potable supplies, the use of recycled or 'grey' water and the development of grasses and technologies that enable the use of sea water for irrigation purposes.

Further information on water management can be found on The R&A best practice website: www.bestcourseforgolf.org



TALKING HEADS

Compiled by Melissa Toombs

DROUGHT

So what is going on in your Section? I spoke to British and International greenkeepers, in search of how/or if the drought was affecting their golf courses.

1

Are there drought orders in place in your area, or are there some threatened?

Name: Bernard Findlay
Position: Head Greenkeeper
Club: Portstewart GC
Course Type: links/parkland 54-hole course
Region: Northern Ireland

In Northern Ireland we have not shared the same severe drought conditions as southern parts of the UK but that is not to say that we do not get long periods of dry weather during the summer months. There are no drought orders in place or threatened at this time.

Name: Steve Evans
Position: Course Manager
Club: Yelverton GC
Course Type: 18-hole course
Region: Devon

There are no drought restriction orders in Devon at the moment although it has been well publicised that the situation could change if we don't get significant rainfall. (140mm last week!)

Name: Anthony Davies MG
Position: Course Manager
Club: Prestbury GC
Course Type: 18-hole course
Region: Cheshire

There are no drought orders in place in Cheshire and not likely to be.

Name: Iain Barr
Position: Course Manager
Club: Largs GC
Course Type: 18-hole parkland course
Region: Scotland

No, No, No, this is the west coast of Scotland. We are just short of 500mm of rain so far this year at the end of May and inland towards Glasgow gets a fair bit more than Largs.

Name: David Wood
Position: Course Manager
Club: Hever Castle GC
Course Type: 18-hole Kings and Queens course
Region: Kent

A drought order was put in place by our water company on May 27 and will last until at least November.

Name: Jonathon Scoones
Position: Course Manager
Club: Caversham Heath GC
Course Type: Championship & standard length heathland
Region: Berkshire

Thames water have applied for a drought order although our area (Thames valley) is not covered by it, because we have had slightly higher rainfall than London. If there is going to be one we will expect it by about August.

Name: Scott Young Liddle
Position: Course Manager
Club: Penna Longa Resort
Region: Portugal

So far there hasn't been any drought orders this summer, but last year in the Algarve and for the rest of the country there were drought orders.

2	3	4	5
What provision does your club take to ensure a regular water supply?	**Have you changed the way you have utilised your water resources recently, in light of climate change talk?**	**How would a significant reduction in water usage affect your course?**	**Are you starting to amend your long term thinking towards course management as a result of water becoming an ever more precious resource?**
The DoE is currently developing proposals for new legislation, to introduce a system of licensing for water abstraction. However, there is currently no water abstraction licensing required in Northern Ireland. Consequently, we use three sources of water for irrigation: On course water feature (approx 6000m³) fed by land drainage and used as a last resort. Borehole and mains water. These water sources can be held in a 300m³ reservoir for use as required.	No, at Portstewart, which is predominately links, I take a minimalist approach to irrigation. The aim being to keep the grass alive rather than lush, green and stripy, the results of such a policy are firm fast playing surfaces where fescues predominate.	I feel we have the species in place to cope with periods of drought and we have irrigation for greens and tees only and none for the fairways. In 2002 we built an additional 9 holes to one of our courses. The greens were built to the USGA spec in terms of rootzone etc. The greens were originally sown out with bent and fescue, but suffered a take-all attack. I decided not to water and today these greens are 99.5 % fescue and easier to maintain (at 6mm) than many of our older greens.	I consider myself very lucky to be greenkeeping in a part of the world where water shortage (to-date) is not a problem. However, I have experienced drought conditions and have been constantly amazed at the ability of fescue species to recover after prolonged drought. Maybe amendment to thinking should come through the expectations of the golfer - Who was it that said you don't play golf on colour?
We have just installed a new 130,000 litre holding tank to replace the old one which only held 55,000 litres. This is fed by mains water although we are currently exploring the possibility of installing a borehole.	Up until the spring of this year we used to water greens and tees with a tractor and bowser. Stage 1 of a new irrigation system was installed last summer (05) consisting of a 125mm ring main branching off to a valve box at the greens, a set of pumps and a holding tank. This will allow us to hand water the greens in a couple of hours as opposed to a couple of days with the old system. Automatic irrigation is in the pipeline (forgive the pun), but not for a fair few years yet.	Not that much really. Yelverton is quite unique in the fact that we have never applied much water to the greens. This is purely down to actual time taken to fill the bowser, take it out to the greens, apply the water, bring the bowser back and fill up again - 4 hours to water 6 greens @ 600 litres per green.	The use of tried and tested wetting agents is very important at our club and we are constantly monitoring new products that are becoming available. There is also the constant battle to control poa coupled with a regular overseeding programme using bents and fescues. This has been part of our course management policy for some time now.
The club extract the irrigation requirements direct from a stream that runs through the course and have done so for the past 70 years.	I have not changed my view on water requirements In light of drought problems as I have always adopted the view of using water sparingly, more so to encourage deeper rooting.	There would be little difference to the course upkeep or condition if restrictions were enforced.	My only reaction to water shortage in the future is to increase further, aeration on the golf course. A deeper rooting system will find the necessary water supply needed to survive.
Our Irrigation system is supplied from a pond. We have a Borehole to back up the pond if it can't sustain itself naturally.	SEPA are introducing Abstraction and Impoundment regulations in Scotland this year and I suppose it has got me to think more about water. Being a traditionalist with a minimal water view anyway and all the sustainable golf course hype, I will use it to assist me in further reducing my use of irrigation.	A significant reduction for us would probably mean only hand watering as we only use the sprinklers very occasionally. 9 years out of 10 that would be sufficient to service our course as I advocate minimal water, but the once in every 10 year drought we normally get would see the fairways burn up, but grass has a great power of recovery when the rain comes. It would probably have no long term effect.	My long term thinking has always been the same in my 8 years at Largs. It is with the promotion of the finer grasses in particular Browntop Bent on our greens and this has involved less water each year as the root structure improves increasing sustainability and improving all year playability. I will take this approach as far as I can as long as I have the support of my club.
Fortunately we abstract from a stream into lakes on the golf course. However we are limited to 18,000 m3 per annum for 27 holes. The abstraction licence has certain conditions attached preventing us from abstracting at certain times when river flow falls below a certain level downstream from us. We have not been allowed to abstract so far this year, so have to rely on water stored.	As we are limited to how much we can abstract we always water as efficiently as possible making 2006 no different from any other year. This includes a well maintained irrigation system, the use of wetting agents and aeration to improve root development. Hand watering is also very important. In fact this year we have not irrigated yet.	The greens and tees are very prone to drying out so it could become a major problem. Our course management policies would have to adapt.	Winter storage of water and increased efficiency of the irrigation system, coupled with development of more drought resistant grass species has to be the way forward.
Our water is supplied by borehole. It goes down about 90m into chalk and we extract 22 m3/hr. We have irrigation to greens, tees, approaches and fairways, about 400 heads.	Yes. By using a more regular wetting agent application we have seen quite a reduction in irrigation to greens - almost half in fact.	We are a 6 year old course, with very undulating (David Williams design) sand greens. Last year we lost irrigation for 3 weeks. In the end we lost about 30% cover to greens and tees. Luckily the fairways just about held on. I dread to think what will happen if/when this drought order is enforced it will have a massive effect on this course, and to our industry.	Following last year's disaster! We have been overseeding, with fescue/bent, have maintained a height of cut at 5.5mm and are verti-cutting and topdressing (800Kg/Ha) on a fortnightly basis. If we need to pick the pace up for a competition we double cut and roll. We are doing this to try and give the fescue a chance and its actually working quite well, we are getting really good feedback from the members! Looking long-term we have identified the need for larger water storage, and are planning to extend our irrigation lake - I want to quadruple it.
The water that irrigates the course is provided from a dam called Arade near Silves (nearly 40%) and the other 60 % comes from wells. The water that comes from the second source is blended in because it is very high in salt content and we need to diminish it. We maintain our lakes for each course nearly full or half full, before we start pumping for each irrigation during night.	These last summers in southern Portugal and in the whole of Portugal, have been demanding in terms of water consumption but we only apply the water volume that turf needs to grow or even less to replenish the water necessities of turf. Our fairways are Bermuda Tifgreen 328, so they don't need to be irrigated every day (in the summer, day in day out).	I think if we reduced the amount of water volume applied to the turf, fairways would become yellow and the board and members would start making complaints about the course because it was less green. They are not accustomed to fairways resembling those in United Kingdom and the board is demanding on having lush turf.	In terms of course management in the Mediterranean zone and dealing with this course, I am aware that we need to apply the resource water with a lot of criteria as the quality of the water here in the south is very bad (high saline content). In the future I believe desalinisation plants for certain courses will be needed in order to diminish the consumption of water from the dams needed for domestic use.

What preventative steps can I take?

Michael Shaw from the National Golf Clubs' Advisory Association says that golf clubs can minimise the disruption to their courses with a little careful planning.

"Whenever the threat of a hosepipe ban rears its head, Golf Club Managers and Greenkeepers tend to panic. Everyone, including members, has to be sensible and bear in mind that with the British weather it is simply not possible to have Augusta style courses throughout the year."

Michael Shaw of the NGCAA

Michael says clubs should follow these simple steps:

1) Check the exact details of the drought order. It might just ban hoses but not sprinklers, and an order wouldn't normally apply to bore holes or water saved and recycled by the club. Once a drought order has been granted then the relevant water authority must inform its consumers either by post or through the local press as to the extent of the restrictions being placed upon them.

2) Meet your greenkeeper and agronomist. Make sure you discuss the situation, including the worst case scenario, and work out an plan action. This might include reducing the size of the greens or not dewing the course each morning.

3) Brown isn't a problem. Accept that keeping the grass alive is the one overriding issue. This doesn't necessarily mean having it a beautiful green colour the whole time!

4) Contact your neighbouring water authority. It might well be that your neighbouring water authority doesn't have a ban in place. Most are happy to sell their waste water but bear in mind the storage issues.

Regarding the vexed question of whether or not members can claim a refund for the days on which they are unable to play because the course is out of commission, Shaw is adamant:

"Clubs can rest assured that members don't have a leg to stand on - although clubs try their utmost, no club will ever guarantee that a course will be fit for play 365 days a year. Given the British weather, this would be madness!"

What would you do? Desperate times call for desperate measures.

Billy McMillan, Greenkeeper for Tyrrells Wood GC in Leatherhead, kindly took the time to tell me how the golf club - recognised as one of the finest golfing venues in Surrey - was coping, since their water supply was cut on May 27.

As soon as Sutton and East Surrey Waters Drought Order, (restricting non-essential use of water), came into effect, the first thing that Tyrrells Wood did, was inform membership. Billy explains:

"We made membership aware of the situation and explained that it would be a tough year ahead." Billy, who described the drought as the most disastrous to happen to golf courses in the south east in decades, continued: "We put a contingency plan in place and prioritized the greens, but this in turn causes stress factors with the tees. We have employed good greenkeeping. Our cutting frequency has gone down, therefore the grass is longer needing more top dressings.

Tyrrells Wood are relying on their borehole for 45% of their water, should the flow rate in the river Nole go below a certain level, then the worry is that their abstraction licence may be cut by 50%.

Billy explains that the fact of the matter is: "Should water be stopped, grass will die." Drastic measures are being considered if the drought intensifies, the main one being buying water. At present the golf club pays Sutton and East Surrey Water 97p per cubic metre for water, should the club buy "grey" water - water that comes out of sewage works or water that hasn't passed sufficient tests to become drinking water and is therefore not fit for human consumption - they will have to pay over 20 times the market value at £22 - £25 per cubic metre.

Billy's brother Ian McMillan, Course Manager at Walton Heath GC - who recently hosted the US Open Qualifer - in Tadworth, Surrey, has recently bought two tankers and is training staff to ferry water from another resource.

Tyrrells Wood GC

IC SurreyOnline recently reported that Redhill and Reigate Golf Club are also planning to use "brown" or "grey" water to help them cope with the drought. If the warm weather continues, the club will need to import this water from Oxted. The club are concerned that members of the public might think they are breaching the recent drought order put in place by Sutton and East Surrey Water, if they are seen watering their greens.

Aeration Additives Conserve Water

Since hose pipe bans in the south of England were first announced, Terrain Aeration have been injecting water storing polymers as part of their deep, compressed air de-compaction treatment.

Injected on the final air blast and using dried, milled seaweed as a carrier, the polymer crystals travel into the newly created underground fractures and fissures where they are capable of expanding to 100 times their original size following rainfall or irrigation.

Operations Director, Lynda Green, who can remember aerating with water storing polymers on Local Authority sports pitches under similar drought conditions in the early to mid 1990s, says that in her experience, the crystals, once in place in the root zone are active for up to10 years.

"The polymers act as an underground reservoir, absorbing water when it is available, ready for use by grass roots during dry periods," she says. "As soon as the water content of the crystals has been exhausted, they will revert to their original size until they are once again replenished."

Water storing polymers are suitable for injection during the company's aeration treatment of all amenity turf including golf courses, sports fields, and parks and gardens. Trees and shrubs, whether established or newly planted are also ideal candidates.

For further information contact Terrain Aeration on Tel: 01449 673783.

Little Ashton golf course using water storing polymers.

New Turf's Suited to Drought

Developed in the scorching Portuguese climate, Xeris grass, with its 3ft 6in root system, passed the test this season at Ipswich Town's Portman Road.

Requiring less watering and able to withstand heavy usage by vehicles and pedestrians, this new type of grass was laid on Real Madrid's football pitch and has been tested on various golf courses. Suffolk based Sovereign Turf, developed Xeris south of Lisbon, where temperatures can reach the high 30s and rainfall is very low.

Zeba, a starch based polymer, claims to improve soil moisture retention and water availability to the roots of grass plants. Environmentally safe, this product is made from corn and biodegrades over 12 to 16 months.

Zeba can cut watering needs for a year, by capturing water as it enters the soil and preserving it for plant use. It can absorb more than 400 times its weight in water, helping greenkeepers to make the most of soil moisture and reducing plant stress caused by heat and limited water.

For more information visit www.logicalliance.co.uk

BIGGA bulletin board - www.bigga.org.uk

Boreholes and irrigation water have both been hot topics on the BIGGA members bulletin board recently, so I feel it's only right to discuss these alternatives in view of the drought.

The period between February and October last year was the driest on record and this has resulted in renewed interest in new and upgrading irrigation systems on our golf courses. While the general level of irrigation provision on UK golf courses has improved significantly, there is a need to make better use of these systems.

As discussed earlier, greenkeepers wishing to take more than 20 cubic metres of water a day from an underground source, for example a borehole or well, or from a river or stream, need to obtain an abstraction licence from the Environment Agency. The agency has the power to cut existing licences and to decline new bore hole drillings. While boreholes are a dependent option for water supplies, it's important to take into consideration the cost of setting up the abstration, this can be hundreds of thousands of pounds, but if droughts become a regular occurrence this is an important option to consider.

Reed bed treatment systems have grown in popularity in recent years, although they have been around naturally for a considerable time. They can be built as a complete system, with say some form of primary treatment to remove the gross pollutants, followed by a reed bed treatment system. There are two types of reed bed, namely a vertical flow and horizontal flow system.

Reed beds are proven to be very effective at removing toxic elements from water, but on the downside, these systems require a large land area for correct treatment, and this needs to be taken into account when choosing the system. Anyone wishing to install a reed bed needs to obtain a discharge licence from the Environment Agency. On the upside, reed beds prove to be much cheaper than a waste to water system.

Another viable method for re-using and filtering water is Sustainable Drainage. SUDS (Sustainable drainage systems) are made up of structures built to manage surface water run-off. SUDS provide treatment for surface water, using the natural processes of sedimentation, filtration, adsorption and biological degradation. Sustainable drainage systems benefit from managing runoff flow rates and protecting or enhancing water quality, while also, being sympathetic to their environmental setting.

Eric Green, Course Manager at Woodcote Park Golf Club in Surrey - a part parkland, part downland course, founded in 1912 - spoke to me about the affects that Sutton and East Surrey's drought order is having on their course.

"These are a critical few months," said Eric. "I've never seen our course and other local courses looking so bad."

Unable to use mains water to irrigate their greens, the greenkeepers at Woodcote Park have had to make some serious changes. Considering building a borehole and having had MJ Abbotts map out a reservoir, the club have had, like Walton Heath, to resort to using "grey" or "brown" water. Pains Hill at Oxted, is an old water treatment plant, that is providing free water to all golf clubs in the area, as long as they organise their own transport. "It costs £9,500 to hire a lorry and then there's the hiring of lorry drivers," said Eric. "Myself and my First Assistant will be taking heavy goods vehicles driving tests in the near future, as a precaution for next year," continued Eric. Oxted is about half an hours drive from the course and then, of course, there's the time it takes to fill up and empty the tanker. Four runs need to be made each day to transport the 8,000 gallons needed on a daily basis. "The plant closes at the weekend, so we have to store the water up in preparation," said Eric.

As well as tankers, the club have installed water butts around the Club House and staff accommodation, and more recently next to their 17 Century barn. "We have collected 1200 gallons of water from the butts alone," commented Eric. "Water has been drained from a swimming pool onsite, at one of the houses, to use in the sprayers, " continued Eric. The upsetting thing for Eric is that passers-by see the club using sprayers and immediately assume that they are floating the drought order, when in actual fact, they are having to make a lot of changes to ensure they don't get fined.

"Being on a chalk down means that the course is easily affected by a lack of water," said Eric. "I've started to stock up on grass seed -

Is desalination the answer?

Desalination is a process that removes dissolved minerals (including, but not limited to, salt) from seawater, brackish water, or treated wastewater.

In the event of extreme drought, the ability to supply water through desalination is an important, non-rainfall option.

Of the more than 7,500 desalination plants in operation worldwide, 60% are located in the Middle East. The world's largest plant in Saudi Arabia produces 128 MGD of desalted water.

In contrast, 12% of the world's capacity is produced in the Americas, with most of the plants located in the Caribbean and Florida. To date, only a limited number of desalination plants have been built primarily because the cost of desalination is generally higher than the costs of other water supply alternatives available (eg water transfers and groundwater pumping).

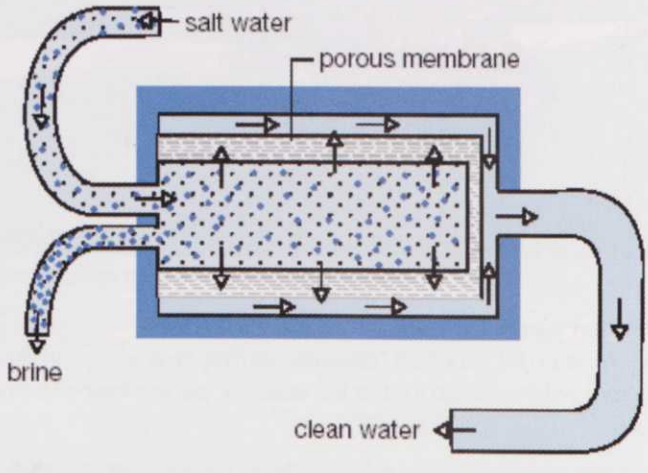
However, as drought conditions occur and concern over water availability increases, desalination projects are being proposed.

A £200m desalination plant was to be built in London, it would've been the first of its size in Britain and could have rivalled many in the Middle East. It could have provided water for the 900,000 people expected to move to the capital within 25 years, and be a back-up in case of emergency.

London's water supply is fragile and with an ever-growing population, Thames Water are concerned that unless a desalination plant is built, re-growth will be threatened.

Even if a drought only occurs every 20 years, this could lead to standpipes and water rationing. Mayor, Ken Livingstone has decided to block the plant, but Thames Water are appealing against his decision.

So it seems there are steps that can be taken, to try to prevent drought becoming an increasing problem. We must ensure that everyone understands what an important and precious resource water is, and make sure that our golf clubs and greenkeepers are well prepared for dry summers.



Desalination. Copyright Sydney Water

Top Tips

- Reduce or eliminate nitrogen fertiliser - Nitrogen overly promotes leaf growth, at the cost of the roots. Plan on fertilising in the fall when top growth slows down and root growth increases. Use a slow-release fertiliser, if possible.
- Avoid herbicides - Most weed killers also reduce the vigor of grass roots.
- Reduce thatch and compaction - Aerify early in the year so moisture and air can reach the roots as easily. Thatch can act like a sponge, and compaction will increase run-off.
- Sharpen the mower blade often - Dull blades will shred grass and greatly increase water loss.
- Mow less or when it's cooler - Grasses lose moisture after every mowing, but less is lost if you mow when the weather is cool.
- Mow as high as possible - Taller grass promotes deep rooting and shades the soil.
- Leave clippings, not clumps - Returning grass clippings will add moisture and nutrients to a lawn, while providing a mulching effect.
- Reduce traffic on the lawn - Try to stay off the grass, especially during the heat of the day.

When you do irrigate, make sure you use conservation practices:

- Water late at night or early in the morning - taking advantage of cooler temperatures and less evaporative losses to afternoon winds and hot sun.
- Water infrequently and deeply - this encourages roots to go deeper where moisture remains available for longer periods of time.
- Let the grass go dormant naturally by withholding water, except for 1/4-inch every four to six weeks, this will keep the crowns hydrated and ready to green up when moisture becomes available.

Watering plants:

- Gardens consume an enormous amount of water. A sprinkler can use as much water in an hour as a family of four uses in a day. They can actually damage your plants. Choose trickle systems, which can work from a water butt without mains pressure and avoid the heat of the day.
- Rainwater is better for plants anyway. Collect it from your roof with a rainwater diverter and water butt.

For further advice on the drought, contact:

The Met Office: 0870 900 0100
Email: enquiries@metoffice.gov.uk
DEFRA: 08459 33 55 77
Email: helpline@defra.gsi.gov.uk
Environment Agency: 08708 506 506
Email: enquiries@environment-agency.gov.uk

Visit:
www.beatthedrought.com
www.water.org.uk

Water Authorities:
Southern Water: 0845 278 0845
Scottish Water: 0845 601 8855
Yorkshire Water: 08451 24 24 24
Water Direct: 0845 3451725
South Staffordshire Water: 01922 638282
Severn Trent Water: 0121 722 4000
Thames Water: 0845 9200800
Sutton & East Surrey Water Plc: 01737 772000
Anglian Water Services Ltd: 0845 7919155

Harrogate week - come and learn

Wanting to improve your water usage?
Ken Richardson, Education and Training Manager for BIGGA, will be holding a two day workshop during Harrogate week entitled: Water usage on the golf course. In addition to this, a 1 day Drainage Workshop and a seminar on Water usage in amenity turf, will also be held.

For further details check out our website: www.harrogateweek.org.uk or contact Sami Collins at sami@bigga.co.uk

Help is at Hand

McPherson Ltd, a large tanker haulage company based in Scotland and northern England, has the facility to supply "non-drinking" water, to organisations.

Golf clubs that are affected by water restrictions can use their fleet to transport water from Scotland or more local sources, such as the Oxted spring water supply in Surrey. The company can deliver into customer storage tanks or leave their tankers on site, to swap over when required.

- 22,000 litre tanker = 10p per litre
- 28,000 tanker = 7p per litre

The above prices are estimates based on transporting water from north Scotland to south London.

Contact Graham Dixon, Contract Manager, McPherson Ltd, on: 0161 886 3540 or email: gdixon@abn.co.uk

How To Squeeze Out The Last Drop

Roger Davey, of independent irrigation consultants Irritech, works closely with Toro. He discusses how good water management can help golf courses to avoid running dry in times of drought

With all this talk of drought, there is a real danger that sprinklers will be banned on golf courses, but by putting good water management programmes in place, greenkeepers and golf course managers can ensure water supply continuity for the foreseeable future.

The volume of water used by golf courses varies immensely from course to course. Factors such as construction of greens or tees, the area to be irrigated, aspect of the site (altitude/links course, etc), management techniques (and manager!), as well as the age, type and efficiency of the irrigation products that apply the water, all have a bearing and are crucial in water management.

So where can we get water from? Sources of water for irrigation can be generally classified as follows:

Mains potable supply
Supplied by the water company or water provider. Costs vary throughout the UK, but average approximately £1 per cu m (220 gallons is 1cu m of water). This is generally a good quality supply of water. However, in times of water shortage the first casualties are those that are not 'essential' users - and that means those with sports turf areas and golf courses.

Borehole supply
Water is abstracted from below ground via a borehole pump either during the summer, the winter, or all year round. This is subject to an abstraction licence issued by the Environment Agency. Water quality needs to be monitored regularly and costs can be a fraction of mains water (water taken during the winter months is stored in a water storage reservoir for summer use).

Surface water abstraction - streams or rivers
As with the borehole, a licence is required. Costs are minimal and, when abstracted in the winter, water is taken at times of excess to be stored in a winter storage reservoir for summer use.

Treated sewage effluent (TSE)
Recycled water from sewage treatment works or the golf club's own treated sewage system. This must be solids-filtered and passed through an ultra violet filter prior to irrigation system use. The water must be tested regularly and a detailed management risk assessment undertaken (this applies to the storage and use of all water).

Grey water, roof run-off and surface run-off
Ecologically a very 'friendly' way to catch and utilise water. However, large water storage areas are required as water can be obtained only when it rains - when irrigation is required surface run-off is not available, because it has not been raining - again the topic of winter storage looms!

Of the above sources (specifically mains water, borehole and surface water abstraction) permission must be granted by the provider and the Environment Agency for the use of water for spray irrigation. However, if, for example, usage is less than 20cu m per day from a borehole, an abstraction licence is not required. In many cases 20cu m will be enough for emergency irrigation if the end user, and irrigation system, is efficient. Prior to drilling a borehole for this flow, permission must be sought and granted from the Environment Agency.

Winter storage reservoir
This is the term often used to define the site used to store water gathered from sources such as surface run-off and boreholes during winter months. The correct siting of water storage resources is paramount. For example they should not be an integral part of the 18th hole, as by the end of August, having served its purpose, the reservoir will become an eyesore as levels will have fully dropped.

Winter storage should ideally be sited at or in an area that is not in play, can be easily accessed, allows the supply of power effectively and easily, and can provide an area large enough to store the required volume. Always design a reservoir based upon seasonal usage and not total storage volume, but effective storage volume! Many reservoirs will require lining, and all will require planning permission and Environment Agency approval for filling. But once constructed, it will provide the club with a reliable source of water throughout the irrigation season.

So, now that we have it, or know where to get it, how do we make the most effective use of it?

The approach is multi-faceted and no one rule is golden. However all good irrigation systems depend upon:

- Accurate and effective application of water through evenly and accurately-spaced sprinklers that produce a uniform coverage. In simple terms - sprinklers that place water where you want it, when you want it.

As always technology helps - today's sprinklers have cutting-edge nozzle technology and nozzle angle adjustment. However, even the best sprinkler selection will not work effectively and provide a high coefficient of uniformity unless correctly spaced. This means head-to-head coverage - a sprinkler with a radius of throw should be spaced at no more than 20m from the opposing units when on a square spacing.

- Know your water requirements - ask 100 turf managers how much water they put on during a night and 80 will tell you eight minutes! Minutes means nothing - millimetres means everything.

The calculation of required water per night is simple and based upon the volume of water lost during the previous 24 hours. This can be measured either by practical means (evaporation pan) by formulae calculation, or by automatic means, such as a weather station linked to a PC-based control system.

This water application calculation is vital in conserving water and ensuring that water is not wasted, and, when used in conjunction with a water balance sheet, considerable savings are made.

- Control your water application - water automatically during the hours of darkness when water can percolate before it is evaporated; use multiple programmes to allow water to infiltrate and prevent run-off; use a PC-based control system which is essential as it allows multiple starts each cycle and water volume can be recorded.
- Prevent wastage or leakage, repair all pipeline leaks and weeps, and isolate areas that are problematic. Upgrade the mainline pipe network to provide a trouble-free supply.
- Ensure that all sprinklers are pressure regulated, either as electric valve-in-head units, or that the solenoid valves controlling the sprinklers are installed with a pressure regulator.
- Audit and appraise your sprinklers (or have the system audited and appraised), calculate actual run times and application rates according to the actual sprinkler spacings and nozzle flows and pressures.
- Seek to plan water usage; predetermined irrigation strategies rarely fail. This means a known volume of water over a known period at a known application rate.
- Emergency sourcing of water - in theory if the irrigation strategy has been executed, this should not be required. However if an emergency supply of water is required the irrigation system water usage calculations and run time and evapotranspiration calculations per area will be invaluable to determine how much water is required, and when.

Emergency sources of water may be those such as imported tankers of treated sewage effluent, or water purchased from other users (such as farmers) whose irrigation cycles are somewhat different to golf course requirements. For some agricultural enterprises, the irrigation system is finished by mid to end of July. All sources of water should be tested upon delivery or be delivered with a test certificate. This can and will affect the fine turf management regime and the operating risk assessments.

Other regimes, including adjusting cutting heights, the use of wetting agents, prioritising irrigated areas, and informing the end user (the golfer) are also paramount.

Asking questions internally often helps to appraise the issue. How much water do I need per area, per day, per week, per annum? Can the infrastructure then apply this when I really need it to? How can I purchase extra water if the volume required or used by the system is not known?

In order to have a reliable irrigation strategy, the end user must have in place the above items. When developing and/or upgrading an irrigation system, this can take up to two years to put in place, but the ability to apply water when it is required accurately and efficiently is a huge management tool and, as with most other things in life, you only get out that which you put in - or in this case, on!

Toro Irrigation products are distributed in the UK by Lely (UK) Limited, Station Road, St Neots, Cambridgeshire, PE19 1QH; tel: 01480 226848, email: toro.info@lely.co.uk or visit website: www.toro.com For more information about Irritech email: info@irritechlimited.co.uk.