AS WE ENTER THE THIRD DROUGHT SUMMER it is beginning to
dawn on us that water is no longer the inexhaustable resource
it once was and the phrase “spending money like water” is no
longer relevant.

To examine the implications of the prolonged, perhaps
indefinite, water shortage Greenkeeper International asked
four experts from the irrigation field to take a look at the
situation and explore possible solutions.

Giles Wardle, who has written for the magazine before and who
is an independent irrigation consultant; Roger Davey of Ocmis
Irrigation (UK) Ltd; Graeme Francis, of Toro Irrigation Ltd, and
Richard Pocock, of Watermation Sprinklers and Controls Ltd
have each produced an excellent examination of the situation.

Why and how we should
conserve a finite and valuable
resource. By Giles Wardle
BSc, MSc, MIAgrE.

We have, apparently, just
experienced the driest 20
month period since records
began. As the demand for water
increases and its supply seem-
ingly diminishes, competition for
this essential resource will
become more heated.

The consumption of water for
irrigation by agriculture, horti-
ulture, amenity and sports turf
combined, comprises less than
2% of total water consumption.
The use of water for irrigation
pales into insignificance when
compared to domestic and indus-
trial use. So why does irrigation
get disproportionate attention
and criticism in the media?

The reason is that while the
annual proportion of water used
for irrigation is small, the con-
sumption of that water is concen-
trated in the summer months,
when supply is at its lowest.

Long term weather forecasting
is fraught with difficulties. There
is, however, a generally accepted
view by meteorologists that the
climatic trend in the British isles
is that of increased temperatures,
hotter and drier summers, more
frequent droughts but not neces-
sarily less average annual rainfall.
The trend, we are told, is towards
wetter winters and longer and
drier summers.

Irrigation therefore is set to fea-
ture still more prominently in the
water debate. Irrigators do not
have a very good public image.

This, whether it is deserved or
not, needs to be improved if irri-
gators are to be listened to in the
debate. This can be done by
showing that irrigators are using
this valuable resource in a
responsible and efficient
manner?

1. Winter Storage of Surface
Water
On the face of it a simple solu-
tion. The Environment Agency is
encouraging the construction of
reservoirs for storage of winter
water and look upon this
favourably when awarding
licences. The messages is when
water is plentiful “grab it while
you can”. Once you have stored
this water it is yours to use, as
and when you please. Farmers
see the advantages in this, as it
avoids having their licenses
revoked in the middle of irrigat-
ing their potatoes. There has thus
been a boom in the reservoir con-
struction industry... in agricul-
ture.

But this has not necessarily
been the case for the golf sector.
Farmers generally have a large
area of land to find a suitable site.
Where golf clubs are concerned
land is at a premium. So why not
incorporate a lake around the
golf course? It would not only
incorporate a lake around the
golf course and disposal of the exca-
vated material.

Reservoirs/irrigation lakes can
be incorporated into the drainage
system of the golf course.

2. Irrigation Scheduling
The best irrigation scheduler is
the greenkeeper/irrigation tech-
nician. There are many tools at
his disposal in order to perform
the task accurately.

Weather stations: Visit a golf
course in Florida or California
and you will invariably find the
golf course has its own weather
station with software to calculate
the evapotranspiration rate and a
link to the irrigation controller.

Yes they are expensive but in
climates where the irrigation sea-
son is nearly all year round and
all the fairways are watered, a
5% saving in water consumption
results in huge savings in water
and energy costs. More than
equal to justify purchasing the
weather station on financial
grounds let alone environmental
ones. This is not really the case
in Britain, where irrigation is often
confined to merely greens, tees
and approaches. However on
courses with full fairway irriga-
tion the installation of a weather
station is certainly justifiable. (see
Learning Experience article else-
where in this issue)

There are alternative, cost
effective ways of irrigation sched-
ing.

Balance Sheet Method: This
can be done manually, using a
computer spreadsheet or purpose
written software. This method
when properly carried out can
give very accurate results. Crop
(grass), meteorological, rainfall
and irrigation data are used to
calculate rates of evapotranspi-
rations and soil moisture defects.

This method, however is only
as accurate as the data fed in (soil
type, rainfall, irrigation etc). The
method is really no different to
using the weather station above,
but the meteorological data is
input from the local met station

11 GREENKEEPER INTERNATIONAL June 1997
rather than recorded on site. There are companies (eg ADAS, Levington) that offer an irrigation scheduling service using this method.

Incidentally, if you don't have one; get a rain gauge!

Plant stress indicators: There are methods (infra-red thermometry, displacement transducers, chlorophyll fluorescence, porometers) that identify the first signs of stress, displacement transducers, are methods (infra-red thermometry, displacement transducers, chlorophyll fluorescence, porometers) that identify the first signs of stress.

The Environment Agency is, and will as time progresses ensure as far as is practically possible, that water abstraction from natural ground water reservoirs is used to its utmost effectiveness by limiting amounts/periods of abstraction and implementing time limits/review periods on abstraction licences.

Savings in water (be the water from a borehole, winter storage reservoir or mains supply) will increase the long term cost efficiency of the golf course, by reducing leaks or over irrigation it is possible to reduce pumping costs and water charges. With mains water costing approximately 70-80p per cubic metre and an average golf course using approximately 100 cubic metre per night at peak irrigation period every cubic metre of water saved is a financial saving.

To this end, today's modern irrigation equipment is armed to the teeth regarding conservation and efficiency, pinpointing exact areas of irrigation.

In all existing irrigation systems waste water to some extent, whether through old and leaking pipes, inefficient and ineffective sprinkler heads, too high application rates or unmanageable control systems. All these areas can be improved by today's modern equipment and design capabilities, for example:

- PVC – (glue jointed) underground mains can be replaced with 100 metre coils of Medium or High Density Polyethylene jointed at degree of arc in the case of point circle sprinklers.

Upgrading your controller to a PC based unit, will remove the repetitive task of calculating sprinkler run-times and will allow you to program watering on the basis of depth. There are many PC control systems on the market today, of varying costs and specifications. Most PC control systems can be retrofitted to your existing control system.

Alternatively draw up a table with the run times for given water applications (say 1,2,3,5,7 and 10mm) for each station on the controller.

How often do you reprogram your irrigation to take into account changing conditions? Do you program the irrigation according to the conditions of each individual station or do you program according to station type ie. tee station, green station etc? Do you have a flow meter? If not linked to the irrigation control programmes ensuring a design 

1. Irrigation Programming

Determining how much water is required is only one half of the story. Programming the irrigation to apply the requisite amount of water is just as important. Irrigation programming is the easiest part of irrigation scheduling, yet rarely is it done properly. When an irrigation operator is asked how much water he is applying the answer is often in minutes per day this could mean anything between five to 25 millimetres of water per week, depending on the design and type of the irrigation system.

Irrigation should be programmed on the basis of depth of water applied. However, most irrigation controllers are programmed in minutes rather than inches or millimetres. One must therefore calculate the run time in minutes for a given depth of water.

To calculate this, one needs to know the desired depth of water to apply and the precipitation rate of the sprinklers (a factor of sprinkler flow, spacing and

2. Irrigation System Design

The design of your irrigation system is probably the most important factor in enabling you to operate your system effectively and efficiently. Good design is fundamental to the long term success of an irrigation system. The only keys design factors affecting water use efficiency are:

a) Uniformity of water distribution by the sprinklers. This is a factor of sprinkler model and nozzle, sprinkler spacing, sprinkler configuration (triangular, square, single-row etc), operating pressure and wind speed.

b) The level of control of the sprinklers. The ability to differentiate the sprinkler run times for certain areas to match their individual conditions is paramount. Avoid systems with too many sprinklers grouped to one control station and systems with two solenoid valves attached to one controller station.

5. Irrigation Operation, Service & Maintenance

Not all golf courses have well designed irrigation systems, whether through lack of funds, poor design or that the system has been extended and modified over a number of years. If you do not have the funds available to replace or upgrade your existing irrigation system, what can you do to improve its water use efficiency?

Poor uniformity is manifested by dry or wet spots. The dry/wet spot maybe due to a variation in soil type or topography. However a dry spot in the middle of a green or tee is almost certainly a problem of poor sprinkler uniformity. Firstly you should check that the sprinklers are running at their design operating pressure. Do you have the correct sprinkler nozzle and operating pressure for the spacing? Is the sprinkler appropriate for this application? Are the sprinklers poorly positioned? Is the area particularly susceptible to wind?

If you do have dry spots, they should be watered manually using a hose rather than the sprinklers. Alternatively get an irrigation engineer to check your system to see if the problem an be remedied.
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importance of encouraging water conservation

To quote Benjamin Franklin, "We know the worth of water when the well is dry". Contrary to the perception of the British nation being a country with constant rain; the average precipitation rates over recent years, combined with the changes in urban and industrial water requirement, have left us no option but to ask ourselves the following questions: "what is water conservation?", "why do we need it?", and "what do we intend to do about it?".

"Conservation" is defined as the preservation of the natural environment, and in this case water. Secondly, we leave this earth to our children, so let's leave it in a better state when we arrived, and thirdly to do something about it we need to adopt some common sense strategies:

- We need more public education and awareness programs aimed at educating the end user in efficient water use;
- We need to investigate price structures on water usage that buy "water usage" saving by providing a financial incentive for using water more efficiently, or by encouraging the use of alternative water sources such as reclaimed water;
- We need to improve efficiency within the water system itself, such as ongoing maintenance of irrigation systems, and optimisation of existing systems by conducting irrigation system audits;
- We need to improve system design by getting "back-to-basics" and designing more efficient systems, without going to great expense, and to getting the optimal operating costs in line with irrigation system efficiency.

In line with the above facts, as a responsible public we must get our irrigation moral codes right if we have any obligation toward our future. The irrigation designer or contractor is not the consumer who pays the water bills. Life-cycle costing is not factored into the decision making process. Instead the irrigation system with the lowest initial cost is often favoured. This quite often leads to disasters, as apples were not compared with apples. The first time I went to the USA I become aware of why the Apple Computer Company called its up-market PC "Macintosh". This had always been a mystery because to me a Macintosh was a raincoat but in discussions about apples, when I issued the wisdom that Australians probably ate more green apples than red, I learned that for Americans green apples where not for eating, only cooking. Red apples were for eating and why there was really only one red apple - the Macintosh.

That observation taught me a very important lesson and that is that when you start making decisions about anything you really need to know everything there is to know about what you are deciding about. Your natural expectation is that irrigation designers keep their information up to date as possible. Certain some do, but sadly some don't and equally certainly some "designers" are not truly designers at all, but are merely product salesmen masquerading as designers. The true designer will have a very broad spread of knowledge in a given area, and as will, will have a depth of technical knowledge which takes him past the problems which he immediately has to deal with. He will also know what he does not know but know to whom to talk if he does not know.

Over the years greenkeepers have accumulated a lot of wisdom about what they use and will have options about certain equipment which either they swear by or swear at. If you swear at it why did you buy it in the first place? Did you compare apples with apples or did you compare a lemon with an apple.

We must ask, "What do we want from our irrigation system?". Basically we are trying to emulate useful rainfall, trying to make turf grass are playable and visually enticing.

There is no "secret formula". It is obvious that lower pressures and precipitation rates to match soil infiltration rates will mean energy saving and water conservation. The initial cost savings will be augmented by such long term benefits as extended system life, and lower ongoing maintenance costs.

You might ask yourself if there is, or, if there should be any commonality between golf courses and agriculture. I happen to believe there is, let's face it, they are both in business to make a profit, and it makes good business sense to invest in good equipment, good people, and any tool that can make the operation more efficient.

Therefore the anatomy of future golf course irrigation systems should contain the principles of low pressure, controlled volume, precipitation rates that match soil requirements and uniform sprinkler distribution.

The future of control has to lie in the direct measurement of soil moisture in the root zone and climatic condition at the irrigation site linked together with lower pressure and precipitation rates to match soil infiltration rates.

The end result of this is that I have endeavoured to bring some very important irrigation considerations forward for the late '90s. Apples may be red or green, but they still need to be apples - not lemons.

Richard Pocock CLIA, MASAЕ European Contracts Sales Manager Watermation Sprinkler & Controls Ltd
The future of irrigation

The recent dry weather and the apparent trend towards drier conditions in the UK make adequate irrigation provision more important than ever. Indeed it's the unpredictability of the weather which makes irrigation planning increasingly more difficult. The inevitable result of the drier conditions is that water is being recognised as an increasingly valuable resource.

For greenkeepers there could be some very serious implications, restrictions on using the potable water supply have already been seen, and in the longer term the cost of mains supplied water could go up significantly.

The greenkeeping professional needs to consider long term irrigation planning. This involves investigating alternative sources of water such as boreholes. If the alternative use of water from rivers or streams is envisaged it will only be allowed on the basis that all the course's irrigation water is taken from the river during the winter and stored in a reservoir. In order to know the reservoir capacity, greenkeepers will have to know how to plan and calculate water use and water budgeting, both financial and quantitative, will become a standard course management task.

Effluent water is another potential source as yet undeveloped in the UK. If lakes and reservoirs are being used for irrigation purposes the water in them will have to be maintained and long term solutions such as water aeration will form part of the essential process of irrigation water quality management.

Once a suitable and tenable water source is secured the next stage is to optimise the use of this water. This can only be achieved by having a well designed, well installed, well operated and well maintained system. All of these factors are interdependent and are key to effective irrigation.

While many greenkeepers will not have the opportunity to start with a new system those who are looking for replacement or extension must involve themselves and the other relevant people at the club in a thorough evaluation of what they want, and how to get it.

All too often decisions over golf course irrigation are made based around the contract price with little consideration of the longer term economics. Golf clubs must look for, and should expect, to buy not just an irrigation system, but an all round package of products and, perhaps more importantly, services. Long term support from the installer and his suppliers is key to a successful irrigation system. Investment in the right system will go a long way to offsetting the problems we are currently seeing, but time needs to be taken in selecting that system. Make sure you have enough technical and commercial information to allow an informed view to be created, price is important, but it is not the sole criteria upon which to make a decision about something as complex as a bespoke irrigation system. There is a wealth of experience and expertise in the specialised golf course irrigation companies and advantage of this must be taken.

Control systems, sprinklers and pipes are examples of areas where technology has moved on a long way from the early days. Inaccurate control systems are no longer acceptable, nor are pipe systems which allow significant amounts of water to be lost through joints.

For those not in a position to replace an existing system, correct maintenance and operation need to be the priority. Poorly maintained systems cost more to run and waste water and, as with most things, the break down is sure to occur at the most inconvenient time. Pro-active and regular maintenance should be the norm.

When it comes to operation there is much to do in regards to effective watering scheduling. Current control systems allow a high level of flexibility, in not only the amount of water to apply, but also in how it is applied. As an example, splitting the applications up into smaller amounts can ensure that water is not lost through run-off. Combinations of different schedules linked to other turf management programmes can make best use of available water. More consideration of creating a sward with better drought resistance will allow a more consistent irrigation regime.

We will see an increase in the use of products such as wetting agents and soil moisture retention compounds all aimed at optimising water use, but all with a degree of additional cost.

Greenkeeper training with specific regards to irrigation provision needs to be accelerated to the necessary levels.

We must remember that in the future water will be a more valued resource, we within the golf course industry must take responsibility for optimising water use for commercial reasons, and because quite simply without it there be no courses to manage.

Graeme Francis
Marketing Manager
TIL Irrigation Ltd

Research surprises

The Golf Research Group has published a new report based on a telephone survey of every golf course in the UK. One of the big surprises was that 34% of them were proprietary – golf in Britain is not as dominated by private member courses as people thought.

Searches of company accounts show that 76% of the new built courses continue to be in financial danger (two years ago 98% of them were in jeopardy).

What’s happening to cause this gradual improvement? In part some courses are managing to trade themselves out of trouble, average turnover at the new courses rose a healthy 31% to £776,000. In part the weaklings are being bought by strong hands. Sale of golf properties were at a record level last year, 42 courses sold. The total spent on these purchases was around £80 million.

Certainly this type of money being put into golf is a major sign of investor confidence in the industry. On a more sombre note it should be remembered that these new courses are going for 40p in the pound on their original development cost. Projecting this up, of the £2.5 billion spent on golf development in the 1990s, 60% is likely to end up being lost.
June at the Oakwood Club

by WILLIAM P MONTAGUE, MG

The Oakwood Club was founded in 1905 with our first nine opened in 1906 and a second nine built in 1915 to a Donald Ross design. We are a private club with full facilities from bowling alleys, indoor tennis, exercise rooms, Olympic size pool, eight outdoor tennis courts, and the list goes on with a 66,000 square foot clubhouse. Our course measures out at 6,289 from the white tees with bent tees, greens, and fairways. Greens are maintained at 0.137 of an inch, tees and fairways are cut at 7/16 of an inch. Many of our greens are still the original push up greens from 1905 and two are 1972 built to USGA specifications, each green has its own personality in management needs. We are located on heavy clay soil that drains very poorly and to add to that we have a mile of creek running through our course that drains the neighbourhood. If we receive more than a half inch of rain in a short period of time two of our fairways will be under water for several hours.

Oakwood Club is located on the border of what is called the “snow belt” in Northeastern Ohio. This area receives excessive snowfall and rain from a “Lake Effect” caused by Lake Erie to our north. Our average snowfall for the months of November through April approaches 100 inches yearly. Last November we had over 20 inches of heavy snow in a one week period which was devastating to our trees, all of our Hawthorns were wiped out, and the damage to other trees was in excess of £20,000 in clean up costs alone.

In the past five years we have installed a new irrigation system, completely renovated all 68 bunkers, added additional tees, and will start on building a new 12,000 square foot practice green on September 2 of this year. We are now in the process of a large scale tree preservation program for £150,000. On top of our tree preservation, since we are a very old club and the city has closed in around us, we will be screening our fence lines with over 450 additional trees and shrubs this year. Our 1997 spring was one of the wettest and coldest on record through mid May, so much so that I saw active fusarium on our fairways on May 16 this year.

June in this part of the States usually brings us our first heat of the summer, and sometimes a very dry stretch. Our 2,000 gallon per minute pump station is ready to go to boost our city water pressure, we purchase city water at a tab of about £50,000 per season. Due to the media our membership allows us to make chemical applications on Mondays when we are closed or at night only. We spray every Monday, one week greens and tees, and the next Monday fairways. When we do need to spray at night it is because of bad weather on Monday or something unexpected shows up. Due to the close proximity of houses and membership concern we apply as much as possible in granular form. We buy all of our chemicals with safety to operator and environment being our main concern and the cost we just deal with accordingly.

Our summer schedule kicks off with our average snowfall approaches 100 inches yearly. Golf course turf is continually under pressure, constantly suffers from stress and is regularly subject to an amazing range of injuries deliberately inflicted. Is it any wonder that sometimes it looks a little off colour!

To alleviate many of these problems, and assist turf recovery, Toro irrigation systems have been specifically designed for the individual needs of the course. To ensure these systems are designed and installed to the highest standards, a regional network of specialist dealers has been appointed to provide a quality and affordable service.

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Pulling out the tulips...

into high gear in the month of June. Every Tuesday is ladies’ day at our club, Wednesday is typically packed, and Thursday in the last two years has been almost as busy as Wednesdays anymore, Friday mornings are slower with the course filling up by 2pm. Saturday and Sunday the members do not what to see us around, and by 10am our maintenance crew can hardly move around the course it is so full.

Our tulips, which we are known for, have just expired (over 12,000 new ones each year) and will all be pulled out this month so we can begin planting our annuals which will number about 300 flats. By the middle of this month we will hopefully be up to full staff although the labour market is extremely bad at our location, being an in town facility most city kids have no idea what work is all about and many of them go to work for fast food chains or department stores.

June is the most pleasant month for us as staff because the members are enjoying the course, playing all they want and getting ready for their matches. The crew is enjoying working outside after months of cabin fever, working on equipment, and plowing snow. Almost everyone is happy with the first great weather of the year and we are at full speed ahead for the next four months.

Most of our June work is involved with bringing the course to the finest condition possible for July and August, and maintaining it through Labor Day at its peak. Our Club Championships are held in Early August and finish in mid August. A few weeks after Labor Day, September 1 this year, our play will diminish rapidly.

Dealer appointed

Jacobsen E-Z-GO has appointed Walter Wilders as the official dealer for North Surrey, Middlesex and West London, Berkshire, Buckinghamshire and Oxfordshire.

Depot Manager Jason Scott commented, “We are delighted with this appointment and the opportunities it provides, and we feel we can provide our existing customers with an even better service and look forward to attracting new customers now that we have this premier range of fine turf equipment to promote.”

He added, “It is our goal to be the easiest company to do business with, achieving this through one stop shopping.”

Walter Wilders is a well established company with over 50 years in business behind them. The main groundcare office is in Reading but it also has an additional depot in Wallingford. In the last two years they have been successfully promoting the Iseki brand of compact tractors for which Jacobsen is now responsible.
'Intrepid' will take care of your turf weeds

'Intrepid' is a new cost-effective selective weedkiller that can be applied throughout the growing season. It's powerful three-way mixture will control many broad-leaved weeds in turf. And unlike some turf herbicides, repeat applications are possible should new weeds germinate or deep-rooted weeds regrow during the season.

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Good buy, Intrepid
Get the low down on Cooden Beach

Cooden Beach, right on the south coast, is probably the lowest golf course in the country. As Scott MacCallum found out it's not only right at the bottom of the map it's so low it's well below sea level.

To all intents and purposes Stefan Antolik appears quite normal. He doesn't have any obvious quirks or mannerisms to mark him down as someone different but, in reality, he is probably unique among British greenkeepers.

Stefan is Head Greenkeeper at Cooden Beach Golf Club, Bexhill on Sea, the venue for this year's National Tournament sponsored by Miracle Professional, and it was the matter of fact way in which he said "To be honest I hope we have a dry year" which makes him just a little bit unusual.

So why is it that while 99.9% of greenkeepers have been enrolling in night classes to sharpen up rain dance routines Stefan is happy to keep his dancing shoes in the cupboard?

Well, the answer lies in the fact that it is perhaps not Stefan who is unique but his golf course. Cooden Beach is built on reclaimed land and is in places up to seven metres below sea level. There are certain spots where you have to look up to see boats sailing past within a few yards of the course for heaven's sake.

"There can be few courses in the country which are below sea level and there can't be many which are entirely SSSI sites," explained Stefan, who is only the fourth Head Greenkeeping in the Club's 85 year history.

Although beside the sea Cooden Beach isn't built on sand. Go down 18 inches under the silt and you'd find two feet of clay and under the clay, three feet of decaying timber. Below that there is lovely blue alluvium clay.

"That's excellent for ponds as it retains the water well but it doesn't allow the course to drain."

The answer is to pump water off the golf course and this is exactly what happens at Cooden Beach where a pump is a necessary piece of equipment and the club has one which can operate at 3,000 gallons a minute.

"If we go beyond the prescribed limit of rainfall on the course we pump out to sea so we can control the water levels throughout the course."

What it all means is that Cooden Beach is a popular place to be in the summer when the rest of the country's golf courses are gasping for drop of water.

"People know that we will have grass cover and reasonably lush fairways," explained Stefan.

The downside, and there always is one, is the winter when as Stefan so succinctly put it, "you really have to paddle your way round".

"We spend in the region of £3,000-£5,000 a year on drainage and a lot of it is surface drainage to greens which we do ourselves as a team."

But perhaps the courses was never designed for winter play.

"In the past when membership subscriptions were light compared to now golfers would be members of Cooden for summer play and members of Rye, eight miles down the road, for winter play. Cooden was never played in the winter."

It brings Stefan nicely on to his pet subject. One he aired during the final of the '94 ICI Premier Greenkeeper of the Year Competition, in which he finished runner-up behind David Walden, when he was asked what one aspect of golf would he change.

"I said I'd make waterproof clothing illegal in golf. The biggest burden to any greenkeeper is Goretx waterproof clothing because if he's going to get soaked to the skin he's not going to go. Now he can come in off the course in any conditions as dry as when he set foot in it and in a lot of instances that's to the detriment of the course," explained Stefan.

Stefan is coming up for his sixth year at the club following on from his predecessor who was in position for 40 years.

"When I started here the greens were on almost 100 millimetres of thatch, it had been very much a case of feed, water and cut. We still have spongy greens but the thatch layer is