

Managing sports surfaces in drought conditions

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26 March 2012

This information is provided for the purposes of general drought guidance only. Always seek independent professional advice when considering drought mitigation actions for specific locations.

What has caused the drought and who is currently affected?

2011 and 1990 represented the two driest springs on record in England and Wales over the last century. In 2011, most areas received less than 50% of their long-term average (LTA) rainfall whilst in East Anglia, only 30% of the LTA rainfall fell between March and May. The relatively cool and wet summer (June and August) eased conditions in southern England. However, in autumn 2011 dry conditions returned and have persisted throughout the winter. In November 2011, the Environment Agency warned that river flows were extremely low for the time of year, and soils were still not back to field capacity (FC) in areas stretching from east Gloucestershire, Oxfordshire and Shropshire across the East Midlands into Bedfordshire, Cambridgeshire and west Norfolk as well as parts of Kent and East Sussex. Some parts of south Yorkshire and south west England also had low flows mainly as a result of low groundwater levels and are now considered to be in drought too. Wales and northern England were reported to be within the normal ranges for water resources at that time of year (EA, 2011).

In March 2012, the EA released an update and confirmed the situation had not improved. Most of the south east and eastern England was reported to be in drought as a result of two consecutive dry winters with below average rainfall. Across East Anglia, the last six months were the driest since records began in 1921. The low winter rainfall and dry soils have meant little or no groundwater recharge has occurred across the affected areas, leading to some drying of streams, more widespread low river flows and an unseasonal number of drought impacts on the environment. The Environment Agency has run stream and wetland support pumps and rescued fish. Many farmers have been unable to fill their winter storage reservoirs. In drought affected areas, water companies have appealed to their customers to save water and have stepped up their leakage control. The Environment Agency and Secretary of State have granted drought permits and orders to Anglian Water, South East Water and Southern Water to help refill public supply reservoirs.

Water companies are restricting water use to ensure supplies of drinking water through a drought that is being caused by a prolonged period of low rainfall that has left water sources low on water over large parts of England.

Significant further groundwater recharge is now unlikely. As weather conditions warm, and transpiration rates rise, soils will dry out further. Modelling scenarios from the EA and water companies show that even with above average rainfall there will still be significant drought impacts. The low groundwater levels will lead to low river flows and drying of wetlands that rely on groundwater, with widespread effects for the environment and all water users. The EA therefore anticipate a severe drought in spring and summer 2012.

For the latest information on the drought situation visit the [Environment Agency's Website](#).

As drought conditions extend and deepen, surface water bodies such as lakes, reservoirs and rivers dry up. This has environmental consequences for aquatic life and reduces the water available for drinking, bathing, food production and other irrigation – including sport. Based on GIS modelling by Cranfield University, it is estimated that 58% of sports pitches in Sport England’s Active Places database currently lie within the EA defined ‘High Risk’ water resource stress zone, with a further 18% in the ‘Moderate Risk’ zone – so the potential impact of the drought on sport could be very significant.

What are Hosepipe Bans and how do they affect sport?

In order to manage water resources to prevent environmental damage and ensure supply of drinking water to our homes, Water Companies are required by Defra and the Environment Agency to plan for drought under the Water Act 2003. To balance supply and demand, Water Companies can apply to Defra to restrict the availability of water for ‘non-essential uses’. Initially this takes the form of Temporary Use Bans (‘Hosepipe Bans’) but if drought conditions continue and worsen, the extent of water use restrictions could become more severe.

In response to low water availability, seven water companies* (Anglian Water, South East Water, Southern Water, Sutton and East Surrey Water, Thames Water, Veolia Central and Veolia South East) have announced Temporary Use Bans to come into effect on 5th April 2012. Temporary Use Bans can vary between individual water companies so it is important for facilities to check their local water company website and water resource status for specific details (see list of contacts).

Using an analysis of Sport England’s Active Places facility database and water company boundaries, Cranfield University have determined that currently* 39% of all outdoor turf sports pitches are subject to Temporary Use Bans. This number could grow as additional bans are imposed by other water companies as the drought extends into other currently unaffected regions. It also varies by sport (43% of Cricket pitches, 42% of Rugby Union Pitches, but only 10% of Rugby League pitches).

Water Companies have initially followed a common template which restricts watering of a ‘Garden’ using a hosepipe (with some variations – it is important to check your water company’s website). However a ‘Garden’ includes: ‘An area of grass used for sport or recreation’ and ‘Any other grass space’. This prevents the watering of sports pitches using hosepipes connected to a mains (drinking) water supply. There is an exemption for ‘fixtures of national and international significance’ – but this is unlikely to apply to the majority of other grassed surfaces used for recreational sport.

Facilities that use non-mains water such as from boreholes (groundwater), or facilities with specialist pop-up irrigation systems that are not served by an over-ground pipe should be able to continue to water under a Temporary Use Ban but you should confirm this with your water company and the Environment Agency. Note that if drought conditions worsen and a ‘Non-Essential Use Drought Order’ is put in place (a higher level of restriction) – then this would restrict abstraction of other water sources including water used for sprinkler irrigation systems.

* As at 23/3/2012

Why is water needed for sports pitches?

Water is needed for two main reasons:

1. To support plant growth, allowing the grass to recover from use and wear.
2. To ensure safe surfaces with the correct hardness – particularly important in contact sports such as rugby and sports where ball bounce is critical.

In cricket and tennis, water is also needed for a third reason:

3. To help roll pitches/courts to produce hard smooth surfaces with even ball bounce.

Normally, the majority of sports pitches receive sufficient water from rainfall to allow good grass growth and surface hardness and irrigation is not required, provided playing seasons are aligned with soil water availability. Players of sports such as football and rugby are used to pitches being harder at the beginning and end of the season and becoming less hard through the winter but if drought conditions persist, the pitches will become even harder and remain harder into winter.

There are specialist ‘fine turf’ sports surfaces such as cricket squares, bowls greens, grass tennis courts and where additional irrigation is routinely applied.

Bowls greens are normally constructed from free draining sandy soils to help with pace and draw, but this means that irrigation is needed to help keep the grass alive during the summer. The method by which water is applied is important. Using a permanently installed pop-up sprinkler irrigation system is not currently restricted, but a static hand-moved sprinkler (e.g. rain gun) supplied by a hosepipe would be banned and should not be used.

Water is used to help support grass growth and provide resistance to wear. In some sports such as tennis and cricket, water is used to with rolling to provide good ball bounce.

In cricket and tennis, water is used not just to support grass growth but also to help level and compact the surface using rollers to help ball pace and bounce. Research at Cranfield University, funded by the England and Wales Cricket Board has shown the crucial role that water plays in effective pitch preparation – if the soil is too dry a roller can become ineffective – so it is common to apply water to help wet the soil and make it more deformable during rolling, after which it is allowed to dry and harden up once level.

There are many sites where facilities are shared among sports – with football and rugby pitches becoming cricket outfield in the summer – this is common in schools and at local authority facilities. The transition between sports is affected by the drought with it difficult to remove wear and undulations in a cricket outfield during the spring because the ground is hard and dry and alternatively in the autumn football and rugby pitches remaining hard longer into the season.

It is difficult to quantify the amount of water used in the irrigation of sports surfaces because it is dependent upon the size of the surface, the soil type, the water deficit in that soil and the prevailing weather in terms of rainfall and evapotranspiration. You can monitor water use by using meters (if you are on mains and have a meter, monitor the amount used for irrigation whilst ensuring that

other water uses (lavatories, showers, sinks, kitchen appliances) are not used. An online search will reveal suppliers of water meters that fit onto your hose pipe for £20-100 but ensure that you get a meter with the appropriate fittings and flow rate for your hose. An alternative lower cost method is to time how long it takes to fill a bucket of known volume and multiply this volume by the amount of time you would normally water for.

How do we manage turf in a drought?

With 39%* of all outdoor grass facilities subject to Hosepipe Bans from 5th April 2012, what can be done to ensure that we can still play sport in a quality and safe environment? The answer is a combination of short term coping measures and longer term strategic investment.

All sports facilities and organisations have their role in conserving water. Clean water for drinking and bathing is essential for all of us and it is important not to damage the environment by excessive use. It is really important that water is not wasted, particularly during a drought. Using water wisely and adapting the way we do things are all ways that sport can help reduce pressure on water resources during the drought and still provide participation in healthy sport and exercise for our communities. The following sections look at some short term and some longer term steps that sports facilities can take to manage water during this and any future droughts.

39% of sports pitches are subject to hosepipe bans. It is essential to conserve water wherever possible and to adapt to the current drought conditions.

Note that there are no magic answers – these measures limit, but do not remove the impact of drought, some disruption (and cost) is inevitable.

The importance of good club/facility management

Good club/facility management is essential during drought periods. The whole committee / management team should be involved – not just groundstaff. Coordinating fixtures, facility availability, pitch rotation are all key tasks for the management team – including groundstaff. Water resource availability and restrictions can change rapidly and it is important to keep abreast of key information. Get the web address for your water company ([click here for info](#)) and keep an eye on the [Environment Agency's Website](#) which includes local drought information. Club secretaries (or similar) should be coordinating any exemptions (including compliance with any exemption conditions) and abstraction permits.

Good, coordinated management will help limit the impact of drought and help to keep facilities available for use.

It is really important to educate members / users with signage, newsletters, websites and social media. We are all in this drought together and we can all do our part – pulling together as a club or organisation is essential to help reduce water consumption and the impacts of restricted water availability. Tough decisions on surface safety, fixture cancellation and renovation/construction

projects will be needed – by communicating with members, users and stakeholders these tough decisions have a better chance of being understood.

Whilst managing this drought requires rapid short term action – water availability restrictions are likely to become more common so plan for the future (see How to reduce drought impacts in the future) below.

Information on managing turf in drought areas not subject to Temporary Use (Hosepipe) Bans

In drought areas it is particularly important to use water as efficiently as possible and to minimise waste as this will help reduce the impact of drought on the environment, on others – including us in our homes, and will extend the period before hosepipe bans have to be introduced. These steps could help you reduce your water consumption:

- 1. Encourage deeper plant roots by removing compaction** – both at the surface and deeper in the profile. Take a core or use a spade to look for compacted layers and at how dry the soil is at depth. Increasing the depth of rooting increases the volume of water (and nutrients) available to the plant – allowing the plant to reach deeper water that is less affected by evaporation.

Regular spiking can help roots to get deeper into the soil but be aware if conditions remain dry aeration can increase the rate at which a soil dries out – so **do not do aeration if rain or irrigation is likely to be unavailable.**

- 2. Increase your mowing height** – this helps to reduce water consumption and encourages deeper rooting by the plant.
- 3. Reduce your mowing frequency** – this helps to reduce stress on the plant and helps to reduce compaction.
- 4. Return clippings** (do not collect clippings) where possible – this returns both nutrients and water to the turf and also provides a bit of a mulch to reduce soil evaporation.
- 5. Manage your wear** – look at closing parts of school playing fields on prime pitches to avoid wear and pay attention to high traffic areas. Normal wear recovery rates will be slower as the plant's growth rate slows as it becomes hotter and short of water.
- 6. Service your irrigation equipment** to ensure that it is leak free, blockage and scale free, and all moving parts are free to move through complete arcs etc. Check distribution uniformity by putting buckets out to ensure water is being distributed evenly.
- 7. Apply water using efficient equipment** micro-spray hoses can be an effective method to reduce application rates so that run off does not occur whilst covering large areas.

8. **Never leave a static, hose-fed sprinkler system unattended** (one where the sprinkler head does not move across the pitch). Always be prepared to monitor and move it regularly.
9. **Apply water in larger amounts on fewer occasions** rather than applying the same amount of water little and often. This is to get the water deeper into the soil – this limits losses due to evapotranspiration and encourages deeper rooting.
10. **Only apply the amount of water needed** – take a spade or corer and check the depth to which water is penetrating. If you have very sandy soils or well drained soils then do not over apply water – if the drains start to flow then you have applied too much. If you have heavily cracked clay soils, apply water slowly otherwise water will simply flow down the cracks and away from the turf plants.
11. **Do not allow water to pond or run-off** – this wastes water and can cause pollution. If irrigation is not going into the profile then consider spiking and look for compaction. Reduce your application rate and increase the irrigation period – this will reduce wastage.
12. **Never irrigate during the heat of the day.** Ideally water should be applied late evening or overnight. When the sun is down, evapotranspiration is reduced which allows more water to get deeper into the soil – it is much more efficient. Most of the water applied during the heat of the day will evaporate or transpire.
13. **Look for signs of water repellency** (hydrophobicity) – this is extremely common on dried out sandy or thatch soils. Water repellency isn't just when water ponds on the surface – it can cause water to flow down just narrow parts of the soil and other parts to remain dry – take cores or use a spade to look where water is going in the profile. Be aware that although thatch in soils can stay wetter for longer, once they do dry out the organic compounds released can make them difficult to wet up. An analogy is the plant grown in compost in a pot on your window sill – when it dries out, you water it, the water runs off the surfaces and down the cracks around the outside – water is wasted.

Products called wetting agents can help breakdown this water repellency and to get a more uniform, deeper distribution of water in the soil – speak to your turf supplies company about suitable products.

14. **Limit evapotranspiration.** For small areas you could consider using nets/meshes and covers to help reduce evapotranspiration but be sure to avoid overheating during hot periods and ensure that the plant gets enough light.
15. **Consider only watering the minimum number of pitches possible** – it could be that keeping one or two pitches well watered is better than watering 3-4 pitches insufficiently. Look at your fixture load and any potential closure periods such as summer holidays.
16. **Consider water retaining amendments.** Polymer and aggregate materials are available from the turf management industry. These can be injected or incorporated into the ground but

check the durability of the product and weigh this up against the application rates and cost – some products can be costly and relatively short-lived. Note that consistent, independent reliable evidence of product effectiveness is limited – try before you buy large quantities.

Good practice in drought areas with Temporary Use (Hosepipe) Bans

When water restrictions are in place then note the advice on how to limit water demand above but **do not use aeration or decompaction equipment** – significant surface damage and increased rates of drying will occur. In addition the following guidance will help:

1. **Limit wear** – close access to primary sports pitches if necessary. Where wear areas develop either renovate using hand watering with watering cans or defer renovations to the end of the season/drought period.
2. **Avoid applications of fertiliser and pesticide** which could cause scorch or stress the grass.
3. **Limit machinery use to essential turf maintenance.** Minimise mowing – it is likely that the grass plant will not be growing quickly under drought conditions.
4. **Accept that the grass will brown** – they should recover once water becomes available (provided that they are not worn excessively - recall what happened to cricket outfielders in Summer 2011). In cricket warn/educate players on diving and stopping on hard ground – where risk of impact injuries and abrasions will increase.
5. **Monitor pitch safety regularly and cancel fixtures where appropriate.** It may not be possible to prevent pitches getting hard over summer – this could affect fixtures in contact sports, depending on how rainfall develops – make a plan for disruption.

Match officials and facilities managers should be making regular assessments of pitch safety due to hardness – just as they would for frozen or waterlogged ground. Make routine assessment of pitch hardness in light of the sport being played and consider risk of injuries which can range from blisters to bone breakages and head injuries. Fixtures should be postponed/cancelled where appropriate.

6. **Make the most of any rainfall that does occur**
 - a. Try to encourage as much of this rain to infiltrate as possible – but avoid aeration which can speed the drying of a soil.
 - b. React to rainfall with water sensitive operations such as rolling in cricket – when it has stopped raining – think about which pitches can be rolled.
 - c. If rainfall falls on seeded areas – help germination with germination sheets.
7. **Capture rainfall off roof surfaces** by installing water butts on downpipes (make sure they are installed with diverters and that when the water butt is full, water continues to flow to sewers/soakaways as before). This captured water can then be used to water small renovation areas.

8. **Use covers to reduce drying rates.** Use covers to shade turf but avoid heat stress. With cricket covers – try to allow the square to wet on pitches not used for fixtures and see how much of the water you can collect from the covers – particularly if they have guttering.
9. **Look for alternative sources of water** – it is currently possible[†] to abstract up to 20 m³ a day from a watercourse or borehole without a licence. Note that permission is required to disturb or alter the bank of a watercourse however so you should be careful not to do this. You also need the landowner's permission to access the watercourse. But this could be a potential supply of water.

Where flows allow, it might be possible to pump water from a river using a small diesel pump or similar (be aware of the risk of electrocution – do not use electricity near water – do not run extension leads to an electric pump). The abstracted water should be stored in temporary tanks (such as recycled intermediate bulk containers –IBCs) and used as necessary. Be sure to filter the water before it goes into the pump and do not trail the inlet at the bottom of the watercourse. It is advisable to get the water quality tested for irrigation suitability as poor water quality can actually increase drought stress.

Note that you should not abstract water from a river/pond where flows are low and harm could be caused to the river/pond environment.

Where groundwater tables are high it might be possible to sink a shallow borehole. Or look into deeper borehole exploration for water in aquifers. This will depend on the geology beneath your facility and is a technical undertaking.

You should seek advice from properly qualified consultants or contractors when considering surface or groundwater abstraction. Permit requirements are dependent upon design and can be complex.

10. **Use water from the kitchens and showers** (providing it does not have detergents or dangerous wastes in it). It might not be possible to install a grey water recycling facility at such short notice but capturing water from kitchens and showers etc could be a small scale source of water.

11. Consider applying for an exemption to the hosepipe ban

It is possible to appeal to your Water Company for an exemption to the hosepipe ban but this should be a last resort and needs to be a reasonable case as any exemption needs to be considered in the light of other demand for water – including water for drinking.

Possible grounds for an exemption could be on the basis of maintaining safe participation in sport – which has associated health benefits and is important for the sustainability of clubs. Keeping the grass green is not justifiable.

[†] This limit is subject to review under a non-essential use drought order or other restriction by the Environment Agency which may come into force. It is not permissible to abstract water when it could cause harm to the environment of the water body or neighbouring water bodies. This limit is also subject to review (downwards) in future legislation currently being considered as a white paper.

Any exemption will have to consider the amount of water to be used – you need to calculate how much water you would normally use and how much this could be reduced to as a minimum.

Any exemption granted will restrict watering times in terms of length and time of day and will be likely to occur between dusk and dawn to limit evapotranspiration.

Be aware that neighbours and the wider community might not support the use of water for irrigating sports pitches when their gardens are suffering and drinking water supplies are at risk. It is important to avoid conflict by being considerate and explaining the benefits of water application in terms of safe participation and the benefits that brings.

What to do when the drought passes

As soon as drought conditions are lifted then it should be possible to start renovations. Look to re-establish grass if temperatures allow by seeding. Consider seeding with more drought resistant varieties and species if possible/appropriate.

Help infiltration by loosening capped and compacted soils and wetting agents can help overcome water repellency (hydrophobicity) that can occur in some soils – particularly sandy and thatch soils.

Review how you have managed the drought and causes of problems with water supply and look at what you can do differently in the short and medium term to help maintain your facility.

What about planned construction / renovation projects?

This is an area where difficult decisions will need to be made and it is really important to discuss plans with your consultant / contractor. It is difficult to predict the weather in the medium / long term – it is a difficult decision to delay a project with uncertainty over weather through autumn and winter. Dry conditions are beneficial for handling soils during construction (provided that dust does not cause a problem) but lack of access to irrigation during drought conditions will make grass establishment difficult and there poses a risk to project delivery dates and when new facilities will be available. Discussions could consider whether turfing is more viable than reseeding but new turf still needs to be watered in to establish root growth and resistance to wear and turfing is likely to add to project cost. It is prudent to make contingency for overseeding/reseeding later in the project when rains return if established summer seeding / turfing plans go ahead. Whatever the decision reached, it is important to determine whether responsibility for irrigation during grow-in lies with the contractor or the facility management.

Speak to your consultant and construction company to develop a strategy for managing construction during water shortage – particularly for grass establishment.

How to reduce drought impacts in the future

There is a high dependency on mains drinking water for irrigation in English sport. This has been because traditionally water has been relatively plentiful, and relatively affordable. It is also relatively easy to tap into the supply which comes at a reasonable pressure (in most locations).

Research by Cranfield University funded by the England and Wales Cricket Board and Sport England has shown that large numbers of sports facilities are located in regions where the mains water system is already under stress due to low rainfall, high population and ageing infrastructure. This is only set to get worse as demand for water increases due to population growth and supply is put under further stress due to climate change. The research concludes that mains water supply is likely to become more costly and more unreliable for non-essential use (drinking and bathing).

Water shortages could become more common due to climate change and population growth. Plan for the future and look at how you can reduce your water consumption and find alternative to mains water for irrigation

In the future sports facilities will need to:

1. Reduce their water consumption – this includes irrigation but also in buildings – sport can play a leading role in saving water and helping to educate others to save water.

Better water metering – not just of supply for bills but also specifically for supply to irrigation systems is really important – the starting point for many sports facilities is learning how much water they use – then they can begin to cut waste.

Longer term strategies for saving water include better soil and plant management – making sure that roots are allowed to get as deep as possible and that plant stress is kept to a minimum. Moving towards more drought tolerant varieties or species of grass is another strategy.

Before looking at where else to get water it's important to reduce water use and waste to a minimum.

2. Find alternative sources for irrigation water. Investment now in alternative sources of water such as rainwater harvesting, groundwater abstraction and surface water abstraction, which are currently less susceptible to hosepipe bans and other restrictions, should provide a return for sport in the long run. The following organisations have lists of consultants who can help you with such projects and where potential funding might be available:

- SAPCA (Sports and Play Construction Association – directory of member consultants specialising in irrigation) www.sapca.org.uk
- UK Irrigation Association (an independent body with a directory of consultants and irrigation engineers) www.ukia.org

3. Improve irrigation efficiency and effectiveness. This might include replacing old and worn application equipment with modern, more efficient alternatives such as pop-up sprinklers. It could also include better training for irrigation scheduling and the use of simple weather data to help maximise the benefit of water use.

Other sources of information

For advice on the irrigation of water-based synthetic turf please see the separate advice provide by MSc Consulting.

STRI have published a Turf Irrigation advisory leaflet for golf (see STRI Advisory Leaflet No 17 – www.stri.co.uk).

The Institute of Groundsmanship have guidance available at:

http://www.iog.org/latest_news_and_media/latest_news/drought_orders

You can find out the contact details for your water company at:

www.water.org.uk/home/our_members/list-of-companies

You can find out the latest about the drought from the Environment Agency website:

<http://www.environment-agency.gov.uk/homeandleisure/drought/default.aspx>