Drought prospects for spring and summer 2012

March 2012

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Executive summary

Most of the south east and eastern England is now in drought as a result of two consecutive dry winters with below average rainfall. Across East Anglia, the last six months have been the driest since records began in 1921. The rain received in the first part of March has been very welcome, however, the amount received has not reversed the impact of two consecutive dry winters. River flows and groundwater levels are exceptionally low for the time of year, and soils unusually dry, across an area encompassing most of the country from the Dorset coast to Grimsby through to the south and east including London. Parts of the country further west, and south east Yorkshire, are also affected by the dry weather and remain at risk of drought. Water resources in northern England and Wales are within normal ranges.

The low winter rainfall and dry soils mean that we have had little or no groundwater recharge across the affected areas. This has led 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. Some farmers have been unable to fill their winter storage reservoirs, so we have worked with them locally to find solutions where possible. 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.

Significant further groundwater recharge is now unlikely. As plants start to grow and it becomes warmer, soils will dry out further. The scenarios the Environment Agency and water companies have modelled 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. We are therefore anticipating a severe drought in spring and summer 2012.

The Secretary of State chaired a drought summit meeting on 20 February 2012 at which representatives of many sectors affected by the drought reviewed the situation. They agreed actions to manage the drought that are reflected in this report. The main focus is on continuing to work together across all sectors to make good use of reduced water resources this year. The representatives also agreed the need to develop contingency plans should the drought extend into 2013.

Actions already in progress, or planned, include convening a national cross-sector high level drought team, flexibility in how the Environment Agency allows farmers to fill irrigation reservoirs and maintaining water levels for the environment and for navigation. Water companies are likely to apply for more drought orders or permits to allow them to take more water at low river flows. They will continue a co-ordinated campaign asking customers to save water and may well have to introduce hosepipe bans and other restrictions.

We cannot predict the spring and summer weather, which will influence the severity of some of the drought impacts. A hot, dry summer would worsen effects, whilst a cool damp one would lessen them. The Environment Agency will continue to monitor the water resources situation, share information and co-ordinate actions. We plan to review the situation regularly and provide further reports during the spring and summer.

Acknowledgements

We would like to thank the following organisations that have contributed to preparing this document:

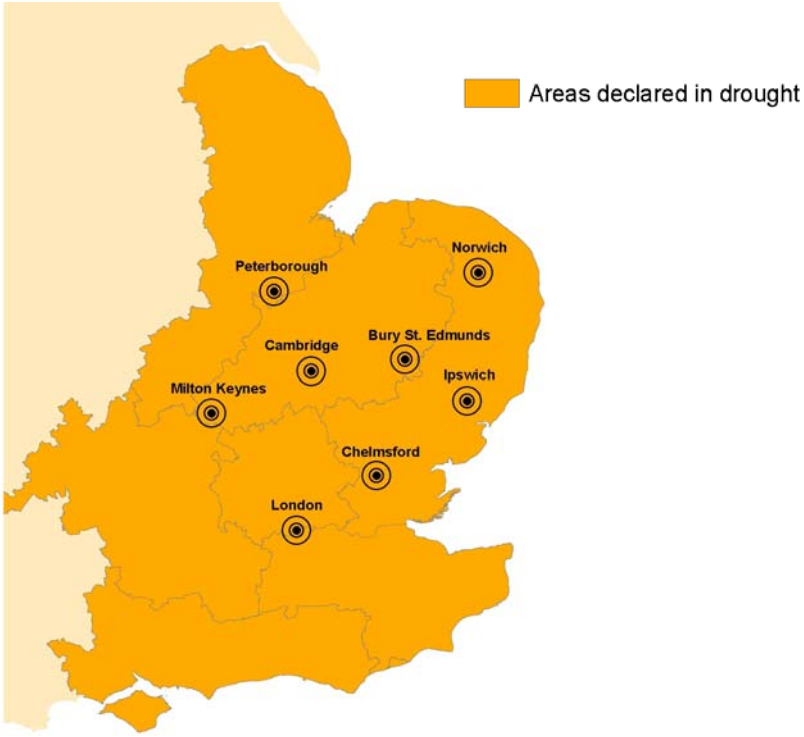
- British Waterways
- Defra
- Met Office
- National Farmers Union
- Natural England
- Water companies
- Water UK

Contents

1 Current situation

A large part of England is now in drought. Since June 2011, drought has affected Lincolnshire, Cambridgeshire, parts of Bedfordshire and Northamptonshire, and west Norfolk. Following a dry winter, much of south east England is now in drought, including London.

Figure 1.0 - Areas in drought (as of 5 March)



For the past 17 months there has been extremely low rainfall across a large area of England, as outlined in Figure 2.0. It has been the driest six months on record for eastern England. The rainfall received during December and at the start of January helped stabilise the water resources position, but the return to dry, cold conditions in February slowed the recovery. The rain received in the first part of March has also been very welcome, however, the amount received has not reversed the impact of two consecutive dry winters. In central, eastern, south east and parts of south west England there is still a long way to go for full recovery and with much of the winter now over we will start spring 2012 in a worse water resources position than spring 2011. In contrast northern England and Wales will start the spring with resources in a normal position.

The following sections provide a summary of the current water resources position.

1.1 River flows

Despite rainfall at the end of December 2011, the dry conditions throughout January and February in central, east and south east England mean some river flows are still

very low. The snowfall across much of England in February helped, but did not provide a lot of water.

Those rivers that are groundwater fed are particularly low and a few streams that often dry up in summer are already dry now. The lowest mean monthly flows on record for December occurred at two reported sites, at Upton Mill on the River Nene in Northamptonshire and at Abbey Heath on the Little Ouse in Norfolk. The lowest mean monthly flows on record for January were at Kegworth on the River Soar in Leicestershire, and in February at Goldbridge on the River Ouse in East Sussex. The majority of rivers in the areas affected by drought are now notably or exceptionally low for the time of year (Figure 3.0). The wetter weather in western England has meant the majority of sites in western England and Wales are currently normal or higher for the time of year.

1.2 Reservoirs

The December rainfall helped to boost storage and the levels in the majority of public supply reservoirs are where we would expect for this time of year. However we are concerned about several reservoirs in eastern and south east England. These include:

- Bewl and Darwell reservoirs in Kent
- Ardingly reservoir in Sussex
- Pitsford reservoir in Northamptonshire
- Rutland Water reservoir in Rutland

Draycote Reservoir in Warwickshire is also below normal for the time of year. Severn Trent Water are implementing a recovery plan. This includes measures to move water around their network to assist reservoir refill. There are several other small reservoirs in eastern and south east England that are at very low storage levels and the water companies are taking action to reduce how much they take from them so that supplies are managed overall.

At the beginning of February storage in public supply reservoirs in northern and western England was where we would expect it to be for the time of year, reflecting the wetter conditions in these areas (Figure 4.0).

1.3 Groundwater

In our last prospects report, published in December 2011, we reported that groundwater levels had fallen throughout the summer and autumn. Groundwater levels are now notably or exceptionally low for the time of year across most of England due to the dry weather over the autumn that has continued into winter. We would typically only see notably low levels 8 percent of the time and exceptionally low levels 5 percent of the time. The only area where groundwater is at normal levels is in north west England and in south Wales.

Levels in the limestone aquifers of the Cotswolds benefited from the rainfall in December and January, however the lowest end of January levels on record were recorded for limestone near Mansfield in Nottinghamshire.

Levels in the chalk in Lincolnshire are generally below normal for the time of year. Elsewhere in eastern England levels are generally notably low, or in north Norfolk, now exceptionally low. Further south in the Chilterns, parts of the North and South Downs

and on Salisbury Plain, levels in many aquifers are exceptionally low. Record end of January minimum levels were set in the Chilterns, North Downs in Kent and in the South Downs in Hampshire.

Groundwater levels in the Midlands sandstones are exceptionally low for the time of year in the Staffordshire Trent valley and in the Shropshire Severn valley, Worcestershire and Gloucestershire. Levels in the sandstone in Devon are exceptionally low and have been the lowest on record at some wells.

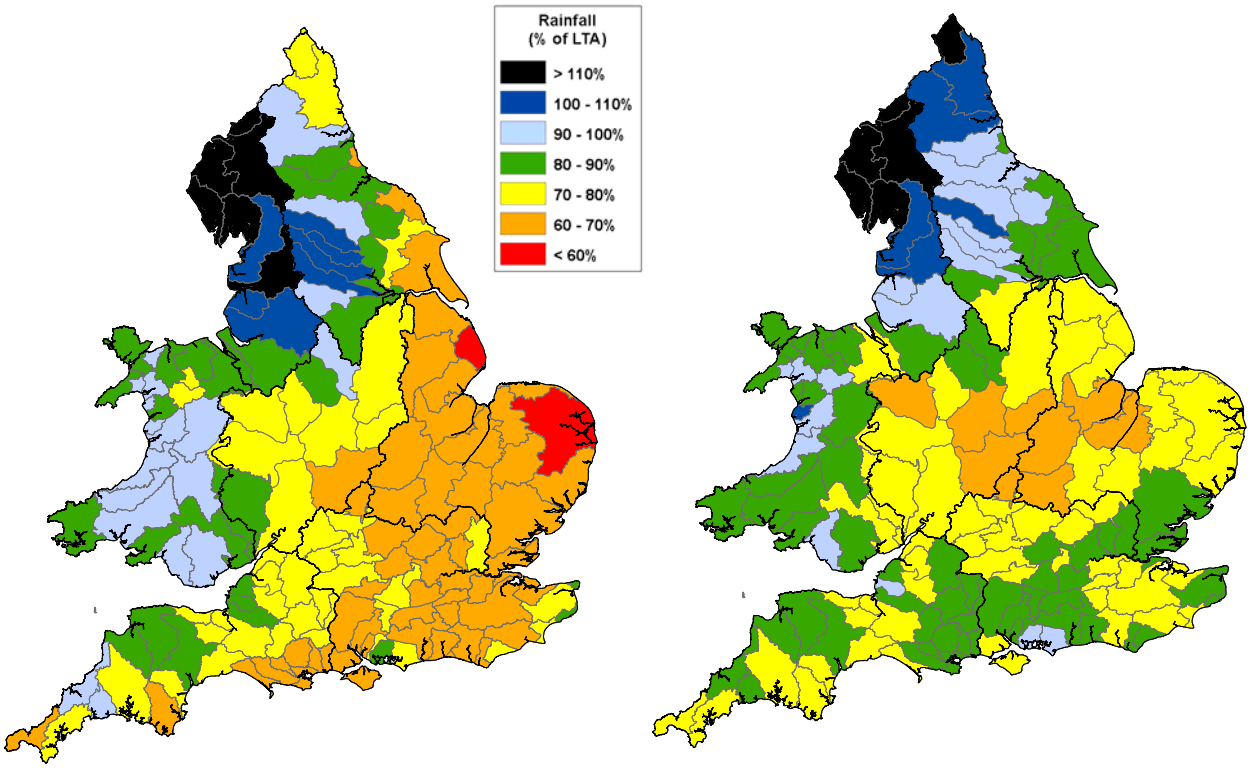
Figure 5.0 shows that groundwater levels are at a lower starting position at the end of February compared to the same time of year in 1976.

1.4 Soil moisture

Soil moisture deficits usually return to zero, or close to zero, in the winter as the soils become fully saturated allowing aquifer recharge to take place. Currently soils are still very dry and high soil moisture deficits are still prevalent across large parts of eastern England due to the dry weather through the autumn into the winter recharge period (Figure 6.0 and appendix). In eastern England, soil moisture deficits are the highest on record for the time of year at 55mm (29 February).

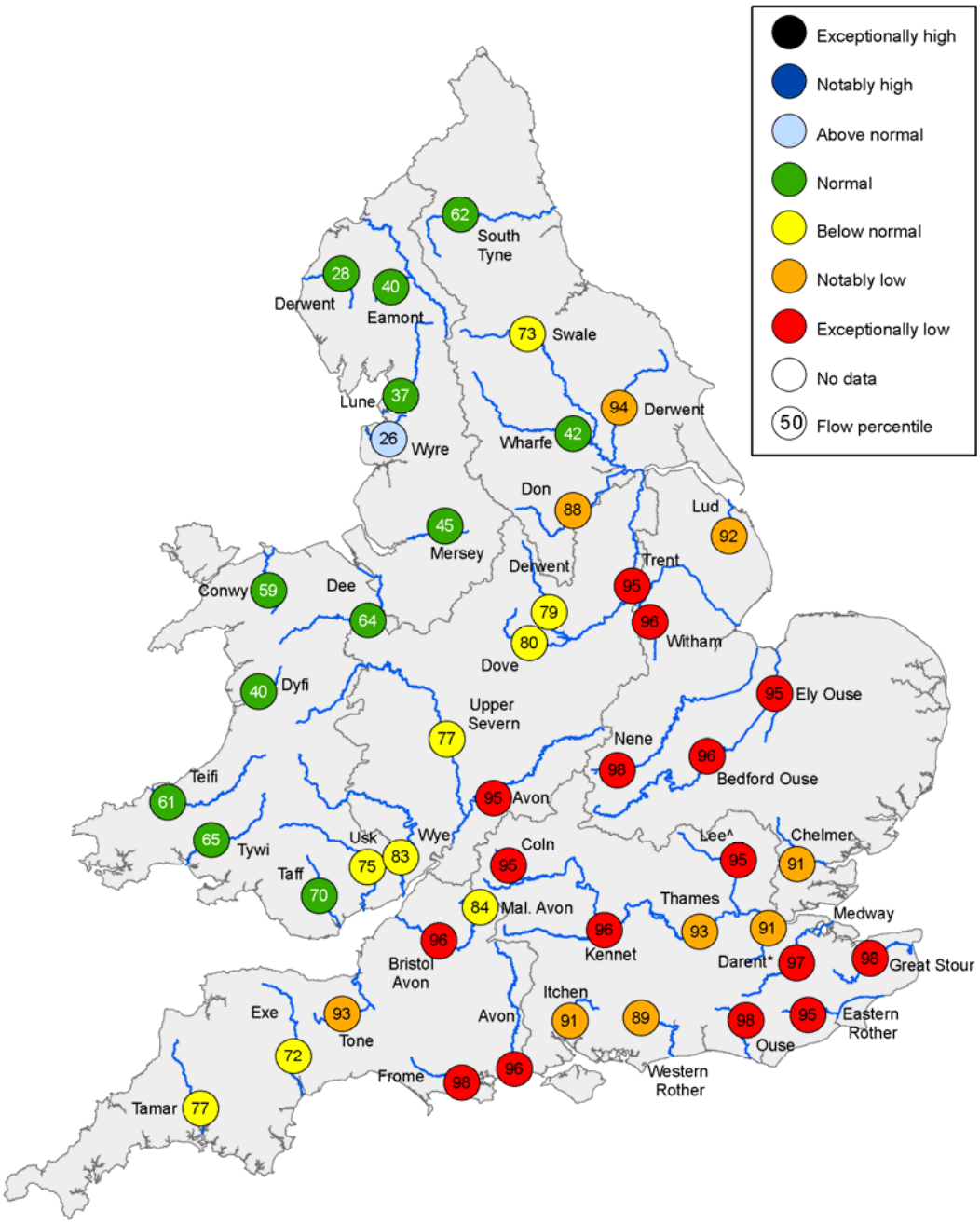
Looking at future forecasts of potential dry weather over the spring, it is likely that soil moisture deficits will remain high in East Anglia and soils in some places will not be fully saturated before the end of the winter recharge period. For example around the Wash, the soil will need approximately two months' average rainfall to reduce the soil moisture deficit to zero. This poses a high risk of drought impacts starting early during the spring and summer in those areas most affected by dry soils.

Figure 2.0 – Cumulative rainfall for October 2011 to February 2012 (left) and October 2010 to February 2012 (right) for hydrological areas across England and Wales[1].



[1] Classed as a percentage of the 1961-90 long term average. Final and provisional NCIC (National Climate Information Centre) data based on the Met Office 5km gridded rainfall dataset derived from rain gauges (Source: Met Office © Crown Copyright). Crown copyright. All rights reserved. Environment Agency, 100026380, 2011.

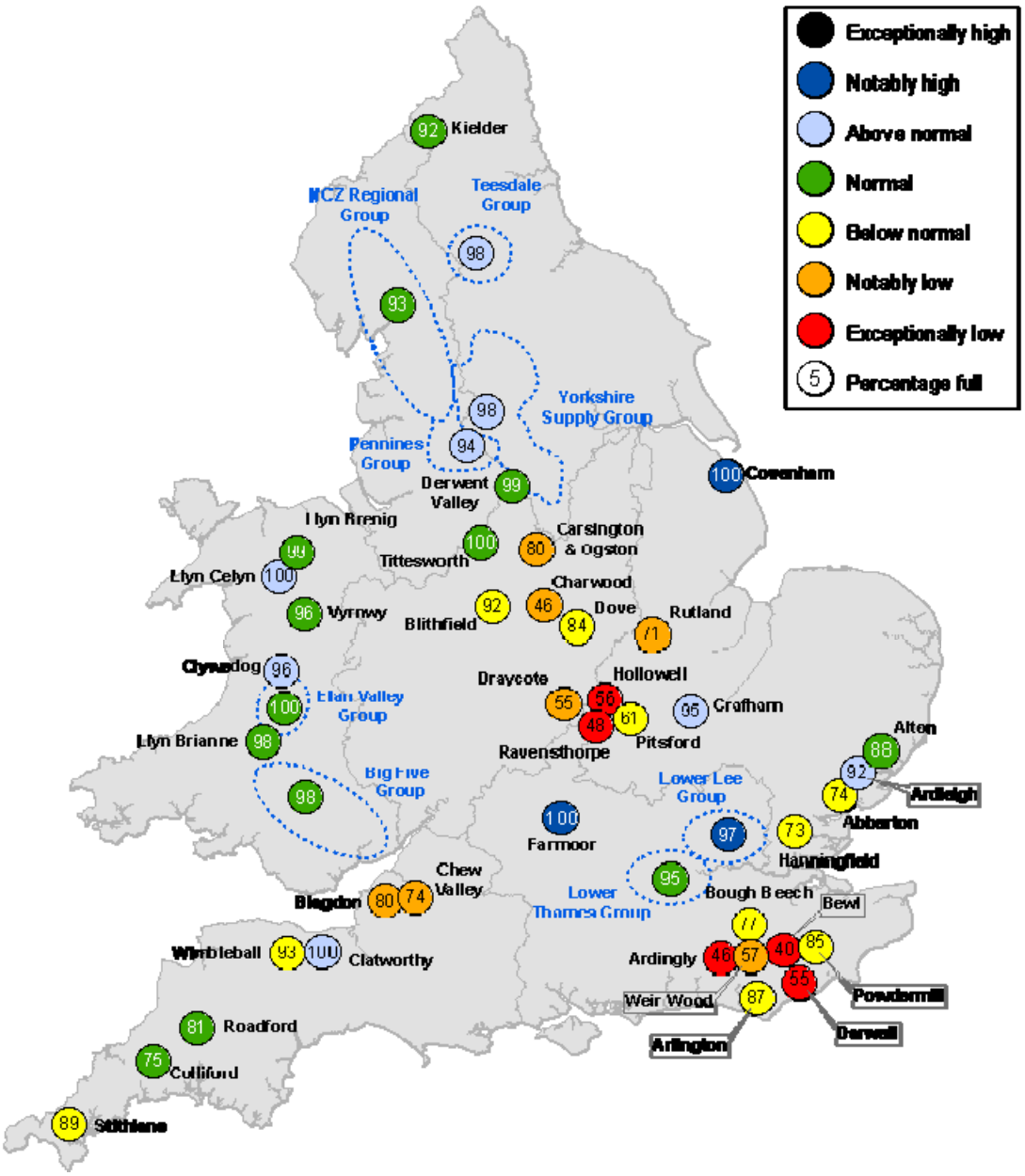
Figure 3.0 – Latest daily mean river flow for 28 February expressed as a percentile and classed relative to an analysis of historic daily mean flows for the same time of year (Source: Environment Agency)[2]



[2] Flow percentiles describe the percentage of time that a particular flow has been equalled or exceeded compared to the historic flow record for that site for the time of year. For example, a flow percentile of 5 indicates that the current flow has only been equalled or exceeded approximately 5% of the time within the historic record for that time of year – i.e. a very high flow. A flow percentile of 95 indicates that the current flow has been equalled or exceeded approximately 95% of the time – i.e. a low flow. Flow percentiles presented relate to an analysis for the time of year and not a whole yea

^ – ''Naturalised' flows are provided for the Thames at Kingston and the Lee at Feildes Weir. These are the gauged flows with the impact of major abstractions taken immediately upstream added back in.

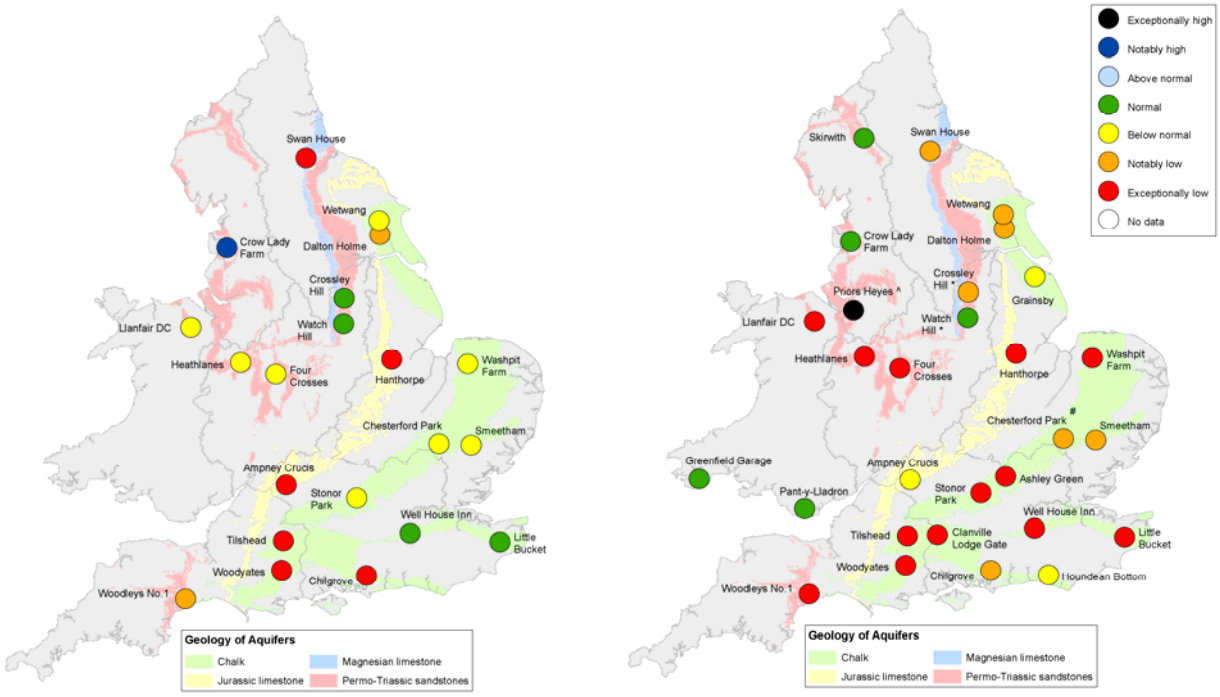
Figure 4.0 - Reservoir stocks at key individual and groups of reservoirs for the week ending 28 February, as a percentage of capacity and classed relative to an analysis of historic values for the same time of year[3]



[3] (Source: Water Companies).Note: Stocks shown may not necessarily relate to control curves or triggers for drought actions. As well as for public water supply, some reservoirs are drawn down to provide flood storage, river compensation flows for hydropower generation or for reservoir safety inspections. In some cases current reservoir operating rules may differ from historic ones

The level at Abberton Reservoir in Anglian Region is affected by ongoing engineering works to increase capacity by 60% - works are expected to be complete by the end of 2013.

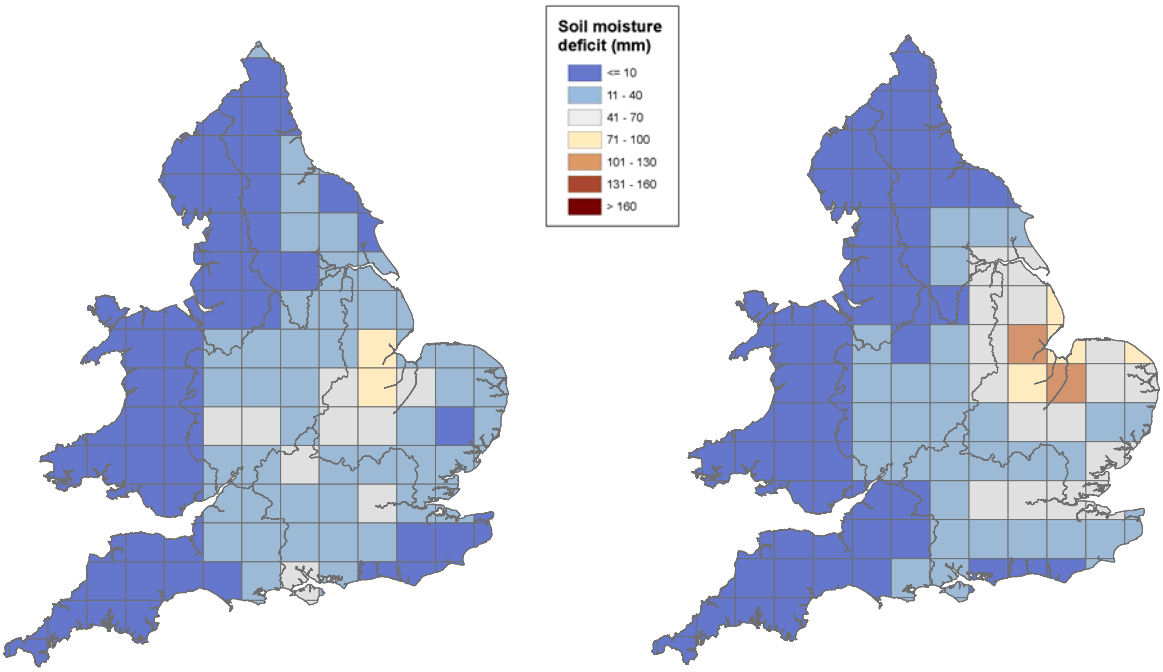
Figure 5.0 – Groundwater levels for indicator sites at the end of February 1976 (left) compared to the end of February 2012(right) classed relative to an analysis of historic end of February levels[4],



[4] Classed relative to an analysis of historic end of February levels (Source: Environment Agency). Geological map reproduced with kind permission from UK Groundwater Forum, BGS © NERC. Note: groundwater levels are reported at different times during the month and therefore may not be fully representative of levels at the month end. Crown copyright. All rights reserved. Environment Agency, 100026380, 2011

^ The groundwater level at Priors Heyes remains high compared to historic levels because the aquifer is recovering from the effects of historic abstraction.

Figure 6.0 - MORECS soil moisture deficits for 2 March 1976 (left) compared to 29 February 2012 (right)[5]



1.5 What are the impacts of this drought?

In our last prospects report we presented the impacts of the drought and dry weather in 2011. During the winter, we would not usually expect any further impacts but the lack of rain has meant these have continued. With the help of other organisations, this section summarises the current impact of continuing drought across England and Wales on water resources, wildlife and habitats and on those who use water and the water environment.

Water availability - dry rivers

Low groundwater levels have caused some streams and ponds to dry up during the winter. For example, the East Glen River in Lincolnshire, a tributary of the River Welland, is dry. Although this happens occasionally, it normally occurs in late September and the river is usually flowing again by late January. We are receiving reports from the east and south east of England that some rivers and domestic wells are drying up.

Water Quality

Incidents relating to dry weather impacts on water quality have been low throughout the autumn and winter, as would be expected. However there is evidence of adverse effects on water quality. Low flows and low groundwater levels due to lack of rainfall have meant that algal blooms have formed in stagnant water in some ponds and lakes.

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[5] MORECS - Met Office Rainfall and Evaporation Calculation System, Soil Moisture deficits calculated based upon the land use in each square.

Source: Met Office © Crown Copyright

In some instances this has led to fish kills, for example in a lake in Grantham, Lincolnshire. We have responded quickly to incidents such as these and carried out a number of fish rescues as well as oxygenating stretches of rivers with mobile pumps.

Public water supply

The dry autumn and winter to date has meant a number of water companies have implemented their drought plans (including Anglian Water, Cambridge Water, Thames Water, South East Water, Southern Water, Sutton and East Surrey Water, Severn Trent Water, South Staffs Water, Veolia South East). The low amounts of rainfall in central, east and south east England had an impact on reservoir levels during the winter and resulted in low river flows and exceptionally low groundwater levels.

At the end of November the Environment Agency granted Anglian Water a drought permit for refill at Pitsford reservoir in Northamptonshire. In December 2011 the Secretary of State granted South East Water a drought order to refill Ardingly reservoir. Due to the increase in rainfall and subsequent increase in river flows, South East Water has not yet implemented the drought order (as of 8 March 2012). Also in December the Environment Agency granted Anglian Water a drought permit to increase refill pumping to Rutland Water. At the end of February Southern Water was granted a drought permit by the Environment Agency to help refill Bewl reservoir.

Levels in Ardingly reservoir in West Sussex are still exceptionally low for this time of year. We are working with South East Water to address this problem. The level of Draycote reservoir that supplies Rugby in Warwickshire is of concern to Severn Trent Water. The company has put a number of actions in place to help the reservoir recover and reduce the need for drought permits or restrictions.

Towards the end of January reservoir levels had slowly begun to recover but some water companies are in pre-application discussions with us on drought permits for the coming spring and summer as these may be needed to complete refill or maintain supplies. For further information see section 3.1.

Agriculture

The impacts on farmers have been highly variable geographically and over time. The prolonged dry weather in parts of England over autumn and winter has resulted in restrictions on summer and winter abstraction, soil compaction and bare ground. In some places grass growth has been limited resulting in some farmers having to bring livestock indoors and using winter stores and supplementary feed. This in turn has meant certain areas such as the West Midlands have had low forage stocks for winter 2011/12, which has created high forage prices - grass seed prices have increased by £20 per acre.

Across central, east and south east England some farmers have been, and still are, prevented from abstracting water. This is very unusual for the time of year. For example, in eastern England over winter there were 106 licences with restrictions out of a total of 911 licences for winter storage filling for spray irrigation. The majority of the licences affected were for spray irrigation winter storage reservoirs. We worked with the NFU and farmers to inform them quickly when they were able to take advantage of high flows. The majority of winter storage reservoirs will be full before spring.

We recognise the problems farmers face this spring and summer where they have not been able to fill their reservoirs. To help them we have introduced a number of changes they can consider to help fill their reservoirs. These are to reduce the cost of taking high flows in summer, increasing their pump rates to fill reservoirs faster, relaxing certain hands off flow conditions in abstraction licences and extending the abstraction

season. When implementing these actions we have given careful consideration to the impacts on the environment (see section 4 for more actions).

Navigation

The Oxford Canal, sections of the Grand Union Canal, the Birmingham Canal Navigations[6] and the Kennet & Avon Canal have experienced particular water resource problems over the autumn and winter due to the drought. With the exception of the Kennet & Avon, these canals are predominately supplied from reservoirs. Many of these reservoirs have shown limited refill during autumn and winter, resulting in most of them being well below the long term average for this time of year. The Kennet & Avon Canal relies on a combination of a significant pumped surface water abstraction from the Bristol Avon and a series of internal transfers. It also relies on groundwater within much of the River Kennet catchment. Groundwater levels in this area are at exceptionally low levels, and surface water flows in the River Kennet and its tributaries reflect this.

British Waterways closed a section of the Kennet & Avon Canal in Wiltshire on 17 November due to lack of water supplies resulting from the low groundwater levels. This reopened on 4 January following the refill of empty sections of the canal. British Waterways has lowered water levels on a section of the Grand Union Canal near Tring to conserve water supplies for the main boating season.

Fish and wildlife

Water availability is of significant concern, particularly in central, southern and eastern England. Significant numbers of rivers have low flows for the time of year. The normal high winter flows are important for flushing silt out of the river system that cleans the sand and gravel beds which are important for spawning fish. Low flows can also make it difficult for fish such as salmon and eels to migrate upstream. The current situation is therefore likely to have an impact on fish populations in a number of rivers this year. Low groundwater levels are of concern for habitats which are groundwater fed, especially as recovery of groundwater levels is likely to take longer than for surface fed systems. Water levels in the well supplying Parsonage Down National Nature Reserve near Salisbury have been too low for abstraction, making the site reliant on mains water supplies.

Although a number of groundwater-fed sites maintained good water levels during 2011, there is concern that this may not be the case this year if groundwater levels do not recover.

The dry weather in the autumn and through the winter had an impact on breeding for birds and amphibians. Natural England has highlighted some examples of affected habitats:

- The 26m deep well at Martin Down that supplies the National Nature Reserve on the Hants and Wiltshire border was dry from the beginning of July 2011 until January 2012. This is unprecedented in the National Nature Reserve's records, as the well is normally only dry between August and November, in drier years.

[6] The Birmingham Canal Network comprises: the Worcester & Birmingham Canal, the Droitwich Canals, the Stratford Canal, parts of the Birmingham & Fazeley Canal, the Stourbridge Canal, parts of the Grand Union Canal, the Wyrley & Essington Canal, the Titford Canal, the Dudley Canal, the Daw End Canal, the Tame Valley Canal plus the Birmingham Old Main Line.

- There are reports that the ponds at Holkham National Nature Reserve, an important breeding site for the natterjack toad, have little water in them at present. Without sufficient rain in March the ponds are likely to dry out, with consequent impacts on the breeding success of the species this year. This situation is repeated at other sites around the country.
- Several peatland sites, for example on Humberhead Peatlands in south Yorkshire and Fenns & Whixall on the Shropshire / Wales border, have reported low water tables that are not ideal for the habitat. However, the dry conditions have meant that site management works, including ongoing restoration activities such as damming, have been able to continue longer than usual, which should have benefits in the long run.

2 Water resources outlook for spring and summer

Rainfall received at the end of December 2011 helped stabilise the water resource position but the drier conditions over January and February have increased the risk of drought in some parts of central, east and south east England. These areas are dependent on the amount of rainfall received over the next couple of months to reduce the risk to drought. This section looks at the outlook for water resources over the spring and summer 2012.

2.1 Available water resources

We have assessed what might happen to groundwater levels and river flows over the spring and summer. We used three different scenarios: above average (120 percent), average (100 percent) and below average (80 percent) rainfall from now into the autumn 2012.

The likelihood of each scenario depends on the length of time. For example, a six month period with 80 percent rainfall is less likely than one or three months with 80 percent rainfall.

2.1.1 Groundwater

Groundwater is a very important source of water for water companies, farmers, industry and the environment. Usually groundwater levels increase during the winter and reduce through the summer. It can take some time for groundwater levels to increase in response to rain as water has to wet up and then travel through the soil and into the spaces between rocks further underground. The time it takes from rain falling on the ground to increases in groundwater will depend on how dry the soil is, the type of rock and plant growth. Table 1.0 summarises what might happen to groundwater levels by the beginning and end of summer 2012 and Figure 7.0 shows this based on the three scenarios. There may be a risk to the deployable output from some wells in chalk aquifers if groundwater levels drop below previously historic minimum levels. Within sandstone aquifers this is unlikely to have the same impact due to natural storage in this aquifer and deep abstraction boreholes.

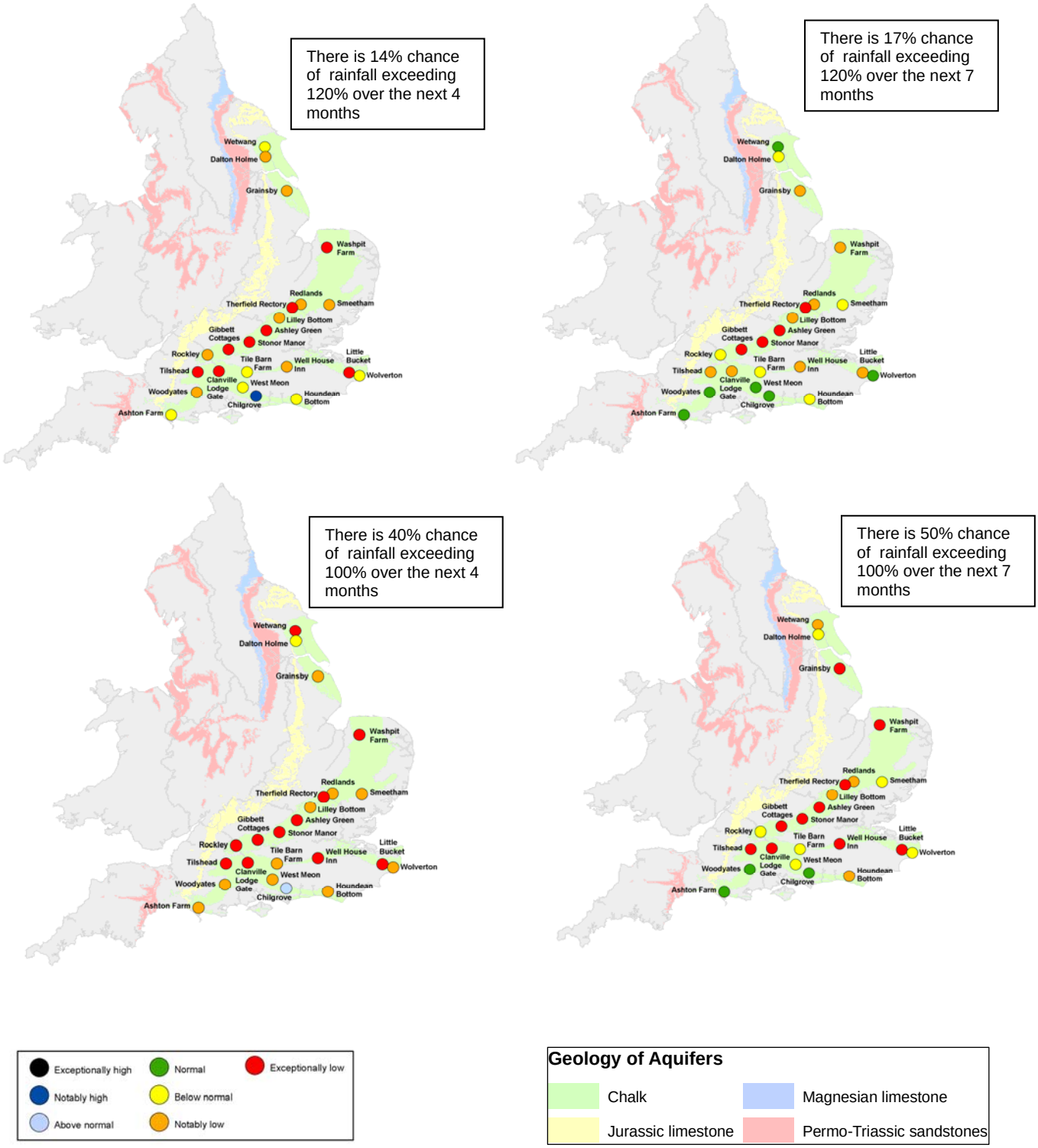
Table 1.0 Predicted groundwater levels over spring and summer 2012[7].

Aquifer type[8]	Location	Rainfall by end of	Above average rainfall 120%	Average rainfall 100%	Below average rainfall 80%
Chalk aquifers (moderately quick to react to rainfall)	Mainly in south east and eastern England	June 2012	Range from below normal to exceptionally low	Notably low or exceptionally low	Most exceptionally low
		September 2012	Range from normal to exceptionally low	Most notably or exceptionally low	Most exceptionally low
Sandstone aquifers (is slow to react to rainfall)	Mostly in Midlands and parts of south west England	June 2012	Range from normal to exceptionally low	Range from below normal to exceptionally low	Range from notably to exceptionally low
		September 2012	Range from normal to exceptionally low	Range from below normal to exceptionally low	Range from notably to exceptionally low
Greensand aquifers (moderately slow to react to rainfall)	South east England	June 2012	Most will be low or notably low	Notably low	Notably or exceptionally low
		September 2012	Most normal	Most notably low	Most exceptionally low
Limestone (fast reacting)	Thin band from Dorset through Cotswolds/ and Lincolnshire to North York Moors	June 2012	Range from above normal to notably low	Range from normal to exceptionally low	Range from normal to exceptionally low
		September 2012	Range from notably high to below normal	Range from normal notably low	Range from below normal to exceptionally low

[7] Assessment based upon time of year

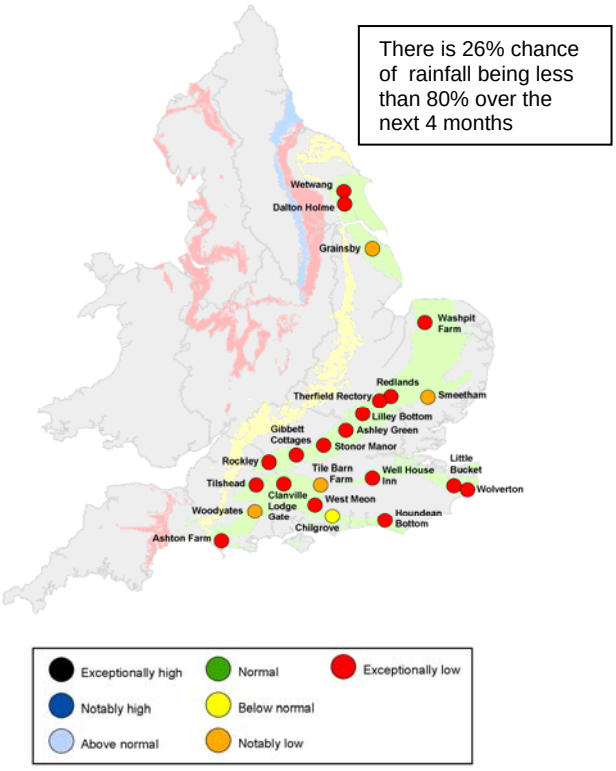
[8] Aquifer response when soils are saturated

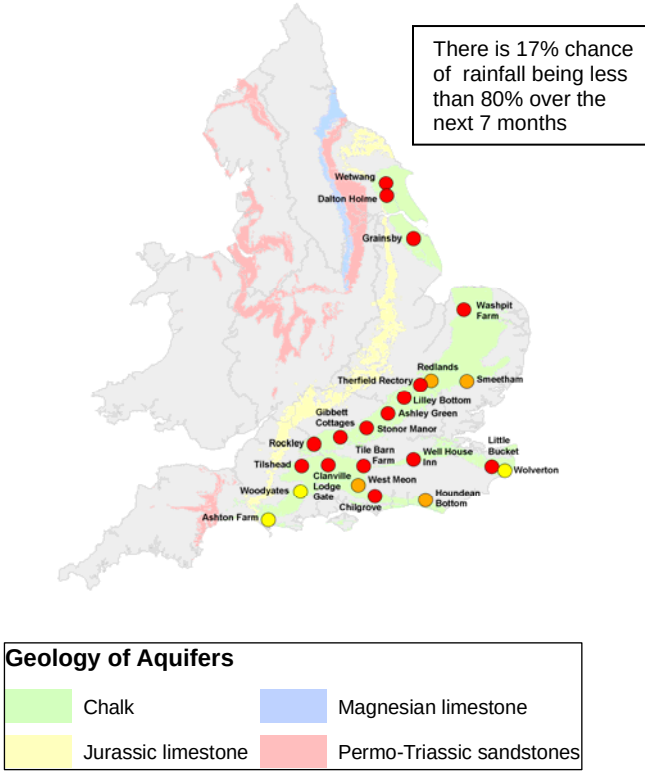
Figure 7.0 – Forecast groundwater levels at key chalk aquifer indicator sites for the end of June 2012 (left) and end of September 2012 (right). Forecasts based on three scenarios: 120% (top), 100% (bottom) of long term average rainfall over the next 4 and 7 months [9]



[9] Classed relative to an analysis of historic end of June or September levels as appropriate. (Source: Environment Agency). Geological map reproduced with kind permission from UK Groundwater Forum, BGS © NERC. Crown copyright. All rights reserved. Environment Agency, 100026380, 2011

Figure 7.0 continued – Forecast groundwater levels at key chalk aquifer indicator sites for the end of June 2012 (left) and end of September 2012 (right). Forecasts based on: 80% of long term average rainfall over the next 4 and 7 months.





2.1.2 River Flows

Once soils are fully saturated, river flows are much more responsive to rainfall events. As illustrated in Figure 7.0, large parts of eastern England still have soil moisture deficits at the end of February which mean any rainfall that does fall is needed to wet up the soils before there will be any significant or sustained rises in river flows.

By looking at rainfall scenarios we can only give a very broad indication of what river flows might be in the summer. From the rivers we have modelled in a range of catchments, we would expect river flows to remain below normal by the summer with average rainfall (see appendix). With 80 percent rainfall or less, these rivers are likely to be notably low or exceptionally low for the time of year by the summer. The natural response in individual catchments is largely determined by the degree of flow in the river that comes from groundwater. Rivers dominated by groundwater flow will mimic changes in groundwater levels. Without significant rainfall, these rivers are likely to slowly recede from the spring onwards. Rivers which are on more impervious catchments, which have less groundwater flow, may be more responsive to rainfall, but increases in flows are likely to be short lived.

2.2 Met Office forecast

There needs to be well-above-average rainfall during March and April to ensure a full winter-time recovery of the water resource situation in southern, eastern and parts of central England. The chances of receiving the necessary amounts of rain in these

regions are vey low in the forecast. For the remainder of March drier-than-usual conditions are favoured over most of the UK[10].

For the spring as a whole (March-April-May) forecasts of pressure patterns do not show any strong signals. There is a small bias towards high pressure across the south of the UK, and this would not be especially favourable for rainfall in the south east. There is large uncertainty in the forecast for UK-average precipitation; this is in part a reflection of the relatively low skill of predictions of seasonal precipitation. However, the probability that the UK average precipitation will fall into the wettest of our five categories is 10-15 percent, whilst the probability that it will fall into the driest of our five categories is 20-25 percent (the 1971-2000 probability for each of these categories is 20 percent)[11].

[10] Input from the Met Office, 8 March 2012, Crown Copyright 2012

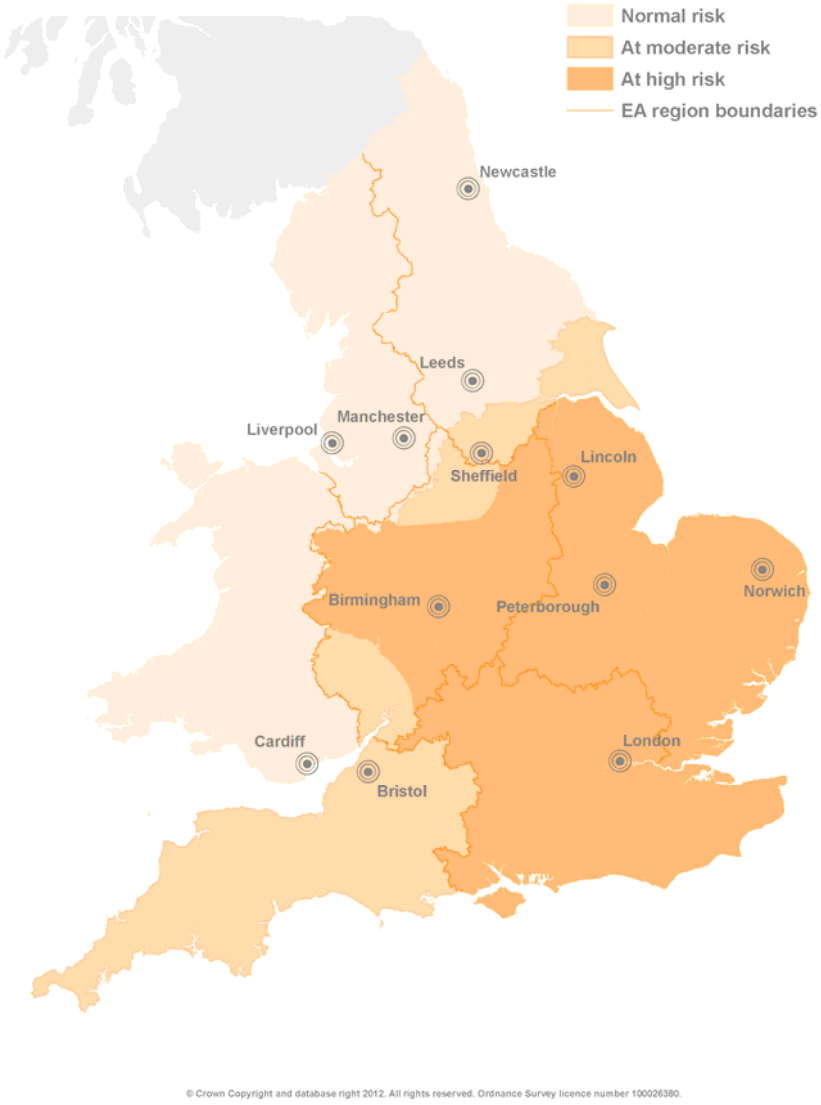
[11] Latest 3 month forecast for the UK http://www.metoffice.gov.uk/publicsector/contingency-planners

3 Prospects if it is dry

Figure 8.0 shows the areas at risk of drought this year if we have a drier than average spring as described in section 2. The classifications in the map are based on a combination of impacts on agriculture, the natural environment, wildlife and on public water supplies. Impacts will vary according to competing demands for available water and what we and others do to manage the risks.

The following sections summarise the consequences of a dry spring and summer for different sectors.

Figure 8.0 - Areas at risk of drought in spring and summer 2012



3.1 Water companies

With the backdrop of a dry winter in 2011/12 there will need to be well above average rainfall in these areas in the spring for recovery of reservoir levels and groundwater levels. The Environment Agency granted two drought permits to Anglian Water and the Secretary of State granted a drought order for South East Water over the winter. The Environment Agency granted Southern Water a drought permit at the end of February.

Those water companies that have identified there is a high risk that their supply area will be impacted by drought during the spring and summer include Anglian Water, Southern Water - East Area, South East Water, Sutton and East Surrey, Thames Water and Veolia Water Central. The remaining companies predict that their supply areas may be affected by drought (medium risk) or that the water resource position will be at normal risk. Table 2.0 (below) gives a summary of each water company's position now, the position following a dry winter and spring (including the risk of drought - see appendix for classifications) and outlines the company actions.

All water companies are continuing with planned supply measures, leakage management and customer awareness campaigns. Some water companies predict that they will need to step up actions in their drought plans over the spring and summer including seeking drought permits to recover reservoir levels, commissioning new and refurbishing old boreholes and introducing restrictions on customers - including hosepipe bans and temporary use bans.

We are in pre-application discussions and have received formal applications for drought permits from several water companies. These are the current applications we are aware of:

- Sutton and East Surrey Water is in pre-application discussion with us regarding a drought permit. This is to extend their licensed abstraction into May from the River Eden to Bough Beech Reservoir in Kent, which normally stops at the end of April.
- Thames Water is in pre-application discussions with us for four potential drought permits, all within their London zone.

As well as the main water companies there are some limited companies that supply small areas by taking bulk supplies from the main water companies. These companies are not listed below but we expect them to work with the main water companies that provide their bulk supply of water to reduce the risk to drought and to also work closely with customers to raise awareness.

Table 2.0: Summary of each water company's position and prospects at start of April 2012

Water company	Position now	Position after a dry winter and spring	Possible actions during spring and summer 2012
Anglian Water	Groundwater below normal in almost half of the sources. Granted two winter drought permits to help refill its Rutland and Pitsford reservoirs. Refill is progressing slowly Storage at the company's other reservoirs are at normal levels.	High risk If rainfall continues to be significantly below normal, and under worst historic drought conditions, drought triggers for temporary use bans may be crossed at Pitsford and Rutland by May and June respectively. Reservoir storage is unlikely to recover to normal levels unless rainfall is significantly above average for the remainder of the refill season.	Likely to apply to extend the drought permits to refill Rutland and Pitsford reservoirs as rainfall has continued to be significantly below normal. We would expect the company to introduce temporary use restrictions (hosepipe bans) if it needs to continue its current drought permits into spring / summer. A targeted water efficiency campaign is continuing in areas supplied by Pitsford and Rutland reservoirs. Additional drought permits may be required in 2012 for drought vulnerable direct river intakes and groundwater sources. Specific action plans to secure additional resources in each drought vulnerable planning zone will be completed at the end of the recharge season. Including the need for further permits and demand restrictions. Enhanced leakage detection will continue for the duration of the drought.

Water company	Position now	Position after a dry winter and spring	Possible actions during spring and summer 2012
Southern Water	Reservoir storage levels below normal. Levels at Bewl reservoir are of particular concern and a drought permit has been granted to support refill. Groundwater levels are above their long term minima.	Eastern area high risk Central area medium risk West area low risk Refill at Bewl reservoir will be severely affected. This would impact on levels at Darwell reservoir and abstraction at Burham. This will impact on the ability to supply Kent Medway, Kent Thanet and Sussex Hastings water resource zones.	Increase customer campaigns in those areas affected. Consider whether any other drought permits needed. There may be the need for temporary water use bans in affected areas. Implementing bulk transfers and the possibility of recommissioning disused sources.
South East Water	Groundwater levels are exceptionally low. Some reservoir stocks are very low. A drought order was granted in December to support the refilling of Ardingly reservoir and Arlington reservoir levels are low.	High risk. It is anticipated that Arlington reservoir will be 100% full come April even with dry conditions. It is likely that Ardingly reservoir will recover to moderate drought levels.	Continue to optimise all other sources over the winter. Anticipate that extension to the initial drought order will not be required., although the company has not ruled them out for later in the year. No further drought permits or orders are planned for 2012. Customer restrictions may come in spring / summer if the current position does not improve.
Sutton and East Surrey Water	Groundwater levels are exceptionally low. 85% of the company's water supply comes from groundwater.	High risk.	Customer restrictions are likely for late spring / summer, to restrict demand and conserve water resources available. School education programme and

Water company	Position now	Position after a dry winter and spring	Possible actions during spring and summer 2012
			increasing customer awareness of the drought and possible restrictions (use water wisely). Continuing to reduce leakage. Bulk supply – will be requested from Thames Water (Merton) if dry weather continues. However, Thames Water has stated that if the drought continues they will not be in a position to supply. Drought permit will be applied for in February / March to allow for an extension of abstraction from the River Eden during May.
Thames Water	Groundwater levels exceptionally low. Some low reservoirs storage levels. More water has been abstracted from the Lower Thames than would normally be expected to recover reservoir storage levels and is in line with the company's drought plan.	High risk. Likely to experience water supply difficulties this year in both London, and Swindon and Oxfordshire water resource zones	Consideration of imposing water use restrictions at the start of Spring. Continue with the customer awareness campaign on water efficiency. Submission of drought permit and drought order applications (to ban non-essential use) are expected in April to ensure additional water is available in June. The enhanced and sustained peak demand that is likely to be experienced in London during the Olympics is an

Water company	Position now	Position after a dry winter and spring	Possible actions during spring and summer 2012
			additional consideration that has been built into forward planning.
Veolia Water Central	Exceptionally low groundwater levels - the lowest since 2005, a previous significant drought for groundwater in the area. Some sources under licence restrictions. Interconnectivity of sources is proving successful.	High risk. Possible that groundwater levels could decline below the lowest recorded and take them into further restrictions and the use of drought permits later this year.	Likely that a dry spring will mean customer restrictions and the use of drought permits. Discussing with neighbouring companies to explore mutual support during drought, including the full use of the Grafham entitlement. Plans to increase the balance of surface water use from early spring through the coming summer where groundwater vulnerability is apparent.
Cambridge Water	Groundwater levels are lower than normal.	Medium risk. Boreholes would remain below average until the beginning of April but not reaching critical levels. Monitor groundwater levels closely and adjust output accordingly. The trigger for temporary restrictions is unlikely to be met before the autumn.	Customer restrictions are unlikely in the summer, but are not ruled out. May ask for voluntary restraint. Review of future leakage effort and ceasing planned maintenance at operational sites. Based on anticipated position at beginning of April, the trigger for temporary restrictions is unlikely to be breached until autumn.
Portsmouth Water	Groundwater levels are low but so far the company has not encountered resource problems.	Medium risk. If winter rainfall is 80% of the average and spring rainfall exceeds 70% of the	Customer restrictions may be needed when supplies are at their lowest. Winter rainfall and recovery of

Water company	Position now	Position after a dry winter and spring	Possible actions during spring and summer 2012
		average it is likely that groundwater levels recover to above the drought trigger and water supply problems are unlikely.	groundwater levels will continue to be carefully monitored together with the need to commence implementation of the 2011 Drought Action Plan.
Severn Trent Water	Majority of reservoir storage levels are near normal for this time of year. Draycote reservoir is exceptionally low for this time of year. There are actions in place to address this such as moving water around the company's water grid.	Medium risk Low flows may continue and affect refill of Draycote reservoir. Lowest level of storage anticipated for Draycote is 55 – 60% of full capacity by the end of April. Under very dry conditions the reservoir level could reach around 30%. However, connectivity of the water grid and refill of remaining reservoirs reduces the risk.	Continue to use strategic grid to minimise demand on reservoirs and groundwater sources under most stress. Continue to maximise ability to refill our reservoirs under the ongoing low river flow conditions. Anticipate that drought permits will not be needed but will keep under review. Implement customer campaigns.
Veolia Water South East	Exceptionally low groundwater levels and drought triggers have been reached.	Medium risk. Less than average rainfall, will cause groundwater levels to decline below the lowest on record. This would result in further restrictions and the use of drought permits.	All planned demand is being considered for their impact on water availability at key periods (e.g. the Jubilee Weekend). Development of contingency plans to cover sudden losses of key sources in the event of pollution or source failure due to extremely low groundwater level conditions. Increasing customer awareness. Discussion with neighbouring companies for the possibility of

Water company	Position now	Position after a dry winter and spring	Possible actions during spring and summer 2012
			additional transfers. No permits applications planned at present.
Bristol Water	Reservoir levels are within a normal range for this time of year. Groundwater levels are lower than usual, but not critical. (Groundwater provides only 15 percent of water available).	Normal to medium risk Dry weather will lead to reservoir volumes below end of year target.	Customer restrictions are unlikely to be required during 2012. Continue to conserve reservoir storage by bulk water transfers from the River Severn. Maintain a low level awareness campaign to encourage customers not to waste or misuse water and promote availability of free household water saving devices.
South West Water	Overall reservoir storage is 84 percent of total net capacity, similar to levels this time last year. Continue to use pumped storage facilities at Wimbleball, Stithians and Colliford reservoirs. Although groundwater levels at some sites are below the long term average, levels at other sites are normal for the time of year.	Normal to medium risk. Under unusually dry conditions, there may be concern over the Colliford and Roadford reservoirs.	Unlikely that there will be customer restrictions during summer and autumn. Customer awareness campaign, informing customers of possible issues in the spring and summer. Actions to manage resources and whether planned maintenance maybe affected, e.g. leakage control works.

Water company	Position now	Position after a dry winter and spring	Possible actions during spring and summer 2012
	River flows are below normal for the time of year.		
Sembcorp Bournemouth Water	Normal, although groundwater levels are low.	Normal risk	Coordinated actions with other companies to maximise customer and media understanding. Customer campaign during the spring. Customer restrictions not anticipated.
Cholderton & District Water Company	Normal	Normal risk	Instigate operational modifications. Commence high level customer awareness campaign.
Dee Valley Water	Normal	Normal risk	Water resources are dominated by surface water and, as in any year, an exceptionally dry period could mean actions may be required later in the year.
Essex and Suffolk Water	Reservoir storage levels slightly below average. Groundwater ranging from average to below average. River flows all below normal, but no impact on yield.	Normal risk Full refill expected by end of April. Potential for some groundwater issues to develop if conditions remain notably dry, No significant issues anticipated this summer.	Continue enhanced monitoring, particularly for groundwater resources. Customer restrictions not anticipated nor supply-side drought actions this summer. Continue to promote ‘use water wisely’ campaign.
Northumbrian Water	Groundwater levels and reservoir stocks are normal.	Normal risk	Under exceptionally dry conditions, would rest reservoirs where stocks are unusually low and support from alternative sources including the Tyne-

Water company	Position now	Position after a dry winter and spring	Possible actions during spring and summer 2012
			Tees transfer (normal operating procedures).
South Staffs Water	Normal Some groundwater levels are low but not impacting on company supply.	Normal risk	Customer restrictions not anticipated. Do not expect to implement any customer awareness campaigns nor apply for any drought permits or cancel any planned maintenance works.
United Utilities	Normal	Normal risk	Water resources are dominated by surface water and, as in any dry year, an exceptionally dry period could mean actions may be required later in the year.
Veolia Water East	Groundwater levels slightly below long term average but within normal range for the time of year. Sole surface water reservoir is full which is higher than normal for the time of year.	Normal risk Groundwater levels above drought trigger levels and surface water availability is predicted to be sufficient even if dry weather persists until April.	Routine monitoring of groundwater and surface water levels continuing to ensure no trigger levels are reached. Leakage control is to continue to minimise wastage. Surface water is shared with Anglian Water and as a precaution joint measures are being taken to support surface water even though no drought trigger has been breached. Customer restrictions not anticipated.
Wessex Water	Reservoir levels normal and groundwater levels typically below average	Normal risk.	Customer restrictions not anticipated. Do not expect any additional actions. Continue to promote ‘leakstoppers’ hotline to help customers report leaks

Water company	Position now	Position after a dry winter and spring	Possible actions during spring and summer 2012
			they may notice. Continue with promotion of free water saving devices and customer campaigns.
Yorkshire Water	Normal for most surface water stocks. Groundwater levels, particularly the chalk in the East, are low. This is reflected in low levels in rivers that are fed by groundwater (for example, the Rivers Derwent and Hull).	Normal risk. Area of concern remains the groundwater and the rivers it supports.	Customer restrictions not anticipated. Use grid supply system (reservoirs and direct river abstractions) conjunctively to support groundwater allowing minimising of groundwater abstraction. Continue with demand management winter campaigns and water savings packs. Actively maintaining a low level of leakage.
Welsh Water	Normal	Normal risk.	Water resources are dominated by surface water and, as in any year, an exceptionally dry period could mean actions may be required later in the year.

Prospects for the Olympics and Jubilee celebrations

We have carried out an assessment for the Olympics that sets out the risks and issues that can be caused by dry weather, and also sets out the actions to mitigate the risk. We have been advising the Olympic Delivery Authority (ODA) since 2007 on developing sustainable sources of non-potable water for the Olympic Games and legacy, and have been working with Thames Water to assess water demands. Most of the work in providing sustainable supplies is now complete and the Olympic Park and other Olympic venues have a high level of resilience to meet their needs even during a drought.

A non-potable supply network across the Olympic Park has been installed to supply water for events, irrigation and cleaning. This non potable supply network is planned to be supplied by a blackwater[12] re-use plant, taking water from a Thames Water sewer main. If the blackwater re-use plant is unavailable there are a number of other sources available. For most venues potable water is the backup supply and in some cases borehole supply can be used. In those cases where neither potable water nor borehole supply is an option we could be asked to allow water to be supplied from the River Lee.

Other areas such as the rowing and canoe venues in Windsor and Waltham Cross have also been considered. We have licensed the canoe slalom to abstract from a confined chalk borehole to top up the slalom course. Should additional water be required it will be obtained from Thames Water. The rowing lake is linked to the river Thames and extremely low levels would need to be experienced to cause a problem. Should this happen then further water can be taken from a confined borehole.

It is anticipated that the Queen's Diamond Jubilee pageant at the beginning of June will not be affected by the drought in the south east. The pageant will take place on a stretch of the river from Battersea to Tower Bridge which is supplied by tidal waters. It is likely that river traffic will increase on the non-tidal sections of the Thames as people travel to the pageant and may be affected by the Environment Agency's drought management actions that are in place (see section 3.4).

3.2 Agriculture

If the dry weather continues into the spring in central, east and south east England, and parts of Yorkshire, then it is likely that current restrictions on agricultural abstraction will remain and additional restrictions will be enforced.

River flows and groundwater levels are unlikely to recover and will pose significant risks to spring planting and subsequent summer abstraction. Those farmers relying on refill of winter storage reservoirs to the normal levels to irrigate crops later in the year, will be hit hard. Spray irrigation prospects currently look much less favourable for this time of year than they have for several years, particularly in East Anglia. This will significantly impact on food production. For example in the south east of England a dry spring could affect fruit, vegetable (including potato) and salad growers this summer. Drought management actions, such as hands off flow restrictions and section 57 irrigation bans, are probable throughout parts of central, east, south east and south west England particularly if there is below average rainfall over the coming months. Some eastern areas of the Wye catchment may start the spring at lower than normal river levels and could see low flows in the summer.

[12] Blackwater is water coming from sewage or wastewater.

Continued dry weather could also increase risks to supplies of drinking water for livestock, particularly housed pigs and poultry. The Environment Agency and NFU are working with water companies to ensure there are emergency plans in place for this eventuality. It is likely that the quality of grass will continue to decrease, resulting in either more expense for farmers re-seeding or reductions in livestock numbers as there is less grass to feed livestock. Limited grass growth could lead to water quality issues as nutrients are washed directly into watercourses due to the lack of absorption by plants.

3.3 Power sector and industry

We are aware that some industrial activities that abstract water directly are beginning to experience some issues as a result of the dry weather during the winter. As with all other abstractors there is a risk that should the dry conditions continue into spring and summer then some abstractions, particularly from rivers, will be restricted through licence conditions.

Individual electricity generators may be impacted where they rely on abstracting cooling water in affected areas however this is unlikely to affect electricity supply as this may be met by an alternative supplier and balanced by the National Grid. Other large industrial abstractors such as aggregate washing and concrete production may be affected by restrictive conditions on licences being implemented earlier than normal. We continue to work with industrial abstractors to review the situation and help them plan ahead to consider the options available if the drought develops further (actions are set out in section 4.7).

3.4 Navigation

The Oxford Canal and sections of the Grand Union Canal are of most concern to British Waterways should the dry weather continue into spring and summer. Although the Birmingham Canal Navigation group is currently showing a high risk, British Waterways judge that the situation there is less vulnerable due to the alternative water resources available to supply these canals. For much of the Kennet & Avon Canal within the River Kennet catchment, the groundwater situation is a dominant controlling factor. Given the exceptionally low groundwater levels surrounding the Kennet & Avon Canal the poor prospects of a rapid recovery and the water resource position are cause for some concern at present.

The Oxford Canal, sections of the Grand Union Canal and the Kennet & Avon are at increasing likelihood of restricted lock opening hours during the 2012 main boating season (April – October). All other waterways are at normal risk for spring / summer.

The Environment Agency does not anticipate any significant drought impacts on the River Thames navigation. We have a drought plan in place to manage this navigation during times of dry weather that is triggered by low flows at Teddington. We are able to carry out a number of actions such as holding back flows at weirs, putting summer boards in at certain weirs to raise levels, promoting waiting at locks and imposing lock restrictions to reduce the impact.

3.5 The water environment and wildlife

If there is a dry spring with below average rainfall, there is a concern that there will be more widespread impacts on the environment compared to last year. Most healthy

freshwater and wetland sites are resilient to lower than average rainfall. However, prolonged periods of dry weather will have a medium to long term impact on their condition. This can have knock on effects for any wildlife associated with these habitats, as well as having direct impacts on the habitats that support them. Some plant and animal species can be lost from a site as a result.

The main cause for concern is the impact of drought on sites that are already under environmental stress, such as from existing abstraction pressures or pollution. We are working to investigate and resolve environmental impacts at sites caused by unsustainable abstractions. There are concerns that whilst our investigations are in progress, environmental impacts at some of these sites may be exacerbated by drought. Pollution (including air pollution) can make some species more sensitive to the impacts of drought. In addition, low flows reduce the level of dilution of pollutants in rivers. The effects of drought will last longer and be more pronounced on sites adversely affected by abstraction.

Fire has not had a significant impact on habitats since June 2011. If the dry weather continues, fire will return as a risk in the spring and summer.

4 Recommendations

The forecast for the coming months is uncertain. Preparations need to be made for the worst case scenario - the weather continues to be drier than normal. The plans that are put in place and actions carried out will help people, businesses, agriculture and the environment to cope with the potential impacts of a long drought.

In our last prospects report we set out a number of actions that we had taken with partners and abstractors, and recommendations for abstractors. This section builds on our previous report to show progress. Many of the recommended actions from the last report stand and feature in this section.

4.1 Environment Agency

We play a lead role in co-ordinating and managing what needs to be done to deal with the effects of drought on people, businesses, agriculture and the environment.

We have carried out a number of actions resulting from meetings that we and Defra have held over the past year.

- Defra hosted a further meeting of agricultural sector abstractors at the end of December 2011 to review progress and plan ahead. The Environment Agency has taken forward key actions to provide flexibility for farmers to fill storage reservoirs.
- We introduced a fast-track application process for taking high flows in the summer to top-up storage reservoirs. Farmers have told us the main obstacle to taking summer high flows is the relatively high cost of this water. To help farmers take advantage of these high flows to top up their reservoirs, we have decided not to charge extra for this water provided they keep to their existing licensed quantities.
- At the end of January 2012, Natural England and the Environment Agency held a joint meeting with non-governmental wildlife and fisheries organisations to discuss prospects for and impacts of drought on wildlife and habitats. Both organisations are monitoring the impacts of drought and recording the actions taken in response to drought, including the effectiveness of the response. This will build an understanding of how to protect habitats and species during recovery and in future drought. The meeting also identified practical actions which are set out in Section 4.5 below.

We will continue to co-ordinate actions and monitor drought and its effects locally. We will:

- Support and provide advice to the national cross sector drought management group agreed at the Drought Summit on 20 February.
- Work closely with the National Farmers Union, UK Irrigation Association and Agriculture and Horticulture Development Board on agricultural water resource issues locally and nationally.
- Keep farmers up to date about the local risk of drought restrictions affecting spray irrigation this spring and summer to try and avoid section 57 irrigation restrictions.

- Issue warnings and advice on the prospects for spray irrigation - our regional teams are producing reports for spray irrigators to provide them with the prospects for spring and summer. We have been in continuous close liaison with farmer groups to discuss and agree how we and they can best manage the reduced amount of water available.
- Encourage and help farmers to set up water abstractor groups.
- Carry out environmental monitoring studies in partnership with Natural England to determine the long-term impacts of drought on fisheries and biodiversity and share the results with interested groups and communities.
- Determine water company drought permits (and support government on drought orders) where required.
- Prepare more detailed action plans in consultation with others for 2012 if the dry weather continues.
- Begin to look ahead to 2013 at the possible implications and actions of a third dry winter in drought affected areas.
- Check abstractors are complying with conditions on their abstraction licences and take enforcement action against those who don't. For more information on our approach to enforcement please see our website.

Over the medium to longer term, we are reviewing existing initiatives and developing ways to increase resilience to future droughts. We continue to work with the Met Office and other partners, to provide abstractors with more information about the likely weather and rainfall prospects, and what this means for water availability. The information will help abstractors to plan for and limit any impact on the environment. The Environment Agency is also looking at ways to provide better access to online information on river flows and restrictive conditions to enable best use of licensed quantities.

In the longer term, we are working with all sectors to ensure their abstractions are resilient to climate change. We are working with the government following publication of the Water White Paper in December 2011 on future approaches to abstraction licensing to facilitate this.

We published our revised Environment Agency drought plans in February 2012. The plans have been revised to include comments received to our consultation on the draft drought plans, lessons learned and improvements made as a consequence of the 2011 drought and previous droughts. Some recommendations will take longer to implement these include:

- Looking at the definition of drought with particular focus on the causes and types of drought.
- Improving the way we communicate externally during drought.
- Working with others to communicate the important messages around using water wisely.

4.2 Water companies

The risk of drought is high for many water companies across England. As we do not know how long this drought will continue, we expect water companies at high risk to:

- Co-ordinate imposing of temporary restrictions on water use such as hosepipe bans from an early stage in the spring. This could be as early as mid March for a number of water companies.
- Talk to us about drought permits as early as possible but companies need to factor in that demand management measures should be in place before a company applies for a drought permit during the spring or summer.
- Engage and communicate with their customers to help them understand the current position and encourage them to use water wisely.
- Demonstrate that they have increased leakage detection and publicly show they have reduced leaks from their network.
- All water companies should be testing back up pumps and critical infrastructure to ensure they are in working order.

All water companies monitor their resources carefully and the Environment Agency will ask companies in areas of increased risk to keep the situation under regular review through spring and summer 2012. Companies will need to act as soon as they are aware of any increased risk to public water supply. The present water resources situation means that this particularly applies to companies in central, eastern and southern England. We expect these companies to follow their drought plans to ensure timely decisions are made.

Actions we expect all water companies to take include:

- Following their drought plans and talking to us about applying for drought permits and orders in good time.
- Keeping their customers up to date with the latest position if the company is at risk after a dry winter and spring.
- Encouraging their customers to use water wisely now, which will put them in a better position for the summer.
- Keeping on top of their leakage detection and managing leakage through a range of weather conditions.
- For all companies, regularly reviewing the need for future restrictions using the new powers in the 2010 Act and different supply strategies including drought permits, especially if there is a third consecutive dry winter.
- Learning lessons from the dry weather and drought in 2011/12 and incorporating them into their drought plans.
- Completing the consultation and update of their drought plans, which most companies are now progressing.
- Consider and discuss sharing water resources between neighbouring companies.

4.3 Abstractors

All abstractors need to be proactive and consider whether their abstraction licences will meet their needs in 2012 and beyond (share, conserve and adapt). It is better to make planned changes to licences in advance than to have to react to events. The Environment Agency will continue to work closely with sectors that may be affected to help them plan for drought.

Irrigators

- Consider the need to extend the summer abstraction period to wet the ground and lift crops (see our position statement).
- Consider options for scheduling irrigation. There are a variety of techniques available including the use of soil moisture sensors and/or water balance methods.
- As a longer term option, consider a storage reservoir. Farmers with reservoirs were largely unaffected last summer, and only those in the driest areas are struggling to fill them during a two-year drought.

Winter storage abstractors (1 November - 31 March)

- Be aware that if flows and groundwater levels remain low, the Environment Agency may have to restrict abstractions. We will warn farmers as soon as we can and work with them to limit the impact of restrictions.
- Abstractors with winter storage reservoirs should consider varying their licence to take high flows in summer or investigate topping up their reservoirs from another source, for example harvesting rainwater from roofs or sharing sources.
- Consider water security in the face of multi-season droughts.

All abstractors

- Look for ways to share resources such as setting up a water abstractors' group. The Environment Agency can offer advice on best practice and put abstractors in touch with groups working in their local area.
- Consider how abstraction restrictions could affect a business and what contingency plans you may be needed.
- Consider doing a water audit and implementing measures to improve water efficiency, such as checking for leaks.
- Monitor how much water is being using, and if authorised quantities may be exceeded contact the Environment Agency as early as possible so we can discuss options and avoid enforcement action.
- Read our short leaflet 'top tips for complying with your water abstraction licence'.
- We need abstractors to help us to help them, so we can make better and faster decisions. If we understand particular water needs, we can manage them better and try to make existing supplies last as long as possible. Our customer contact number is 03708 506 506 (Mon-Fri, 8am -8pm).

4.4 Navigation and recreation

Organisations, groups and individuals who regularly use the water environment for navigation and recreation need to prepare for the possibility of further impacts this year. The organisations with particular responsibilities for boating and leisure activities should:

- Continue to target communications to river and canal users in the areas likely to be affected.
- Promote water saving initiatives and early warning systems with boaters to reduce the likelihood, or severity, of navigation restrictions later in the year.

- Work with event organisers to plan boat movements to festivals and events in a way that ensures the optimum use of water.

In an attempt to reduce the likelihood of a poor water resource position during the main 2012 boating season, British Waterways has taken the unusual step of implementing a Drought Schemes Project, focussed on the Oxford Canal, Grand Union Canal, the Birmingham Canal Navigations and the Kennet & Avon Canal. Nearly 30 schemes have been identified to either increase water resources or reduce canal demands during early 2012. British Waterways has issued a press release to explain this work.

Given the current drought situation and the recent interest in the use of the canal system as a possible transfer route at a strategic level, the Environment Agency and British Waterways have been discussing this opportunity. British Waterways is keen to highlight that there is the potential to move water this way and are open to strategic discussions.

4.5 The natural environment and wildlife

Prolonged drought will have long term impacts on water dependent wildlife and habitats. At the joint Environment Agency and Natural England meeting in January a number of calls to action were agreed:

- Managers of water dependent wildlife sites will consider the benefit of keeping key areas of the site wet only, as a temporary drought measure to maintain limited habitat for critical water dependant species, and seek out alternative water sources where feasible.
- Fisheries operators are being advised to consider likely low water availability in planning density of fish stocks, and to undertake pool maintenance and site management with drought in mind.
- The Environment Agency to continue with our flexible approach to licensing within the legislation and our responsibilities.
- All environmental organisations to communicate using water wisely messages with members and the wider public. A set of messages were agreed at this meeting.
- All environmental organisations to capture and report on the impacts of drought and the effectiveness of any management actions, to aid management of future drought incidents. A follow up meeting will be organised by the Environment Agency.

Natural England will continue to assess the need for active management of water on sites, especially where they are part of a wider hydrological network or where they rely on stream support / compensation flows. Natural England is continuing to identify SSSIs vulnerable to drought. These will be reviewed as the situation develops. We are working closely with Natural England and abstractors on sites already impacted by abstraction, which are consequently more vulnerable to drought.

4.6 Olympics

Since 2007, we have worked with the Olympic Delivery Authority (ODA), its delivery partners and contractors to develop sustainable sources of non-potable water on the Olympic Park. The ODA has set a target to reduce potable water usage on the Olympic

Park by 40 percent for permanent venues and by more than 30 percent for residential buildings compared to current practice, by:

- Rainwater harvesting from roofs, car parks and other hardstandings.
- Thames Water's new 'blackwater' recycling treatment plant which can deliver between 500,000 and 800,000 litres per day and will be the main source for a number of non-potable uses on the Olympic Park (e.g. plant landscape irrigation, toilet flushing, supply to the new Energy Centre).
- Abstraction from a number of sustainable, confined underground sources on the Park.
- Water efficient fixtures and fittings (e.g. low flow taps, waterless urinals).
- Swimming pool backwash recycling.

As a result of the recent dry weather we have been working with the ODA, the London Organising Committee of the Olympic Games and Paralympic Games (LOCOG) and other delivery partners to activate Dry Weather Plans for the Olympics. Work currently being undertaken includes:

- Preparing information and considering the implications of possible water quality and environmental impacts in the Lower Lee.
- Having a plan in place for improved levels of incident response during the Olympic Games.
- Working with the ODA to inform and support them in their responsibilities during environmental incidents as riparian land owners, raise awareness about the possibility of environmental impacts, encourage them to produce joint actions plans with ourselves and British Waterways to minimise impacts.
- Engaging with the ODA to identify how they will supply non-potable water in the event that their preferred source becomes unavailable.

4.7 Power sector

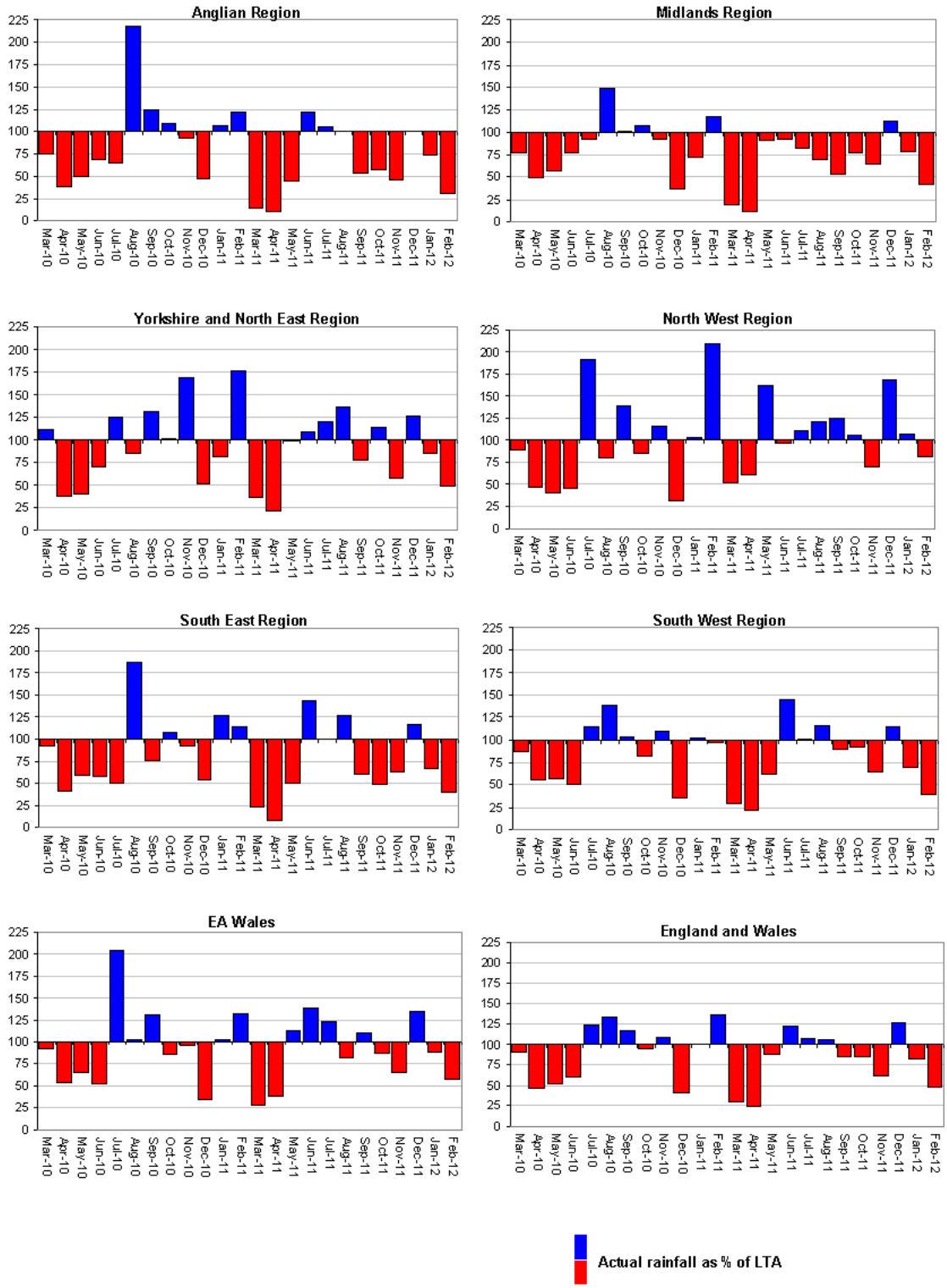
For those power companies that rely on river abstractions for power generation, it is advised that they closely monitor the situation and put contingency plans in place for those sites located in areas at risk to drought. This should include the effect other abstractions may have on the availability of water, engage regularly with key stakeholders, and consider modifying their operations should drought pose a risk to supply.

4.8 Public health and safety

We do not believe that the likely level of drought in England during 2012 will pose a major risk to human health and safety. Issues can arise from heat waves, such as wildfires and air pollution, that take more careful management during a drought. The Environment Agency will continue to support government in sharing information about the water resources situation with specialists in health and emergency planning so that any potential risks can be identified and managed.

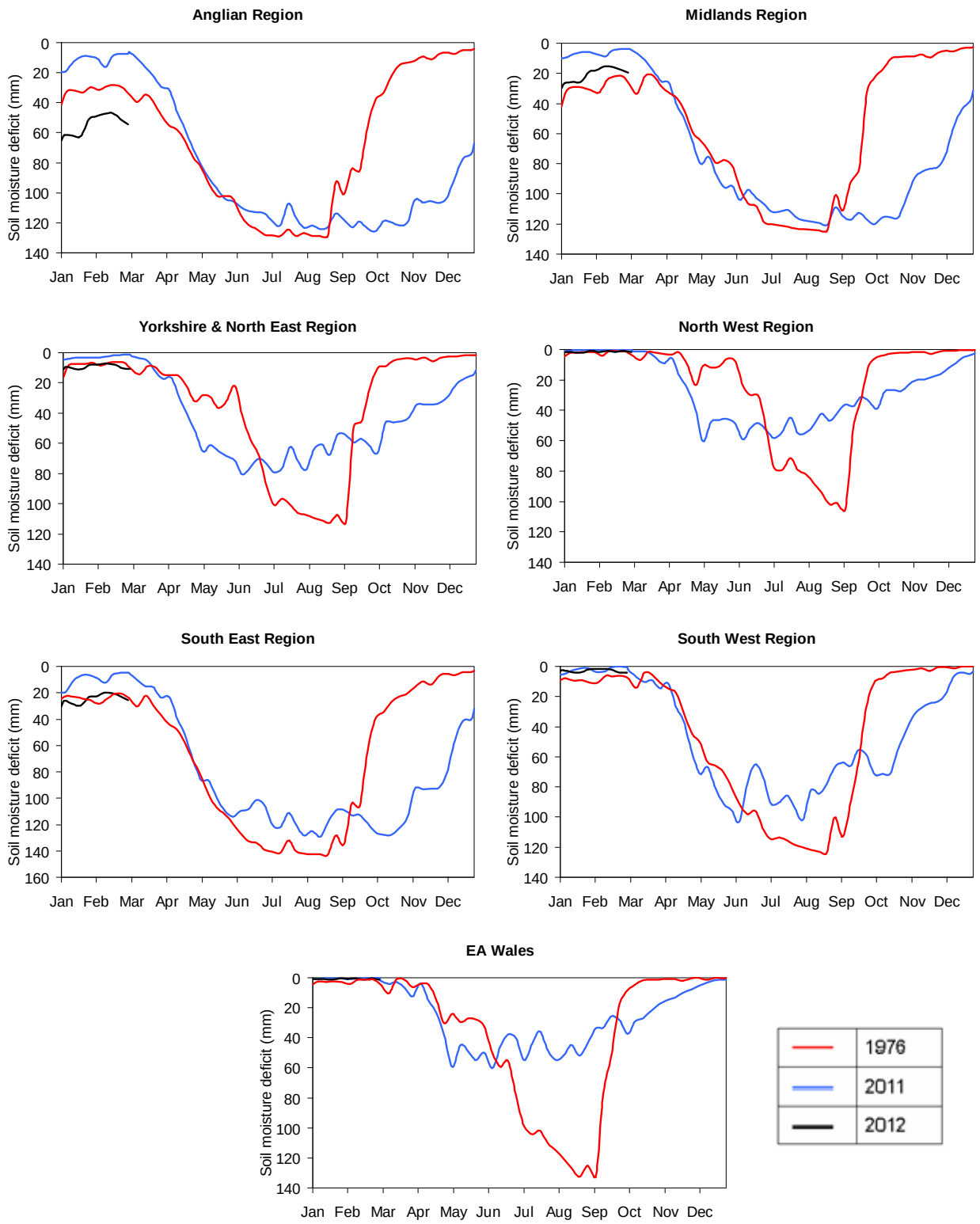
Appendix

A.1 Monthly rainfall totals for the past 24 months as a percentage of the 1961 – 1990 long term average for each Environment Agency Region and for England and Wales[13]



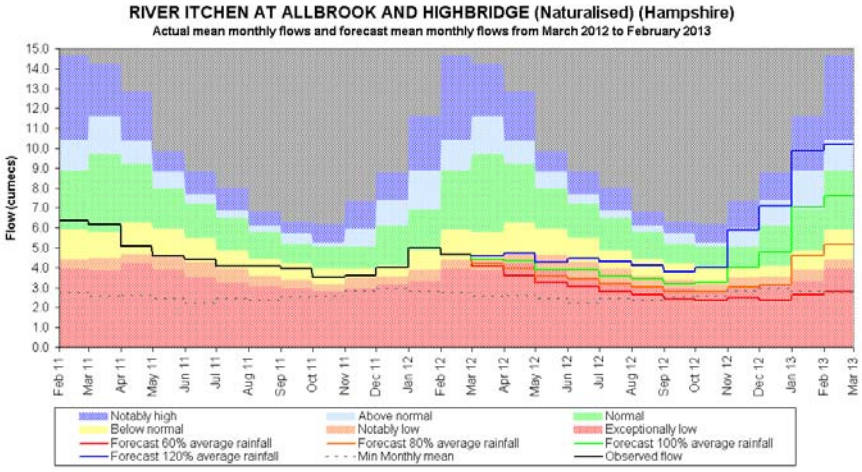
[13] NCIC (National Climate Information Centre) data. (Source: Met Office © Crown Copyright).

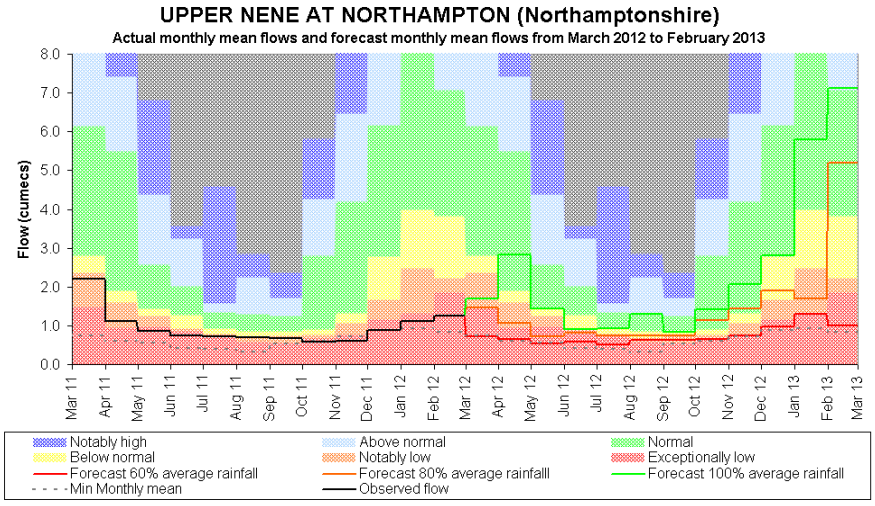
A.2 MORECS soil moisture deficits for real land use for all Environment Agency Regions[14]

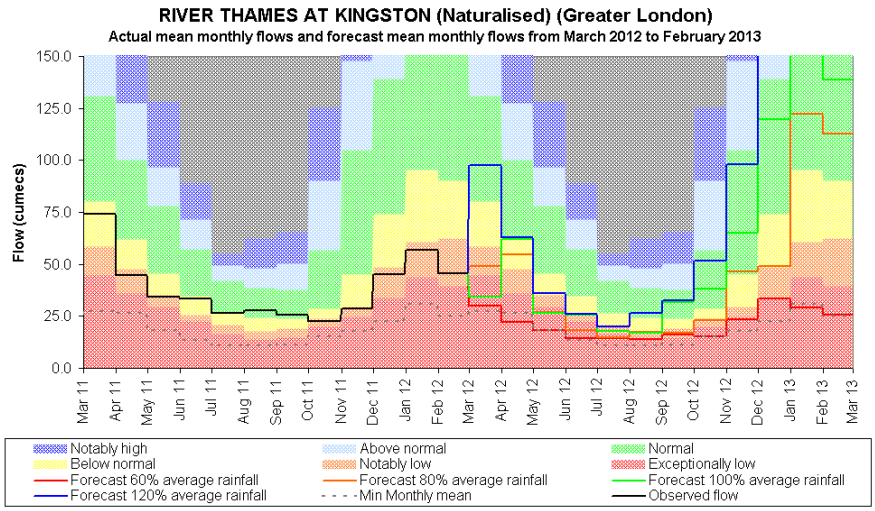


[14] MORECS - Met Office Rainfall and Evaporation Calculation System. Source: Met Office © Crown Copyright

A.3 River flow forecasts[15]

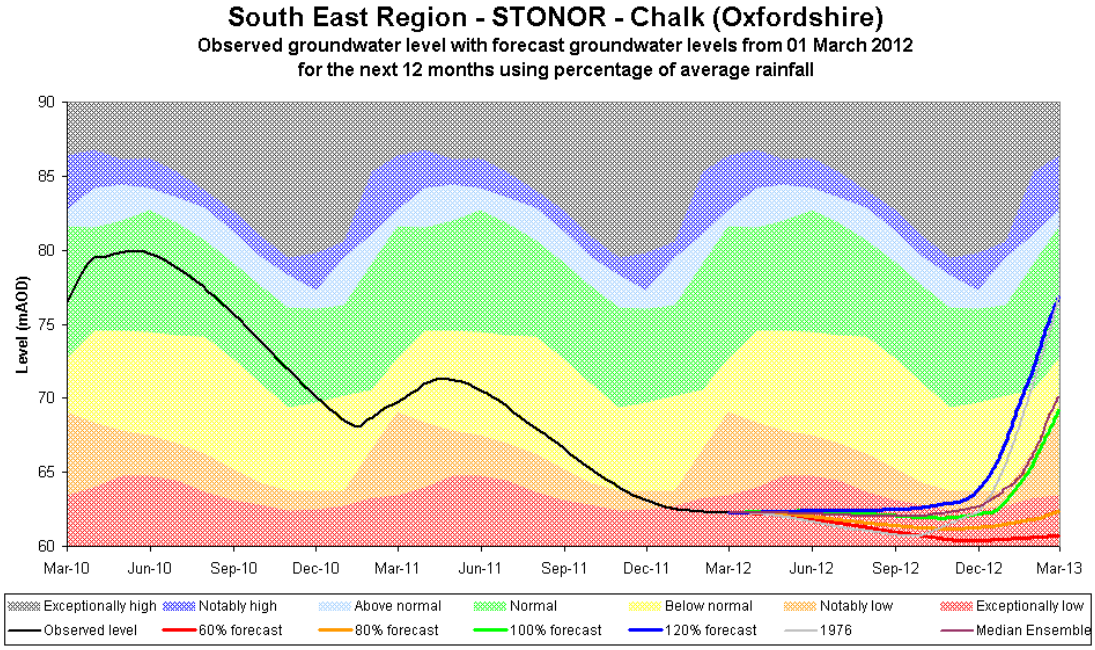


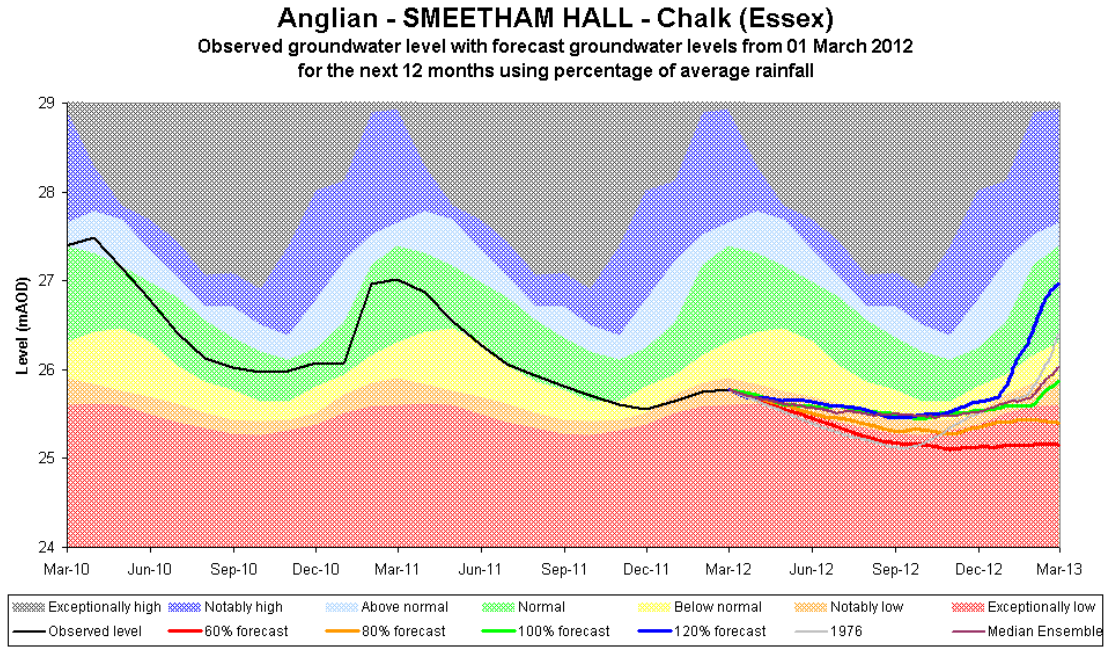




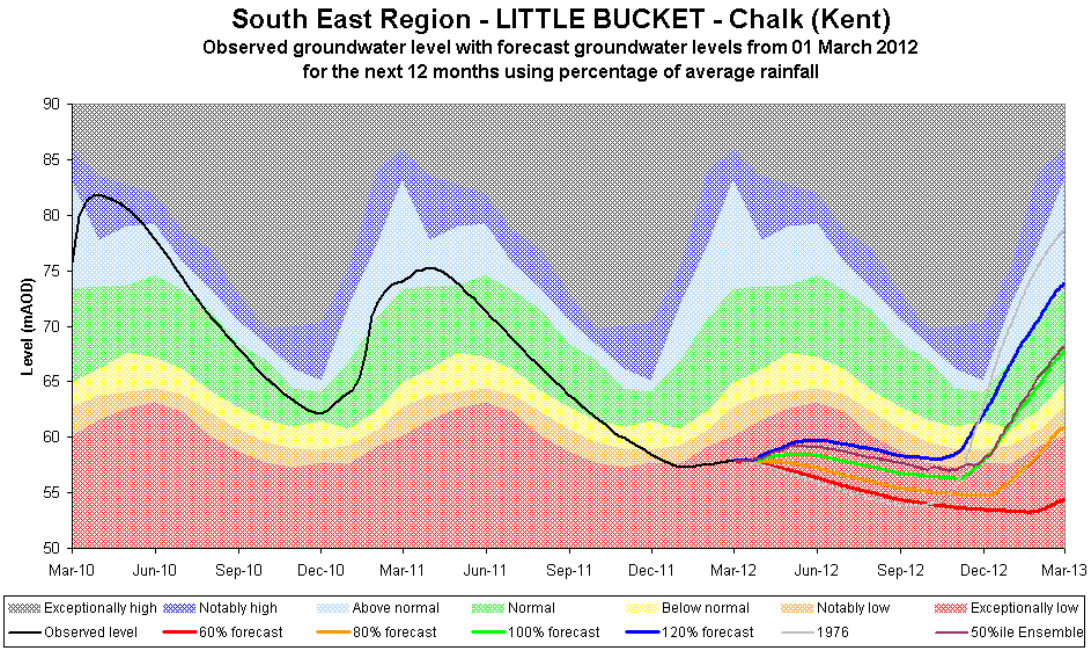
[15] See Figure 5 for locations

A.4 Groundwater Forecasts[16]





[16] See Figure 9 for locations



A.5 Drought risk classification

Drought risk - high	Concerned that the water resources position **will not** have recovered to a position to avoid implementing drought management actions during the spring and summer.
Drought risk - medium	Concerned that the water resources position **may not** have recovered to a position to avoid implementing drought management actions during the spring and summer.
Drought risk - normal	Expect to start April in a normal water resource position and do not expect to undertake any drought management activities during the spring and summer.

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