



NATIONAL RIVERS AUTHORITY

THE DROUGHT OF 1995

A Report to the Secretary of State for the Environment

Environment Agency
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Head Office

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ENVIRONMENT AGENCY



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DROUGHT REPORT TO THE SECRETARY OF STATE

FOR THE ENVIRONMENT

EXECUTIVE SUMMARY

1. This report has been prepared in response to a request from the Secretary of State for the Environment for an urgent report on the current drought as it affects water resources across England and Wales. The Secretary of State has expressed concern that should the dry weather continue for the next few weeks it could mean that water companies have difficulties in maintaining public water supplies. There is also concern for supplies next summer should the drought continue through the autumn and winter. The NRA has therefore been requested to review the current situation and advise on the actions which should be taken.
2. The NRA is the water environmental regulator and is the licensing authority for water abstraction. Routine monitoring of resources by the NRA makes it well placed to advise on the current overall state of resources. The day to day management of resources to meet customer demands is however the responsibility of the water companies. The companies are also regulated by the Office of Water Services (OFWAT) for prices and standards of service.
3. In general terms the present water situation has resulted from a combination of:-
 - an exceptional summer period of dry weather causing water resources to decline;
 - an exceptional period of high demand for water.

Despite the widespread hosepipe bans, the situation is reasonably satisfactory over much of England and Wales. Many of the actions being taken or planned are a precaution against a worsening situation should the dry weather continue into the Autumn or even into the winter period. As indicated below, the most immediate problems are in parts of the Yorkshire Water Area; and further dry weather would soon give problems for South West Water and North West Water.

4. Following a wet winter the overall water resources situation at the end of February appeared good. Reservoirs were full and groundwater levels were high. With the onset of the drought in March and April river flows declined, particularly in the impermeable catchments of the north, west and south west parts of England and Wales. Elsewhere high groundwater levels sustained the base flow of many rivers. Continued dry weather throughout the summer now looks to make the April - August period drier in most parts of the country than the same period in 1976, although that event occurred towards the end of one of the most severe long droughts for much of England and Wales with two hot dry summers with a dry winter in between. Over 50% of rivers are now flowing at half the normal flow for the time of year. Groundwater levels are generally in a better position than in 1976, but parched soils could delay winter recharge leaving groundwater resources in a delicate state next summer.
5. As may be expected, the water environment has been affected in a number of areas. Low flows, high temperatures and low dissolved oxygen have threatened fish and wildlife. The NRA has been active in managing fish rescues and other alleviation measures.
6. The NRA has taken a forward looking approach in this report to the management of available resources and has identified a range of actions which it considers necessary to conserve supplies both for customers and the environment.
7. Options available to manage the drought include measures to manage demand such as:
 - appeals for restraint;
 - improved leakage control;
 - hosepipe and sprinkler bans;
 - ordinary Drought Orders to restrict non-essential use such as watering of public gardens, filling swimming pools, washing all types of vehicles;
 - emergency Drought Orders to restrict the supply of water, using standpipes or rota cuts.

Measures can also be taken to make additional water resources available by the following means:

- authorising abstraction from unlicensed sources;
- changing conditions on existing abstraction licences;
- reducing compensation flows from reservoirs and prescribed flows in rivers.

All Drought Orders require the approval of the Secretary of State.

8. The NRA's approach is to support applications for Drought Orders made by water companies where adequate steps have been taken to manage demand and the impact on the environment is acceptable or could be mitigated. When serious environmental impact is likely, the NRA will object to the proposal and put forward a robust case for the environment. The Secretary of State would then make a decision taking all relevant factors into account.

9. Individual Water Companies will be able to provide more detailed information on the water resources affecting local supply systems. However, the NRA has reviewed the overall situation on information currently available and has formed the following views:

- The worst affected areas include parts of Yorkshire Water, North West Water and South West Water. The situation for each company is given below, together with references to relevant paragraphs of the main report.

- Yorkshire Water. The full range of demand management measures are now in place and a Drought Order application for rota cuts or standpipes in some areas is expected to be submitted to the Secretary of State at the beginning of September. Further Drought Orders to increase available resources are also awaiting determination. Discussions continue with the company to seek further options. (5.2.2)

- North West Water. The situation is not yet as critical as in 1984 which is the driest period on record in that region. The risk to supply can only be improved in the absence of rain by either a significant reduction in demand or by the introduction of Drought Orders for additional resources. Continued dry weather through September could lead to significant water supply problems by the end of the month.

A hosepipe ban is now in place and applications for Drought Orders for additional resources have been submitted. The NRA, however, is strongly of the view that a non-essential use ban should be initiated by the company to reduce demand and avoid or limit potentially damaging Drought Order abstractions from the River Lune, Lake Windermere and Lake Ullswater. It is now understood that the Company are likely to announce an application for a ban on non-essential use on 31 August followed by a Drought Order application to draw water from Lake Windermere on 7 September. (5.3.2)

- South West Water. Storage in the strategic reservoirs, although not yet considered critical, gives cause for concern, particularly for next summer if there is a dry winter. The Water Company should present a management action plan to the NRA to agree the most appropriate conservation measures. (5.6.2)

Local sources for particular communities are also showing signs of failure and the company has submitted seven applications for Drought Orders affecting the environment. The NRA is concerned to ensure that the company undertakes all reasonable measures to alleviate the environmental effects of these Orders including a restriction on non-essential use to reduce demand on the affected sources.

- The drought has not yet significantly affected the water resources of most water companies in Anglian, Thames, the Wessex area of South Western or Southern Regions which are largely dependent on supplies taken directly from groundwater or from rivers naturally fed from groundwaters. There is however no room for complacency and the situation will require close monitoring during the next few weeks and on into the autumn and winter. Low winter rainfall coupled with high soil moisture deficits could threaten supplies next year. Specific actions have however been identified in the report to deal with local concerns.

10. Summary of proposed actions: (further details are contained in the text of the main report)

a) Emergency Drought Orders

- progression of powers to enable rota cuts or standpipes to be made in parts of the Yorkshire Water area. (5.2.2)
- South West Water to apply for Drought Orders for rota cuts or standpipes for parts of Cornwall if drought continues into September. (5.6.3)

b) Drought Orders to manage demand

- progression of Drought Order powers to enable restrictions on non essential use in parts of Cornwall and for North West Water; (5.6.3), (5.3.2)
- consider possible need to ban non essential use for water companies in parts of Southern Region; (5.5.2), (5.5.3)

c) Drought Orders to make more water resources available

- application for, and determination of Drought Order applications by Yorkshire Water, North West Water and South West Water; (5.2.2), (5.3.2), (5.6.3)
- Severn Trent Water to consider need to seek Drought Orders if drought persists; (5.4.2)

d) Water management

- appeals for restraint in the use of water should continue across all Companies; (6)
- NRA and Essex & Suffolk Water to prepare action plan to ensure refill of Essex reservoirs this winter; (5.1.3)
- NRA to consider ways to assist winter refill of Clywedog Reservoir; (5.4.5)
- Southern Water to consider possible transfer scheme from Bewl Water to Darwell; (5.5.2)
- NRA and South West Water to prepare action plan for operation of strategic sources to assist winter refill of reservoirs; (5.6.2)
- detailed monitoring of surface and groundwater resources, especially in water stressed areas, to assist in identifying if further actions are necessary to meet demands this year and to ensure that water resources are in the best possible state for next summer; (5.1.2), (5.5.3), (5.7.2), (5.8.2)
- Anglian Water to investigate operational solutions to falling water levels in Ardleigh Reservoir; (5.1.2)
- Yorkshire Water, North West Water and South West Water should provide weekly statements of the situation affecting their companies to the NRA to agree appropriate conservation measures. (6)
- NRA to determine licence application to increase take from Kielder Reservoir. (5.2.3)

DROUGHT REPORT TO SECRETARY OF STATE

1. INTRODUCTION

This report has been prepared in response to a request from the Secretary of State for the Environment for an urgent report on the current water resources situation across England and Wales.

The Secretary of State's request follows a period of well below average rainfall and a medium term forecast from the Meteorological Office that substantial rain is unlikely before mid-September. The Secretary of State has therefore expressed his concern that, if this forecast is correct, it implies that water companies could have serious problems in maintaining public water supplies. There is concern not only about the immediate future, but also the situation next summer if there is a dry winter.

The Secretary of State has requested the NRA's view on the situation, the adequacy of actions taken so far and the measures which should be applied in future.

The organisations involved in the management of the drought are described below together with an overview of relevant powers.

1.1 National Rivers Authority

The NRA is the water environmental regulator and is the licensing authority for water abstraction.

Licences are granted to water companies and others to meet their reasonable needs taking into account the environmental impact of new developments and the impact on existing users. This system of licensing and the associated planning framework is the principal means of performing the NRA's general duties to conserve, redistribute and augment water resources and to secure their proper use. Specifically these duties do not relieve water companies from any obligation to develop water resources for the purpose of maintaining their water supply systems.

The NRA is also responsible for a number of raw water transfer schemes which make extra resources available for water companies, industry and agriculture. The schemes use rivers as natural pipelines to take water closer to centres of population. Major examples include regulation of the River Severn from Clywedog reservoir, regulation of the Tyne, Tees and Wear from Kielder reservoir, regulation of the River Dee in Wales and the Ely-Ouse to Essex river transfer.

1.2 Water Companies

The day to day management of water supplies is the responsibility of Water Companies. Companies are required to manage supplies in accordance with an operating licence granted by the Director General of Water Services and are responsible for maintaining an efficient and economical system of water supply. Water Companies are responsible for making supplies available to customers who demand them in accordance with the conditions of their operating licences. The NRA requires Water Companies to take water only in accordance with their water abstraction licences unless special arrangements have been made using Drought Orders as described below.

1.3 Office of Water Services (OFWAT)

OFWAT is the financial regulator responsible for Water Company prices, standards of service and performance with further duties towards the customers of Water Companies.

1.4 Powers for Drought Management

Various measures can be taken to manage the demand for water as follows:

- appeals for constraint;
- improved leakage control;
- hosepipe and sprinkler bans;
- ordinary Drought Orders to restrict non-essential use such as watering of public gardens, filling swimming pools, washing all types of vehicles;
- emergency Drought Orders to restrict the supply of water using standpipes, or rota cuts.

Measures can also be taken to make additional water resources available by the following means:

- authorising abstraction from unlicensed sources;
- changing conditions of existing abstraction licences;
- reducing compensation flows from reservoirs and prescribed flows in rivers.

These powers to manage demand and resources are described in more detail in Appendix 1.

The need to apply for drought orders for additional resources is normally a decision for Water Companies. The NRA may also apply for a Drought Order for one of its own river regulation or transfer schemes. One of the NRA's main concerns is that the Orders should not allow river flows or levels to drop so low that fish and wildlife are permanently affected. The NRA would normally support applications made by water companies where adequate steps had been taken to manage demand and the impact on the environment is acceptable or could be mitigated. When serious impact is likely then the NRA would object to the proposal and put the case for the environment. The Secretary of State would then make a decision taking all relevant factors into account.

As from 21 September, the NRA will also have new powers under the Environment Act 1995 to apply for Drought Orders to protect flora and fauna.

2. DEVELOPMENT OF THE DROUGHT

2.1 Summary of the 1995 Drought Situation

The present drought followed a notably wet winter featuring extensive flooding over much of the country. In February groundwater levels were generally well above average and reservoir stocks were uniformly high. In February 1995 the water resources outlook for the summer appeared good.

March and April however, saw the onset of drier than average weather and the start of extended recessions in river flows. Associated with this were the first reports of stresses on water company distribution systems attributed to heavy garden watering. Reservoir stocks began to decline in some smaller reservoirs, but the general resource outlook remained satisfactory.

In May and June significantly below average rainfall, high temperatures and sunshine hours meant that river flow recessions continued unabated and substantial soil moisture deficits began to build in most areas. Rapid declines in run off occurred in impermeable river catchments, though rivers with base flows fed from groundwater held up well. The resource outlook remained generally satisfactory across England and Wales despite surges in peak demand.

Very low rainfall and high temperatures have continued during July and August, with the possibility that August may become the driest on record. This has given exceptional declines in some small reservoirs (notably in parts of the North West, Yorkshire and Cornwall), and significant reductions in many strategic reservoir systems, causing concern to those water companies largely reliant on surface water systems. A number of hosepipe bans and drought order applications have been or will be made by water companies to relieve pressure on dwindling resources.

2.2 Implications for the Future

The worst case scenario for next year would arise if the current below average rainfall were to continue through the winter. If this occurred the exceptional soil moisture deficits would delay the start of aquifer recharge and might lead to some reservoirs not refilling. The existing resource problems that are confined mainly to surface water systems could be expected to spread to those water companies reliant on groundwater if sufficient rainfall were not received.

An increase in environmental problems associated with low flows can be expected if no significant rainfall occurs in the near future.

3. HYDROLOGICAL OVERVIEW

3.1 Rainfall

Rainfall totals for August (to 25/08/95) have been exceptionally low in all NRA regions. (See Appendix 2). Region-wide totals vary between 1.9mm (3.3% of Long Term Average LTA) to 17.1mm (17% of LTA). For England and Wales this represents a mean rainfall total of only 9mm (12% of LTA). It should be noted that in parts of the country rain has fallen since 29 August, but this is not thought to be particularly significant in terms of the England and Wales average.

Figure 3.1 shows a comparison of rainfall in the winter/summer period for 1975/1976 and the winter/summer period for 1994/1995. The winter of 1975 was significantly drier than the winter of 1994, indeed 1994 was a very wet winter, therefore the resource outlook at the beginning of summer 1995 was notably better than that of 1976. However, Figure 3.1 shows rainfall for the summer months of April to August to have been drier in 1995 than in 1976. Looking at this in more detail Figure 3.2 illustrates how in most NRA regions the summer of 1995 has been characterised by similar or less amounts of rainfall than that received in 1976, with only South Western Region having received more rainfall in this period.

3.2 Riverflows

As a result of the very low August rainfall flows in many rivers are generally low when compared to their long term average for August. Within this overall picture, groundwater fed rivers tend to have healthier flows than those draining from impermeable catchments since most aquifers are holding up well. Appendix 3 catalogues the present flow condition of major rivers in England and Wales by giving the current flow as a percentage of the long term average. By assigning these flow data into categories, Figure 3.3 shows that over half the rivers are currently experiencing flows which are less than 50% of the Long Term August Average. Figure 3.3 also shows that out of the 49 rivers listed only 2 are flowing at rates approaching average for the time of year.

Despite these low river flows, a comparison of 1976 and 1995 river flows for August shows that only North West and Northumbria/Yorkshire Regions are presently suffering river flows which are lower than those experienced in 1976, see Figure 3.4.

3.3 Soil Moisture Deficits (SMD)

Table 3.1 below shows estimated Soil Moisture Deficit (SMD) values for the first of August in each NRA region. Notwithstanding a recent change to the way in which SMD data are modelled, these figures are exceptionally high. The lack of rainfall and high summer temperatures have combined to produce this situation. The rainfall experienced during the weekend of 25 August will have done little to reduce these deficits. In order to return soils back to field capacity (the point at which significant aquifer recharge can begin), most regions will require in excess of 100mm of rain during the autumn and early winter.

FIGURE 3.1 RAINFALL - 1976 & 1995 COMPARED

Comparison of Rainfall in England & Wales for
Winter/Summer 1975/76 and Winter/Summer 1994/95

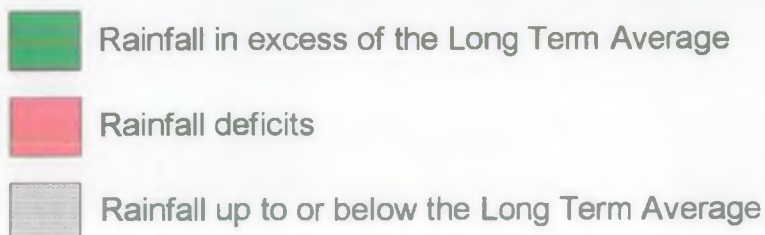
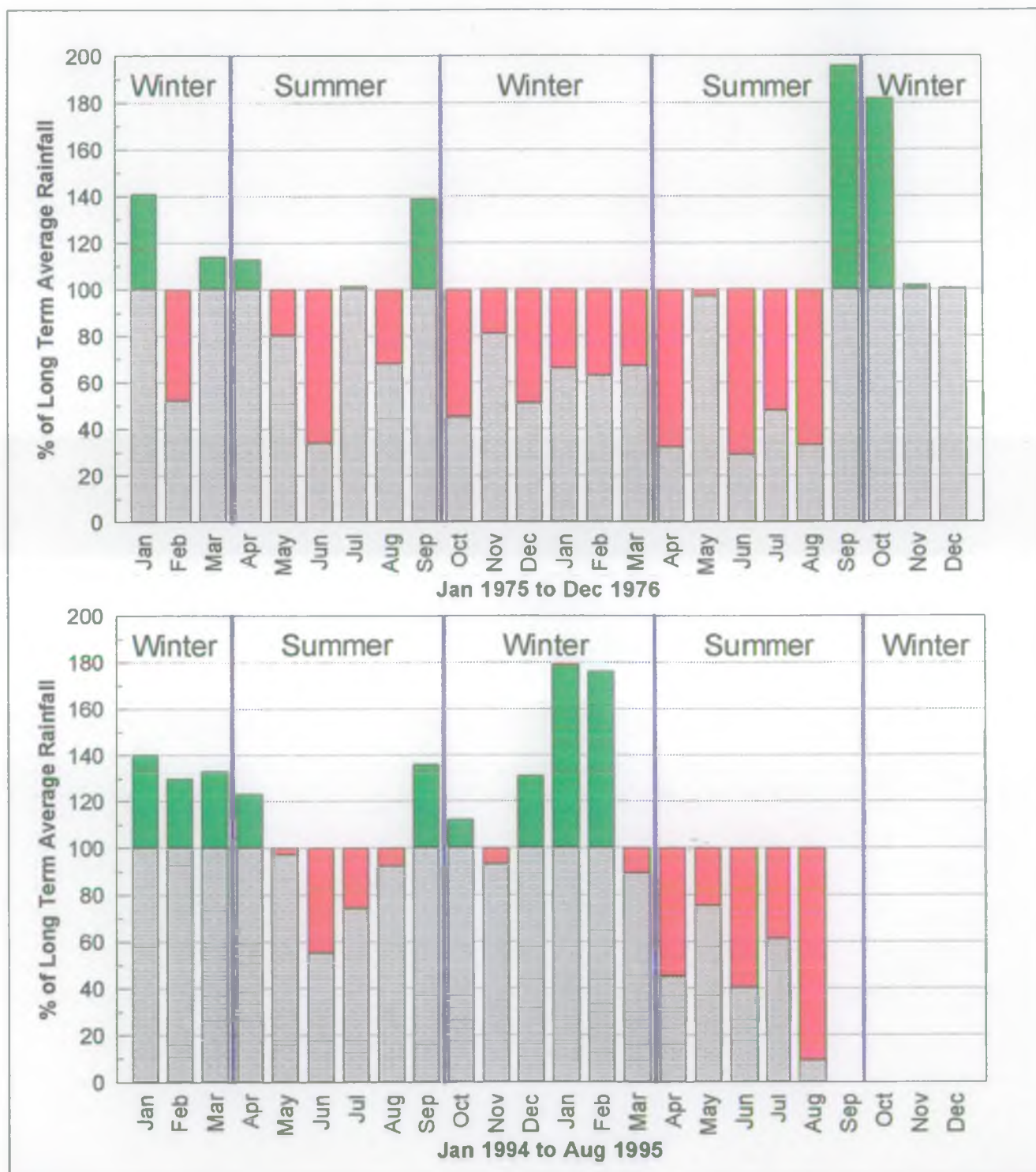


Figure 3.2 Comparison of 1976 & 1995
April to August Rainfall

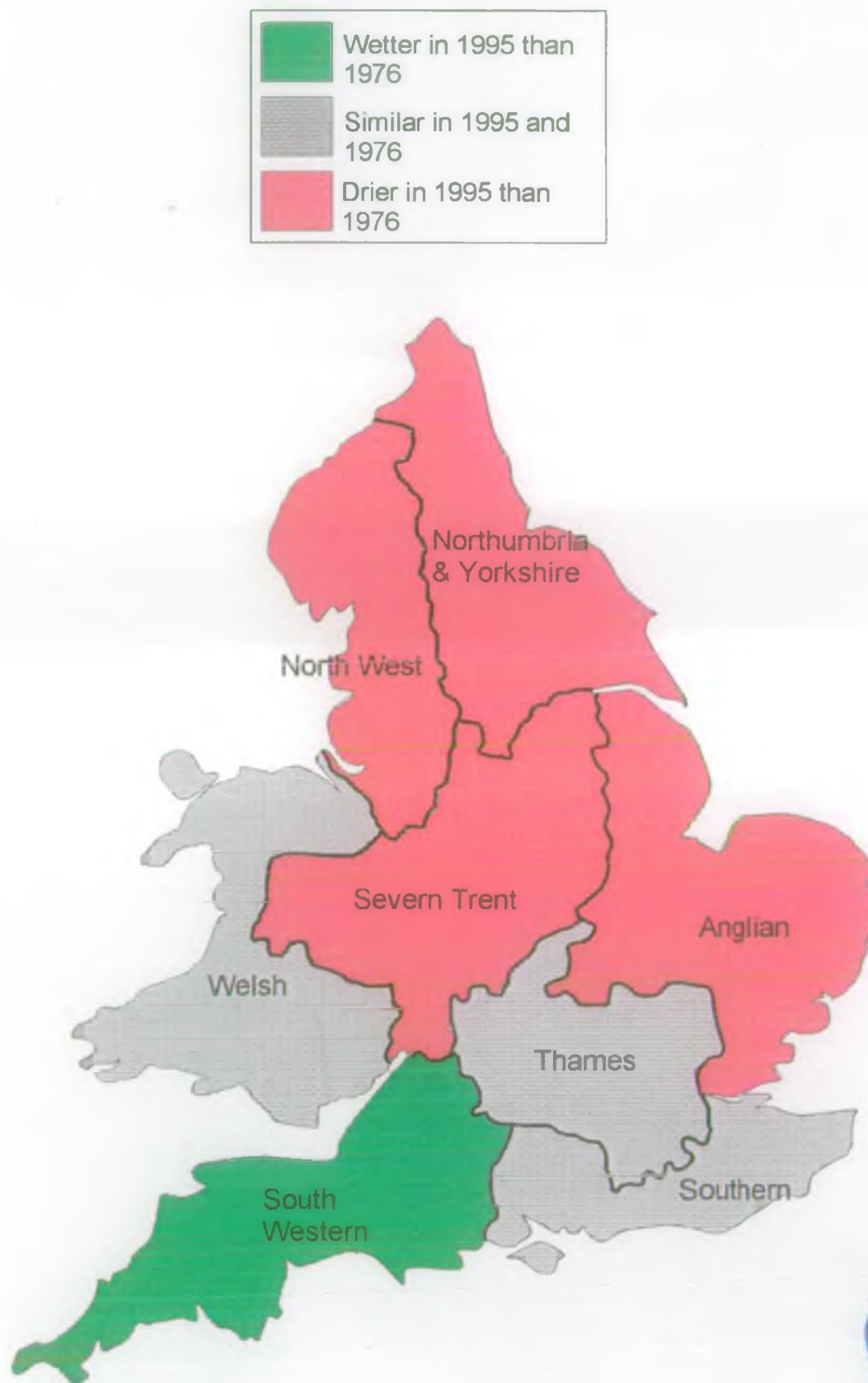
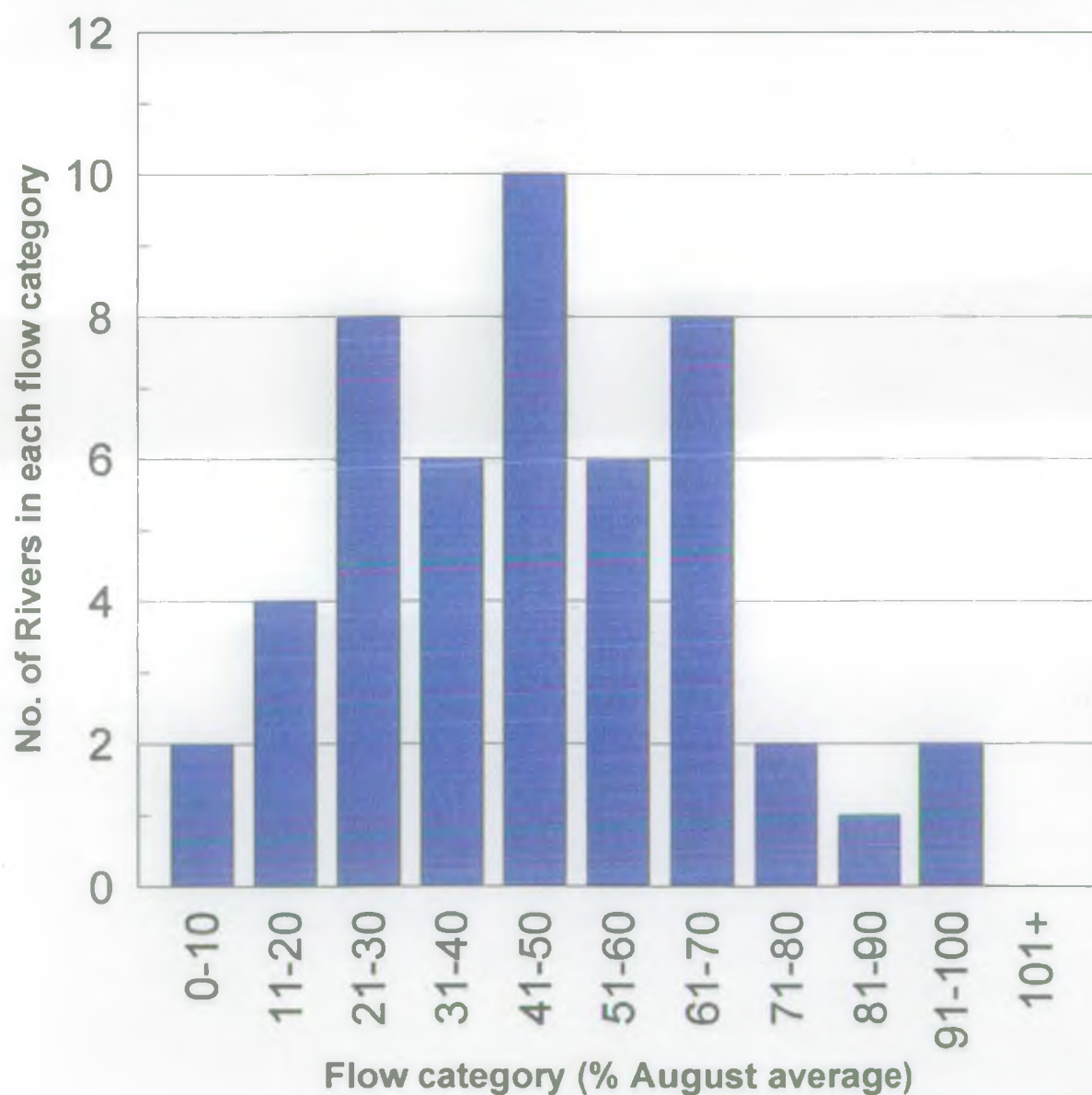


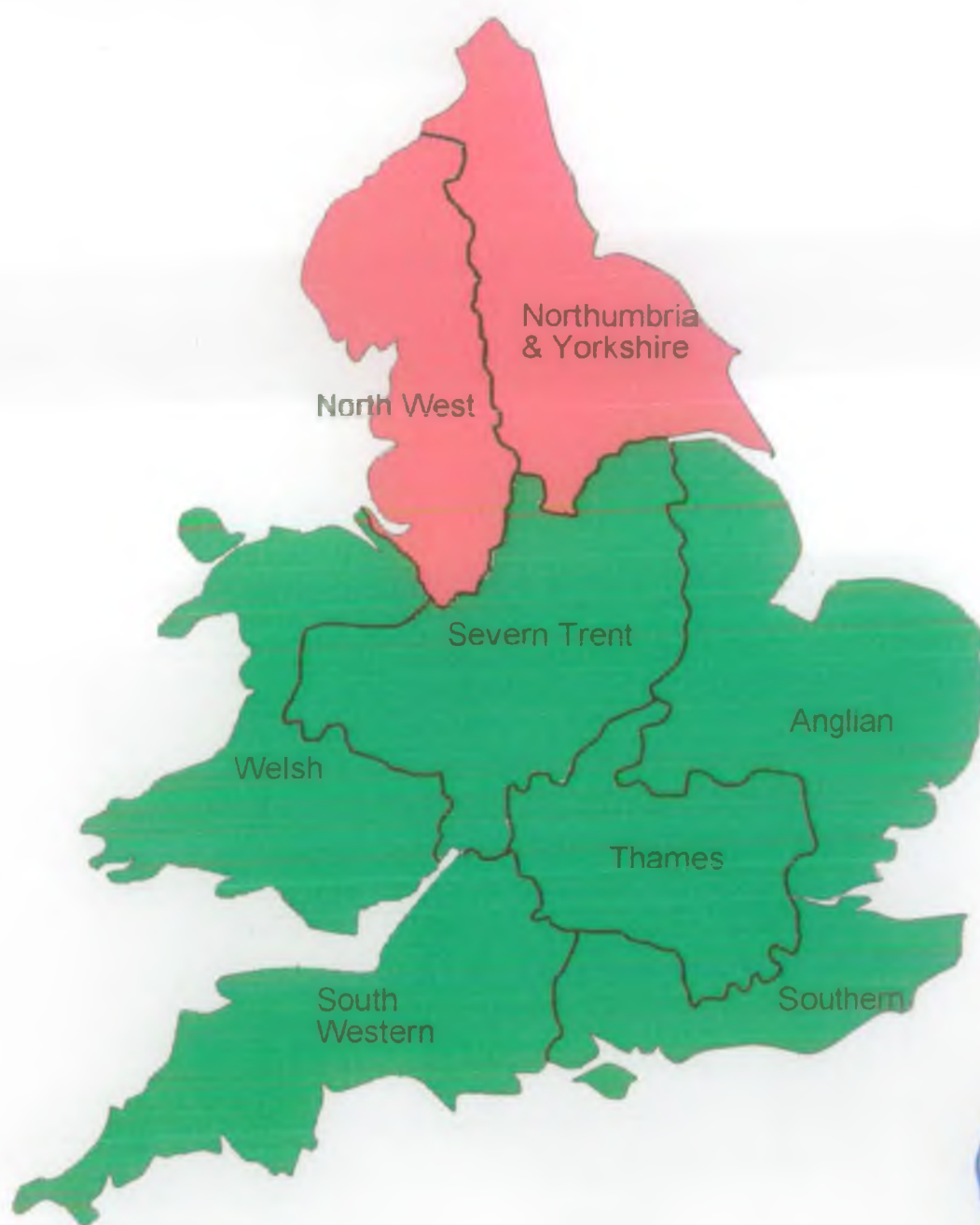
Figure 3.3 Riverflow Distribution

Distribution of late August flow (as % August Average)
in selected major rivers in England & Wales



Number of rivers = 49

Figure 3.4. Comparison of 1976 & 1995
Riverflows for August



N.B. Based on data for selected major rivers in England & Wales



Table 3.1 Estimated Soil Moisture Deficit Values for NRA regions

NRA REGION	AREAL (mm) SOIL MOISTURE DEFICIT FOR GRASS @ 0900 GMT ON 1st AUGUST 1995
Anglian	133
Northumbria/Yorkshire (Northumbria area)	109
Northumbria/Yorkshire (Yorkshire area)	125
North West	93
Severn Trent	122
Southern	139
South Western (South West area)	118
South Western (Wessex area)	129
Thames	129
Welsh	100

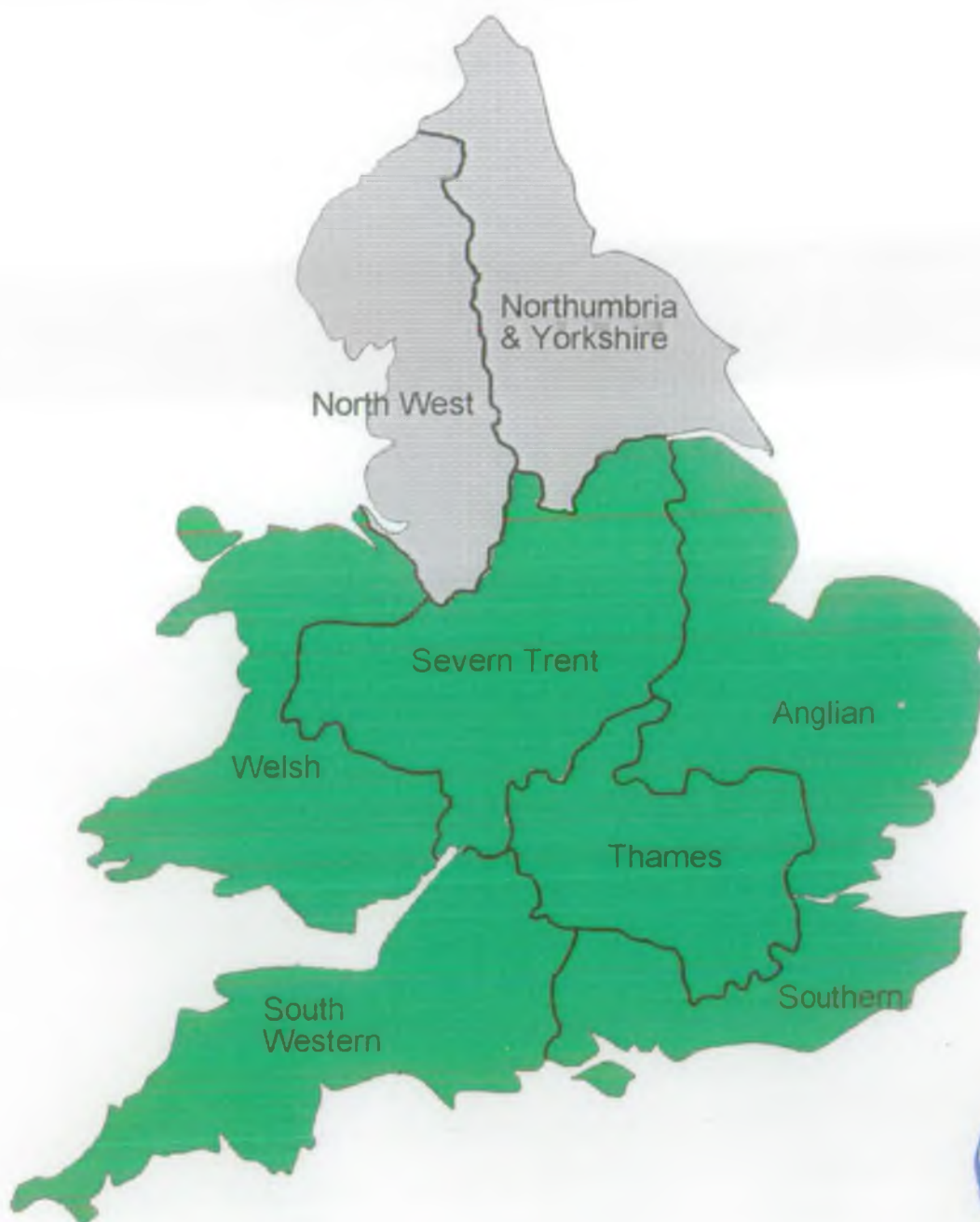
3.4 Reservoir Storage

Current reservoir storage is characterised by wide variation across the NRA regions. Late August stocks range from 25 to 84% full. Many are close to or above 50% capacity but in comparison with the average for the time of year, most are below the average capacity for August. Details of current storage in key reservoirs can be seen in Appendix 4.

Once again a comparison can be made with 1976 experience. Figure 3.5 shows that in most regions 1995 is better than 1976 in terms of reservoir storage for August. It should be noted that the management regimes for some reservoirs has changed since 1976 with many now being operated as part of conjunctive use systems. In some cases this means that the storage is perhaps not drawn down as early now as it was during the 1976 drought. It is also important to note that storage in most major reservoirs was at 100% in the spring of this year whereas in 1976, following the dry winter of 1975, a number of reservoirs were less than 100% full.

It should also be recognised that investment since 1976 has improved the overall resources available eg, Carsington Reservoir and the River Wye transfer.

Figure 3.5 Comparison of 1976 & 1995
August Reservoir Storage



N.B. Based on data for selected major reservoirs in England & Wales



NRA

3.5 Groundwater

Generally groundwater levels are holding up satisfactorily in most locations throughout England and Wales. This is due to the substantial recharge which occurred during the winter months and which led to higher than average groundwater levels at the beginning of the summer. Comparing 1976 groundwater levels with those of this summer, Figure 3.6 shows that in all regions except North West groundwater levels are in a better condition this year.

Nevertheless some isolated groundwater units are now starting to show signs of more serious decline. The primary concern with groundwater is the outlook for the winter; with soil moisture deficits running at 100mm+ in most areas, recharge could be delayed or limited by a winter of below average rainfall. Such a situation would leave groundwater resources in a delicate state for next summer.

Figure 3.6 Comparison of 1976 & 1995
August Groundwater Levels



N.B. Based on data for selected key observation boreholes in England & Wales



4. DROUGHT MANAGEMENT MEASURES

A number of hosepipe bans are now in force and several Drought Orders have been granted or are under consideration. A national summary of the situation is given below:

4.1 Hosepipe Bans

Hosepipe bans are now in force in the following areas:

North West Water:	In force company wide
Yorkshire Water:	In force affecting most of West and North Yorkshire
South West Water:	In force for all of Cornwall and parts of south and west Devon
Mid Kent Water:	In force for 25% of company area
Southern Water:	In force in West and East Sussex and coastal areas
Severn Trent Water:	In force company wide
South East Water:	In force company wide

North Surrey Water and Mid Southern Water also have sprinkler bans in force which affect only those people who have sprinkler licences.

These bans are often introduced because of water distribution problems caused by high peak demand rather than because of a shortage of water resources. The bans are however effective in conserving resources should dry weather continue.

4.2 Drought Orders Relating to Abstraction

Only one Drought Order relating to abstraction is in force:

Yorkshire Water: Increased abstraction from the River Wharfe now authorised

Applications have also been made for the following:

North West Water:	Application made for water transfer from the River Derwent applied for on 11/8/95. Five others also applied for on 23/08/95 relating to reduced compensation flows.
South West Water:	Seven applications made, two for abstraction from unlicensed sources, three further applications for reduced compensation flows and two for reduced prescribed flows.
Yorkshire Water:	Two further applications made relating to abstraction, compensation or prescribed flows.

Possible additional applications may be expected for:

Yorkshire Water:	Four further applications likely in Yorkshire.
NRA:	Considering Drought Order for River Severn.
Severn Trent Water:	Considering compensation substitutions, transfers and groundwater abstraction.
Southern Water:	Considering Drought Order for Bewl Water and Medway
Southern Region	
Water Companies:	Various proposals (see 5.5.3)
South East Water:	Considering application relating to Ardingly and Hartlake.
South West Water:	Further applications likely.
North West Water:	Others under discussion.

4.3 Drought Orders Relating to Supply of Water

Only one drought order relating to the supply of water is in place:

Yorkshire Water: Ban on non-essential use affecting most of West Yorkshire.

Applications have been made for the following:

South West Water: Application made for a ban on non essential use in West Cornwall.

Possible additional applications may be expected for:

Yorkshire Water:	Application for rota cuts expected at the beginning of September.
North West Water:	Likely to apply for non-essential use ban.
South East Water:	Possible application for ban on non-essential use and rota cuts or standpipes.

5. WATER RESOURCES - REGION BY REGION

The following section reports the current water resources situation by NRA region and for each water company, where appropriate. These reports are prepared from the perspective of identifying what is being done to deal with the current situation together with the action required to address the drought problem in future weeks and months.

Details of environmental issues are not included in this report but problems are occurring or are likely to occur if further Drought Orders are sought. These issues are, however, being dealt with by the NRA as part of pre-drought order application discussions with water companies; and mitigating measures will be sought where possible. At times of drought the NRA's stated aim to ensure the correct balance between the needs of abstractors and those of the environment is foremost in the minds of those considering what actions are necessary to conserve essential water supplies.

5.1 Anglian Region - Anglian Water

5.1.1 *General Situation*

The wet start to the year ensured that groundwater levels and reservoir stocks were in a good position at the start of the summer. Groundwater levels are currently below normal for the time of year, but well within the usual summer range. Reservoir contents do not generally give too much cause for concern.

5.1.2 *Measures to be Taken*

There are no formal water saving measures currently in place and this is considered appropriate for the present situation. If the dry weather continues the position during the summer of 1996 could be similar to that of 1990. There were widespread hosepipe bans during that summer, but it is understood that resource and infrastructure improvements have since been made in the areas affected. The situation needs to be monitored by the NRA and Anglian Water during the autumn and winter so that early action can be taken if necessary to conserve resources in the event of a dry summer next year.

Ardleigh reservoir in Suffolk is currently around 60% full, but is falling quickly. It is understood that operational solutions are being investigated by the Water Company to alleviate the situation.

5.1.3 *Other Water Companies in Anglian Region*

Other water companies in the region, including Cambridge Water and Essex & Suffolk Water are in a comparable situation to Anglian Water. A potential problem is the winter refill of Essex & Suffolk Water Company reservoirs which are refilled in part by the Ely-Ouse-Essex transfer scheme. The NRA is to discuss contingency plans with the company to try and avoid a repeat of the Drought Orders required in 1990 and 1991.

5.2 Northumbria/Yorkshire Region - Yorkshire Water

5.2.1 *General Situation*

The drought started in April and has continued to the present with rainfall as low as at any time this century, especially in the west of the region. A severe short term drought of this type causes most problems to water resource systems consisting largely of small reservoirs. As a result the problems being experienced by Yorkshire Water are with their small reservoir sources supplying Bradford, Halifax and other parts of the Pennines.

The water supply problems have been caused by a sharp increase in demand since April coinciding with the start of the drought. Measures by Yorkshire Water to control the demand have included publicity campaigns, hosepipe bans, pressure reductions and other leakage control measures. A Drought Order has also been made to restrict the non-essential use of water. In order to meet demand the company have had to overdraw their reservoir sources. The Company's grid system has not had the capacity to transport water from other parts of the region in sufficient quantities to stop this overdrawing of the reservoirs.

Yorkshire Water recognised the limitations of their grid system to support Bradford following their supply problems in 1994. They planned works to resolve this deficiency, to be implemented over two years. This left them vulnerable in Bradford to an intense drought. Unfortunately this drought has occurred. The leakage rates in Bradford and Halifax zones are recognised by Yorkshire Water as being too high, and the company is now understood to be undertaking improvement measures.

The situation in the reservoirs covering the Pennine area, now under a hosepipe ban and ban on non-essential use (approved 25/08/95), is increasingly serious as shown below in Table 5.1 (as at 29/08/95).

Table 5.1 Key Reservoir Groups

Reservoir Group	Serving	% Stock
Calderdale	Halifax	22 %
Nidd/Barden Grimwith	Bradford	23 % 25 %
Huddersfield	Kirklees	37 %

5.2.2 Measures to be Taken

Yorkshire Water have applied for four Drought Orders and have plans for five more, including an Order for either rota cuts or standpipes, as shown in Table 5.2. Hosepipe bans are in force in the west and north of their region and plans for further bans across the region are being made should the drought worsen. The NRA is not aware of any further action which could be taken by the company in relation to Drought Orders.

It is understood that the Company have increased their efforts to detect and repair leaks. The NRA recommends these actions should continue until an acceptable level of leakage is achieved.

Should the drought continue beyond the middle to late September, rota cuts or standpipes appear to be necessary in Bradford, Calderdale and possibly other Pennine areas. The Company are also experiencing supply problems in their rural areas not linked to the grid. Two of the proposed Drought Orders (numbers 5 and 6) apply to such a location at Thornton Steward. Tankering of supplies is being undertaken now to a number of locations normally fed from springs.

Formal liaison arrangements have been set up with the District Councils and the emergency services in worst affected areas.

5.2.3 Other Water Companies in Northumbria/Yorkshire Region

The remaining companies in the region have sources which are less susceptible to a short intense drought and therefore are not generally experiencing problems. There is one exception in Durham where Northumbrian Water also have several small reservoirs.

These are now very low and the Company has applied for a new licence to abstract from the Kielder transfer tunnel between the Tyne and the Wear to support these reservoirs. With plenty of resource available in Kielder and few perceived environmental issues, the licence should be able to be granted quickly, assuming there are no public objections. Tankering of water to some rural areas normally fed by springs is also taking place.

Table 5.2 Schedule of Drought Orders - Yorkshire Water

Drought Order No./ Application Date	Title
1 26/07/95*	Restriction of non-essential use
2 26/07/95*	River Wharfe
3 18/08/95	Hebden Stream Spring Head Weir (Worth Valley)
4 18/08/95	Silsden
5 Expected 01/09/95	Sand Hutton Boreholes
6 Expected 01/09/95	Stubbing Nook Boreholes
7 Expected 06/09/95	Ogden Mixendon Gorpley Holmestyes Brownhill
8 Expected early to mid- September	Rota Cuts
9 Expected early to mid- September	Chellow Dean (Bradford's reservoir) Sunny Dale Lindley Wood/March Ghyll

* Now approved by Secretary of State

5.3 North West Region - North West Water

5.3.1 General Situation

Whilst the Region had only 60% of average rainfall between April and the end of July, the critical feature was well above average temperatures which led to a high demand for water. Little rainfall has occurred in August resulting in April - August being the driest such period on record in Central and South Areas. In the Lake District conditions equal those in the drought in 1984 which is the driest on record for that Region. Rainfall between April and July was only 42% of average at Stocks Reservoir, 49% at Longdendale and 41% in the Lake District.

Due to the wet winter, reservoir stocks, river and groundwater levels started the drawdown period in a healthy position. Indeed most reservoirs were full during April. Reservoir storage and river levels have deteriorated throughout the summer, though groundwater levels have generally been slow to fall due to the good recharge over last winter.

Storage in the Lake District and Pennines has continued to fall throughout the dry period. The storage has now dropped to 27% (equivalent to 46 days supply), lower than the levels in 1989 but not yet as low as the 1984 situation, which was the driest period on record (1976 was not as severe as either of these in this region). A repeat of the driest conditions on record combined with the high levels of demand would lead to significant water supply problems by the end of September.

Numerous smaller sources are experiencing unacceptably high risks to supply. North West Water is seeking to reduce abstraction by re-zoning from elsewhere, particularly the Lake District which in turn may lead to increased risks in that area. The risk to supply can only be reduced in the absence of rain by either a significant reduction in demand, or by using Drought Order powers. What started as a purely demand driven situation, has become a resources problem due to overdrawing of supplies to meet the high demand.

5.3.2 Measures to be Taken

The NRA has been concerned from the start of the dry period that demand was continuing unchecked and that statements by the water company asking for reduced usage were weak. Throughout August the NRA were asking all water users via direct appeals through the media to be sparing in the use of water. The NRA also urged North West Water to take whatever steps it could to restrict demand. North West Water introduced a hosepipe ban on 17 August to try to combat the high levels of demand. The NRA is concerned that North West Water has not yet introduced a ban on the non-essential use of water and issued a public statement to this effect on 24 August.

North West Water have applied for a Drought Order to temporarily pump a small amount of water from the River Derwent in Borrowdale and to reduce compensation water at Delph, Jumbles, Clowbridge, Longdendale and Rivington (Brinscall and White Coppice) reservoirs. The NRA has not objected to these applications. The NRA did not take these decisions lightly. In the case of Borrowdale it was thought North West Water had done all that they reasonably could to take other measures to support supplies to the village of Grange. The NRA did not object to the compensation water reductions since North West Water had shown reduction in demand since the introduction of the hosepipe ban. By not objecting to these compensation reductions the NRA felt that other applications, which had a more environmentally damaging impact, could be avoided or at least delayed.

North West Water were advised that the NRA would object in principle to any further Drought Order applications that were made in advance of the introduction of a non-essential use ban. The NRA's concern was that opportunities to manage demand were not being taken which might lead to potential environmentally damaging consequences and risks to water supplies later this year. It is now understood that the Company are likely to announce, on 31 August, proposals to apply for a Drought Order to ban non-essential use.

It is understood that North West Water are likely to apply for more Drought Orders should the drought fail to break in the next couple of weeks. These include particularly environmentally damaging abstractions from the River Lune, Lake Windermere and Lake Ullswater. At all three sites, flows are currently below levels at which further abstraction is acceptable. It is the NRA's view that these steps could have been avoided if more effective measures had been taken earlier to constrain demand. Demand is expected to reduce in September, but the introduction of a non-essential use ban is considered to be an urgent measure. The Company advise that an announcement can be expected on 7 September regarding a Drought Order to draw water from Lake Windermere.

5.4 Severn Trent Region - Severn Trent Water Limited

5.4.1 *General Situation*

The Company abstracts water from groundwater sources, rivers and impounding reservoirs in approximately equal proportions. This factor, combined with the regional grid for the distribution of treated water, has reduced the Company's vulnerability to the current drought situation which has put impounding reservoirs under particular strain, but has had little or no impact on output from groundwater.

Nevertheless with no end in sight to the current dry period and notification last week of an impending reduction in permissible abstractions from the River Severn, it was necessary to impose a hosepipe ban to reduce the demand for water. This will conserve supplies in major impounding reservoirs, in North Derbyshire particularly, and allow reductions in river abstractions in line with the NRA requirements.

The overall resource situation is better than in previous droughts due in large part to the better integration of resources and the availability of Carsington Reservoir.

5.4.2 *Measures to be Taken*

There are a number of possible measures which have been discussed with the company that would conserve available storage and hasten winter refill. These would only be contemplated if the drought persists and all would require Drought Orders:

- reduction on compensation requirement from Derwent Valley reservoirs, which would be substituted by releases from Carsington Reservoir;
- partial substitution of compensation water released from Tittesworth Reservoir from groundwater sources;
- transfer of water from the abandoned Thornton Reservoir to boost storage in Cropston Reservoir; and
- potential use of emergency boreholes in the Stourbridge area.

Decisions will be taken on the need to progress Drought Orders at the beginning of September.

5.4.3 *Other Water Companies in the Severn Trent Region*

South Staffordshire Water Company has introduced publicity campaigns to encourage the careful use of water. Options are available to conserve storage if the drought persists and include further abstraction from the River Severn and increased abstraction at an existing borehole at Chilcote.

NRA River Severn Resource System

5.4.4 *General Situation*

This summer the River Severn has supported abstractions in excess of 800Ml/d, predominantly for public water supply. Releases from Clywedog Reservoir, Lake Vyrnwy and available phases of the Shropshire Groundwater Scheme have sustained flows at the Bewdley control point above its prescribed value. Regulation commenced on 17 June and has continued for 71 days. This compares with the design season of the scheme of 100 days. During August the release from Clywedog was close to its maximum 500Ml/d value. However, rainfall towards the end of the month has allowed a modest cutback in total releases. The current storage level in Clywedog Reservoir is 54% (29/08/95) full which is higher than at the same time in the previous drought years of 1976, 1984 and 1989.

5.4.5 Measures to be Taken

For the immediate future there is no problem in meeting demands and maintaining flows at the statutory level. The situation is being kept under review and if the droughts persists and river regulation continues at the existing level into early September it may be necessary to consider making an application for a River Severn drought order to conserve resources and hasten winter refill.

Possible measures include:

- Seek drought order to reduce the statutory minimum flow at Bewdley and limit the maximum daily release to 2% of remaining storage in Clywedog Reservoir each day.
- Measures by water companies to reduce demands on the River Severn by use of alternative sources.
- Measures to protect Severn Estuary water quality during spring tides including:
 - putting limits on pumping from River Severn at Gloucester into the Gloucester and Sharpness Canal;
 - considering making larger regulation releases to coincide with critical spring tides.
- Early completion and commissioning of Shropshire Groundwater Scheme Phase III.

5.5 Southern Region - Southern Water Services

5.5.1 General Situation

The company report the highest ever peak demands in Thanet, Hampshire and Sussex East (Hastings) areas. There is no general resource shortage because chalk aquifer levels in Hampshire, West Sussex and Kent remain above 1990 levels and Bewl Water is well above previous minima. Groundwater levels are close to the average for August, except in local areas of the coastal chalk aquifer in the Brighton area where they have reached previous minima. The relatively healthy state of groundwater is due to the very wet winter in 1994/95, which has also led to the chalk-fed rivers (Test, Itchen, Stour, Western Rother) maintaining flows close to the seasonal normal. Other rivers on predominantly clay catchments have fallen close to previous minima but are not yet below these levels.

In the east, Southern Water Services' Kent area, groundwater levels are at their seasonal average, although Soil Moisture Deficits are greater than normal. The principal surface source, Bewl Reservoir, is 75% full which is close to normal for this time of the year. Groundwater levels are being closely monitored and, if the conditions are right, the new abstraction at Yalding will be used to replenish Bewl Reservoir during the winter. Overall, the Kent situation is satisfactory and, unless there is a significant change, no problems are envisaged.

There is a local resource problem in Sussex East (Hastings) where Powdermill Reservoir is producing very poor quality water and has been taken out of supply, resulting in increased drawdown at Darwell Reservoir. Low groundwater levels have been recorded locally in the chalk around Brighton, causing some operational difficulty. These low levels are believed to be due to the very high demands and limited extent of the aquifer in this area. Demands on the Isle of Wight remain below 1990 levels and no difficulties have been reported. They are well below 1989 levels. Hosepipe bans were introduced in Sussex West (30 June), Sussex Coast and Sussex East (4 August) mainly because of distribution problems, but the Powdermill Reservoir and Brighton chalk levels were contributory factors.

5.5.2 *Measures to be Taken*

The company is discussing a temporary transfer scheme from Bewl Water to Darwell with the NRA. This is in effect bringing forward on a temporary basis a permanent scheme already licensed by the NRA. This transfer will operate from early October.

If the drought persists through September it will be necessary to consider bans on non-essential use and possibly a reduction in the River Medway prescribed flow to conserve Bewl Water, as in 1988 - 1992.

Drought Orders may also be required in the Sussex Coastal area.

5.5.3 *Other Water Companies in the Southern Region*

South East Water's position is reasonably satisfactory at present but relatively fragile due to the Company's reliance on small reservoirs. Record high peak demands have been reported in June and were met without curbs on demand. The company introduced a hosepipe ban on 24 August.

The company will discuss the situation again with the NRA at the end of August. In view of the rapid rate of drawdown in their reservoirs, Drought Orders to curb non-essential use and reduce prescribed flows in the River Ouse may need to be considered if the drought persists through September. South East Water have attempted to obtain increased bulk supplies from Southern Water's Weir Wood Reservoir but without success.

The measures now in place are an appropriate delayed response but the company have few options for increasing supplies. An option not yet brought forward would be a bulk supply from Southern at Bewl Water, but this would also need negotiation with Mid Kent who are stakeholders in the reservoir.

Folkstone and Dover Water Services have experienced peak demands similar to 1990 but have reported no difficulties. Baseline demand through the winter and spring has been lower than earlier years with the ending of the Channel Tunnel water requirements, and this, coupled with the relatively healthy position of groundwater in Kent, has maintained a satisfactory position for Folkstone. If the situation deteriorates as a result of continued drought there are only limited measures available. They include relaxation of the prescribed flow in a local river (River Dour) to increase supplies from two of the company's sources. The NRA would expect a ban on non-essential use to precede this. Given the time of year, a hosepipe ban now looks unnecessary.

Mid Kent Water Company reported highest ever peak demands in June and July and this led to a hosepipe ban on 8 August. This affects 25% of customers. The company depends on the North Kent aquifer and the Medway Scheme (Bewl Water) for the majority of its supplies and both are better placed than 1990.

Difficulties in meeting demands are understood to be due to distribution system limitations and the lack of a strategic trunk main system to move water across the company area. The hosepipe ban was principally in response to these limitations, but also as a precautionary aspect in the event of the drought continuing. Given the relatively healthy state of Kent resources the short term measures so far are appropriate. If rain does not materialise before late September it may be necessary to invoke further measures. These include in addition to a ban on non-essential use, reduced River Medway prescribed flow (as for Southern Water), temporary increases in abstraction at some boreholes and suspension of a small compensation water discharge.

Portsmouth Water Company have reported high demands in June and July but less than 1990 and the company have not reported any difficulty. No hosepipe ban has been introduced. Given the company's healthy resource situation it seems unlikely any further measures will be needed this autumn.

If the drought persists across the region, measures similar to those used in 1989/1990 will be considered. Those were successful in maintaining water supplies and providing protection to the environment through an event that, so far, was more severe. With demands now expected to decline seasonally, the load on water company systems will decrease in the short term. The critical factor for the longer term will be the extent of autumn and winter recharge. Enhanced monitoring of groundwater and other resources should continue through the autumn and winter.

5.6 South Western Region - South West Water

5.6.1 *General Situation*

The water company's area is divided into three strategic water supply zones supplied from strategic reservoirs which represent about 60% of available resources. The current storage in these sources ranges from around 39% to 60%. A hosepipe ban is in force for part of the area supplied, but no other constraints on demand have been imposed. Outside of these supply zones demand is met from local sources of which only 7% are dependent on groundwater. Although storage in the strategic reservoirs is not critical, the NRA is concerned that appropriate conservation measures should be taken to conserve resources in the event of a dry winter.

5.6.2 *Measures to be Taken - Strategic Sources*

The NRA will require the water company to present an 18 month drought action plan for the operation of their strategic sources. These include Colliford and Siblyback Reservoirs, Roadford and Burrator Reservoirs and Wimbleball Reservoir. The plans should show the demand management measures to be used by the company and proposals for drought orders to modify compensation water and prescribed flow conditions in the event of a dry winter and summer.

5.6.3 *Measures to be Taken - Local Sources*

The water resource situation is most critical in the West Cornwall part of the region. Here local impounding reservoirs are of limited capacity, with one already below 30% full. Nearly all river abstractions have been stopped in West Cornwall, due to limits on prescribed flows being reached. This is putting a heavy drain on local impounding reservoirs.

Steps have been taken to conserve resources and hosepipe bans already apply to all of Cornwall and parts of South and West Devon. Five Drought Order applications, for West Cornwall, including one for non-essential use restrictions, are due for a hearing on 30 August. A further three Drought Orders have been made for other parts of Cornwall. All possible emergency sources are being used. Any potential non-licensed source has been investigated. Drought Order applications for two of these are included in the eight applications already made. In the absence of any significant rain or Drought Order approvals, applications for emergency Drought Orders are likely to be required during September.

The NRA is concerned however, that a non-essential use ban has not been applied for to conserve resources in North Cornwall particularly as Drought Orders for Crowdy Reservoir and De Lank river intake have been applied for.

There are also currently local problems caused by enforced reduction in throughput at Littlehempston water treatment works which serves the Torbay area. The NRA recognises the problem that the cryptosporidium outbreak has brought about, but expects the water company to seriously consider bringing in temporary extra water treatment plant to allow full use of this licensed resource.

The result has been to place greater stress on local reservoirs. The prospect of Drought Orders reducing compensation flows from the South Hams reservoir source is of some concern given that the only demand constraint imposed so far is a hosepipe ban.

The NRA will support the Drought Orders to restrict non-essential use: the next four applications will however directly affect the environment. In the absence of proposals for essential environmental monitoring and mitigation measures, the NRA has lodged an objection with the Secretary of State for the Environment. The NRA expect that acceptable environmental protection measures could be put forward by the water company which would allow the NRA to withdraw its objection. The NRA's position on the remaining Drought Orders is under active consideration.

Drought Orders Advertised	Use
1 17/08/95	Non essential use ban for part of Cornwall
2 17/08/95	Leswidden Pool abstraction
3 17/08/95	Reduction in prescribed flow at St Erth, River Hayle
4 17/08/95	Reduction in compensation flow from Stithians Reservoir
5 17/08/95	Reduction in compensation flow from Drift Reservoir
6 24/08/95	Hawks Tor pit abstraction
7 24/08/95	Reduction in prescribed flow on River De Lank
8 24/08/95	Reduction in compensation water from Crowdy Reservoir

5.7 South Western Region - Wessex Water

5.7.1 General Situation

The company uses its groundwater sources which make up 72% of the reliable yield to reinforce areas normally supplied from surface water sources at times of drought. Due to the wet winter and good recharge it seems unlikely that Drought Orders will be required this year. However, this reliance on groundwaters places great stress on certain rivers.

5.7.2 *Measures to be Taken*

In the absence of adequate reservoir refill, the NRA would expect the water company to use river water sources in the spring and early summer next year to conserve reservoir storage. Groundwater will require close monitoring by the NRA and water company and early action taken as necessary to conserve resources in the event of a dry winter and summer.

5.7.3 *Other Water Companies in the South Western Region*

Around 80% of Bristol Water's resources are from surface water sources which include water transferred from the River Severn. No drought orders are expected to be necessary this year. Bournemouth and West Hampshire Water are similarly dependent on surface water sources including large direct abstractions from the Rivers Avon and Stour, neither of which are subject to prescribed flows. Both of these sources are currently in a relatively favourable position compared with 1976.

5.8 *Thames Region - Thames Water Utilities Limited*

5.8.1 *General Situation*

Groundwater levels are currently just below the seasonal average and outputs are generally being maintained. Reservoir storages are currently 66% capacity for London and 68% at Farmoor. The North London artificial recharge scheme is being switched on progressively over the coming weeks to support resources. The Farmoor Reservoir is an important strategic source for the Upper Thames, supplying the Oxford, Swindon and Banbury areas.

As a result of peak summer demands and recent reduction in available abstraction due to river flow constraints, the rate of depletion at Farmoor Reservoir is now giving cause for concern and is being monitored closely.

The target residual flow at Kingston on the Lower Thames is now 300MI/d. In order to balance water resources needs with those of the environment, abstraction from the Lower Thames has recently been reduced to allow freshets to overcome blue-green algal blooms in the lower river and to support the annual salmon run.

5.8.2 *Measures to be Taken*

Thames Water Utilities Limited have made widespread use of press and radio campaigns to encourage customers to use water wisely during the peak demand period. More recently appeals have been made to customers in the Banbury area in order to manage demands because of the very low flows in the River Cherwell, the main supply to the area. Additional supplies are being transferred into the area from Farmoor reservoir placing additional demand on the source.

Appeals are also being made to customers in the Thames Water Utilities Limited supplied areas of Oxfordshire, Wiltshire and Gloucestershire to use water wisely in anticipation of reduced resource availability as a result of flow constrained abstraction at Axeford on the River Kennet which would also increase the demand on the Farmoor system. The water company should consider possible measures to conserve resources at Farmoor Reservoir.

Whilst the resource situation is better than the same period in 1976 and 1988/1992, there remains concern for next year should the region experience a drier than average winter. The situation will require close monitoring during the autumn and winter to ensure appropriate action is taken as necessary to conserve resources in the event of a dry summer.

5.8.3 *Other Water Companies in the Thames Region*

Other water companies in the Thames region including Three Valleys, East Surrey, Sutton District, North Surrey and Mid Southern do not seem to be experiencing significant resource problems. Where appropriate Companies are appealing for restraint or have introduced formal demand management measures such as sprinkler bans. Recent resource developments have been made or are nearing completion in some companies which should help to meet future demands.

5.9 *Welsh Region - Dwr Cymru (Welsh Water)*

5.9.1 *General Situation*

The main sources are reservoirs which still have greater current storage than previous droughts. Reservoirs in the spring were 100% full and despite very little rain in the past five months all the strategic sources are holding up well. There have been local supply difficulties arising from the increased demand, but these have been overcome by tankering water to service reservoirs. Some small sources have been drawn down, but linking of the distribution system, including overland pipelines laid in the past three months, has maintained supplies.

5.9.2 *Measures to be Taken*

The company has advised customers that with careful use of water, resources should be adequate until the autumn. No restrictions on use are in place, nor are any proposed. If the drought continues beyond mid-September the situation would need to be reviewed.

5.9.3 *Other Water Companies in the Welsh Region*

Wrexham and East Denbighshire Water Company's main source is an abstraction from the River Dee, supported by releases from reservoirs at the head of the catchment (Llyn Celyn and Llyn Brenig). Currently, these are 57% (combined) full and in a better state than in previous droughts. There are also a number of abstractions from small surface and groundwater sources across the company's area. These are holding up well and not currently giving any cause for concern. No restrictions are necessary at the moment. Chester Waterworks sole source is an intake on the River Dee. The same comments apply as to Wrexham.

6. NEXT STEPS - A SUMMARY

From Section 5 the key actions required in the Short Term (days to weeks) and Medium Term (weeks to months) by water companies, NRA or Secretary of State (SoS) are summarised below.

Region & Company	Action	Short Term (S) Medium Term (M)	Water Co.	NRA	SoS
Anglian Region					
Anglian Water	Resolve problems at Ardleigh Reservoir	S	✓		
Essex & Suffolk Water	Prepare action plan for Ely-Ouse to Essex reservoirs to avoid need for Drought Order to assist winter refill	S	✓	✓	
All Companies	Enhanced monitoring of groundwater & other resources during autumn & winter	S/M	✓	✓	
Northumbria/ Yorkshire Region					
Yorkshire Water	Determine 2 applications for Drought Orders for additional resources	S			✓
	Apply for 4 Drought Orders for additional resources	S	✓		
	Apply for Drought Order for rota cuts or standpipes	S	✓		
Northumbrian Water	Determine licence application to increase take from Kielder Reservoir	S		✓	
North West Region					
North West Water	Initiate a Drought Order application to restrict non-essential use	S	✓		
	Determine Drought Order application for additional resources	S			✓
	Possible further Drought Order applications for additional resources	S	✓		

Region & Company	Action	Short Term (S) Medium Term (M)	Water Co.	NRA	SoS
Severn Trent Region					
Severn Trent Water	Company to consider need to initiate Drought Order to increase resources	S	✓		
	NRA to consider Drought Order for River Severn river regulation scheme to assist winter refill of Clywedog Reservoir	M		✓	
Southern Region					
Southern Water	Consider temporary transfer scheme from Bewl Water to Darwell	M	✓		
	Consider Drought Orders to restrict non-essential use & reduction in River Medway prescribed flow if drought continues	M	✓		
	Drought Orders may be needed for Sussex Coastal area	S/M	✓		
Other Water Companies	Various measures to restrict non-essential use & reduced prescribed flow if drought continues	M	✓	✓	
All Companies	Monitor groundwater & other resources during autumn & winter	S/M	✓		
South Western Region					
South West Water	Prepare & agree action plan for operation of strategic sources to prepare for 1996	S	✓	✓	
	Determine Drought Order to restrict non-essential use in West Cornwall	S			✓
	Initiate Drought Order to restrict non-essential use in North Cornwall	S	✓		✓
	Determine 7 further Drought Orders to increase resources	S			✓
	Apply for Drought orders for rota cuts or standpipes for parts of Cornwall if drought continues into September	S	✓		
Wessex Water	Enhanced monitoring of groundwater & other resources during autumn & winter	S/M	✓	✓	

Region & Company	Action	Short Term (S) Medium Term (M)	Water Co.	NRA	SoS
Thames Region					
All Companies	Enhanced monitoring of groundwater & other resources during autumn & winter	S/M	✓	✓	
Welsh Region					
Welsh Water	Situation to be monitored	S/M	✓	✓	

The above actions are based on information provided by water companies or otherwise available to the NRA. If the drought persists, the situation could change rapidly, especially in those areas supplied from small isolated reservoirs. North West, South West and Yorkshire Water should therefore provide detailed statements to the NRA on a weekly basis to ensure the best possible understanding of the developing situation and agree appropriate conservation measures.

Appeals for restraint in the use of water should continue across all Water Companies.

7. ACTION IN THE LONGER TERM

7.1 Demand Management

In its national strategy '*Water: Nature's Precious Resource*'¹ the NRA demonstrated that with reasonable success in achieving demand management the need for new strategic water resources such as major reservoirs or transfers can be delayed for 20 years or more. The NRA and the Government consider that it is best to make proper use of the resources already available before developing new ones. This means:

- getting leakage down to economic levels;
- examining the economic levels of metering;
- seeing where spare resources can be used;
- public awareness of water conservation; and
- attention to wider conservation in water byelaws and building codes.

The NRA will not normally grant further abstraction licences for additional water to a water company unless leakage levels are at, or steps have been taken to achieve an economic level of leakage. This policy is supported by the Government in its recently published report '*Water Conservation*'². The NRA is encouraged that although mandatory targets will not be set as it had recommended, recent statements by the Secretary of State have made it clear that if realistic targets are not set by the companies themselves and appropriate action taken, then the Government will set mandatory targets by law. In addition the Environment Act 1995 gives the Director General new powers to require companies to achieve overall standards of performance which should mean that companies take their targets seriously. Consideration also needs to be given as to whether the current OFWAT approach of measuring efficiency by comparison of the costs of water delivered provides sufficient incentive to reducing leakage.

Leakage is an area where in knowledge, the UK is without doubt a world leader, but in practice with some of the highest leakage rates in the developed world. The NRA feels that greater effort is needed in applying the knowledge to the problem. This should be done as follows:

- Water Companies to make vigorous efforts to reduce leakage in line with their new duty to promote the efficient use of water.
- Water Companies to implement the recommendations of Managing Leakage (published by the National Leakage Control Initiative of the WCA/WSA).

- Water Companies to set their own leakage targets, to be agreed with NRA/OFWAT. Leakage targets could form part of the companies Asset Management Plan (AMP) submissions.

The NRA has also promoted the use of selective domestic metering at economic levels in areas where resources are under stress as an alternative to further abstraction. Average water savings of 11% have been achieved in small scale metering trials and savings of 21% have been made on the Isle of Wight. Metering has also been found to have a significant effect on peak demand reducing peaks by up to 30% in years with hot, dry summers. The UK is almost unique in Europe in that households are not generally charged for water by the amount used. The NRA does however recognise the social implications of domestic metering and tariffs which need to be considered by OFWAT and the water companies. The recent Government report '*Water Conservation*' advises that the economic and environmental benefits of metering should be incorporated in all applications for NRA abstraction licences.

The NRA is planning to publish shortly its own report '*Saving Water: The NRA's Approach to Water Conservation & Demand Management*'. This consultation document reviews current water conservation and demand management practices both in the UK and overseas and establishes the potential and priorities for saving water in England and Wales. The report then considers elements of a water conservation and demand management strategy, possible responsibilities and how such a strategy may be put into practice. It is planned to publish the report at the end of September; but key conclusions will be available as soon as the NRA's Board has approved the report on 7 September.

Of interest in relation to the longer term outlook is the impact of the recent protracted departures from the hydrological norm on the reliable yield of water resource systems. The increased frequency of extreme hydrological events such as droughts and floods is just one possible impact of climate change. The NRA is aware of the need to gain a deeper understanding of potential climate change impacts as they relate to water resources and is currently involved in a number of research initiatives. However, further detailed work is required and the NRA will be looking to ensure that relevant research is undertaken.

References

1. NRA (1993), *Water: Nature's Precious Resource* (NRA, Bristol)
2. DoE (1995), *Water Conservation : Government Action* (DoE, London)

APPENDIX 1

Appendix 1

RESTRICTIONS ON WATER USE

1 Hosepipe Bans

Under Section 76 of the Water Industry Act 1991, water companies are entitled to impose temporary hosepipe bans, without having to obtain third party sanction, subject only to giving public notice in the local press. These may apply to the whole or only part of the water company's area, and prohibit the use of hosepipe bans for, say watering private gardens or washing private motor cars.

Contravention of a ban is a summary offence carrying a maximum fine of £1,000.

2. Drought Orders

Drought orders are made by the Secretary of State for the Environment, under Sections 73-80 of the Water Resources Act 1991, on the application of either the NRA or a water company.

There are two types of order: Ordinary Drought Orders and Emergency Drought Orders.

Ordinary Drought Orders

If the Secretary of State is satisfied that, due to an exceptional shortage of rain, a serious deficiency of water in an area exists or is threatened, he may make an ordinary Drought Order authorising the abstraction of water not otherwise permitted or varying an existing abstraction order.

A Drought Order may also authorise the water company to prohibit or limit the use of water for any purpose specified in order. This will typically include such activities as the watering of public parks, filling of swimming pools, the washing of all types of vehicles, the cleaning of buildings, etc. 72 hours notice of the bans must be given in the local press.

An ordinary Drought Order may initially be made for a period of six months, and may not be extended to run for more than a year.

Emergency Drought Orders

If the Secretary of State, in addition, satisfied that the deficiency of water is likely to impair the social or economic well-being of the population, he may make an Emergency Drought Order restricting the supply of water to standpipes and water tanks. Such an Order may only be made initially for three months and may only be extended as to run for a maximum period of five months.

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APPENDIX 2

Appendix 2

Rainfall data for 1995

NRA REGION		Rainfall data for 1995 in mm & as a % of the 1961-90 Long Term Average. August data as at 29/8/95 supplied by the Met Office.							
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
North West	mm	210	148	88	28	62	38	74	12.1
	%	174	190	93	39	83	47	87	11.3
Northumbrian	mm	123	107	60	38	53	39	34	10.2
	%	146	181	86	68	85	65	52	12.5
Severn Trent	mm	128	88	52	20	49	14	30	5.5
	%	183	163	85	36	83	24	57	8.2
Yorkshire	mm	125	100	65	26	44	27	29	5.3
	%	158	172	96	44	73	45	49	7.2
Anglian	mm	98	62	51	16	31	25	25	3.4
	%	196	168	109	35	65	49	52	6.2
Thames	mm	136	83	50	18	37	18	29	1.9
	%	213	184	89	36	66	32	59	3.3
Southern	mm	163	112	58	18	25	22	29	4.5
	%	204	207	92	34	46	40	61	7.9
Wessex	mm	179	111	57	34	53	19	24	15.7
	%	206	171	81	64	87	34	47	23.7
South West	mm	230	163	92	50	55	23	49	15.4
	%	167	161	93	72	76	33	70	18
Welsh	mm	235	181	84	36	72	25	61	17.1
	%	164	187	79	45	88	32	79	17
England & Wales	mm	157	111	64	27	48	26	38	9
	%	178	176	89	45	75	40	62	12

APPENDIX 3

Appendix 3**August river flow data for major rivers in
England & Wales as % of August Average**

Region/River	Gauging Station Location	%August Average
ANGLIAN		
Bedford Ouse	Offord	65
Witham	Claypole	30
Waveney	Ellingham	95
Welland	Tinwell	27
Stour	Langham	52
Nene	Orton	41
NORTH WEST		
Ribble	New Jumbles Rock	13
Derwent	Camerton	9
Eden	Sheepmount	19
Lune	Caton	6
Mersey	Ashton Weir	32
NORTHUMBRIA & YORKSHIRE		
Yorkshire Ouse	Skelton	28
Aire	Fleet	45
Calder	Methley	50
Wear	Chester-le-Street	64
Derwent	Buttercrambe	62
Wharfe	Flint Mill	37
Tees	Low Moor	65
Tyne	Bywell	28
Swale	Crakehill	46
SEVERN TRENT		
Trent	Colwick	52
Teme	Tenbury	22
Severn	Bewdley	36
Avon	Evesham	55
Dove	Marston	43
Derwent	Derby	49

Region/River	Gauging Station Location	%August Average
SOUTHERN		
Stour	Horton	70
Medway	Teston	56
W Rother	Iping	65
Test	Chilbolton	80
Itchen	Easton	85
SOUTH WESTERN		
Exe	Thorverton	21
Tamar	Gunnislake	39
Bristol Avon	Bathford	46
Dart	Austins Bridge	25
Stour	Throop	45
Axe	Whitford	56
Hampshire Avon	Knapp Mill	63
Taw	Umberleigh	15
River Tone	Bishops Hull	55
THAMES		
Thames	Kingston	54
Kennet	Theale	66
Coln	Bibury	75
Cherwell	Enslow	34
Lee	Fieldes Weir	65
WELSH		
Wye	Redbrook	12
Dee	Manley Hall	83
Tywi	Capel Dewi	26
Usk	Trostrey	41

APPENDIX 4

Appendix 4.**Reservoir storage data for August 1995**

(Various days, week ending 29 August)

REGION	RESERVOIR	% FULL	AVERAGE FOR TIME OF YEAR (% FULL)
Anglian	Rutland	66	88
	Grafham	74	90
	Abberton	60	67
	Hanningfield	52	76
Northumbria/Yorkshire	Nidd/Barden	23	Not available
	Calder Group	22	Not available
	Kielder	82	87
North West	Haweswater & Thirlmere	27	60
	LCUS*	25	46
	Longdendale	34	59
	Macclesfield	37	57
Severn Trent	Clywedog	54	78
	Derwent Valley	45	68
	Tittesworth	32	64
	Vyrnwy	48	73
	Blithfield	44	71
Southern	Bowl Water	75	66
	Ardingly	49	81
	Weir Wood	56	83
	Darwell	39	53

REGION	RESERVOIR	% FULL	AVERAGE FOR TIME OF YEAR (% FULL)
South Western	Wimbleball	48	77
	Roadford	47	81
	Colliford	60	82
	Chew Valley	60	51
	Clatworthy	35	60
	Stithians	37	63
	Burrator	39	74
Thames	Farmoor	68	96
	Lee Valley	66	85
	Thames Valley	66	82
Welsh	Celyn	34	Not available
	Brenig	84	Not available
	Brianne	56	57
	Llysyfran	51	Not available
	Ystradfellte	58	Not available
	Elan Valley	48	Not available
	Big Five	34	47

*Lancashire Conjective Use Scheme