

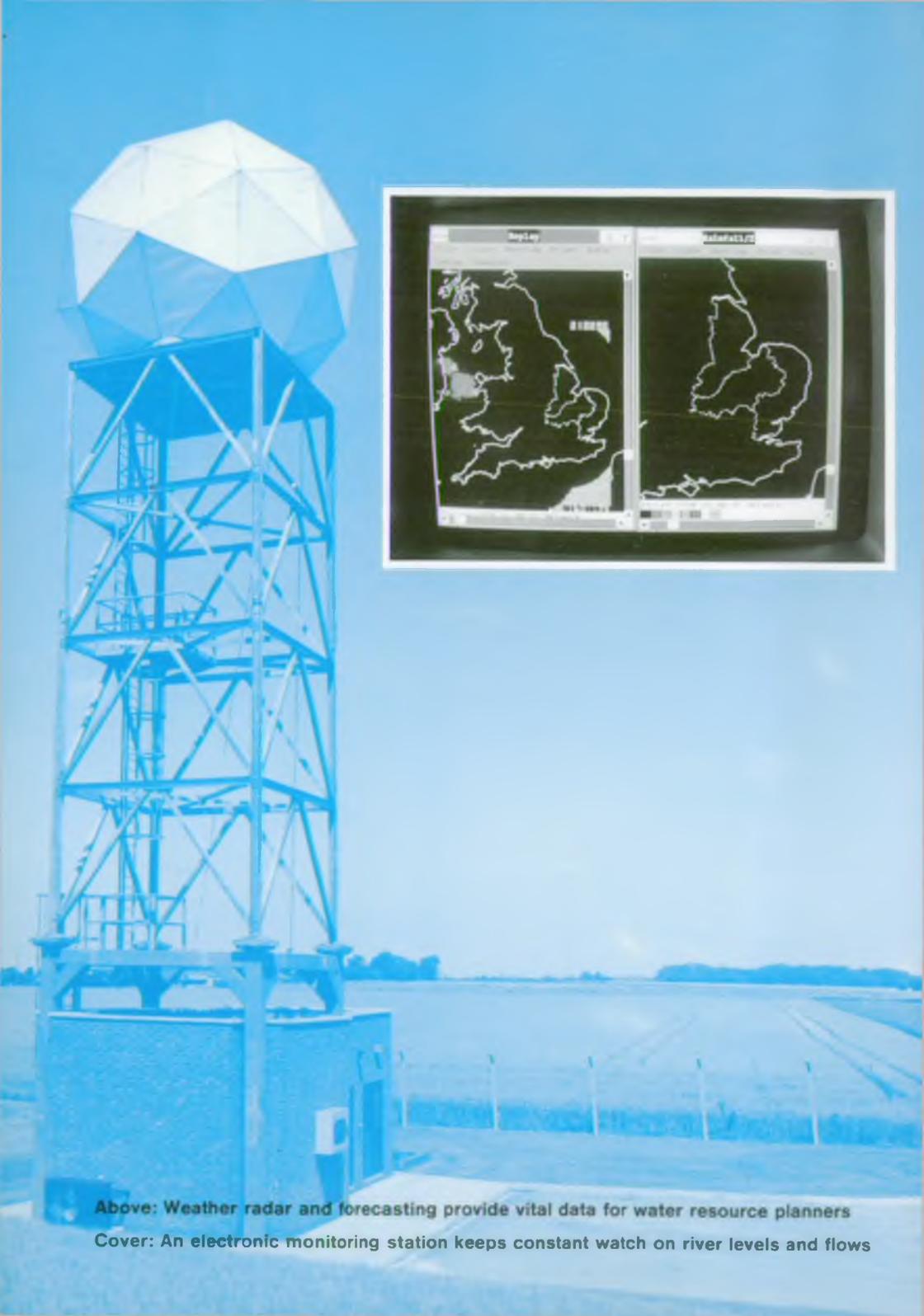
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MANAGING WATER RESOURCES



NRA

*National Rivers Authority
Anglian Region*



Above: Weather radar and forecasting provide vital data for water resource planners

Cover: An electronic monitoring station keeps constant watch on river levels and flows

Managing Water Resources

Water is vital to life. Making the best use of this essential resource, conserving it and balancing the competing needs of abstractors and of the water environment is a prime responsibility of the National Rivers Authority (NRA).

The Water Act 1989 imposes on NRA the duty 'to conserve, redistribute or otherwise augment water resources . . . and to secure their proper use'.

This complex role includes:

- continuously measuring rainfall, evaporation, river flows, and groundwater levels at many locations.
- analysing these data to establish the availability and reliability of water resources.
- controlling abstractions from rivers and groundwater.
- predicting future water demands of all kinds.
- planning, and sometimes building and operating, works to augment water resources to keep pace with the ever-increasing demands.

THE ANGLIAN REGION

The NRA has 10 regions, covering England and Wales. This leaflet describes the water resources of the Anglian region, the largest, flattest and driest, which stretches from the Humber to the Thames in eastern England.

ENVIRONMENT AGENCY

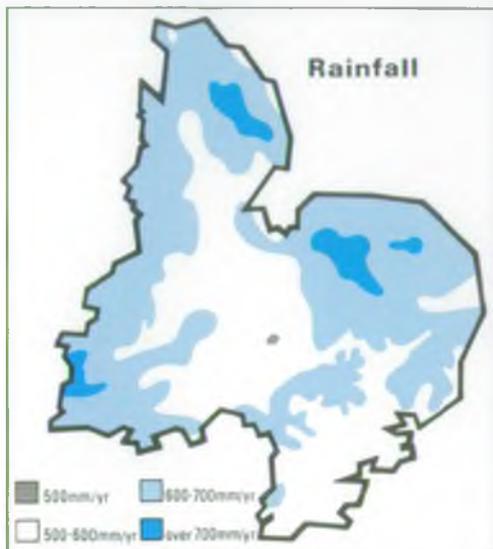


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ANGLIA'S WATER RESOURCES

★ Rainfall and Evaporation

Rainfall is the sole source of fresh water, and the Anglian region has less of it than any other part of the country – under 600 mm/yr on average, compared with 940 mm/yr in the rest of England and Wales. However, it is 'effective rainfall' (rainfall minus evaporation) which sustains rivers and groundwaters and provides all our water supplies. This table shows that on average Anglia has only one third of the effective rainfall enjoyed by the rest of England and Wales, and that in a severe drought year this can fall to *one eighth*:



	Average Year		Drought Year*	
	Anglia	Rest of England & Wales	Anglia	Rest of England & Wales
Rainfall – mm/yr	595	940	463	770
Evaporation – mm/yr	448	453	423	450
Effective Rainfall mm/yr	147	487	40	320

*Defined as happening, on average once in 50 years.

★ Water Resources

Rain that falls on the ground either evaporates, or is stored in water bearing rocks (called aquifers), or drains away to the sea by rivers and streams.

Rainfall in the region is divided equally between summer and winter, but evaporation is concentrated in the summer. As a result it is normal for the area to experience a 'drought' every summer, in the sense that evaporation exceeds rainfall, soils dry up, river flows dwindle, and storage of winter water is necessary to maintain supplies.

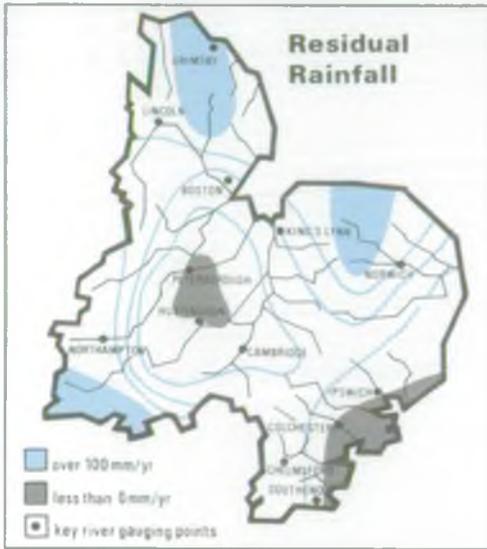
★ Sources of Water

Water supplies are obtained in various ways using the natural passage of the water over and through the land. In the Anglian region, underground sources and abstraction from rivers are used in approximately equal proportions.

★ Underground Sources

Rain water falling on the chalk, limestone and sandstone aquifers, which make up much of the region's geology, penetrates deep underground, forming large natural reservoirs.

These aquifers are Anglian's



directly from rivers. However, because summer flows are so low it is usually necessary to abstract river water in the winter and pump it to storage reservoirs to secure a reliable supply. There are hundreds of such reservoirs in the region, mostly providing water to irrigate farm crops in the summer. A smaller number of much larger pumped-storage reservoirs provide public water supplies to about half of the region. The largest of these, Rutland Water, is as big as Lake Windermere and is claimed to be the largest man-made lake in Europe.

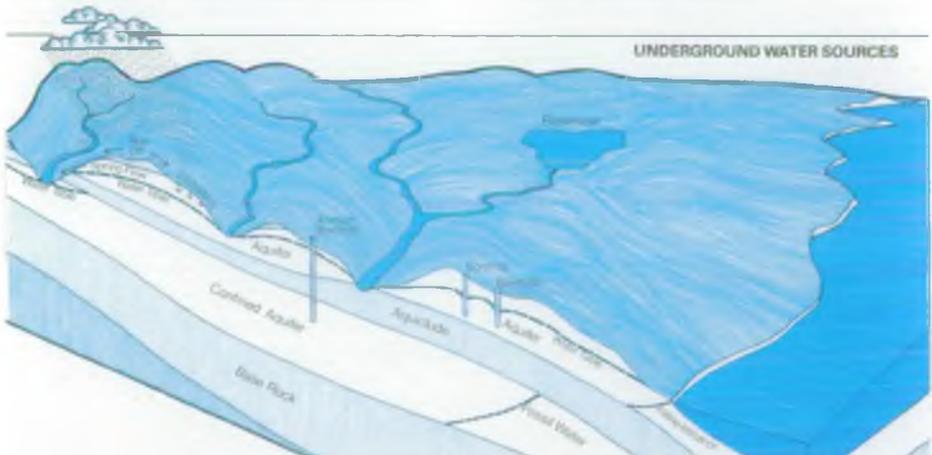
principal water resources asset, and thousands of wells and boreholes have been sunk into them to exploit their supplies. However, many rivers and streams depend on spring flows from the aquifers, and care must be taken not to allow over-abstraction of groundwater to deplete the rivers, particularly their low summer flows.

★ **Surface Water Sources**

Water may be abstracted and used

WATER QUALITY

★ The region's rivers are mostly slow, flat and rich in nutrients. In dry summers sewage and trade effluents form a substantial proportion of their flows and rigorous effluent treatment and control have to be practised. Sophisticated water treatment technology ensures that these surface waters can be treated for public supply and other uses. Ground waters are generally of higher quality and need less treatment.



CONTROL OF WATER ABSTRACTION

The Water Resources Act 1963 lays down strict rules governing the use and management of water resources, and these must be applied by the NRA. The most important general rule is that (with minor exceptions) no one can take water from any source unless they have a licence to do so.

There are nearly 10,000 licences in the region mostly held by private abstractors taking and using water on their own premises for their own purposes.

All these licensed users have protected rights to take water. The NRA must safeguard these rights before granting any new licences.

Two other groups of water users have protected rights but do not need to hold licences. They are:

- ★ an individual drawing water for use in their own household.
- ★ a farmer using surface water on his farm (but not for spray irrigation).

Licence holders normally pay charges according to their licensed quantity, at rates fixed annually by

the NRA. These charges pay for the NRA's work of managing and augmenting water resources.

NEW ABSTRACTIONS

The region's water resources are already largely committed particularly in summer, but in most areas the NRA can still grant new licences providing they would not derogate existing protected rights. It must also consider the impact of any proposed licence on the character of the rivers and their surroundings, and on existing uses of the river, bearing in mind in particular the low flows experienced in summer months. The NRA must balance the available resources with applicants' needs in light of the rights and expectations of other water users.

In the case of groundwater it will almost certainly be necessary for the applicant to drill and test-pump any new boreholes so that the availability of water, and the potential effects on neighbouring abstractors and on the environment can be assessed.

For their part applicants are required by law to publish notices about their proposals in local newspapers and the *London Gazette* and make details available for public inspection for a month before submitting

Purpose	Number of Licences	Licensed Quantity MI/d*
Agriculture (other than spray irrigation)	4,359	75
Spray Irrigation	3,987	328
Industry	779	499
Water Supply	324	2,465
Total	9,449	3,367

*MI/d = Megalitres per day: 1 MI is approximately 220,000 gallons.



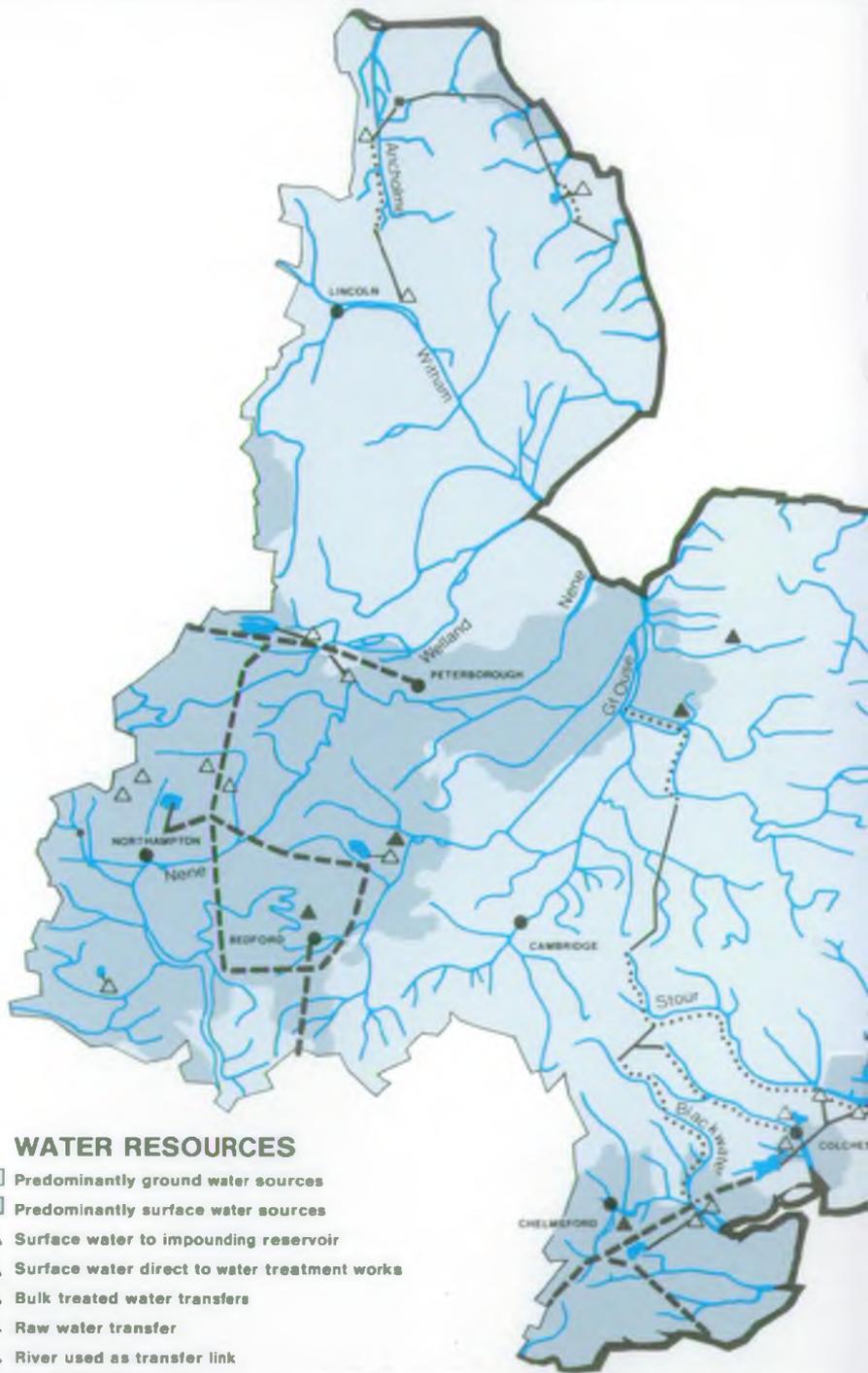
Finding new sources – a borehole is drilled

them to the NRA. Anyone can write to the NRA about the proposals and their views will be taken into account. If an applicant is dissatisfied with the decision of the NRA they can appeal to the Secretary of State for the Environment. Once a licence has

been granted, it gives a legally protected right to abstract. However it does not guarantee that water will be available at all times, nor that water quality will be suitable for the intended use.

Careful measurement of river data







Large scale storage in reservoirs

WATER FOR PUBLIC SUPPLIES

Public water supplies are provided by the water companies, not by the NRA. The companies obtain water from rivers or boreholes under licence in the same way as any other abstractor. They are responsible for their own intake works and for any artificial storage (reservoirs); NRA is responsible for managing the resources available at the intake or borehole to ensure their reliability does not fall below acceptable limits. This often involves operating agreements between NRA and water companies to ensure proper co-ordinated management, but without prejudicing NRA's wider responsibilities to other abstractors and to the environment.

The region's population exceeds five million and is the fastest growing in the country. Water use per person is increasing constantly and total public supplies are forecast to increase from 1,750 MI/d to over 2,300 MI/d by 2011.

Because of Anglia's climate, large volumes of water storage have been developed over the years. As a result public water supplies are in general *not* vulnerable to the short 'one-

summer' droughts which affect other parts of the country. In Anglia 'droughts' of this kind are commonplace, and whereas a very dry summer is harmful to agriculture because soil water storage is limited it takes at least a 'summer-winter-summer' drought to create supply difficulties.

Hosepipe bans are sometimes necessary because of inadequate pipe capacity at times of peak demand, but this should not be confused with a shortage of water at source.

About half of public supplies are from underground. The rest come from river intakes mostly supported by reservoirs, notably at Abberton, Hanningfield, Pitsford, Grafham, Covenham, Ardeleigh, Alton and Rutland.

Water quality issues which constrain the use of some water resources for public supplies are:

- (a) Iron, manganese and fluoride concentrations in some ground waters.
- (b) Saline intrusion from the sea affects both surface and groundwaters in some coastal areas.

- (c) Risks of pollution of some relatively shallow boreholes.
- (d) Increasing concentrations in both surface and groundwaters of agrochemicals and in particular of nitrates due largely to the effects of intensive agriculture.

The water companies are responsible for all aspects of water treatment for public supply and have to ensure that all their supplies are treated to the relevant potable standards.

The region also contains several thousand private domestic wells.

These are unlicensable but they have protected rights which must be taken into account in any water resource development.

WATER FOR INDUSTRY AND AGRICULTURE

In round figures demands for industry and agriculture could rise from 500 MI/d to over 1,000 MI/d by 2011, most of the potential increase being for power generation and for spray irrigation. Half of the UK's spray irrigation takes place in the Anglian region, mostly at times and places where water is scarcest. In the Anglian climate, irrigation helps to improve both the quantity and quality of many crops, and to stabilise prices by sustaining production in drought years.

There are also very substantial, but largely unquantified summer demands to maintain drain levels in the Fen areas. These have to be allowed for in the assessments of water resources available for other purposes.

Major demands for spray irrigation



WATER FOR THE ENVIRONMENT

Water is needed 'in the river' for purposes of amenity, ecology, fisheries, navigation and effluent dilution. In addition, groundwater supports spring flows and wetlands, many of which are designated as sites of special scientific interest. All of these are potentially vulnerable to over abstraction, and indeed some rivers and wetlands have been affected historically by 'licences of right' over which NRA's predecessors had no control. Increasing abstraction can exacerbate the situation.

The NRA's approach to environmental water is two-fold:

1. To prevent any further deterioration, new abstraction licences are issued, where appropriate, subject to what are known as minimum residual flow conditions (or 'hands-off flows'). Such residual flows have been established at many locations throughout the region.

In addition, new licences are often issued on a temporary basis where there is reasonable doubt as to the potential effect on the environment.

2. To improve the situation by the operation of river to river transfer schemes, and by river support pumping from groundwater. This latter system is being progressively developed to optimise the use of the chalk resources in the central and eastern parts of the region.



AUGMENTING WATER RESOURCES

The task of meeting increasing demands for water involves not only sensitive management of the water cycle but also large scale engineering works to make water available when and where it is needed.

In the Anglian region this has resulted in the development of a number of schemes which conserve, distribute and/or augment water resources, such as:

Ely Ouse-Essex System

Water flowing to the Wash in the River Ely Ouse is diverted in a reverse direction into existing channels built to cope with winter flood waters. It is then pumped through 20 kms of two and a half metre diameter tunnels, and 24 kms of pipelines into the Essex rivers Stour and Blackwater. From these it is re-abstracted and pumped to water company reservoirs, as well as supporting river flows and meeting other local demands en route. Both the Ely Ouse and the Essex rivers can be further augmented by pumping from groundwater, and the combined system is the most complex of its kind in the country.

Trent-Witham-Ancholme System

Rapidly rising water demands in North Lincolnshire in the early 1960s, particularly those arising from industrial expansion along the South Humber Bank, prompted development of the Trent-Witham-Ancholme system. These demands are supplied from the River Ancholme, and to ensure adequate flows in the Ancholme in dry spells,

water is transferred to it from the River Witham, which in turn is augmented by pumping water from the River Trent into the Fosdsdyke Navigation Canal which carries it to the River Witham. Again the system also supports the rivers and helps meet local abstraction demands en route.

Great Ouse Groundwater Scheme

Flows in the Ely Ouse and its tributaries the Cam, Lark, Little Ouse and Wissey, and many important wetland sites, are subject to pressure from the increasing demands for water in the area. Fortunately this area contains a major part of the regional chalk aquifer, and a comprehensive scheme has been devised to develop the aquifer not only for water supplies, but also to artificially sustain low flows in the rivers. The scheme may eventually comprise 300 boreholes, of which over 50 are already constructed. These will meet increasing public supply needs, provide river support pumping to compensate the river for abstractions, maintain wetland sites, allow more flexible use of raw water and augment river flows for public supplies in Essex.

Other Groundwater Schemes

Similar, though smaller scale, groundwater schemes exist to make maximum use of groundwater resources, and at the same time to sustain and support flows in the rivers Waveney, Bure, Deben, Stour, Blackwater and others.

SUMMARY

The Anglian region has scarce water resources combined with high and rising water demands and an increasing public perception of environmental water needs.

The purpose of the NRA's work of water resource management is to make water available at the right time, in the right place, to the required quality, with the requisite degree of reliability and proper safeguards for existing rights, while at the same time continuing to balance the region's many competing water demands.



Environmentally sensitive sites require skilful resource management