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ENVIRONMENT AGENCY

The Environment Agency is one of the world's most powerful environmental watchdogs, regulating air, land and water. As 'guardians of the environment' the Agency has legal duties to protect and improve the environment throughout England and Wales and in doing so contributes towards 'sustainable development' - meeting the needs of today without harming future generations.

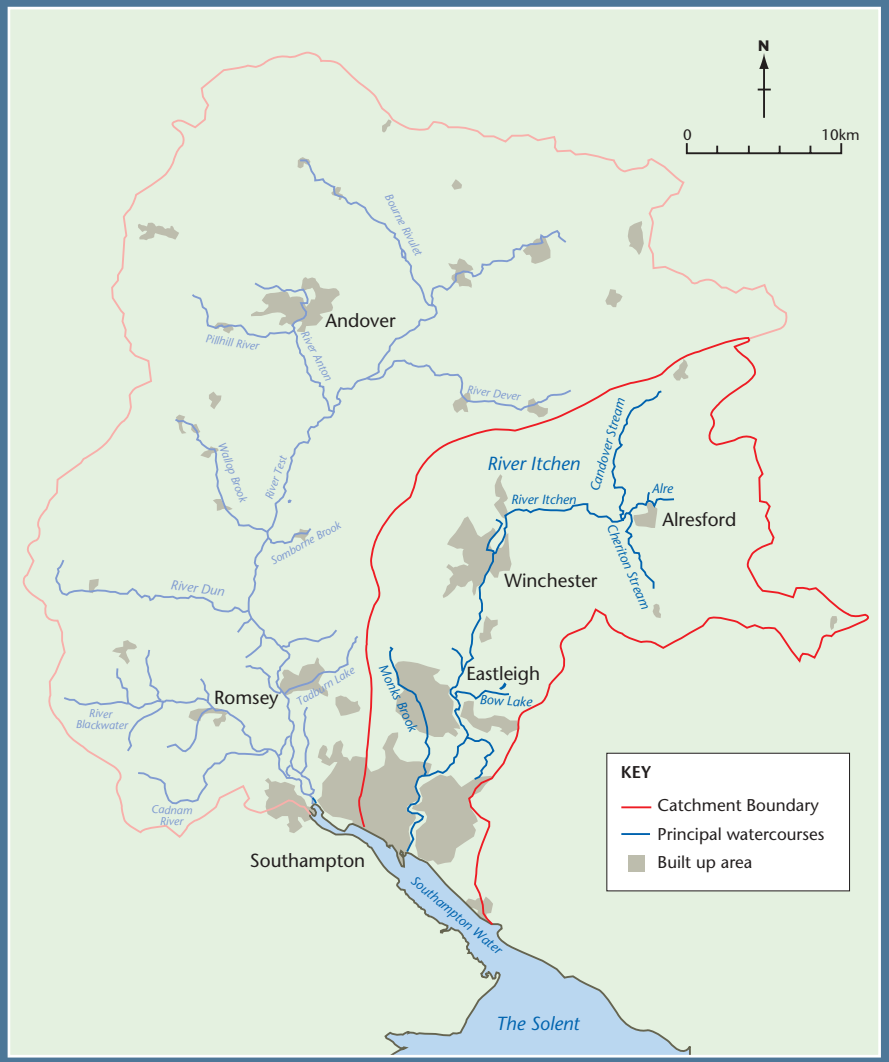
Created by the 1995 Environment Act, the Agency started work in 1996. It is officially a 'non-departmental public body', which means that the organisation works for the public and has specific duties and powers.

Nationally, around 15 million hectares of land are managed by the Agency along with 36,000km of rivers and 5,000km of coastline, including more than 2 million hectares of coastal waters.

There are eight regional offices, which are split into 26 area offices. Southern Region covers the counties of Kent, Sussex, Hampshire and the Isle of Wight.

Front cover photograph:
Main picture - River at Itchen Abbas
Top inset - Bishopstoke sluices
Bottom inset - City Mill and Bridge

The River Itchen



The River Itchen

Along with its sister river the Test, the River Itchen is regarded as one of the finest chalk streams in the world. It flows for 45 kms (28 miles) from its source at New Cheriton to Southampton Water. Designated as a SSSI and candidate 'Special Area of Conservation' (cSAC), and noted for its high quality habitats, the river supports a range of protected species from the otter to the tiny brook lamprey. Anglers from all over the world are attracted to the River Itchen for the quality of its fly fishing.

Itchen at Gaters Mill

From source to sea

The River Itchen rises on the upper chalk as three spring-fed tributaries; the Candover Stream, the River Alre, and the Cheriton Stream. These flow from three points of the compass to unite just west of New Alresford.

From Alresford the river flows west to Winchester where it collects the Nuns Walk Stream from the north-west. It then flows southwards through the outskirts of Eastleigh collecting a small tributary, the Bow Lake, which drains from Lower Upham to the east. The river enters the tidal estuary at Woodmill where it joins the Monks Brook at a medieval salmon pool. This principal tributary drains the expanding conurbation of Chandlers Ford, Eastleigh and Swaythling.

The total catchment area of the Itchen is 400 sq.km, of which 360 sq km is chalk. In addition Monks Brook drains a clay catchment of 49 sq.km.

For much of its length the River Itchen is divided into two or more separate channels running parallel to each other, including the Itchen Navigation connecting Winchester with Southampton, with many structures such as weirs and sluices used to regulate water flows and levels.

Downstream of Woodmill the Itchen is tidal and joins the River Test at 'Dock Head' to become Southampton Water. The ancient centre of Southampton and the original docks, home of the ocean liners from the Titanic to the Queen Mary II, is the peninsula between the Test and Itchen.

River Itchen, Cheriton

River Itchen, Cheriton

Perennial source, Cheriton

Itchen Bridge, Southampton

History

The Hampshire rivers were once tributaries of the ancient Solent River. It flowed eastwards from the River Frome to join the sea somewhere near Littlehampton in times when the Isle of Wight was part of the mainland. A sea level rise of 45 metres some 10,000 years ago disrupted this river system when the sea breached a ridge between the Isle of Wight and Purbeck. Southampton Water is a drowned, low-lying valley dating from that time.

The River Itchen has experienced a number of changes in use over the years that reflect the changing social and economic demands placed on the river, particularly in the lower catchment. Three historic uses of the river gave rise to this multiplicity of channels; the harnessing of water power for milling, the use of water meadow systems to promote the early growth of pasture and the development of the Navigation.

Traditional industries relying on waterpower included wool processing, flour and grist milling, paper making and tanning. The last working mill ceased operation in the 1960's.

Winchester Cathedral

City Mill and Bridge - Winchester

The Romans first diverted the river around Winchester City walls as part of a water supply system and to transport waste away from the City.

Centuries ago the water meadow system was developed to provide farmers with a lush, early crop of spring grass to feed to livestock. The river water was diverted across the meadows through a network of channels, water level control structures, aqueducts and drains to ensure the water meadows were flooded for several months each year. This skilled operation was carried out by 'drowners' to irrigate the meadows and protect the pasture from frost.

Watercress Beds

This process not only provided benefits for the farmers but also filtered-out much of the silt and sediment washed off the upland fields.

The reduced demand for early pasture and the labour-intensive nature of the water meadows system led to it becoming unprofitable and eventually being abandoned. The legacy is a network of streams and carriers that were once part of the channel system.

Besides the creation of water meadows there has been a long tradition of growing watercress, which is still an important present day economic activity. Part of a local railway, the 'Watercress Line', has been restored as a steam driven tourist attraction although the watercress is now transported by road.

The salmon fisheries are probably more than a thousand years old with private fishing rights pre-dating the Magna Carta. It is believed that the Salmon Pool at Woodmill dates from this period.

Between Winchester and Eastleigh the former Itchen Navigation flows parallel to the river. In the 12th century the river was possibly navigable for small craft up to Alresford. An Act to make the river navigable for boats and barges was passed in the reign of Charles II. Subsequently a new navigation channel was cut from Woodmill to Winchester under Acts of 1792, 1795, 1811 and 1822. This channel fell into disuse many years ago but is still an important part of the river system from Winchester to Bishopstoke.

With its partners, the Environment Agency is planning work to preserve the Navigation for another century using a grant from the Heritage Lottery Fund.

Woodmill causeway, Woodmill

Itchen navigation, Otterbourne

Geology

The character of the River Itchen owes much to the geology of the catchment. The underlying rocks form part of the northern flank of the geological structure known as the Hampshire Basin. Its rocks slope gently, or dip, from north to south. The oldest rock is the Cretaceous Chalk, a porous, fine-grained limestone which outcrops over the whole of the valley to the north of Eastleigh. Rain soaks into the Chalk rock rather than running off and then gradually percolates through the pores and small fissures in the Chalk under the influence of gravity until it runs out from springs in the valleys. The Chalk forms a natural underground reservoir or aquifer providing the river with reliable flows of high quality water.

It is the Chalk with its natural storage capacity that gives the river its special character. The river has few tributaries and these fall on a right angle grid pattern, reflecting the structure of the underlying Chalk.

From Eastleigh to the sea the river flows over younger sands, silts and clays of Tertiary origin. These are much less permeable than the Chalk and hence the river has more tributaries in this area.

The landscape of the area was shaped by the last Ice Age 10,000 years ago. The precise origin of the dry valleys in the rolling Chalk Downs is still uncertain, but they were probably formed by stream erosion when the ground was frozen, causing rainfall to run over the surface rather than soaking into the chalk. However, springs break out in many of these valleys during very wet winters. This occurred during the 1930's, 1960's and recently the winter of 2000/2001, the wettest on record, flooding some roads, fields and houses for many weeks.

Water Quality

Chalk streams such as the River Itchen have naturally high water quality because they are fed by springs from the aquifer, where water has been filtered through the Chalk. The crystal clear streams have almost constant temperatures varying little with the seasons. The high natural quality of Chalk streams coupled with their natural alkalinity increases their ability to cope with the discharge of effluents.

This ability is important in South Hampshire where there has been continuing development based on good communication links. Increases in population have resulted in large sewage treatment works discharging directly to the lower reaches of the river. The largest is the Chickenhall sewage treatment works at Eastleigh, which has a consented, dry weather flow discharge of up to 30,000 m^3/day. Effluent at Winchester and Alresford is discharged to the ground using the capacity of the Chalk to treat it to a high standard. The Environment Agency sets stringent conditions on the quality and quantity of discharged effluents to ensure the river and groundwater quality are preserved to high standards.

The Environment Agency routinely monitors chemical water quality at eighteen sites and biological water quality at twenty-two sites across the Itchen catchment. The results are assessed against the General Quality Assessment (GQA) scheme and range from Grade A (very good) in most of the main river Itchen to Grade C (moderate) in some of the smaller tributaries. The Environment Agency has a programme of planned work to identify the sources of problems in the poorer stretches.

Water Resources

The development of South Hampshire was based historically on rail and sea links, but more recently on the improved road network and high quality environment. It has generated a continuing demand for water for domestic and industrial use.

The Water Resources Act 1991 gives the Environment Agency the duty to ensure that water resources are conserved and managed properly. Consequently the Agency through its abstraction licensing system balances the needs of the environment with those of the water user. The Itchen is heavily used for water supply and the maintenance of this balance is becoming challenging in the face of continued development.

The long term average rainfall across the catchment is 870mm per annum.

Southern Water intake at Otterbourne

In the summer evaporation always exceeds rainfall, but in the winter the rain percolates down through the Chalk and moves underground to springs in the river valley, a process that may take many months.

Underground reserves of water saturate the Chalk, which is known as an aquifer. The Environment Agency collects information about the levels of groundwater by taking measurements from over 80 wells and boreholes in the catchment every month. Flows are measured at six gauging stations along the river and its tributaries.

Prolific Chalk streams such as the Itchen and Test provide much of the water used in Hampshire. More water is pumped by Southern Water Services Ltd from boreholes sunk into the Chalk aquifer at Otterbourne. There are smaller groundwater abstractions at Totford, Easton and Twyford. The groundwater quality is extremely high and little treatment is required.

Water abstraction licences must be managed in such a way that sufficient flow rates and water velocities are maintained in the River Itchen. This is to ensure that river habitats are sustained and wildlife, recreational and amenity uses of the river are preserved.

Applications for abstraction licences are made to the Environment Agency which then considers the environmental impacts of a proposed abstraction and its effect on other lawful water users. In order to protect river flows, restrictions are attached to licences to ensure that water is only taken from specified locations and at times when it can be spared.

Abstraction licensing was introduced by the Water Resources Act 1963, which was the first statute to control the amounts of water taken from rivers and groundwater. At that time established abstractors were given 'Licences of Right' to continue taking water at the existing rate and at the same location.

One important consideration is whether water will be exported from the river system or recycled within the catchment. Some uses such as spray irrigation or bottling mineral water are almost entirely consumptive.

The Candover Scheme

In the case of public water supply and general industry, most water in South Hampshire is lost to the sea via coastal sewage works.

Watercress growing and fish farming return almost all of the water close to the point from which it was taken.

To preserve the river from the wide range of demands for water and for the disposal of effluents during droughts, the Environment Agency and its predecessors developed two groundwater schemes to boost riverflows when necessary. These utilise water from boreholes in the Candover and Alre catchments.

The schemes use groundwater to augment river flows only in very dry summer months. By siting boreholes at sufficient distance from the river and piping the pumped water to the river, next winters rainfall can be 'borrowed' to enhance low summer flows.

Groundwater schemes are the only viable option on permeable catchments and do not suffer from evaporation, supply high quality cool water and their development does not affect the landscape.

Climate change has been evident during the past thirty years. Summers have been hotter and drier whilst winters have been wetter although with a shorter winter groundwater recharge period. Consequently climate change is a risk to available water resources and is considered one of the key pressures on this function of the Agency in the River Itchen catchment.

Flooding along the Weirs, Winchester

Flood Defence

The Environment Agency has duties to protect people and property from risks of flooding from rivers and the sea. It has the powers to provide an efficient and effective flood defence service on 'main river' and issues accurate and timely flood warnings to alert people of impending risks. To fulfil this the Agency manages watercourse maintenance programmes, constructs flood alleviation schemes and assesses applications for new development projects and their impact on the floodplains, river and sea defences.

The course of the River Itchen is almost entirely artificial having been altered in the past by the construction of mills, the Itchen Navigation and water meadows. The river is less subject to floods from storms than most other rivers because the Chalk aquifer absorbs rainfall and delays discharge for sufficient time to reduce peak flows. However, the River Itchen floods when groundwater levels are high after several months of steady rainfall. Groundwater levels respond two or three months after rainfall in some parts of the catchment.

High groundwater levels lead to high flows in the tributaries and hence into the main channels. Flooding of property can then occur either directly from the river itself, from groundwater or from drainage problems caused by the high levels. The artificially altered channels and development close to the river contribute to the risk of flooding on the Itchen.

The Environment Agency and riparian owners regularly cut weed to control river levels, especially when rapid growth of water plants in spring and early summer coincides with peak flows.

Any development in a flood plain is at risk from flooding and this includes some of the old buildings particularly in the centre of Winchester. The Environment Agency provides constant advice to local planning authorities to avoid further building on the flood plain.

Groundwater Flooding

During the wet winters of 2000/01 and 2002/03, groundwater levels reached the surface and springs broke out in many previously dry chalk valleys. Houses, roads, schools and fields were flooded for weeks or months and much damage and misery was suffered by residents across the catchment.

Although there are no defences to prevent the water table rising to the surface, the Agency has advised on measures that can be taken to prevent it entering houses, such as widening culverts and maintaining the existing drainage system. A question remains over whether these events will become more frequent as the climate changes.

Groundwater and river levels are constantly monitored. The information gained is used to provide a flood warning information service.

Fisheries

Along with its sister river the Test, the River Itchen is rightly regarded as one of the finest chalk stream trout fisheries in the world. The upper reaches above Easton are particularly coveted as high quality wild brown trout fisheries. Further downstream the river has a long history of management, where the channel has been maintained to provide optimum conditions for stocked trout and fly-fishing.

Groundwater in the Crypt of Winchester Cathedral

Anglers at Riverside Park

Historically the river has been heavily modified for milling, navigation and to support the network of water meadow systems. In more recent times, riparian fisheries interests, often with the help of full time river keepers have largely influenced the management of channel shape and flow control.

As well as the trout fishery, the Itchen also supports a salmon and sea trout fishery, which is predominantly found downstream of Bishopstoke. Although there is limited access for the general public, some day tickets for fishing are available. Local anglers also enjoy good quality free fishing for grayling and coarse fish right in the heart of Winchester and Southampton.

In 1998 the Itchen was designated as a candidate Special Area of Conservation (cSAC) under the European Habitats Directive. Included in the range of features of interest were salmon, bullhead, brook lamprey and crayfish.

In its efforts to protect salmon stocks, the Agency has installed a salmon counter at Gaters Mill in Southampton. Salmon stocks in Hampshire rivers declined rapidly

between the 1960s and 1990s. Since then, stocks have remained stable but still remain below their conservation target. Poor survival of salmon eggs has been identified as a major reason for the decline in numbers. All salmon caught on rod and line are returned alive to help maintain a viable brood stock population. The salmon fisheries also provide an accurate record of all rod caught salmon to assist the Agency in monitoring stocks.

To offset the problems of poor salmon egg survival the Agency annually removes silt from the gravels using water jetting techniques, leaving them loose and well aerated ready for mid water spawning. The Agency also works on a range of improvement initiatives designed to create new habitat by replenishing gravels previously removed during dredging operations.

Although little information is available on lamprey and bullhead populations, the Agency is developing new monitoring techniques that will enable it to carry out a rolling programme of surveys designed to gather information on their current status.

Sluice and fishpass, Bishopstoke

River Itchen

Conservation

Parts of the Itchen valley floor have been designated as Site of Special Scientific Interest (SSSI) for many years and the whole river, including its three headwater tributaries, was confirmed SSSI in 1997. The River Itchen was selected as a SSSI because it is one of the finest examples of a chalk stream habitat anywhere in the world. Particular mention was given to the quality of the River Itchen plant, invertebrate, mammal, bird and fish communities. In recent years most of the SSSI has been additionally designated as a candidate Special Area of Conservation (cSAC) based on the presence of seven ecological interest features namely the water crowfoot *(ranunculus)* and populations of southern damselfly, crayfish, otter, salmon, bullhead and brook lamprey.

In partnership with other organisations including the Hampshire and Isle of Wight Wildlife Trust, English Nature and local Councils the Environment Agency works to protect the flora and fauna of the River Itchen and conserve its natural habitats.

Water Crowfoot

Crayfish

The plant community of the River Itchen, and in particular the presence of water crowfoot *(ranunculus)*, is perhaps the most characteristic feature of the chalk stream habitat. The diverse plant community influences the river flow, water levels and provide habitat for much of the river fauna.

In terms of invertebrates the southern damselfly and crayfish are cSAC interest features while the river and marginal invertebrate community form part of the SSSI designation. The southern damselfly is both nationally and globally rare and is currently threatened over much of its existing range. One of the largest remaining colonies of this species is on the River Itchen and in particular on the water meadow ditch system of the lower Itchen. The southern damselfly has very specialised habitat requirements including the presence of extensive marginal vegetation within permanently flowing, unshaded ditches. Suitable habitats are currently fragmented in the Itchen valley and if this species is to be conserved in the long term, it is essential that habitat management works are continued and supported in the future.

Crayfish populations on the Itchen are very much under threat with only a few fragmented populations still present in the upper catchment. It is thought that a fungal disease associated with non-native crayfish has been accidentally introduced.

The invertebrate community of the River Itchen has been shown to be of exceptional diversity in recent years with over 300 species recorded from the main river channel. Many of these invertebrates are rare in a national context and their conservation requires the maintenance of high water quality and a diverse array of habitats in the river. Another characteristic of the River Itchen and Chalk streams in general is that they are able to support very large numbers of invertebrates such as mayfly and shrimps. The abudance of these organisms has been shown to be closely related to river flow rate with drought conditions

Southern damselfly

significantly reducing their abundance. Invertebrates play an important part in the food chain of the River Itchen by feeding on algae and detritus and providing a food source to fish and mammals. Monitoring the status of the invertebrate community therefore provides a useful measure of the health of the wider River Itchen ecosystem.

Otter

The River Itchen is designated for two mammal species, the otter and water vole. Both these creatures are endangered in Britain and have been in serious decline throughout the 20th Century. The Agency works closely with the Hampshire and Isle of Wight Wildlife Trust to conserve these beautiful creatures and preserve or enhance their habitats. Effort is also being targeted at improving the water quality of River Itchen tributaries and providing safe passage through urban areas in order to promote otter populations within the Itchen and across Hampshire.

Recreation

The Agency is also responsible for developing and promoting the recreational use of water and associated land and for liaison with river use groups.

However, increased access to natural habitats can increase disturbance and have a detrimental effect on wildlife. The Agency's management policy is to promote water-based recreation where it is appropriate on the basis of permitting the harmonious enjoyment of the environment.

There are many footpaths close to the River Itchen and long distance footpaths such as the Itchen Valley Walk, Clarendon Way and Wayfarers Walk. The Pilgrims Way begins in Winchester and follows the Itchen and Alre to New Alresford where it crosses into the Wey catchment on its way to Canterbury. The Itchen Way follows the navigation towpath from Winchester to Southampton.

River Maintenance

River maintenance plays an important part in reducing the risk of flooding. The Agency's Hampshire and Isle of Wight Emergency Works Force carry out a programme of annual maintenance in some places, and weedcutting by the fishery owners helps to maintain the river channels. Removal of debris likely to block sluices, culverts and weirs is vital. Also important is the clearance of overgrown bankside vegetation to maintain flow capacity.

Careful checking and monitoring of man-made flood defences is routinely carried out.

Itchen Valley Park

Wharf Mill

Glossary of terms

Abstraction	Water taken from a river or groundwater, usually by pumping.
Aquifer	A layer of permeable rock capable of absorbing and storing water.
Groundwater	Rainfall that has trickled down through the soil and is stored in the spaces between the rock particles in permeable rock layers known as aquifers.
Riparian Owners	A person or organisation with property rights on a river.
Salmonid	Game fish of the salmon family - Salmon, trout/Sea trout.
Special Areas of Conservation	Internationally important nature conservation sites designated under EC Habitats Directive.
Catchment	Total area of land that contributes surface water to a specified watercourse.
Tributary	A small stream that joins a main river.
Water table	The level below which the ground is saturated with water.

Photographs by John Chandler, Rod Murchie and Elinor Smith