

## SOUTHERN REGION ADDRESSES

### REGIONAL OFFICE

Environment Agency  
 Guildbourne House  
 Chatsworth Road  
 Worthing  
 West Sussex BN11 1LD  
 Tel: 01903 832 000  
 Fax: 01903 821 832

### KENT AREA OFFICE

Environment Agency  
 Orchard House  
 Endeavour Park  
 London Road  
 Addington  
 West Malling  
 Kent ME19 5SH  
 Tel: 01732 875 587  
 Fax: 01732 875 057

### SUSSEX AREA OFFICE

Environment Agency  
 Saxon House  
 Little High Street  
 Worthing  
 West Sussex  
 BN11 1DH  
 Tel: 01903 215 835  
 Fax: 01903 215 884

### HAMPSHIRE AND ISLE OF WIGHT AREA

#### OFFICE

Environment Agency  
 Wessex Business Park  
 Wessex Way  
 Colden Common  
 Winchester  
 Hampshire SO21 1WP  
 Tel: 01962 713 267  
 Fax: 01962 841 573



### ISLE OF WIGHT

Tel: 01983 822 986  
 Fax: 01983 822 985

[www.environment-agency.gov.uk](http://www.environment-agency.gov.uk)

ENVIRONMENT AGENCY  
 GENERAL ENQUIRY LINE

**08708 506506**

ENVIRONMENT AGENCY  
 FLOODLINE

**0845 988 1188**

ENVIRONMENT AGENCY  
 EMERGENCY HOTLINE

**0800 80 70 60**



ENVIRONMENT  
 AGENCY



ENVIRONMENT  
 AGENCY



FACT FILES

5

The Darent  
 and Cray



**ENVIRONMENT  
AGENCY**



**Environment Agency - a better environment in England and Wales for present and future generations.**

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.

The Agency has funding of about £585 million, 75 per cent of which is funded from its own charges and the rest from Government.

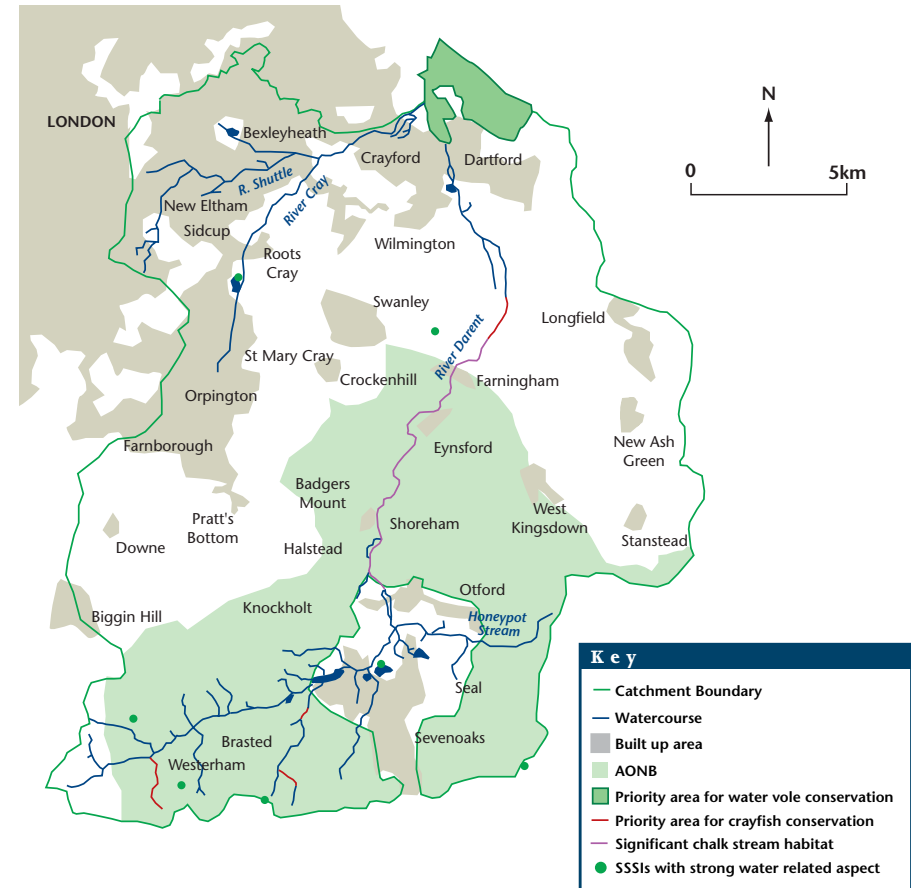
Nationally, around 15 million hectares of land are managed by the Agency along with 36,000km of rivers and 5,000km of coastline, including more than 2 million hectares of coastal waters.

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 photographs:  
Main picture - Eynsford Ford  
Top inset - River Cray at Crayford  
Bottom inset - River Darent - Shoreham Bridge*

# Darent and Cray



## Key Facts

Area of river system: 400 km<sup>2</sup>  
 Resident population: 422,000 (estimated for 2001) - approximately 1000/km<sup>2</sup> - highest density in area as result of inclusion of outer suburbs of SE London.  
 Average annual rainfall: Actual = 700 mm/yr, Effective = 278 mm/yr, after evapotranspiration.  
 Authorised abstraction from resource area (groundwater and surface waters) = 103,065 MI.  
 Total licences (MI/annum) from surface water = 3,527 (20 licensed abstractions).  
 Length of main river including main tidal lengths = 78.7 km.





Shoreham Bridge

### Courses of the Darent and Cray

The Darent catchment (the area drained by the river) falls mainly within Kent, but includes some of the suburbs of south east London and parts of Surrey. The catchment area is 400 square kilometres in size and has a very high population density (approximately 1000/km<sup>2</sup>) as a result of the inclusion of these London suburbs.

Popular with the public, who enjoy walks and picnics along its banks, the River Darent is 59 km long and begins its journey to the sea near Westerham in Kent, 251 metres above sea level. It flows in an easterly direction to Otford, where it is joined by the Honeypot Stream, a major tributary flowing from east to west. Both are fed

by springs from beds of the Lower Greensand and Chalk. Turning north, it has cut a large valley through the Chalk of the North Downs, flowing to its tidal limit at Dartford. The Darent is joined by the River Cray in its tidal length where Dartford Creek crosses the Thames Marshes.

The River Cray rises at Orpington to begin its 14km journey to the River Thames. The Cray runs in a generally north easterly direction, mainly on the Chalk, through the edges of a number of urban areas, passing through St Mary Cray, St Pauls Cray, North Cray, Bexley (where it is joined by its largest tributary, the River Shuttle) and Crayford.



Otford Green, near Tonbridge



## History

For many centuries, the Darent Valley has been a hive of human settlement and activity with features that include prehistoric earthworks, Roman villas at Lullingstone, Farningham and Sutton-at-Hone and medieval castles at Lullingstone and Eynsford.

Today, there is a distinct split between the heavily developed urban areas of Greater London to the north and east and the protected rural green belt area to the south and east. Urban development covers around 23% of the area. Outside urban areas, agricultural land for arable and grazing is the main land-use while woodland occupies about 11% of the catchment area (almost all of which is deciduous).

The river was once used as a source of power for over 25 mills, producing flour, paper, fabric and even gunpowder. This meant that much of the flow was diverted down artificial channels which left very little 'natural' stream between mill ponds, changing the nature of the river forever. Now, where there were once extensive water meadows, much of this land has been developed for housing or gravel pits.

None of the surviving mills are in production now, although some of them do have operable sluices. Many

are private residences and the occupiers remain responsible for their own sluices.

The rural Darent valley still provides pleasant recreational surroundings and the flooded gravel pits are valued as nature reserves, fisheries or sites for water sports. Sites still exist where the river was used and enjoyed in earlier times, like the Elizabethan House at Hall Place, Bexley, which is a popular tourist attraction.

Much of the history of the Cray Valley has been influenced by industry. An example of this is the Vickers Armstrong Ammunitions Factory at Crayford, which played an important role in the two World Wars.

Like the Darent, the Cray was used for water power, which left very little natural stream and today sections of the river follow the old artificial mill channels rather than the original rivulets, leaving the river higher than the bottom of the valley. Dredging has been necessary to keep these channels clear of silt, which builds up in times of reduced flow.



The catchment was important historically as a source of a range of minerals including:

- Chalk for the cement industry and agricultural use;
- Clay for brick and tile manufacture; and
- Flint gravels for aggregates.

Main picture - Farningham Ford  
Above - Hall Place, Bexley (River Cray)



## Water Quality

Serious droughts in the south of England have resulted in the Darent being augmented (artificially boosted) in summer and early autumn from 1996 onwards. This has prevented the lower stretch of the river drying out for a prolonged period of time and helped to maintain a healthy and diverse community of river life.

The upper catchment that extends from Westerham to Otford was less

The Environment Agency routinely obtains biological and chemical data through monitoring and sampling programmes. The biological quality assesses the health of river stretches over time through the diversity and abundance of particular species of small organisms (macro-invertebrates) that live on the river bed. Biological data provides a longer term picture and is the best overall guide to the health of the river ecosystem.



Gravel plant at Stone Marsh, Dartford

affected by the drought and was not augmented. There has been a reduced level of abstraction (water removal) by the water companies in all sections of the river and this has helped to maintain river flow, in turn helping maintain water quality.

Biological quality of the Darent is high. For example, the presence of native crayfish in the Sevenoaks area is an important indication of the health of the river and it is hoped that these crustaceans might also colonise the lower catchment.

Tributaries of the Darent – the Cray and Shuttle –

flow through dense urban areas and have been affected by industrial runoff, which has had an effect on the water quality, especially on the River Shuttle's chemical water quality.



Above - Horton Kirby Weir (River Darent)  
Right - In times of drought



## Water Resources

The Environment Agency has to ensure that water resources are properly managed to provide water for all reasonable needs while meeting the Agency's commitment to progressive enhancement of the environment.

Water is abstracted from the area's rivers and groundwater (underground water supplies) for a range of uses including public water supply, agriculture and industry. Ninety six per cent of the water extracted in this catchment is taken from groundwater, with over 70% of this coming from the important Chalk beds.

In recent decades the Darent has suffered abnormally low flows and stretches have dried up several times. The Environment Agency is now working with supporters of the river and with Thames Water Utilities Ltd to improve flows and the river environment.

Improvement works under the Agency's Darent Action Plan include the drilling of eight artificial springs that will locally raise water from below the river back into the channel at times of low flow. In addition, the Water Company has committed to reduce abstraction to help maintain flows even during extreme drought.

## Conservation

Clear alkaline water means plants and animals thrive in the River Darent, which is a fine example of a chalk spring fed river. Water crowfoot dominates some sections of the river with its long flowing fronds and white flowers.

Damsel and dragonflies can be seen, along with the occasional kingfisher, while coots and moorhens patrol the lush bankside vegetation. Colourful plants like southern marsh orchids, purple loosestrife, ragged robin and meadow sweet make the wet meadows attractive in summer.

Under the UK Biodiversity Action Plan (BAP), the Environment Agency is the lead contact organisation for a number of species. Of these the water vole, native white-clawed crayfish and otter are associated with the River Darent.

Native crayfish were once common, but by the end of the 1980s the population had almost vanished. This is believed to be due to the crayfish plague and more recently, the effects of the drought. A specialist survey funded by the Agency revealed isolated populations in low numbers. Since then the Agency has worked hard looking for opportunities to protect and enhance the remaining populations.

The Chinese mitten crab, a non-native species, has already invaded the lower parts of the catchment. This 'invasive' species can cause problems by burrowing into the banks, weakening flood defences and directly competing with other natural inhabitants of the watercourse. Another non-native species, the signal crayfish, has not yet been recorded within the Darent catchment.

Occasional findings of otter spraint (droppings) indicate the presence of this shy animal on the river. Railway lines and roads pose a significant threat to their successful recolonisation in the catchment. Otters have a large range and may use a number of holts, the distinctive dense structures in which they live. The removal of old trees can limit available shelter sites so artificial holts are being built at suitable locations throughout Kent and the catchment. To make these sites more effective a 'buffer' zone can be created by fencing off the river, allowing vegetation to grow to provide protection.

There are a number of lakes associated with the river. Sevenoaks Wildfowl Reserve (a Site of Special Scientific

Interest) (SSSI) illustrates how these sites can be managed to compliment the river's habitats. This Wildfowl Reserve covers 135 acres with a range of wildlife habitats and associated species.

Dartford Marshes are among the largest remaining areas of grazing marsh along the Thames Estuary within the M25. A number of wetland habitats can be found here ranging from intertidal mud in the estuary, saltmarsh to freshwater

Otter

marsh and wet grassland with associated drainage ditches. This area is an important habitat for a number of species including the water vole, which is now a protected species following significant decline.

The Agency part funds the North West Kent Countryside Project to carry out practical conservation work in the Darent valley. The Project aims to promote a sense of awareness and appreciation of environmental issues within the valley by liaising with local communities. The maintenance, enhancement and restoration of habitats and landscape features keeps the Project busy throughout the year.



Native white clawed crayfish





'No fish feeding' notice, Bridge Cottage, Farningham



## Fisheries

The Darent and Cray, their tributaries and adjacent gravel pits contain a wide diversity of coarse fish including roach, chub, perch, pike, eels, gudgeon, carp and tench. The close proximity to central and suburban London makes the catchment very popular with anglers.

These rivers are not known for their stocks of migratory fish. Earlier attempts to install a salmon run by stocking juvenile fish were not successful. There is one fish farm within the catchment, near Otford, which farms mostly rainbow trout and some brown trout.

During the 19th Century the River Darent was renowned for its stocks of wild native brown trout. However, the fishery diminished with declining water quality in the early part of the 20th Century, but improved in the '50s and '60s when the middle reaches were well stocked with fish. Reductions in summer river flow associated with increasing abstraction and periodic

drought (1976, 1990 – 1992, 1996) caused most of these fisheries to be abandoned.

Current trout stocking practice is a balance between hatchery reared brown trout and the non-native rainbow trout. Juvenile, naturally replicated, brown trout are rare but are becoming more plentiful as the environment recovers. Further improvements are likely with increased river flows and increased quality of spawning gravel that favours brown trout replication.

In the past, drought and a build up of silt have made many streams shallow, resulting in a loss of cover for fish and increased predation. In some parts of the river, flow and fish cover has been greatly improved by the redevelopment of the pool and riffle structure -weirs and deflectors built by the Environment Agency and the North West Countryside Project, as part of the Darent Valley Enhancement Project.





*Inset photo - Water-Driven Windmill at Castle Farm, Lullingstone  
Main photo - Meadows at Castle Farm, Lullingstone*

## Recreation

Recreation around the Darent and Cray covers all aspects of water related leisure activities from walking, picnicking and visiting the water's edge to more organised sports like sailing and fishing.

Due to their close proximity to south east London, the areas around the Darent and Cray can become heavily congested during summer months, particularly at places like Eynsford and Lullingstone on the Darent, which places pressure on local resources and habitats.

The catchment is rich in nature conservation interest and there is some public access to the Sevenoaks Wildfowl Reserve.

As well as extensive public rights of way near the rivers, there are a

number of signposted walks following the courses of the main rivers:

- Darent Valley Path - from Sevenoaks to Dartford
- Cray Riverway - from Foots Cray to Erith
- Shuttle Riverway - from Avery Hill to Hall Place

Cycling is fast increasing but there are, as yet, few designated cycle routes.

Water based activities are numerous with sailing at Chipstead Lake and canoeing at Danson Park Lake. Anglers are well catered for with a number of coarse and game fishing sites on the Darent and Cray. There are also two trout fishing syndicates on the Darent and thirteen principal coarse fishing clubs.



*Darent footpath*



## Preventing Pollution from Waste

The Environment Agency ensures that controlled waste - waste produced by offices, businesses, factories, schools and shops among others - is handled, transported, treated and disposed of safely by the holder of the waste.

Waste can have a number of holders from the point of production to the point of disposal or recovery such as the producer, carrier, recycler or landfill site operator. All controlled waste holders have a duty of care to manage waste correctly and ensure that it is passed on to another suitable holder, and all holders must have some form of approval to manage the waste by law.

Other wastes such as agricultural waste and waste from mining or quarrying are not currently controlled in this way by the Agency, although they can have a significant impact on the environment when they are not correctly managed.

Safe disposal of waste costs money and some people try to avoid these costs by dumping their waste illegally. This is called fly tipping. It is unsightly, but more importantly, can be a health hazard to people, wildlife and the environment. The Environment Agency will prosecute anyone found to be disposing of waste illegally.

Agency officers believe that prevention is better than cure and would rather protect the environment by educating people about the correct way to deal with waste. They therefore regularly visit industrial estates, farms and businesses to see what pollution prevention measures are in place and advise if anything further needs to be done.

There are 28 sites with licences for waste disposal activities around the Darent and Cray areas, including landfill, civic amenity, composting and scrap metal. There are no landfill sites used for domestic waste within the catchment, with all waste being exported to sites outside the catchment area. However, there is a limited amount of space in landfill sites across Kent and neighbouring counties for waste disposal and wherever possible, waste should be reduced, reused or recycled.



*Environment Agency staff in action*



*Dartford Barrier from upstream*

## Flood Defence

It is the responsibility of the Agency's Flood Defence team to protect people and property from tidal and river flooding. This includes the provision of adequate arrangements for flood forecasting and warning.

The risk of flooding is a problem in the Darent catchment due to the potential combination of river and coastal flooding.

The worst fluvial (river) flooding in recent history occurred in September 1968 when both the Rivers Darent and Cray burst their banks inundating large areas of farmland and properties including the town centres of Dartford and Crayford. Flood alleviation schemes were carried out at

Westerham, Chipstead and Dartford. Virtually the whole length of the River Cray was subject to improvement schemes including the reconstruction and automation of the Vitbe Mill Sluice, construction of Hall Place flood storage reservoir and flow regulation works at Ruxley Gravel Pits.

In 1953 the worst tidal flooding in recorded history caused extensive property damage, resulting in a major reconstruction of all sea defences in the Darent area. Further upgrading included the construction of the Dartford Creek Barrier in conjunction with the construction of the Thames Barrier that was officially opened in 1984.



## Maintenance

A programme of annual maintenance work of river and coastal flood defences is carried out by the Agency's Kent Direct Works force. The flood defences protecting marshland and farmland are earth embankments sown with a specialised grass seed mixture, while defences protecting built up and industrial areas are hard defences like steel piling and concrete.

On the hard defences, a programme is carried out of monitoring and repairing expansion joints, making minor specialist concrete repairs together with electrical and mechanical maintenance of all moving equipment like flood doors and sump pumps. The grass on the embankments is mown at least twice a year to maintain the structural integrity of the defences.

Along the fluvial defences, the Agency ensures that all material that could block sluices is removed. This includes annual clearance of herbaceous growth to prevent it becoming dislodged at times of high flow and the pollarding of trees during the winter if there is a danger of them falling in the river. The rivers are also patrolled during times of high flow to ensure that blockages at sluices are removed quickly.

The Environment Agency occasionally carries out dredging works on rivers at the request of riparian owners provided there are flood defence, conservation or fisheries benefits.

*Rubbish in stream at Hall Place, Bexley*



*River Cray at Crayford*

## Glossary of Terms

<b>Abstraction</b>	When water is taken from a river or underground rock strata
<b>Aquifer</b>	A layer of permeable rock, deep under the surface, capable of absorbing and storing water
<b>Augmentation</b>	Artificially increasing volume of water in river
<b>Dredging</b>	Removing material from a river bed
<b>Catchment</b>	Total area of land that contributes surface water to a specified water course
<b>Flytipping</b>	Illegal dumping of waste
<b>Groundwater</b>	Water which seeps through the ground into the permeable rocks many metres below the surface
<b>Tributary</b>	A small stream that joins the main river

*Photography by John Chandler*