Knowledge is Powerful

We've spent months researching the perilous state of our waterways and brought sources of information to help you, so that you don't have to waste any more energy than necessary. We continually update these resources, but there is always more to learn in a changing water-scape, so please get in touch if you need more.

- Data Updates □□
- Sources of Water Pollution □□
- Social Justice ⚖
- Fin-ancialisation □□
- Ecology □□□□□
- Talks & Presentations □□

Data Updates

In this section, you will find useful resources to inform your actions.

Follow this link to the Data Stream

Sources of Water Pollution

Sewage Pollution

Latest figures show that raw sewage discharge into rivers and seas accounted for more than **3.6 million hours** last year, an increase of **105%** on the previous 12 months.

Raw sewage contains a plethora of bacteria and toxins from human households. Fecal indicator bacteria like E. Coli and Entererococci are used in water tests to determine how sewage-polluted a lake, river or coastline is. Measuring these bacteria has to be done by sending a water sample to a lab. Check out Naturalist and Broadcaster, Steve Backshall talking about samples processed by Bangor Uni wastewater research.

Most sewage pollutions in the UK happen when the sewage treatment system becomes overwhelmed with rain water which then triggers storm overflows to simply spill the sewage and rainwater directly into rivers and beaches. All storm overflows (also know as Combined Sewer Overflows - CSOs) in England are now fitted with monitoring devices generating data about the number of spills and the duration of each spill. Data coverage in Wales, Scotland and Northern Ireland is much more patchy. The data is then provided by the water companies to the Environment Agency and published once a year in spring.

There are several web sites which summarise this data in maps and graphs:

- Top of the Poops
- The Rivers Trust
- Greenpeace Unearthed

There is also a free app which sends out real-time alerts whenever sewage pollution impacts bathing sites:

- Safer Seas and Rivers Service by Surfers Against Sewage

Agricultural Pollution

Fecal bacteria pollution doesn't just originate from human waste, but also originates from animal waste when it leaks into rivers or is washed off farming fields where slurry is used as fertiliser. High intensity poultry factories and other livestock units excarcerbate this situation due to the large amount of animal waste they create.

Fertilisers of any kind, either animal waste or commerical fertiliser, are often washed off the fields into nearby rivers, creating a nutrient overload which significtly harms the rivers and connected eco systems. The River Wye for example has now reached a state of emergency. It is being killed by pollution, a cocktail of excessive agricultural nutrients (over 70%), sewage (22-24%), microplastics and superbugs. Find out more here.

The widespread use of **herbicides and insecticides** as well as **antibiotics** given to animals in farming today creates further unmeasured damage when it runs off into water-based eco systems.

Microplastic Pollution

Fishing nets and lines dumped in water, degraded plastic containers resulting in polluting microplastic beads on coasts and on land.

Chemical Pollution

Toxic chemical waste dumped on land which gets into waterways. Waste from industry and house building. Road run-off from tyres and petro chemicals. Human antibiotics and hormonal contraceptives.

Radioactive Pollution

All nuclear reactors for civilian or military use need water to cool excess heat away from the reactor plant. When smaller radiactive accidents happen it is often water receiving contamination from radiactive material, which then leaks into rivers and seas. But even in day-to-day operations, some radioactive elemtents cannot be filtered out of water and are legally dumped into water eco-systems.

Landfill Leachate

If you have concerns about a local historic landfill site where there seem to be a concentration of people suffering from a range of health conditions, such as cancers, it could be that there is a leachate issue, where water courses and local aquifers are being contaminated by forever chemicals.

It is only fairly recently that waste companies depositing toxic chemicals have become obliged to report the contents of their waste. There is extensive mapping ongoing of sites around Europe and UK, which you can see here.

Beware of allotment sites, or new build areas where there have been historic landfills. If you want to talk to experts about your local area, the Dirty Water team can connect you, so please email us.

Social Justice ⚖

Global South bares the brunt

Global Justice and climate justice are inherently linked as climate change devastates countries around the world but particularly in the global south. These countries have fewer resources for dealing with climate catastrophe and often have much more harsh punishments for climate activism.

The water pollution crisis fuels injustice, where poorer communities, especially in the Global South, are tasked with the polluting production of consumer goods destined for richer communities like the UK.

Marginalised groups and people already struggling with poverty and inequality will be the first to feel the effects of the climate and ecological emergency.

The climate crisis is at least in part due to the current and historic oppression and exploitation of those most impoverished and vulnerable in our communities and around the world.

As the effects of the climate and ecological emergency worsen, resources such as water, but also money, food, healthcareand housing will become scarce. This will affect everybody but none more so than vulnerable groups such as: Low-income countries & households, people of colour, indigenous people, women, trans people, young people and disabled people. It is important that we stand together in solidarity against all injustice if we hope to tackle this crisis.

Global sustainable water management is a key concern of the UK Food and Agriculture Organisation (UNFAO). More comprehensive information can be found here.

There is a whole book dedicated to Global Justice in our Rebel Toolkit, and also a separate Social Justice Action Pack with more resources.

We also invite you to take action specifically in August 2024 for a month of solidarity and direct action as part of the 2024 Actions Strategy. Though the battle doesn't end there, these actions can be taken at any point by anyone.

Closer to home

Our lives depend on water and so does the world around us. Water is so fundamental to our daily lives that it is considered a basic human right, with the provision of safe, sufficient and affordable water directly linked to the health, dignity and prosperity of communities across the world.

Due to poorly designed wastewater infrastructure, the UK has struggled for decades with sewage pollution to rivers and seas including many bathing sites.

Although the scourge of sewage pollution is spread evenly across the UK, **one in 16 households here live in water poverty**, where the cost of water makes up more than 5% of their income (data source). We all rely on water, but not all of us can afford to pay for it.

In England, wastewater services are run by nine privately owned water companies. In Wales, Scotland and Northern Ireland, these services are publicly owned (but unfortunately have an equally terrible environmental record).

The failure of **privatised water** in England allowed so-called 'investors' to borrow money against the value of their infrastucture and to use that money to pay themselves excessive dividends. Over the last 30 years this process 'hollowed out' all privatised water companies, where they owe 65-80% of what they are worth to banks and other companies, a process called 'gearing'.

As a consequence of 'gearing' in England now approximately 20% of every water bill is used to pay dividends and interest on loans. This **social injustice** burdens every person in England to pay for the stolen billions extracted through 'gearing' over the last 30 years, paying dividends to shareholders, while leaving their water infrastructure to rot.

From 2025 all water companies have announced they will **further increase water bills by 30-50%** to pay for badly needed improvements to cope with the rising amount of sewage and increasing rainfal due to the climate crisis.

If the cost to fix our crumbling water infrastructure is carried by the public (as it will be), rather than by their private owners, then we deman that **water companies must be forced to stop paying out dividends**.

Dirty Water - other examples of Social Injustice

7-year-old Zane died from flood waters poisoned by landfill

In 2014 Zane Gbangbola, a 7-year-old child was killed and his father permanently p
hydrogen cyanide emanated from a flooded toxic waste site in Surrey. Loca
the courts did nothing but obstruct and cover up the truth about Zane’s death. How
toxic landfill time bombs are waiting to be flooded?

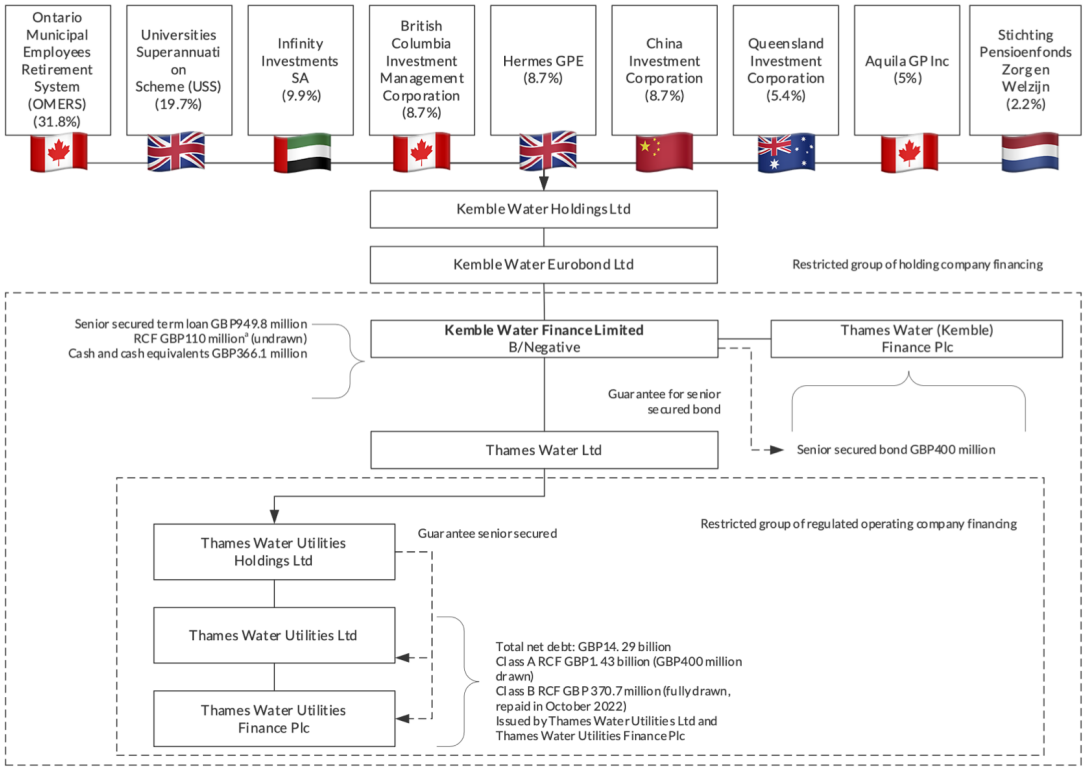
Read more about Zane's story here: truthaboutzane.com

When Thames Water collapses, pensioners will pay the price

Two thirds of Thames Water, the largest water company in Europe, is **owned by pension funds**. The privatised financialised system is pitching pensioners from the UK and Canada with their retirement investments against our natural habitat and the safe use of our rivers and seas for people all across the UK.

The following diagram shows the complex ownership structure of Thames Water with its ultimate owners and where they are based shown at the top:

Structure Diagram



[a] Revolving credit facility (RCF) upsized to GBP150 million in November 2022
Source: Fitch Ratings, TWUL and Kemble investor reports, 30 September 2022

Fin-ancialisation □□

Water - a Cash Spiggot f

How did we get here? What does it

A brief history of ownership of water com

From the late nineteenth century onwards, water services similar to most European countries. Water services were **authorities**, with some individual authorities running wa operators, and a surviving handful of private water-supply regulated by a simple cap on their profits at a maximum

In 1974 the service was reorganised. 10 unitary **regional** created, each covering a river basin area, each responsib sewage treatment. These authorities were appointed by t so were not accountable to local government any more. T employees from 80,000 to 50,000 between 1974 and 1989.

Management and Control by Economics, Not the Science

The Thatcher government originally proposed **water privatisation** in England and Wales in 1984, but due to strong public opposition the proposals were abandoned before the issue could influence the 1987 election. Once this was won, the privatisation plan was resurrected and implemented rapidly.

Under the **Water Act 1988**, the newly formed water companies became owners of the entire water system and all assets of the Regional Water Authorities (RWA's) in England and Wales. The RWAs were sold by issuing shares on the stock market.

The exceptions to the **privatised for profit of the shareholders** model are in Scotland and Northern Ireland, however, water remains controlled and operated by public authorities. In Wales, Welsh Water (Dwr Cymru), the business is a not for profit, albeit the Board has received massive bonuses on top of high salaries, despite shocking performance on sewage pollution.

Contrary to promises by the politicians, privatisation did not create any **competition** and resulting lowering of bills for consumers. The companies were given **monopolies** in their regions for 25 years, without having to compete even once for the business. Nevertheless, the government was desperate to mark the sale of common assets to private owners a success.

Behind the scenes, however, there was an injection of welfare into water companies. The government **wrote off all the debts** of the water companies before privatisation, worth over £5 billion pounds and gave the companies an **additional 'green dowry'** of £1.6 billion from the public purse, i.e. taxpayers.

The initial water **pricing regime**, set by the government, resulted in pre-tax profits of the ten water companies to rise by 147% between 1990/91 to 1997/98 with sewerage and water prices rising respectively by 42% and 36%. The companies were also given special **exemption from paying taxes on profits**.

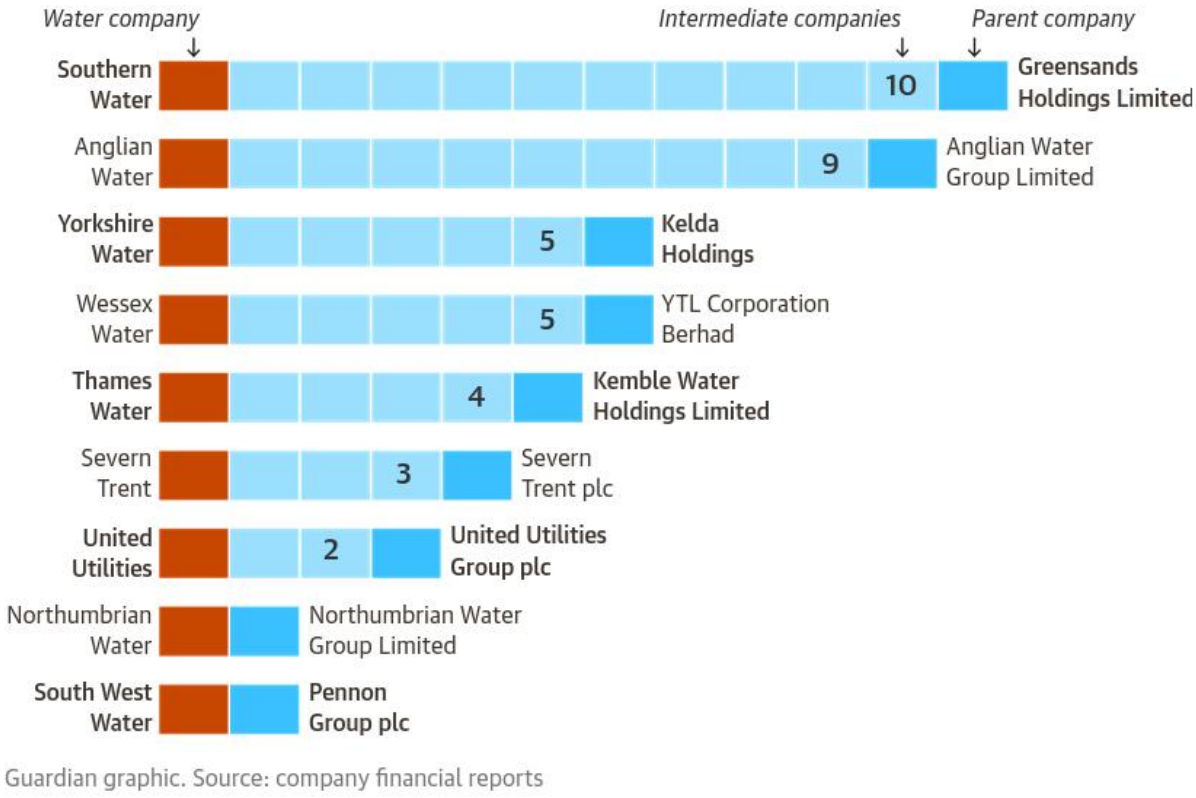
Who Watches the Water Workings?

OFWAT, the financial regulator for private water companies, is statutorily responsible for ensuring that the companies were profitable. It has performed that supporting role very well; it's also responsible for encouraging efficiency. As there is no competition, however, OFWAT compares the companies' performance with each other. That would be the equivalent of a low watermark!

Water companies were protected from takeover for 5 years by the government's 'golden share'. Once the 5 year period was up, many were bought off the stock market by giant multinationals. These corporations restructured, stripped and mortgaged and then resold for huge profit, a process commonly known as **'financialisation'**. A process in which making profits from financial constructs, becomes more profitable than trading real products and services.

To learn more about the neo-liberal economic theory behind financialisation, be sure to check out Investopedia's explanations of eg 'asset stripping', 'value extraction', 'derisking finance'

The increasing **financial engineering** for shareholder profits leads to more and more **opaque and complex ownership structures**. Check out this Guardian graphic showing the structures for English water companies:



Read more about transparency and accountability problems with the financialisation of water.

Case Study in Failure: Thames Water

The result of financialisaton is best demonstrated by looking at a specific example:
Thames Water Ltd - Europe's largest Water and Sewerage company.

- **1974** - The Thames Water Authority was formed as the largest regional water authority in the UK.
- **1989** - Thatcher's privatisation handed all water system and assets of the region to Thames Water Ltd, **free of debt** and a 'green dowry' gift of more than £100 million.
- **2001** - RWE, a German energy giant bought Thames Water off the stock market and burdens the company with a **£3.4 billion** 'mortgage' debt.
- **2006** - Macquarie Group, an Australian global financial services group buys Thames Water for **£8 billion**.
- In the next eleven years Macquarie Group adds another **£7.1 billion** 'mortgage' debt to the company while paying themselves **£2.8 billion** in dividends. Over this time Macquarie sells off Thames Water in chunks to the highest bidder.
- **2017** - Macquarie successfully sold all Thames Water shares at healthy profit for themselves. Two thirds of Thames water is now owned by pension funds in different parts of the world.
- Over the last 35 years in private ownership Thames Water has paid out **over £7 billion** in dividends to shareholders and accumulated a debt of **over £15 billion**. Every month Thames Water customers pay approx. 20% of their water bill just to pay the interest on this debt.

- **2024** - Thames Water is now in existential crisis and may soon collapse under its burden of debt.
- The company has asked to be allowed to rise bills by 50% and begged OFWAT to be lenient with future fines for illegal behaviour.
- Thames water demonstrates how **privatisation turned water, the essence of life, into cash machines for globally capitalised cooperations**.
- Thames Water's ruin is but one example of the terrible consequences of the financialisaton of water while underinvesting in real and badly needed infrastructure.
- The resulting broken sewage systems are intolerable for all life in our land and coastal waters.
- We must correct this mess now. Different models and ways of funding are available. It's time for the people to have their say.

For an informative potted history of Thames Water as a case study in how the neo-liberalism works, CronxWatch is worth a listen to gain an insight into how financialisation tools work this essential utility for the interests of the few!

Sources and Further Learning:

- How infrastructure building projects become assets which profit water companies at the cost of customers and what the alternatives could be - Alternatives to Massive Infrastructure:
- How Privatisation has failed: "Despite its deliberate limitations, the Cunliffe Review still manages isolated admissions of privatisation's failure, noting how "high levels of debt relative to equity have impaired resilience" – a polite understatement for decades of corporate looting disguised as financial innovation."
- Why Public ownership (at least initially during transfer of assets) costs nothing..
- Academic Research: 1989-2001 UK water privatisation.
- Wikipedia on Water privatisation in England and Wales.
- Parliamentlive.tv: Industry and Regulators Committee.
- 'The Guardian' links:
  - Thames Water Apologises to MPs for Confusion over 500m loan.
- How Privatisation Drained Thames Waters Coffers.
- Thames Water's Second Largest Investor Slashes Value of its Stake.
- Thames Water Nationalised Ofwat MPs Customers.

Definitions: for an explanation of finance terminology or acronyms search Investopedia.

Ecology □□□□□

“Everything that we do, from the water we drink, air we breathe and food we eat is all dependent on the natural world. The processes that keep our reservoirs clean and the food in the fields growing are all underpinned by the wildlife - or biodiversity - that surrounds it, and without any of these, other species simply would not be able to survive.

“It is not, however, the mere presence of these species that matters most but their relationships with each other and how they interact to create a complex network of life. As individual species are then pulled from this web, the ecosystem in which they live eventually collapses.” - Natural History Museum

report

This is a look at some aquatic and semi-aquatic species, showing their roles in the healthy ecosystem. Losing any of them threatens them all.

River-water crowfoot (Ranunculus fluitans)

There are several common species of ranunculus found in the rivers and lakes of Britain and Ireland . Above the surface, the leaves of Ranunculus fluitans are very similar to those of other members of the buttercup family, while the submerged leaves are finely divided: characteristic of a truly amphibious plant. The flowers are at their best from mid-May until the end of June.

Slow to moderate paced lowland river reaches of shallow depth, especially where the river bed contains limestone, are places where this lovely water plant is most plentiful. In the wild, Ranunculus fluitans is an important food source for many species of fish and waterfowl. The plant's leaves and stems are eaten by ducks, geese, and other birds, and its seeds provide a source of food for fish and insects. It is also an important part of the aquatic food chain, as it provides essential in-stream habitat for freshwater shrimps, snails, insect larvae and nymphs.

Caddisflies (or sedges - trichoptera)

Insects in the order Trichoptera are commonly known as caddisflies or sedges. There are 199 species of caddisfly in the UK. Caddisfly larvae live underwater, where they make cases by spinning together stones, sand, leaves and twigs with a silk they secrete from glands around the mouth. Most larvae live in these shelters, which can either be fixed or transportable, though a few species are free-swimming and only construct shelters when they’re ready to pupate.

Adult caddisflies are moth-like insects which generally fly at night. They hold their wings above their body in a roof-shape when at rest.

Adults are often attracted to moth traps, or can be found during the day on vegetation near to the water's edge, or flying in swarms over the water. Caddisflies are an important food source for all kinds of predators, including Atlantic

Salmon and Brown Trout, and birds such as the Dipper.

Common Barbel (Barbus barbus)

One of England's native fish species, believed to have been present in at least some English rivers for more than 10,000 years. They are thought to be native to eastern English rivers between Yorkshire and the Thames but have been widely stocked in many others, such as the Severn and Wye, and in parts of Scotland.

Barbel are cyprinids and there are several species from the genus Barbus that all share similar anatomical features. These include adaptations to living in faster flowing water, such as a streamlined body with large, almost mini-wing like, pectoral fins and powerful tails. Barbel species also have downward-facing mouths and two pairs (four in total) of barbules (sometimes referred to as barbels or whiskers) on their upper lips, which hint at their preferred benthic feeding habits.

Their underslung mouths make them especially well adapted for feeding on benthic organisms, including crustaceans, insect larvae and molluscs, which they root out from the gravel and stones of the riverbed. Barbel diets change as the fish develop from fry to juveniles and then to adults. Diatoms that cover rocks and the larvae of non-biting midges (Chironomidae) are particularly important foods for young fish. Barbel also like to seek refuge and forage amongst aquatic plants (especially Ranunculus) or underneath overhanging trees or submerged tree roots and branches.

Barbel can live for 20 years and mature relatively slowly, with males taking 3–4 years and females up to 8 years to become sexually mature. This leaves them susceptible to a range of pressures over a prolonged period, which can affect their ability to reproduce successfully and thrive in rivers. Some of the issues facing barbel include poor water quality and predation, at all life stages, from a range of predators, including human poaching, piscivorous birds (e.g., herons, goosanders and cormorants), fishes (e.g., pike and perch) and mammals such as mink and otters. They also suffer with destruction and modification of habitats, which can create bottlenecks for different life stages – barbel require different habitats throughout their lives and the juxtaposition of these is important for maintaining viable populations.

Common frog or grass frog (Rana temporaria)

The Common Frog is easily our most recognisable amphibian. They’re found throughout Britain and Ireland, in almost any habitat where suitable breeding ponds are near by. Common Frogs have smooth skin and long legs for jumping away quickly. Garden ponds are extremely important for common frogs, particularly in urban areas.

They breed in shallow water bodies such as puddles, ponds, lakes, and canals. They deposit ‘rafts’ of spawn, often containing up to 2000 eggs. Each small black egg is surrounded by a clear jelly capsule around 1 cm across. Frogspawn is a remarkable material. It is 99.7% water and dissipates heat very slowly, which means that the egg mass is maintained at a higher temperature than the surrounding water. In addition, the egg mass is permeable to water currents, ensuring that all eggs within the mass receive adequate supplies of oxygen. The temperature at which the eggs and emergent tadpoles develop influences the speed of development. Common Frog tadpoles are black when they hatch but develop light bronze speckles as they mature.

Mating and spawning is usual over by the beginning of May (though may be later in more northerly latitudes) and most adults move away from the breeding pond within a few days of mating. By the beginning of August, most of the resulting froglets will have left the breeding pond.

'Mature' tadpoles are faintly speckled with a gold/brown colouration which distinguishes them from the black tadpoles of the common toad. They tend to feed on algae and decomposed plants. They are eaten by a range of aquatic animals, including dragonfly larvae and newts.

Tadpoles generally take up to sixteen weeks to grow back legs, then front legs before they metamorphose into tiny froglets, ready to leave the water in early summer (often June, but in some ponds this may be as late as September). They become carnivorous once the back legs are grown, taking small prey like mites, ticks and small fly larvae.

Adult males grow up to 9 cm in length and females up to 13 cm in length. They are usually a shade of olive-green or brown (although can be yellow, pink, red, lime-green, cream or black). They have dark patches on the back, stripes on the hind legs, and a dark ‘mask’ behind the eye. They have an oval, horizontal pupil. They call with a soft repetitive croak.

The Common Frog is native to the UK. They are found throughout Britain and Ireland. They are also widespread across Europe but numbers are thought to be declining.

They tend to be most active at night, they are carnivores so feed on a variety of invertebrate prey including slugs and snails which makes them especially popular with gardeners.

Despite their wide mouths, frogs drink by absorbing water through their skin and swallow using their eyes – they retract them into the head to help push food down their throats. When they moult, they usually eat the skin as it is a valuable source of nutrition! During winter they hibernate under rocks, in compost heaps, or underwater, buried in mud and vegetation.

Frogs make attractive meals for a vast array of wildlife, so they are vulnerable to predators on the ground, underwater and from above. Their predators include small mammals, lizards and snakes, water shrews, otters and birds such as herons.

Commom frogs are also threatened by degradation of habitats (the loss of ponds, even garden ponds, as well as lakes), threats to many food sources from declining water quality, and the introduction of disease.

Otter (Lutra lutra)

Otters inhabit rivers and wetland, coastal waters & marshland. They have brown fur, often pale on the underside, a long slender body, small ears on a broad head, long thick tail, and webbed feet. An otter swims very low in the water, the head and back barely showing. They are usually 60-80cm, the tail is about 32-56cm. Their weight is on average 8.2kg for males, 6.0kg for females. They live up to 10 years, though few survive more than five.

The otter is a secretive semi-aquatic species which was once widespread in Britain. By the 1970s, otters were restricted mainly to Scotland, especially the islands and the north-west coast, western Wales, parts of East Anglia and the West Country (though they remained common and

widespread also in Ireland). This decline was caused by organo-chlorine pesticides. Since these were withdrawn from use, otters have been spreading back into many areas, especially in northern and western England.

Otters eat fish, especially eels and salmonids, and crayfish at certain times of the year. Coastal otters in Shetland eat bottom-living species such as eelpout, rockling, butterfish, as well as crabs and shellfish. Otters occasionally take water birds such as coots, moorhens and ducks. In the spring, frogs are an important food item.

They are an apex predator in Britain and Ireland, even taking mink, and are themselves only at risk in the wild when young, from eagles, or when venturing outside their coastal range and encountering much larger marine predators. Their biggest threat is still from humans, though. Commercial fisherman resent otters taking their catches, while poor river water quality sends otters into stillwater lakes, where they come into conflict with anglers. Road traffic, habitat destruction and fishing nets all take their toll.

Otters can travel over large areas. Some are known to use 20 kilometres or more of river habitat. Otters deposit faeces (known as spraints, with a characteristic sweet musky odour) in prominent places around their ranges. These serve to mark an otter’s range, defending its territory but also helping neighbours keep in social contact with one another. Females with cubs reduce spraining to avoid detection.

In England and Wales, otter cubs, usually in litters of two or three, can be born at any time of the year. In Shetland and North-west Scotland most births occur in summer. Cubs are normally born in dens, called holts, which can be in a tree root system, a hole in a bank or under a pile of rocks. About 10 weeks elapse before cubs venture out of the holt with their mother, who raises the cubs without help from the male.

Otters are strictly protected by the Wildlife and Countryside Act (1981) and cannot be killed, kept or sold (even stuffed specimens) except under licence. In the late 1950s and early 1960s otters underwent a sudden and catastrophic decline throughout much of Britain and Europe. The cause was probably the combined effects of pollution and habitat destruction, particularly the drainage of wetlands. Otters require clean rivers with an abundant, varied supply of food and plenty of bank-side vegetation offering secluded sites for their holts. Riversides often lack the appropriate cover for otters to lie up during the day. Such areas can be made more attractive to otters by

establishing “otter havens,” where river banks are planted-up and kept free from human disturbance. Marshes may also be very important habitat for raising young and as a source of frogs.

While otters completely disappeared from the rivers of most of central and southern England 50 years ago, their future now looks much brighter. There is evidence that in certain parts of the UK the otter is extending its range and may be increasing locally. However, otter populations in England are very fragmented and the animals breed slowly. Attempts have been made to reintroduce otters to their former haunts by releasing captive bred and rehabilitated animals, with some attempts proving very successful.

Cormorant (Phalacrocorax carbo)

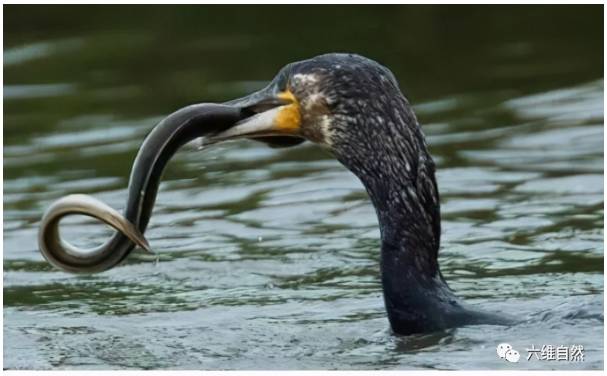
There are two subspecies of cormorant in the UK. There's the mostly coastal nesting Phalacrocorax carbo carbo, and there's Phalacrocorax carbo sinensis, which arrived from continental Europe and has led the increase of inland cormorant nesting colonies. This has accounted for a 53 per cent range expansion in Britain since the first nesting by sinensis in 1981 (at Abberton Reservoir, Essex).

By 2005 there were an estimated 2,100 pairs of sinensis nesting in Britain. However, since the establishment of inland tree nesting by sinensis Great Cormorants, coastal birds have also started to breed inland, particularly in those sinensis colonies that are older and well established.

Great cormorants build large conspicuous nests with coastal colonies normally situated on stacks, rocky islets, cliffs or rocky promontories. Many colonies persist at the same location for long periods, but others come and go or suddenly shift location – the presence of a colony in one year is no guarantee that there will be one there the following year. Inland colonies will nest in trees.

The cormorant lays a clutch of three to five eggs that measure 63 by 41 millimetres on average. The eggs are a pale blue or green, sometimes with a white chalky layer covering them. These eggs are incubated for a period of about four weeks.

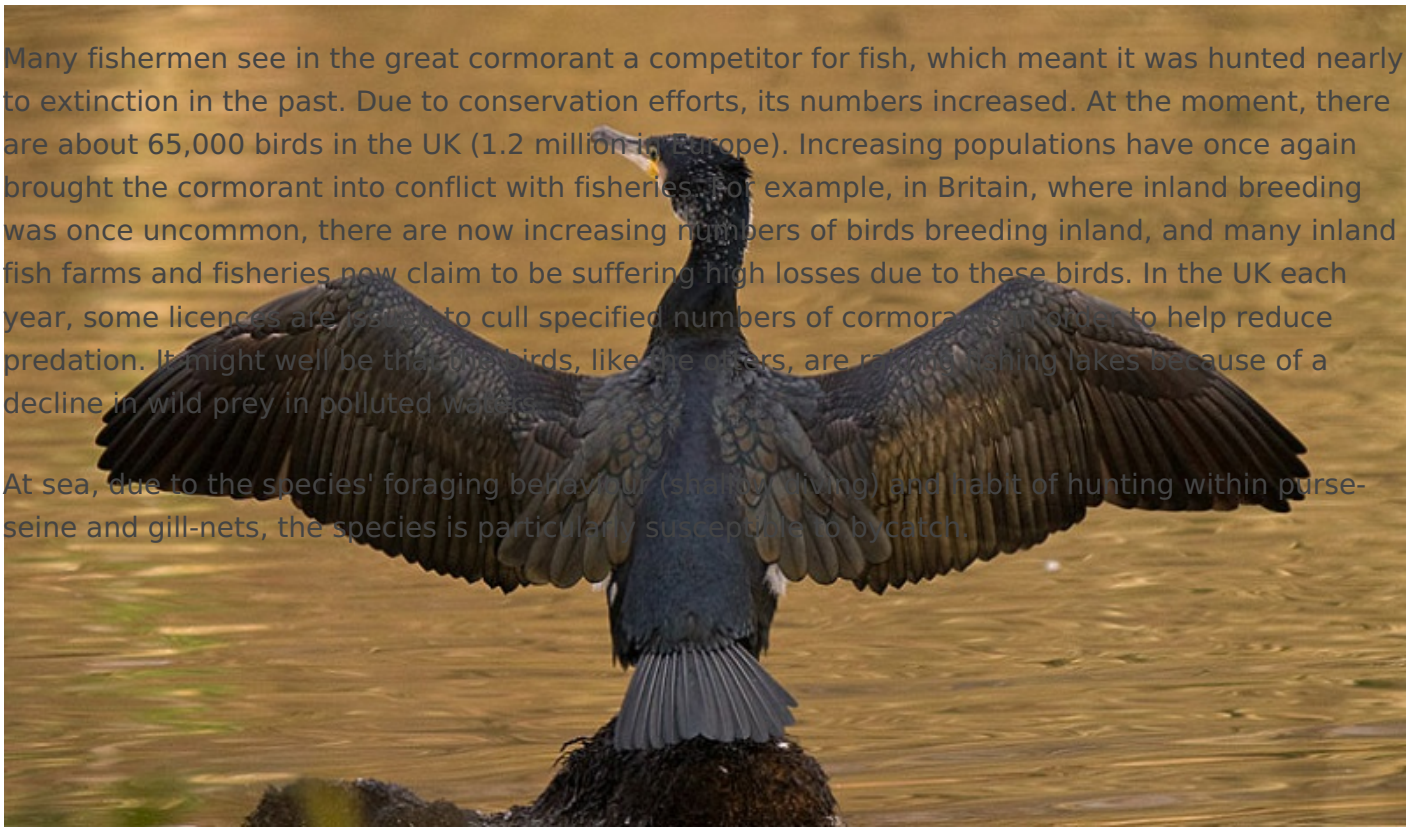
In marine environments cormorants are found in sheltered coastal areas on estuaries, coastal lagoons and coastal bays, requiring rocky shores, cliffs and islets for nesting, but generally avoiding deep water and rarely extending far offshore. They also inhabit fresh, brackish or saline inland wetlands, including lakes, reservoirs, wide rivers, flood waters, deep marshes with open water, swamps and oxbow lakes. They require trees, bushes, reedbeds or bare ground for nesting and will avoid overgrown, small, very shallow or very deep waters.



Cormorants forage by diving and capturing prey in their beaks. The duration of dives is around 28 seconds, with the bird diving to depths of about 6 metres. About 60% of dives are to the benthic zone and about 10% are to the pelagic zone, with the rest of the dives being to zones in between the two. Studies suggest that their hearing has evolved for underwater usage, possibly aiding their detection of fish. Cormorants' diet consists predominantly of fish, including flatfish, as well as crustaceans, amphibians, molluscs and nestling birds. At sea the species preys mostly on bottom-dwelling fish, occasionally also taking shoaling fish in deeper water. It is a generalist, having been shown to feed on at least 22 different fish species. They hunt by swimming.

Cormorants are large birds, up to 100cm long. Their wingspan can be 160cm, and they weigh from 2 - 2.5kg. They live on aerage 11 years. Their long necks and hooked bills give them a primitive, almost reptilian, appearance. This is enhanced by the fact that they are commonly seen standing on top of rocks, posts or trees with their wings out-stretched.

The cormorants' oily plumage is only partially waterproof and after diving for fish, they effectively have to hang out their wings to dry.



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River-water crowfoot

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- https://www.wyevalley-nl.org.uk/caring-for-wye-valley-aonb/our-projects/priority-species-project/water-crowfoot/
  And an appreciation of ecological value from EA:
- https://environmentagency.blog.gov.uk/2022/11/30/water-crowfoot-or-how-we-learned-to-love-ranunculus/

Caddis fly

- https://www.wildlifetrusts.org/wildlife-explorer/invertebrates/other-insects/caddisfly
- https://www.riverflies.org/trichoptera

Common barbel

- https://insideecology.com/2022/07/18/a-look-at-old-whiskers-the-common-barbel/
- https://animalia.bio/common-barbel
- https://www.inaturalist.org/taxa/95147-Barbus-barbus

The Common Frog

- https://www.froglife.org/info-advice/amphibians-and-reptiles/common-frog-2/
- https://www.woodlandtrust.org.uk/trees-woods-and-wildlife/animals/reptiles-and-amphibians/common-frog/
- https://www.discoverwildlife.com/animal-facts/amphibians/facts-about-common-frogs
  On frogspawn
- https://www.bto.org/our-science/projects/gbw/gardens-wildlife/garden-reptiles-amphibians/a-z-reptiles-amphibians/common-frog
  On declining populations
- https://www.froglife.org/2018/03/23/amphibian-and-reptile-declines-uk-perspective/

Otters

- https://www.mammal.org.uk/species-hub/full-species-hub/discover-mammals/species-otter/

- https://ukwildottertrust.org/otters-101/

Cormorants

- http://datazone.birdlife.org/species/factsheet/great-cormorant-phalacrocorax-carbo/text
- https://www.bto.org/understanding-birds/birdfacts/cormorant
- https://www.birdguides.com/articles/identification/great-and-double-crested-cormorants-and-european-shag-photo-id-guide/
- https://rspb.org.uk/birds-and-wildlife/cormorant

Talks & Presentations

Previous talks with resources. You can use these to increase awareness and use the resources to deliver your own talks.

Talk at XR Wandsworth 15 May 2024.

- Slides
- Video of talk

Talk for Odiham U3A group 24 May 2024

- Slides