Biology Week

Royal Society of Biology

The Royal Society of Biology: **The UK's favourite freshwater species poll**

Species factfiles

Introduction

Why is fresh water so important?

Fresh water is a renewable but finite natural resource that essentially supports much of life on Earth.

People depend on fresh water for drinking sources, agriculture and sanitation, as well as for a range of activities such as manufacturing, swimming, fishing and leisure. It is no surprise that big cities often have rivers running through them; society requires freshwater to function.

However, freshwater habitats are under threat; since 1970, freshwater species numbers worldwide have declined by 83%.

In the UK, where freshwater habitats cover around 12% of the total land, 69% of rivers and canals, and 62% of lakes, are classed as in a poor or bad condition.

How to use these resources

Each species that features in the poll also its own factfile, including details on habitat, lifecycle, characteristics and more.

If you would like larger versions of our resources, or printed copies sent to your school or another UK based address, contact **outreach@rsb.org.uk**

Freshwater: an introduction

What is freshwater?

Freshwater refers to naturally occurring water, excluding sea water. Although more than two-thirds (71%) of the earth's surface is covered by water, 99% of this is unusable as drinking water for people or freshwater organisms.

Freshwater sources include ice sheets, ice caps and, more commonly, lakes, ponds, streams, flushes, rivers, canals, springs, wetlands and ditches.

Where does freshwater come from?

Freshwater starts out as water vapour evaporated from the surface of a body of water, that then collects in clouds then released back via different forms of precipitation such as rain or snow. When it reaches the ground it flows into streams, lakes, ponds and wetlands.

UK Freshwater

The UK is home to 85% of the world's chalk rivers – lowland rivers formed of crystal clear water that emerges from chalk aquifers underground.

The water is consistently cool in temperature and the streams are renowned for their biodiversity. For example, the European freshwater crayfish, one of our species in this year's poll, are often found in these chalk rivers, as they provide refuge against non-native crayfish species.

In England, less than a fifth of all rivers are considered to be healthy, with some drained almost dry in places, and others polluted by fertilisers, pesticides, herbicides or urban sewage.

One of the biggest problems facing our steams is 'over-abstraction' – taking too much water from rivers and streams. If consumption of fresh water exceeds the natural replenishment mechanisms, availability is reduced which can cause serious damage to surrounding and associated environments.

In addition, about a third of the water we take from these sources is actually wasted, meaning a lot of the damage done by this removal could be reduced.

Freshwater sources

Stream	**A body of moving water**
River	**A large, natural stream of flowing water**
Canal	**Human made channels or artificial waterways**
Springs	**Point at which water flows from an aquifer to the Earth's surface**
Wetland	**Distinct ecosystem that is covered with water either permanently or seasonally**
Lakes	**Body of water that is surrounded by land. There are millions of lakes in the world**
Ponds	**An area filled with water, either natural or artificial, that is smaller than a lake**
Ditches	**A small to moderate depression created to channel water**
Aquifer	**an underground layer of rock or earth which holds groundwater**

This year's Biology Week poll

Picking this year's species

This year's Biology Week poll aims to focus on some of the inhabitants of these fresh water areas.

We have picked ten species that rely on freshwater to survive, including birds, insects, mammals, molluscs, crustaceans and plants. We're hoping that this year's poll not only highlights some of the species that rely on our freshwater bodies, but also the importance of freshwater habitats and their role in the wider ecosystem.

The ten fresh water species chosen are either endangered or protected under the Wildlife and Countryside Act 1981, or classified as vulnerable in Europe by the ICUN Red List.

What is the Wildlife and Countryside Act 1981?

The Wildlife and Countryside Act of 1981 is the primary legislation which protects animals, plants and habitats of the UK.

The act helps prohibit certain methods of killing or taking wild animals. It also serves as a guide to restrict the introduction of certain animals and plants.

The act contains "schedules" which categorises species and how they should be protected. The schedules include:

Schedule 1: Birds which are protected by special penalties
Schedule 2: Birds which may be killed or taken
Schedule 3: Birds which may be sold
Schedule 4: Birds which must be registered and ringed if kept in captivity
Schedule 5: Animals which are protected
Schedule 6: Animals which may not be killed or taken by certain methods
Schedule 7: Protection of certain mammals
Schedule 8: Plants which are protected
Schedule 9: Animals and plants to which section 14 applies
Schedules 10 to 15: Further information, including amendments, procedures
Schedule 16: Orders creating, extinguishing or diverting footpaths or bridleways
Schedule 17: Any enactments repealed after the act was passed

Natural England acts as a regulator for the Wildlife and Countryside Act 1981 for England, whilst the Countryside Council of Wales and Scottish Natural Heritage regulate the act for Scotland and Wales.

Natural England will also advise police in enforcing the Act, whist the National Wildlife Crime Unit also helps agencies with enforcement.

Smooth newt

Lissotriton vulgaris

These newts have orange bellies with black spots, and are most active during the night. Usually found in ponds during the spring and summer, these amphibians spend their time eating slugs, worms, tadpoles, water snails and shrimps.

Freshwater habitat	Ponds
Food	Insects, slugs, worms, tadpoles, water snails, shrimps
Life cycle	Adults often colonise ponds, and are commonly found during their breeding season between February and June. Female newts wrap each of their eggs in a leaf of pond weed, and when the newts hatch, they develop their front legs first. Once they lose their gills, they leave the water and like to reside in damp spots like under logs or leaf debris.
Appearance	Orange bellies with black spots.
Status	Protected under schedule 5 in the UK under the Wildlife and Countryside Act, 1981 with respect to sale only.

Freshwater pearl mussel

Margaritifera margaritifera

One of the longest-living invertebrates in existence, the oldest known freshwater pearl mussel was caught in Estonia, and was 134 years of age. These mussels spend their adult lives anchored to the river bed, filtering water through gills which improves the quality of the water for other species.

Freshwater habitat	Rivers and streams
Food	Tiny particles in the water: mussels are filter feeders
Life cycle	Mussels reproduce sexually, with their larval form attaching to the gills of fish to access oxygen-rich water. Once the grow, they break free and may drift up to six months before settling on a surface.
Appearance	Their shell is large, heavy and elongated, typically yellowish-brown in colour when young and becoming darker with age.
Status	Protected under Schedule 5 in the UK under the Wildlife and Countryside Act, 1981 with respect to sale only.

Common toad

Bufo bufo

The common toad is the fourth most common amphibian in Europe, and is native to the UK. These toothless amphibians have yellow- or copper- coloured irises, and typically struggle to recognise prey, so will try to consume any small, dark-coloured moving object it encounters at night.

Freshwater habitat	Ponds
Food	Woodlice, slugs, beetles, caterpillars, flies, earthworms, small mice
Life cycle	These toads emerge from hibernation during the spring and mass migrate to ponds for breeding, usually the same pond every year. Toadspawn is laid in strings, and when the tadpoles hatch after two to three weeks, they'll eat the string and jelly as their first meal. They attach themselves to the underside of the leaves of water weed before becoming free swimming.
Appearance	The bulbous, protruding eyes have yellow or copper-coloured irises and horizontal slit-shaped pupils. Adult males grow up to 8cm in length, and females up to 13cm.
Status	Protected under Schedule 5 in the UK under the Wildlife and Countryside Act, 1981 with respect to sale only.

Glutinous snail

Myxas glutinosa

This small, air-breathing, freshwater snail relies on some of the cleanest water for its survival. It has an extremely thin brown or green shell that is shiny and translucent, giving it a glass-like appearance. Its usual fresh water habitats include canals, streams and lakes.

Freshwater habitat	Canals, streams and lakes
Food	Algae coating rock surfaces
Life cycle	Snails prefer to lay their eggs in a nest underneath vegetation, and can lay up to 400 eggs a month. Eggs hatch after around two weeks, and snails emerge with a soft shell. They have to eat food rich in calcium so their shell can harden, and the rings on their shells indicate their age.
Appearance	It has a brown or green shell that is extremely thin and has a glass-like appearance. When fully grown, the shell can be up to 15mm in width.
Status	Protected under Schedule 5 in the UK under the Wildlife and Countryside Act, 1981 with respect to sale only.

European freshwater crayfish

Austropotamobius pallipes

These freshwater crustaceans are the only species of crayfish that are native to the UK. They feed on small fish, snails and algae. When they are young they are small enough to be eaten by dragonflies, but bigger crayfish are eaten by otters, trout, herons and mink.

Freshwater habitat	Canals, streams and lakes
Food	Worms, insects, larvae, snails, small fish, macrophytes, algae, water plants, dead and organic matter
Life cycle	Freshwater crayfish eggs take about three weeks to hatch, depending on temperature. A small crayfish emerges, which has all the same structures of an adult crayfish. A crayfish reaches adult size in three to four months and can live up to eight years of age.
Appearance	They are olive-brown in colour, with pale-coloured undersides to the claws. These crayfish may grow up to 12cm long, although sizes below 10cm are more common. Adult males have larger claws than the females.
Status	Protected under Schedule 5 in the UK under the Wildlife and Countryside Act, 1981 with respect to sale only.

Norfolk hawker dragonfly

Aeshna isosceles

These dragonflies spend up to two years in their freshwater homes as larvae, before emerging as adults. The Norfolk hawker needs unspoiled grazing marsh with non-saline water to survive, and can often be spotted flying around marshes and ditches in June and July.

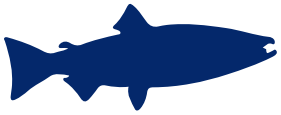
Freshwater habitat	Marshes and ditches
Food	Other insects such as mosquitoes and midges, butterflies and smaller dragonflies.
Life cycle	The larval form spends two years living underwater. When mature, dragonfly larvae climb on to vegetation at night and molt into adult dragonflies, which are commonly spotted in June and July in the UK.
Appearance	They are entirely pale brown with green eyes and clear wings. Males and females look similar, although females have a bulkier abdomen.
Status	Protected under Schedule 5 in the UK under the Wildlife and Countryside Act, 1981 with respect to sale only.

Water vole

Arvicola amphibious

These chestnut-coloured freshwater furry mammals can be found in rivers, streams, ditches and ponds. They like to stay in the same place for long periods of time, often in a burrow they dig themselves in steep grass banks, complete with underwater entrances.

Freshwater habitat	Rivers, streams, ditches, ponds
Food	Grass, fruits, twigs, buds, roots
Life cycle	Water voles start to breed in spring and have three to four litters a year between March and September. Young leave their mother after 28 days and those born in July may breed that autumn, though most reach sexual maturity after their first winter. Juvenile water voles need to weigh at least 170g to survive winter.
Appearance	Voles have chestnut brown fur with a blunt and round nose, small ears and a furry tail. Scotland's vole species appear darker and often have a black coat.
Status	Protected under Schedule 5 in the UK under the Wildlife and Countryside Act, 1981 with respect to sale only.



Atlantic salmon

Salmo salar

These fish spend most of their life at sea but return to freshwater to spawn, and can be spotted leaping across streams and rivers during the autumn months here in the UK.

Freshwater habitat	Rivers and streams
Food	Invertebrates and small fish
Life cycle	Salmon spend most of their life in saltwater, in which they do most of their feeding and growing. However, they will return to their native freshwater sources to spawn, often having to swim against strong currents. In the UK, the salmon season usually lasts around three weeks from mid-October to mid-November, usually as the weather turns wetter. The adults return to sea after spawning and the young remain in the freshwater streams and rivers for two to three years before migrating to the sea.
Appearance	Salmon appear silvery with a few dark spots on the back. Adults are around 1.5m in length and can weigh up to 40kg.
Status	Although not protected in the UK by Wildlife and Countryside Act, they are classed by the ICUN Red List as vulnerable across Europe.

Fen Violet

Viola persicifoila

These beautiful, pale, bluish-white leafed freshwater flowers are usually found in wetlands or around peat cuttings, and are very popular with bees. They are considered to be endangered in Britain, and they are unable to cope with competition with other plants, so are often found on bare ground.

Freshwater habitat	Wetlands or peat marshes
Food	Sunlight
Life cycle	Seeds can lie dormant for many years, germinating only when conditions become favourable. The seeds germinate in the spring and flowers begin to appear in May. They are able to self-pollinate, which is advantageous if bad weather means pollinators are few and far between.
Appearance	Pale bluish- white flowers and typically violet shaped- narrow and triangular.
Status	Protected in the UK under Schedule 8 of the Wildlife and Countryside Act, 1981. This protects plants from being picked and sold.

Common Otter

Lutra lutra

These brown furry mammals have a long slender body and can be found often in rivers and wetlands. They eat fish, eels and crayfish. They can live for up to ten years and they prefer clean rivers, with an abundant source of food, and plenty of vegetation to hide their secluded holts.

Freshwater habitat	Rivers and wetland
Food	Fish, eels, crayfish
Life cycle	Otters have their cubs in underground burrows known as holts. Weighing up to five pounds, pups are born in the water with their eyes open. Pups start diving within two months, but the young may stay with their mothers for up to 14 months, and reach sexual maturity after 2-3 years.
Appearance	They have brown fur and often pale with a long slender body, small ears, broad head and long thick tail.
Status	Protected under Schedule 5 and 6 in the UK under the Wildlife and Countryside Act, 1981. This means they cannot be killed or taken by certain methods such as trapping or snaring.

Further reading

The Wildlife Trusts provide information on UK wildlife alongside freshwater and wetland facts:
www.wildlifetrusts.org/water

The WWF on why rivers and chalk streams are important:
www.wwf.org.uk/where-we-work/places/uk-rivers-and-chalk-streams

The WWF Living Planet Report on the population numbers of species worldwide:
www.wwf.org.uk/updates/living-planet-report-2018

The Freshwater Habitats Trust aims to protect freshwater life for everyone to enjoy. Their website has lots of educational resources and more information:
www.freshwaterhabitats.org.uk

They have a range of facts on freshwater creatures and plants:
www.freshwaterhabitats.org.uk/pond-clinic/identifying-freshwater-plants

The Wild life and countryside Act, 1981 lists all protected species in the UK:
www.legislation.gov.uk/ukpga/1981/69/contents

National Geographic resource library on Freshwater Ecosystems:
www.nationalgeographic.org/news/freshwater-ecosystem

The River Thame Catchment Project, which is working to improve the quality of the River Thame and its tributaries:
www.freshwaterhabitats.org.uk/projects/catchment-projects/river-thame-catchment-project

Want to get involved with some surveying? The Freshwater Habitats Trust has a number of PondNet survey options that anyone can get involved with, regardless of their experience or training:
www.freshwaterhabitats.org.uk/projects/pondnet/survey-options

The Clean Water for Wildlife citizen science survey, ran by the Freshwater Habitats Trust, issued over 30,000 kits for volunteers to submit levels of nutrient pollutants to understand the extent of pollution levels:
www.freshwaterhabitats.org.uk/projects/clean-water

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