Saving a Species

The Freshwater Pearl Mussel Story

by South Cumbria Rivers Trust for the

LIFE R4ever Kent Project

A partnership project. Co-funded by the European Union.

Saving a Species – The Freshwater Pearl Mussel Story

Saving a Species – The Freshwater Pearl Mussel Story is part of the LIFE *R4ever Kent*, a collaborative 5-year project between Natural England, South Cumbria Rivers Trust, Freshwater Biological Association, and the Environment Agency.

LIFE R4ever Kent project aims to **revive**, **revitalise,** and **restore** the River Kent system, ensuring it is **resilient** to future changes.

It tells the story of freshwater pearl mussels and of the work that is being undertaken to save this incredible species from extinction in the River Kent catchment in South Cumbria.

This pack can be used to bring to life elements of geography and science in the National Curriculum and make them relevant to habitats and species found locally.

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January 2025

What is a Freshwater pearl mussel?

Freshwater pearl mussel is a species of **mollusc** that is classed as **critically endangered** by the International Union for Conservation of Nature (IUCN). There has been a decline in population of 90% in the last one hundred years, putting Freshwater pearl mussels firmly on the IUCN Red List.

www.iucnredlist.org/species/12799/3382660

Freshwater pearl mussels (*Margaritifera margaritifera*) are incredibly rare. The mussel is a **bivalve**, meaning its case is in two parts held together with a hinge. The shell protects the soft body of the mussel. They have a large muscular "foot" which anchors them to the riverbed.

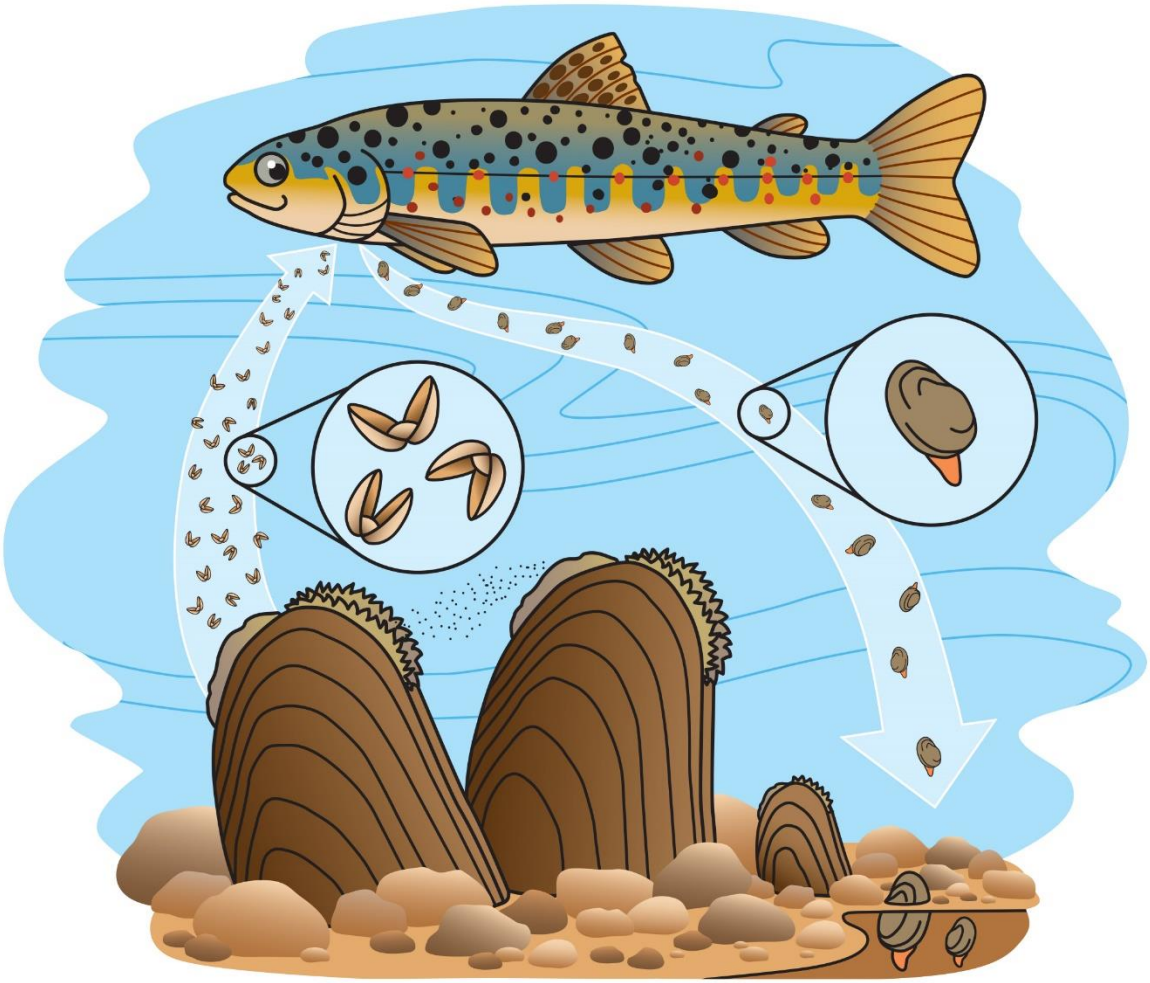
Pearl mussels are **filter feeders**. The mussel has a siphon which sucks up the water, passing it through the gills where tiny pieces of plant and animal are trapped and absorbed as food. The "cleaned" water is then squirted back out.

One adult mussel will filter around 50 litres of water a day, making them amazing cleaners, improving the river environment for a wide range of species including trout and salmon as well as freshwater **invertebrates**.

Mussels, like most river species need clean, well oxygenated water and a riverbed with gravels and rocks free of silt and without a lot of algae. **Sediment** and **silt** can affect how mussels breathe and feed. They are very sensitive to pollution so are called an **indicator species**. If a river is good enough for pearl mussels, then it will be good enough for lots of wildlife.

Life cycle

The mussels have a very interesting and unusual life cycle and relies on the presence of salmon and trout. Without these fish the young mussels will not develop into adults.



An adult mussel releases 1-4 million **larvae** in the summer. Most of these **glochidia** are swept away but some get inhaled by young salmon and trout into their gills. The tiny glochidia attached themselves firmly to the gills where they stay for about 9 months until the following spring. This does not harm the fish in any way, it's just like them being in a safe, oxygen-rich nursery!

When ready the small mussels drop off the fish and bury themselves in the gravels at the bottom of the riverbed. At this stage the mussels are smaller than a grain of rice, about 0.5mm in length. If they land in mud, or silt then they will not survive. It is important that the gravels are just the right size to protect the little mussels and allow oxygenated water to swirl around them.

Mussels grow very slowly, developing gills between 3 and 5 years of age, and becoming adults at 10-15 years when they start to produce eggs. They carry on growing and each year a layer is added to their shell, which you can sometimes see as a ring in the shell. The mussels can grow as long as 15cm.

Only a few mussels will make a pearl. This happens when a **parasite** gets into the shell and the protective "mother of pearl" coating that lines the inside of the shell grows over it in layers. These natural pearls can vary in size, shape, and colour.

Freshwater pearl mussels can live for one hundred years but human impact, poor water quality, illegal harvesting, and climate change mean that they are now at risk of extinction.

The River Kent catchment is the only area in South Cumbria where these mussels are found. There are just two sites hosting very old mussels and without any successful breeding to maintain the populations.

Did you know……

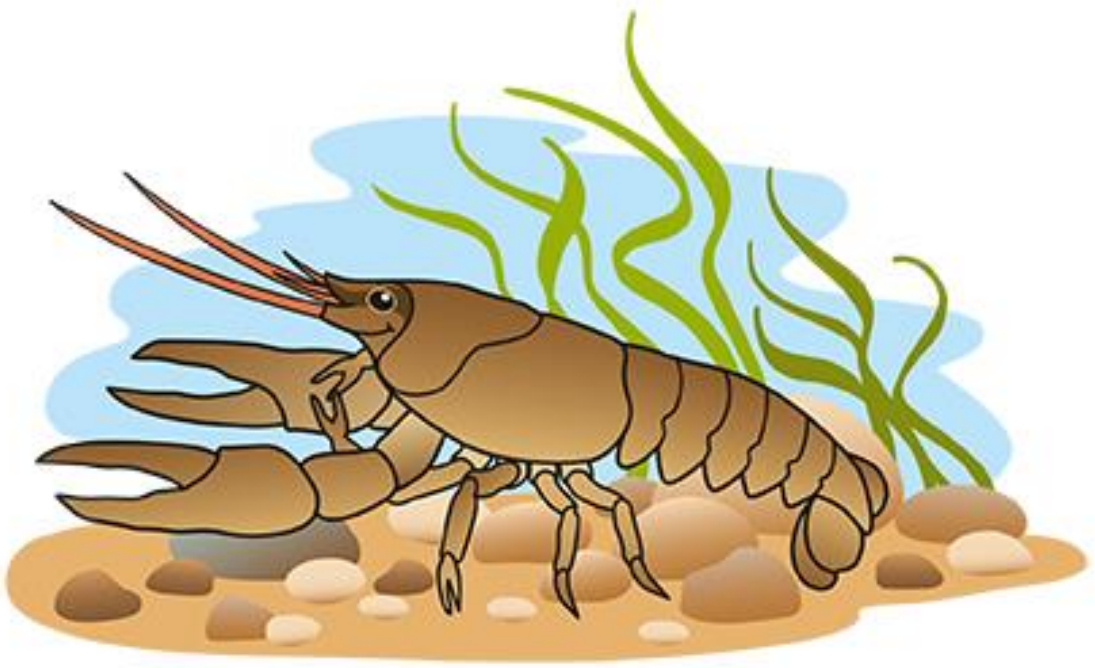
- Only 400 in one million mussel glochidia will successfully attach to suitable fish
- Of these 400, 20 will survive on the fish host
- Of these 20, just one or two will fall into suitable habitat and continue to grow

Saving more than just a mussel

The Freshwater pearl mussel is not only an indicator species but is also classed as a **keystone species**. By protecting and restoring our rivers for mussels we are also doing the same for other equally amazing species.

White-clawed crayfish

The White-clawed crayfish (*Austropotamobius pallipes*) is the UK's only native crayfish and is one of our largest invertebrates, it is also classed as a **crustacean.**



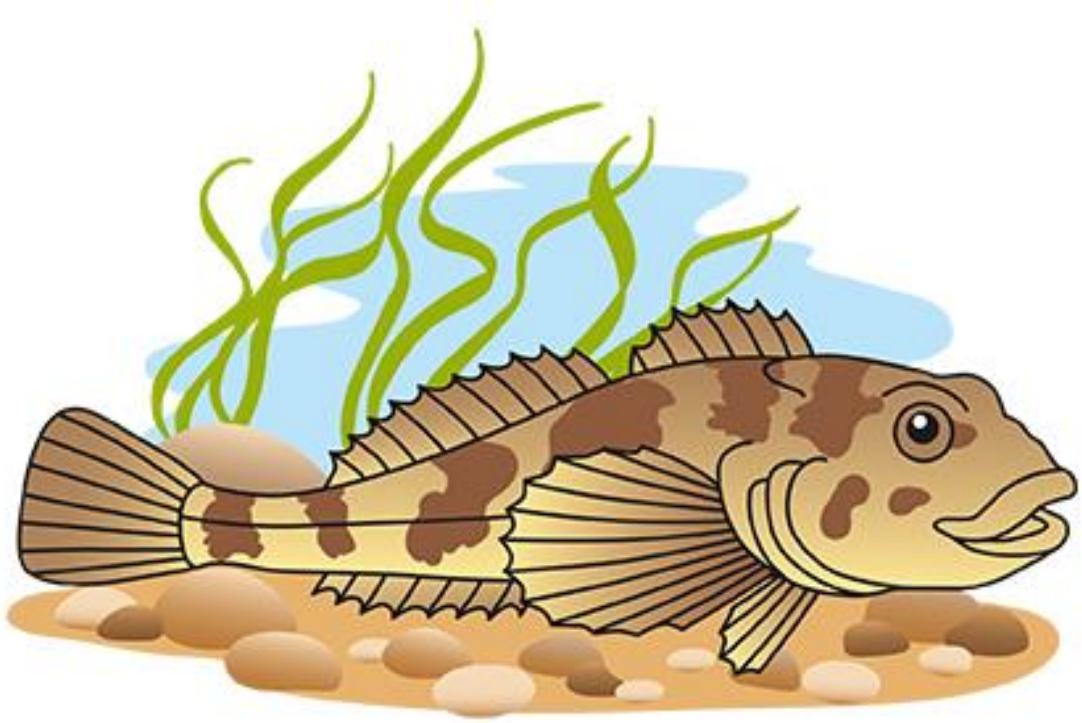
White-clawed crayfish are an endangered species, as they have declined by 70% in the last 50 years. Crayfish need to live in well oxygenated, calcium-rich healthy waters as calcium keeps their outer shell (**carapace**) strong.

The main threat to White-clawed crayfish is the signal crayfish. It is bigger, more aggressive and carries a disease that native crayfish have no resistance to. Introduced to the UK from America, signal crayfish have red undersides to their claws, eat our native crayfish as well as fish, fish eggs and invertebrates. Signal crayfish are found just a few miles outside the Kent catchment.

Bullhead

Bullheads *(Cottus gobio)* are amazing little fish, found on the riverbed hiding in between and under rocks and stones. They need clean, well oxygenated water and feed on invertebrates, fish eggs and tiny fish larvae.

Bullheads are master of camouflage so are hard to spot even with their big head, wide mouth and big pectoral fins.



Bullhead don't have scales but are very slimy instead, which helps them escape from predators.

Bullheads are a member of the *Cottidae* family, and is the only found in freshwater, the other 299 members are found in our seas and oceans.

Atlantic Salmon and Brown Trout

Atlantic salmon (*Salmo salar*) Brown trout (*Salmo trutta*) are native to the UK and are part of the salmon family (**salmonid**).

Brown trout have a golden body with paler ringed dark spots and a creamy-yellow belly. They can grow up to 80cm in length and weigh as much as 14kg and are smaller than Atlantic salmon. The lifespan of a brown trout is usually 15-20 years.

Neither Atlantic salmon nor Brown trout are as widespread or abundant as they used to be so are now classed as priority species.

Atlantic salmon and Brown trout are very adaptable and can live in both fresh water and sea water.

Atlantic salmon and some Brown trout will **migrate** out to sea when they are two to three years old. These **smolt** turn silvery and adapt their body and internal organs to live in salt water. After a few years the salmon and sea trout will return to the river to **spawn**. These fish are **anadromous**. However, some Brown trout will remain in a river throughout their whole life and are described as resident trout.

The fish spawn in the winter (Nov – Jan) when the river temperatures are much cooler. Females create depressions called **redds** in the gravels on the riverbed and lay their eggs in them, which are then fertilised externally by the males before being covered over. A female trout may lay 2000 eggs in one redd.

The eggs remain in the gravels and take two to three months to hatch. These little fish are known as **alevins** and after hatching will feed off its attached **yolk sac** for two to four weeks, staying hidden in the gravels. Only when the egg sac is almost finished do the fish begin to feed on freshwater invertebrates, venturing out of the gravels. These young fish are known as **fry.** After a few months the fry become known as **parr**.

It is these young salmonid that are vital to freshwater pearl mussels, playing host to the glochidia, so without the fish the mussels will not develop into adults.

Threats to freshwater pearl mussels

Habitats & Water Quality

- Man-made changes to rivers such as straightening and **revetment** work can reduce the range of habitats, so fish and invertebrates are at risk from predation as they have fewer places to hide. Water flow has little variation and is often faster without bends to slow it down.

- Declining water quality impacts on fish and invertebrate populations via the food chain.
- Pollution incidents can wipe out freshwater invertebrates, small fish, and large fish.

- Soils from fields that have been ploughed or grazed right up to the river edge can wash into the water when it rains.
- Silt settles on the riverbed, reducing the flow of oxygen through the gravels to the fish eggs and fry, it can even smother the eggs and fry completely.

- Fertilisers that have been added to the fields can also wash away into the nearby watercourse when there is heavy rain.
- Fertilisers are a nutrient which helps things grow, but too much in the water can encourage lots of algae to grow, which is bad for the river and the wildlife.

Barriers to migration

- Atlantic Salmon and some Brown trout migrate out to sea before returning to the rivers to spawn.
- Barriers in the form of weirs can hinder this movement, often trapping the fish in front, making them an easy target for predators.
- Leaping the barriers also takes a lot of energy and can also result in some injuries.
- Once heading out on their migration fish undergo a transformation so have a limited time to make it out to sea or back to the river.

Climate Change

- Scientists are seeing the ocean currents slowing and moving due to the effects of climate change which will impact on fish migration.
- We're also seeing our rivers warming up which might sound good to us, but for a lot of wildlife it is bad. Increasing periods of drought can also dry up smaller streams, forcing fish into smaller pools with a greater risk of predation.
- Warmer, stiller water has less oxygen in it, which affects fish and their food source.
- Warmer conditions can also increase some types of algae, including toxic blue-green algae.
- Additionally, climate change is causing more flood events which is bad for our river wildlife.

Helping our Rivers – South Cumbria Rivers Trust

There are many ways we help our rivers and precious species

- Raise the profile of fish and other species through education and engagement
- Encourage people to learn more about rivers through education and engagement
- Improve river habitats through engaging with landowners and people to reduce pollution, nutrient enrichment, and sedimentation.
- Make river habitats better through practical work such as making rivers ‘wiggly’ again and varying water flow.
- Plant trees. Trees help shade the river, keeping the water cooler in the summer. Tree roots help to stabilise riverbanks and overhanging branches in the water provide a safe place for little fish and invertebrates.
- Improve migration by removing barriers, bypassing them, or installing fish passes and ladders.

Helping pearl mussels – Freshwater Biological Association

The Freshwater Biological Association (fba) is dedicated to understanding and conserving freshwater environments through scientific research and species recovery programmes.

The Freshwater Pearl Mussel Recovery Project – The Ark

The Ark project at the Species Recovery Centre is a captive breeding and release programme and supports Freshwater pearl mussel restoration projects in England and Wales.

The aim is to release and monitor 3000 juvenile mussels to restore and enhance the populations in the Kent catchment, following extensive research and habitat restoration.

Helping pearl mussels – Natural England

Natural England (NE) is the government's advisor for the natural environment in England, helping to protect England's nature and landscape for people to enjoy and for the services they provide.

Natural England is responsible the managing the project as a whole, and provides expertise guidance and support for farmers, land managers and landowners in the Kent catchment.

Helping pearl mussels – The Environment Agency

The Environment Agency (EA) is the environmental regulator for England with powers and duties that cover environmental protection, flood defence, water resources, fisheries, recreation, conservation and navigation.

NB: Species and habitats mentioned in this pack are protected by laws and regulations, in particular Freshwater pearl mussels, White-clawed crayfish, Bullhead and Atlantic salmon.

If you would like to know more, then South Cumbria Rivers Trust can come along and deliver some learning sessions in person either in the classroom, by a river or both!

Email: admin@scrt.co.uk

Ideas for the Classroom

- Make a food chain for trout and freshwater pearl mussel. Think of fun names for its food.
- Write a poem about trout, how they move and how they look.
- Make or draw some salmon. Do they need to be camouflaged?
- Draw a river that is full of wildlife, how may it look? What are good feature and what are bad features?
- Draw a habitat that is best for pearl mussels? What is needed in it?
- Think about endangered wildlife. Can you name any other species that are found in Cumbria or England?
- Make some pearl mussels or draw a picture of the mussel's life cycle.
- Contact South Cumbria Rivers Trust if you'd like to know more.

Visit a River

- Explore your local river.
- Can you see any places where trout and salmon might live?
- Can you spot any barriers?
- Can you find some freshwater invertebrates?
- What natural features can you see?
- Contact South Cumbria Rivers Trust if you'd like a supported visit.



There are activity sheets which can be downloaded from the website www.r4everkent.co.uk

Our Rivers

A healthy river system is key for good **biodiversity** as it reflects the health of the surrounding environment. Ideally a river should be as natural as possible with good bankside and in-river vegetation, water flow variation and be full of wildlife. Trees add shade, while tree roots give stability to the banks, reduce erosion, and provide river corridors for a range of species from birds to bats.

The majority of our rivers have been altered in some way and are under a lot of pressure as a result of human impact. This can be from development and water extraction, to how we manage the land and often results in changes to water flow and the loss of suitable habitat for many freshwater species. Water flow is important for sorting gravels, moving sediments, and circulating oxygen, all vital to sustaining healthy fish and invertebrate populations.

Good water quality is really important for rivers and wildlife. Water quality is classified under the Water Framework Directive, assessing the water on ecology and chemical levels. Originally the aim was for all UK waters (lakes, rivers, streams) to achieve "good" status by 2015, this has since been extended to 2021, then to 2027.

- In 2019 no water achieved good status, with all failing on chemical assessments, and only 14% were classed as good ecologically.

- Research shows that in the last 100 years we've lost an estimated 90% of our freshwater habitats across the world.

- Freshwater **ecosystems** are the fastest declining of all, with a 76% decline in freshwater species in the last 30 years.

- Since records began, 26% of UK freshwater species have become extinct.

Freshwater invertebrates are vital to supporting a wide range of other freshwater species as well as birds and bats. Many are intolerant of pollutants so can be used as an indicator of water quality. Key species include stonefly, caddisfly, and mayfly, as they all have their larval stage in freshwater.

The River Kent

The River Kent flows for approximately 20 miles from the hills of Kentmere, through Kendal then to Morecambe Bay.

Its main **tributaries** are the River Gowan, The River Sprint and the River Mint.

The River Kent and its wider **catchment** is very special and has lots of **designations.**

In the UK it is protected as a **SSSI** – A **S**ite of **S**pecial **S**cientific **I**nterest. This is because of the rare species and special habitats that are found within it. It is also classed as a Principal Salmon River.

It is recognised as being an important place in Europe as a **SAC** – A **S**pecial **A**rea of **C**onservation

It is also recognised as being an important place in the world and forms part of the Emerald Network.

The River Kent is home to Freshwater pearl mussel, white-clawed crayfish and bullhead – which makes it unique!

There are more than 60 weirs on the rivers in the Kent catchment – that's a lot of leaping for salmon and trout.

Glossary

Mollusc – a type of animal with a soft body, with most having a hard shell to protect it

Critically endangered - something that is at risk of extinction

Bivalve – a shell with two parts hinged together

Filter feeder – animal that feeds by sieving its food from water

Invertebrate – an animal without a backbone

Sediment – particles/matter that drops to the bottom of the river

Silt – very fine particles of stone smaller than sand

Indicator species – a species that is sensitive to change in the quality of its environment. This could be lots or none depending on whether conditions are good or bad

Larvae – newly hatched insect in the first stage of its life cycle

Glochidia – tiny larvae of freshwater pearl mussel

Parasite – an animal that feeds off or lives on another species

Keystone species – a species that is vital to a habitat or ecosystem. If it is lost or removed it can have a big negative impact on other species, leading to their loss too.

Crustacean – an animal with a hard shell and several; pairs of legs, usually found in water

Carapace – the protective hard case that covers the back of an animal such as a crab or crayfish

Salmonid – a fish of the salmon family e.g. Brown trout, Atlantic salmon

Migrate – to travel from one place to another usually for feeding or breeding

Smolt – a young salmon or trout that has adapted its body to go out to sea

Spawn – to deposit eggs

Anadromous – a fish which spends most of its life at sea but returns to the river to spawn

Redd – a hollow in the riverbed made by a female salmonid in which to lay eggs

Alevin – newly hatched fish that has a yolk sac attached

Yolk sac – contains food needed for growth

Fry – young fish that feed for themselves

Parr – next growth stage of fish after fry and before adulthood

Biodiversity – a range of wildlife in a particular place or habitat

Ecosystem – a group of living things that interact with each other and their non-living environment including water, soil and air

Revetment – man-made wall put up along a bank to reduce erosion

Tributary – a river or stream that flows into a larger river or lake

Catchment – an area of land where water flows from into rivers, streams, and lakes

Designation – saying that a place is particularly special or important

LIFE R4ever Kent

This is a collaborative 5-year project between Natural England, South Cumbria Rivers Trust, Freshwater Biological Association, and the Environment Agency. It is co-funded by LIFE, part of the European Commission. The project started in October 2021 and will run until September 2026.

LIFE R4ever Kent aims to revive, revitalise and restore the River Kent system, ensuring it is resilient to future changes. Habitat restoration, invasive species control and species recovery research are key to the survival of Freshwater pearl mussel, White-clawed crayfish, Bullhead and a healthy wider freshwater ecosystem.

A partnership project. Co-funded by the European Union.

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