WEST WALES RIVERS TRUST
YMDDIRIEDOLAETH AFONYDD GORLLEWIN CYMRU

River Care Groups Actions & Activities

Features to monitor and map

It is important to not only check the main water course but also all the inputs from smaller side streams, ditches and drains. Pollution will be become more concentrated and obvious closer to its source. Consider what the ecosystem should be without human impact. This will give an assessment of how degraded it is.

Where you are asked to record or note features or species, please do this via the West Wales Rivers Trust Survey123 App feature. (Details in information pack).

Water Quality

1. **Colour and clarity (turbidity)**
   Fill a clear glass with a sample from the watercourse. A green, yellow or brown colour may indicate a high nutrient value. Effluent liquor coming from a slurry store, washdown from a yard, dung heap or silage clamp will start off with a dark brown colour and may become lighter with dilution the further away it is from the source.

   A dark colour may be natural if its source is a peat bog or wetland due to a high Dissolved Organic Carbon (DOC) level. These environments have a high productivity and slow breakdown of plant material.

   The sample may be cloudy due to sediment which may have a characteristic colour depending on the nature of the local soil. Leave the sample to settle allowing the sediment to collect at the bottom of the glass leaving the water above relatively clear. Sample a water course after heavy rain to determine if sedimentation is occurring. This can be natural due to a water course cutting away a bank on a meander. Problem sources are excessive erosion due to a bank being destabilised by grazing right up to the edge with a lack of any roots to bind the soil. This is particularly a problem where there are rye-grass leys on intensive farms. These have short roots that do not reach down to the gravel layer.

   Other sources of sediment are poaching by animals being on the pasture during wet conditions adjacent to the water course and at crossing and drinking access points. Sediment can also be generated at gate entrances and cutting of hedge road margins by wide machinery. Soil can be washed along the road and into a watercourse or indirectly via a roadside drain. The drain may be connected to the local sewage treatment works adding extra load.

   The sample may be a cloudy green or brown colour due to phytoplankton which can grow to dense concentrations in warmer conditions during periods of low flow. It will remain cloudy even after being allowed to settle. This is more likely to be found on the larger rivers with deep pools such as the Towy, Teifi and Cleddau. This is a problem as the plankton intercept light from reaching macrophytes (aquatic plants) attached the gravels. They then use up more phosphorous making it unavailable for macrophyte growth. The higher turbidity created by the dense phytoplankton further reduces light to the macrophytes leading to

their decline.

A red discharge into the water course is a sign that iron is present. Its ferruginous (iron bearing) property may be natural when groundwater reaches the surface next to the stream. The iron is then oxidised by dissolved oxygen or through enzyme catalysis by iron bacteria that concentrate it. A red precipitate is formed resulting in the creation of bog iron. An oily film on the water surface is also created by the bacteria.

This is more likely to be observed in the South Wales Coalfield when waste mine water is discharged from old workings. The water dissolves the metal ions and sulphates to sulphuric acid. This may be neutralised if the water then passes through calcite or carbonate bearing rocks and metals may stay immobile. Frequently, however, the water is acidic and can contain high concentrations of iron, zinc, copper, lead, manganese and aluminium. The nature of minewaters varies considerably and they can also be alkaline, highly saline or clean.

Minewater may emerge clear as underground water is low in oxygen and any metals are dissolved. Iron rapidly oxidises when is it aerated in the water course and settles out as a red deposit of ochre. This can smother the gravels which can also be cemented together if the discharge contains carbonate.

2. **Odour**
   Smell the sample and note its odour if any. Water with a strong brown colour may smell sweet if it has originated from a silage clamp. Slurry and untreated sewage both have their own distinct aroma. There is a distinct smell of bleach if hypochlorite is present. A mis-connection discharging to the river may have an odour that will provide a clue as to the nature of its source.

3. **Foam**
   Observing foam should trigger the question as to whether it could be un-natural. It is produced when molecules such as fatty acids act as foaming agents (surfactants) by reducing the surface tension between molecules on the water surface allowing water and air to mix more readily. Agitation from wind-generated waves, waterfalls and fast-flowing riffles cause the surfactant molecules to trap bubbles forming foam.

   This may be a natural occurrence when fatty acids are released from decaying organic material such as leaves and dead organisms. Lipids and proteins are also released when the glass cell walls of diatoms break apart in the turbulent water and are also surfactants. The bubbles accumulate hydrophobic substances, and the dissolved organic matter stabilises and aggregates them into a dense nutrient-rich foam. This phenomenon may be seen when a high spring tide rises over a nutrient rich mudflat and saltmarsh. Foams forms and is concentrated as the tide is funnelled into the river mouth.

   It can be caused by synthetic products such as detergents that are harmful to fish and other aquatic life. It is more frequently caused by excess nutrient levels of phosphates and nitrates being taken up by diatoms which are then broken up. The foam itself is not toxic as it is simply air and water.

Often large “icebergs” of clean white foam is more of a concern than brown tainted foam of organic nature.

4. **pH**
   It is worth testing the pH of the water course to see if it has been changed un-naturally as this can affect aquatic life. Acidic conditions can arise from mine discharges, agricultural activities, industry and from conifer plantations. This can increase the solubility and toxicity of metals such as aluminium, copper, lead, zinc and cadmium. To test this electronic checkers are most appropriate and should be requested if your tributary drains areas of commercial forestry.

5. **Nutrient measurement – phosphate and nitrate meters**
   It may useful to record phosphate and nitrate levels on a regular basis to detect elevated levels and the success of any management interventions. This will not be necessary where there are obvious gross visual indicators of elevated levels of these nutrients that can often be traced back to a point source. Please be aware although testing will help locate pollution sources it cannot be used to frame polluters or as evidence.

Habitat

1. Aquatic plants (macrophytes)
Plants growing attached to the streambed are an essential part of the ecosystem. Mosses are the natural vegetation on boulders in upland streams. Macrophytes then occur further downstream and reduce flow velocity, cause sediment deposition and act as habitat for fish and invertebrates. The species found depends on water depth, velocity and ph. They need sunlight to grow and may be absent from shaded parts. They can be pulled out of the sediment or washed downstream still attached to gravel during high flow episodes. It is important to map presence and sudden absence of macrophytes using the survey app.

2. Sewage fungus
This is actually a mass of grey filamentous bacteria and is found where there are excess nutrients in the water. It can be other colours depending on if there is a discharge of sediment as well. Look out for it in watercourses adjacent to farms, sewage treatment works and industrial discharges.

3. Algae attached to gravels (epiliths) and algae attached to macrophytes (epiphytes)
Look to see if the gravels are covered in filamentous brown algae during the warmer months (it will usually appear from April onwards if the catchment suffers excessive nutrient levels) Another sign is extensive growth of filamentous green algae. This is a sign of elevated nutrient levels and a watercourse in poor condition. Please map any excessive algae growth that spans the entire river channel.

Epiphytic brown algae attach to aquatic macrophyte plants and smother them, stealing their light and leading to their disappearance. Algae growing on the gravels also prevents macrophytes from being able to establish themselves on the stream bed. You may not observe algae in shaded sections as they need light to grow.

4. Banks and bankside vegetation

Pay attention to the height of the bank above the water when the stream or river is not in spate. Water courses can become incised and disconnected from their floodplains. Often this is a result of historic dredging, and will be paired with a constructed embankment that prevents water from reaching the floodplain, often this is made of the extracted material and revegetates quickly.

Note the nature of bankside vegetation. Overshading also known as tunnelling by trees is a problem in a location where this should not naturally occur. This can prevent the growth of phytoplankton and establishment of macrophytes due to lack of sunlight and cooler water. This can cause a potential 70% reduction in Atlantic salmon stocks. Water courses that have walls of bedrock should be naturally shaded. A ratio of 60/40 light to shade is optimal.

5. Gravel

Note the size of the gravel and whether it is covered with sediment, a slimy film or filamentous algae. Kicking the gravel will reveal whether the spaces in-between are full of sediment which can also be deposited in the lee of boulders or macrophytes.

- **Salmon will favour cobble (fist) sized rocks to cut their spawning redd within.**
- **Sea trout will favour large gravel between the size of a golf ball and 2p coin.**
- **Brown trout will favour small gravel smaller than a 2p coin.**

Freshly dug redds are often highly visible and will be identifiable with the following characteristics: a brighter area of gravels between 1-6ft diameter that appears “freshly polished” and a small indentation. Sometimes fish may be observed still in this area defending the redd.

6. Large woody debris

Trees that have fallen into a water course when a bank erodes are key components of a healthy riparian ecosystem. They modify the flow and provide shelter for fish as well as a substrate for bacteria and algae to grow on. They can cause some areas to be scoured, creating pools and riffles and the current redirected to create a meander. What may appear to be blockage to fish above water will invariably be passable underwater. Salmonids will also be able to traverse it when flows are high. Avoid the temptation to make things tidy and neat by removing them as they are essential in creating variety. Plastic debris accumulating on them is not natural and should be removed if safe to do so.

7. Channel modification

Record if a water course has been modified by man-made structures such as blockstone.
Note the nature of culverts.

8. Barriers to migration

Barriers such as: Weirs, culverts, bridge sills and mill workings can delay or prevent upstream and downstream migration for fish and invertebrates. Barriers are responsible for habitat fragmentation and should be recorded & reported to WWRT.

Wildlife

1. **Invertebrates**
   Kick sampling and turning large boulders will reveal the aquatic invertebrates living in the water course. Changes in the invertebrate population will capture the effects of episodic events such as pollution or acid water.

2. **Mammals – otter, water vole, mink**
   Look out for sightings of aquatic mammals and also investigate any muddy areas for tracks. These can be detected with camera traps. Otter spraint is often left in noticeable places and will have a sweet tea like smell. Mink spraint will smell foul. Presence of mink should be reported to WWRT and local council.

3. **Birds – kingfisher, heron, egret, dipper, wagtail, ducks**
   Record sightings of these birds and especially note any nesting sites to avoid any future disturbance. Cormorants are not a freshwater species and note should be taken of their sightings to help WWRT & NRW better understand their inland distribution.

4. **Fish – Salmon, Sea trout, Brown trout, Lamprey, Bullhead & Eels**
   Record sightings of these fish and report to NRW incident line if you see any dead or distressed fish. Brown trout are widespread throughout Wales and are an indicator of water quality, their absence will indicate poor water quality. Spawning activity should be noted to safeguard spawning habitat quality.

5. **Bats**
   Bats use areas above water courses and lakes to feed on abundant insect emergences. A local bat group can provide expertise in identifying species present.

6. **Dragonflies and damselflies**
   Healthy water courses should have an abundance of these who have an aquatic larval stage.

Litter

Record the presence and nature of litter. Try and trace the source wherever possible. Storm overflows from sewage treatment works and overflows from pumping stations can discharge sanitary debris. While agriculture will be the likely source of plastic wrapping and feed buckets.

Invasive Non-native Species (INNS)

Himalayan balsam has become widespread and outcompetes our native flora. It leaves banks prone to soil erosion when it dies back in the autumn. There presence of Himalayan balsam should be recorded to map out its spread throughout the catchment. A top-down approach is best in tackling balsam.

Japanese knotweed is one of the most invasive plants in Britain and has the same impacts as balsam. This requires specialist control as it can grow from tiny fragments and requires spraying with herbicide by licensed contractors. Its presence should be recorded in order to map its presence.

Giant hogweed resembles our harmless native cow parsley and common hogweed but its sap can burn skin when exposed to sunlight. The environmental impacts are the same as for balsam.

Rhododendron is highly invasive and outcompetes native flora. It has negative impacts on soil health, one of which is increasing soil acidity. This can be cut and removed easily, although herbicide treatment is often preferred.

Skunk cabbage is increasingly widespread, noticeable by its pungent smell and bright yellow flower similar to that of a peace lily.

Activities

Coppicing and pruning of bankside vegetation along water courses with soft banks.

Collecting seeds, fruits and willow cuttings and planting.

Balsam control can be attempted by pulling up the plants in June before they flower and set seed. There will invariably be a source of new seed coming in, so this is an ongoing yearly task.

Stabilisation of eroding banks with natural soft techniques.

Installation of dipper nest boxes on bridges and bat and bird boxes on trees.

Laying of hedges.

Construction of otter holts.

Construction of wildlife hides and blinds.

Installation of wooden or electric fencing to promote vegetative growth along the river corridor.

Constructing ponds to collect runoff from roads before entering the water course.

Providing educational services to local schools.

WEST WALES RIVERS TRUST
YMDDIRIEDOLAETH AFONYDD GORLLEWIN CYMRU

Reporting Incidents to NRW

- Where is/was the incident taking place? Provide a grid reference or “WhatThreeWords” if possible. Otherwise provide accurate directions / descriptions of the location.
- What is/was happening?
- Who is/was responsible for the incident?
- When did the incident take place?
- How long has it been taking place?
- Request the incident number while on the phone and take note of it.
- Search the area for dead or distressed fish (any fish kills must be responded to).
- Email images of the incident to icc@cyfoethnaturiolcymru.gov.uk and reference the incident number.
- Share your findings with other members of your community and encourage them to report to, following the same protocol above. Referring to the incident number when possible.
- The greater the number of reports, the great the chance of response.