TAITH AFON

RIVER HEALTH
SUPPORT MATERIALS

INSIDE

This workshop encourages practical learning to delve into the impacts of environmental impacts on river health. Caution; things may get very exciting, messy and wet!

OVERVIEW

Learners consider what a healthy river looks like through discussions. Experimentation allows learners to see the impact of different pollution categories on our water courses before mitigation methods are discussed. Can we clean-up the mess that's been made, or is prevention the best route forward for our river health?

Subjects: Science, Geography
Age Range: 7-11 years
Group Number: 3-6
Location: Classroom
Time required: 1 hour

KIT LIST

Per Group:
- 1 tray
- 2 measuring jugs
- 1 funnel
- 2 cooffee filters
- Paper towels

Per Workshop:
- Washing up liquid
- Vegetable oil
- Ground Coffee
- Hot cholate powder
- Oats
- Clean litter

PREP

Before the workshop, the household items listed in the Kit List will need to be prepared to create the 'pollutants'. All these items are considered safe to touch, however, warnings should be made not to ingest.
Clean Litter - Find out your recycling for plastic cartons that can be cleaned and cut up into small piece to use as litter. Using varied textures and types adds realism.
Chemicals - Label washing up liquid with the title 'Chemicals'.
Soil - Decanter ground coffee into containers labelled 'Soil'.
Oil - Label vegetable oil with the title 'Oil'.
Sewage - Mix water, hot chocolate powder and oats in a container and label 'Sewage'

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1 SLIDES - What does a healthy river look like?

Setting the scene: Explain to learners that for this session, they are the 'River Protectors', it is their responsibility to protect the river at all costs. But are they worthy of this responsibility?

First, we will put their capabilities to the test. Use the slides provided to question the learners' existing knowledge of what they consider to be a healthy river. Make this more interactive by asking for a show of hands for 'yes' or 'no' on each slide and encourage them to share their reasoning.

Slide 1 - A river polluted with rubbish.
Not a healthy river. Use this opportunity to discuss the implications of litter for wildlife and water quality including; entanglement, ingestion, inhalation and microplastics.

Slide 2 - A river polluted with sewage.
Not a healthy river. Sewage pollution is grey/brown and milky in colour associated with a nasty smell. An outflow pipe might be visible next to the incident. Use this opportunity to discuss that sewage pollution comes from human waste, and sometimes our sewage network cannot cope with the amount of waste and rainfall so it overflows into our rivers.

Slide 3 - A river polluted with slurry.
Not a healthy river. Explain that slurry is used to fertilise our land by putting nutrients into the soil to help our plants grow. However, excessive use of slurry often causes it to run off the tops of our fields and into our rivers. When it enters the river it causes the water to go brown in colour, sometimes with a foam present and unpleasant smell.

Slide 4 - A river polluted by oil.
Not a healthy river. This is an opportunity to discuss any local oil-spills that may have taken place or are discussed in your curriculum. Large ship oil spills can also impact estuaries and rivers. On a smaller scale, leaky boats often cause oil pollution in harbours and rivers.

1 SLIDES - What does a healthy river look like?

Slide 5 - A straight river.

The answer is still this is not a healthy river, but this time it's not because of pollution. Several factors make this a less-than-healthy river, including:

- It's straight - a lack of meanders means a lack of variation in water flow. Slow-flowing areas or pools are important for fish to have places to breed and rest.
- No tree cover - a lack of tree cover leaves the banks of the river more vulnerable to soil erosion as tree roots help to hold it in place. Trees also provide shade, helping to control the temperature of the water for all that lives within.

Slide 6 - A weir and industry

Again, this one is not solely related to water quality but encourages the learners to contemplate other environmental factors that may affect the health of a river. A weir impacts the natural flow and shape of the river as it limits sediment transportation, and strong infrastructure holds the river in place. Weirs can also prevent fish migration, inhibiting the natural cycle of some of our migrating fish species (e.g. salmon and trout). The water isn't looking its best colour in this image either. Ask the learners why they think this might be. Orange discolouration is associated with mining pollution, most commonly from discarded mines and industry.

Slide 7 - Cows poaching

This river might look healthy from a far as the colour of the water is not distinguishable. However, livestock access such as that shown can cause direct slurry pollution into our rivers as well as sediment pollution. Cows are heavy footed and cause the edges of river banks to collapse, pushing soil directly into the waterway.

2 ACTIVITY - Polluting the River

It's time to put our River Protectors to the test as we give each group their own 'river' to protect, while you, 'the irresponsible person', pollute their river.

1. Give each group their 'river', a large tray and fill halfway with tap water. Explain to the learners how this is their river and they are required to protect it at all costs.

2

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1) Give each group their 'river', a large tray and fill halfway with tap water. Explain to the learners how this is their river and they are required to protect it at all costs.

2) It's time to litter the rivers. Tour the workspace with your bag of litter, throwing bits into each of the water trays. Whilst doing so, explain how, unfortunately, there are people in society who like to throw litter out of their car windows, leave it on the ground in the park, so it eventually ends up washed into our rivers.
Did the learners do a good job of stopping you from littering? Don't worry, explain to them that they have a chance now to put this right.

How will they make the river healthy again?

- A community litter pick could be organised, they can remove the litter, place it in nearby bins and inform the council for collection.
- Allow the learners time to clean their river, and circle the workspace collecting their rubbish.

3) There is an oil spill on the horizon... A boat has a leaky oil tank, and oil has ended up in our rivers. Tip a small amount of vegetable oil into each river.

What do the learners notice about the oil?

How are the learners going to clean up the spill?

Prompts here can be given for what might be used to clean birds after an oil spill - washing-up liquid. Just the same as what we use on our greasy pans to break down the fats.

4) That's handy, as next on our list is 'chemicals'. Add some washing-up liquid into each tray and then stir the water until the oil has disappeared, and bubbles have appeared in each tray. Problem fixed?!

Has the oil gone?

Are our rivers clean again?

Prompts here can be given to explain that while we may have resolved the oil problem, we now have a serious chemical pollution issue in our rivers. So, pouring chemicals into our rivers is not a solution.

How do chemicals end up in our rivers?

Most commonly, from medicines and washing detergents used in our homes. What goes down our drains ends up in our waterways.

2 ACTIVITY - Polluting the River

5) It's not just humans polluting our rivers though, livestock tend to be heavy footed and often still drink from our waterways so, they can be the cuprit for eroding our riverbanks, causing sediment pollution in the rivers. Pour some of your 'Soil' into each of the rivers.

What has happened to the colour of our river water?

Sediment pollution causes water to turn brown, whereas agricultural pollution, such as fertilisers and slurry, is often associated with foam and a foul smell. Luckily, this soil smells like coffee!

6) Our final pollutant. Can the learners remember which one we are yet to suffer from? Sewage!

What is sewage and where does it come from?

Give your sewage mixture a shake before pouring some into each of your rivers. Hopefully, you have a milky brown mixture with some nice lumpy bits in it. Human waste goes to a water treatment works, but sometimes these can't cope with the load, or combined rainfall and this causes sewage spills into our rivers. Yuck!

What do the lumpy parts in the sewage represent?

It's not just sewage that goes down the sewer. Everything that people put down their toilets end up there too e.g. wet wipes, nappies, ear buds etc. Toilet paper is designed to disintegrate so by the time this makes the river it has already broken down. Everything else though (including biodegradable wet wipes) should not be put down the toilet. Only the 3 P's - Poo, Paper and Pee.

3 ACTIVITY - Cleaning the river

It would seem that the learners haven't done a good job of protecting their river. But never fear, this next section allows them time to try and fix their mistakes.

Each group will now be given a limited set of resources and time to attempt to clean their river to replicate societal problems. These resources included: 2 jugs, 1 funnel and 2 coffee filters. You may choose to give the learners a couple of minutes to think of a plan before beginning the exercise. Give the students 5-10 minutes to clean their rivers. You may assist as much or as little as you see suitable for this time.

This bit gets messy!

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4 Discussion

Were the learners successful in cleaning their rivers?
What did they find difficult?

- They didn't have enough equipment
- They didn't have enough time
- Their equipment performed poorly (coffee filters)

What do they think is a better solution for having clean rivers?

- Not polluting in the first place

Take this opportunity to discuss prevention methods for each pollution:

Pollution	Prevention
Litter	• Public education • Public bins
Oil	• Alternative transport • Alternative power (electric)
Chemicals	• Water friendly detergents in homes • Correct waste disposal
Sediment	• Fencing to prevent livestock access • Over-winter crop to prevent exposed soils
Sewage	• Only 3 P's down the toilet to prevent blockages • increase sewage network capacity • Improvement waste disposal system

5 Conclusion

The key take-aways from this workshop

- Learners can visually identify types of water pollution
- Leaners understand where different pollutions come from
- Leaners can identify prevention methods to protect a rivers health

End of workshop - Thank you for incorporating rivers in your education.

6

Stretch Activity

Split the learners into 4 groups. Give each group a real-world issue and the link to the news article of the event outlined below.

Group 1- **Fly Tipping:** https://www.bbc.co.uk/news/articles/ckgn81v485vo
Group 2 - **Chemical Spill**: https://www.dailymail.co.uk/news/article-1170187/The-river-bubble-bath-Mountain-foam-floats-downstream-suspected-chemical-spill-soap-factory.html
Group 3 - **Sewage**: https://www.bbc.co.uk/future/article/20240704-the-wetlands-cleaning-up-the-uks-sewage-pollution
Group 4 - **Agriculture**: https://www.mirror.co.uk/news/uk-news/british-rivers-filled-almost-34000-34053164

Please ensure you tell the learners that news articles have a bias, so don't always include the full picture.

Give the learners 20 minutes to decipher the following:

- What impact does the incident have on the river's health? Think water quality and wildlife.
- How could this incident have been prevented?
- Who is responsible for preventing this from happening again?

Instruct the learners that they will be presenting their findings back to the class. Choose a method that you think suits your learners best (posters, presentations, scripts ect) and nominate a speaker, recorder and researcher within the group if required.

Feedback tips - When an incident like the above happens, it's usually due to multiple factors. You can encourage the learners' critical thinking by asking them to consider all stakeholders involved, such as:

- Land owners (Responsible for how they manage their land)
- Government (Welsh Government is responsible for rules and legislations)
- Regulating Bodies (Natural Resources Wales are the environment regulators)
- The Public (we each have an individual responsibility to care for our environment)