Community-based monitoring of river health and biodiversity

Transformative Pathways

ICCS Interdisciplinary Centre for Conservation Science

Forest Peoples Programme

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Authors: Albana Berberi, Helen Newing, Anna Freeman, Michelle Jackson, Lucy Radford, Louise Mercer, Peter Duker, E.J. Milner-Gulland.

Project website: http://transformativepathways.net/

This guide will be updated based on community needs. We welcome authors as the guide expands.

Cover photo: Indigenous Pgakenyaw women harvesting fish and other small aquatic organisms.

Credit: Peter Duker

Transformative Pathways partner logos

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SECTION 1.0:

Introduction

For Indigenous Peoples and local communities, rivers are not just sources of water—they are also essential for fishing, cooking, travelling, and sustaining daily life. In many cultures they also have deep spiritual significance. Where rivers become unhealthy, the impacts on people's health, cultures and wellbeing can be very substantial, and environmental impacts can also be significant. This guide for Indigenous Peoples and local communities presents a variety of options for monitoring the health of your local rivers and the diversity of life (biodiversity) that they support.

Monitoring can be done in many ways. It can consist simply of recording observations of what you see and hear. Or it can involve more technical methods, which need varying levels of technical training and scientific equipment. We include a range of methods to monitor your rivers that span this variety. With this guide, you'll be able to:

- Observe the river you wish to monitor and recognise signs that it is in good or poor condition.
- Keep a record of the small animals that are present in the water, which gives a good first indication of water quality.
- Carry out simple tests of water quality.
- Assess fish health and abundance.
- Keep a record of the different types of animals and plants that live in or near the river.

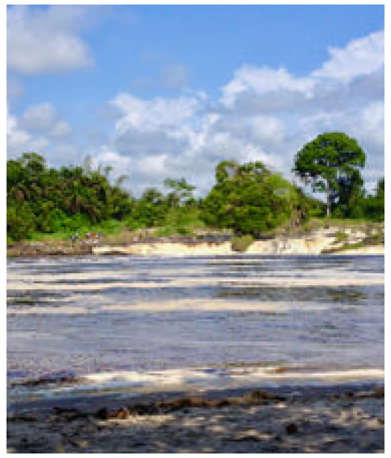
This will enable you to report any significant changes, or potential hazards, to community leaders, environmental groups, government authors, and others.

This guide is part of a series. The two previous guides are:

1. Introduction to Community-Based Environmental Monitoring: A Practical Guidance for Monitoring of Natural Resources by Indigenous Peoples and Local Communities
2. Ensuring the sustainability of Customary Use on Indigenous and Community-Held Lands

The first of these gives procedural guidance on all six stages in setting up and carrying out community-based monitoring of any aspect of the environment (see the figure below). If you aren't already familiar with it, we strongly encourage reading through it first, as it will give you a foundation for using this guide more successfully. The second gives guidance on assessing the sustainable use of land and water resources. This present guide focuses mainly on the different methods and analysis techniques that can be used specifically for monitoring rivers.

Overview of the stages in biodiversity monitoring



Stage 1:
Getting prepared

Stage 2:
Determine monitoring needs & objectives

Stage 3:
Develop a participatory monitoring plan

Stage 4:
Prepare the monitoring team

Stage 5:
Collection & analysis of data

Stage 6:
Community reporting & validation

Adapted from Introduction to Community-Based Environmental Monitoring: A Practical Guidance for Monitoring of Natural Resources by Indigenous Peoples and Local Communities (http://iccs.org.uk/wp-content/uploads/2024/04/Introduction-to-community-based-environmental-monitoring.pdf). Stage 2 image from Pxhere (https://pxhere.com/en/photo/1227057). Stage 4 image by Alejandro Torres-Abreu (https://www.flickr.com/photos/125391306@N03/50702967173).

Outline of this monitoring guide

An essential method for monitoring rivers is drawing on the knowledge of elders and other community members who have lived in the area for a long time or who are particularly likely to know about these places (perhaps because they interact with them closely as part of their daily lives). These people may hold deep, intergenerational insights into the health of rivers, and the environmental changes that have occurred over time. In **Section 2.0 Documenting Traditional and Local Knowledge**, we describe how you can hold conversations with community members, listen to their stories, and gather initial information based on their knowledge and perspectives. This information will provide context for the monitoring process, help in identifying priorities for monitoring, and establish a baseline for river health.

Section 3.0 describes several different technical methods you can use to assess the health of a river and its biodiversity. From these methods, you can choose which method best fits your monitoring purposes. These methods follow a community science approach, where communities lead monitoring of resources using scientific methods.

Section 3.1 Making a Visual and Sensory Assessment of Water Health describes how to assess rivers using simple observations. It introduces several sets of criteria that can be used as a simple scoring system, which should be adapted to your setting based on local and traditional knowledge.

Section 3.2 Monitoring Small River Animals describes how to collect and count different kinds of small animals in the water. Small animals are great indicators of water quality, as well as of the health of fish and wildlife that use these waters. Monitoring them can be much easier and quicker than monitoring all the different aspects of water quality directly.

Section 3.3 Measuring Water Chemistry and Contamination outlines scientific methods for testing water quality using indicator strips (pieces of paper that change colour). Different types of indicator strips are used to test for water acidity, nutrient levels, traces of heavy metals, or harmful bacteria.

Monitoring fish populations directly requires considerable resources and that scientific expertise be done thoroughly. Even then, changes to populations can be hard to detect. However, as an alternative, **Section 4.0 Monitoring Fish Populations** outlines how you can work with fishers to record the number of fish caught, and the amount of effort used to catch the fish, as an indication of fish populations. This method, called catch-per-unit-effort, is based on the principle that if it takes more effort to catch fish, it likely indicates a lower fish population in the river.

A supplementary monitoring guide on Turtle Monitoring outlines methods to monitor freshwater turtles in rivers. This guide outlines three main methods for monitoring turtles. **Section 5.1 Turtle Nesting Surveys** involves recording turtle nests during the nesting season. **Section 5.2 Turtle Basking Surveys** involves counting turtles that are basking in the sun along rivers. **Section 5.3 Capture-Mark-Recapture** describes a more technical method to monitor turtle population changes over time.

There are many other aquatic resources and many ways to monitor rivers. The sections of this guidance focus on specific approaches and aspects of river health and were written based on interest from partner communities and community organisations in the Transformative Pathways project (https://transformativepathways.net/). However, we hope to expand the range of monitoring methods in the future in response to requests from communities.

Safety and Practical Tips for Recording Data

To make the most of this guide, here are some safety considerations for data collection, and practical tips for reporting your observations to help the entire community stay informed and promote action when needed.

Safety Tips for Collecting Data

1. **Look for immediate dangers:** Be cautious of visible contamination, such as signs from dead fish and birds nearby. Beware of currents and rapids, and don't go into the water unless you are sure it is safe.
2. **Work in pairs or groups**: If possible, have two or more people assess the river all together.

Practical Tips for Recording Data

1. **Community agreement:** Make sure you have all agreed on a standard way to record information and you have permission to take these measurements from everyone who needs to give it.
2. **Take notes and photos**: Bring a small notebook or phone to write down observations. Record the date, time, and weather conditions, as they can affect the water's appearance. If you have access to a phone with a camera, take photos for reference.
3. **Always record essential details**
    a. **Date and Time:** When did you make the observation?
    b. **Location:** Where was the observation made? Use nearby landmarks and if possible, take GPS location readings.
4. **Regular community meetings:** Share back your findings and monitoring experiences with the team and wider community members during regular meetings or gatherings. This collaborative approach helps maintain consistency in data collection, allows for adjustments as needed, and fosters a shared understanding of the river condition over time.

SECTION 2.0:

Documenting traditional and local knowledge

Overview

Community-based monitoring is most effective when it is supported by traditional and local knowledge. This can include knowledge of what healthy rivers typically look like, the animals and plants they support, how they are used and managed, and how all these aspects change over time – both with the seasons and through long-term historical shifts. These types of knowledge provide a valuable understanding of river health, biodiversity, and sustainable practices that might not be captured through scientific monitoring methods alone. Basing monitoring on traditional and local knowledge is also key to ensuring that the methods are appropriate and feasible.

Recording knowledge

Once the community has given their initial free, prior and informed consent to work towards monitoring of rivers, one important next step is to hold discussions to explore traditional and local knowledge. These discussions usually include a mixture of community meetings, discussions in small groups, and one-to-one conversations. General guidance on this process can be found in Introduction to Community-Based Environmental Monitoring: A Practical Guidance for Monitoring of Natural Resources by Indigenous Peoples and Local Communities.

The sections below give some examples of questions that can be considered at this stage, which can be adapted to fit your purposes.

Alternatively, you can work with people to create maps, either on paper or in digital form (or both). You can use audio or video on a smartphone to capture what people say, or you can document their answers by writing notes – always with the interviewee's permission. The aim is to make sure that the information is preserved and easily accessible for future use.

After collecting the information, cross-check for consistency between sources. You can then present the initial findings back to the community and ask them to clarify any points that aren't clear. It may help to compile the information into a database or upload it through a dedicated software app, or it may be enough for your purposes to make a written report with maps where appropriate. The records that are produced in this way can be a great basis for designing more detailed monitoring, building on traditional knowledge and, if desired, adding in components from scientific methodologies. The records can also be used by the community as a way to transmit and preserve knowledge for future generations.

Documenting traditional and local knowledge: questions to consider

2.1 Why does the community want to monitor the river and its biodiversity? What are the priorities for monitoring?

- How do community members use and value the river and its biodiversity?
- How is this changing, and what is driving the changes?
- Looking towards the future, what threats are there to the river and its biodiversity?
- What concerns do people have? For example, perhaps the river has become polluted, or fish or certain types of animals have become scarce. Or perhaps outsiders are coming to the area and causing harm, or restrictions have been placed on community use and access.
- What characteristics or features of the river and its biodiversity are most important to monitor? These might be related to changes that people are most concerned about, or alternatively they might include rare and threatened plants and animals that are valued internationally. Monitoring rare species can be valuable in building alliances with external conservation actors.
- Who will use the information that is collected, why, and how?
- What is a suitable timeframe and scale of monitoring for the community's needs? For example, in the tropics, you could collected data twice a year – once in the wet season and once in the dry season.

These questions are explored in more detail in Stage 2 of the Introduction to Community-Based Environmental Monitoring: A Practical Guidance for Monitoring of Natural Resources by Indigenous Peoples and Local Communities.[1]

1 http://iccs.org.uk/wp-content/uploads/2024/04/Introduction-to-community-based-environmental-monitoring.pdf

2.2. How is the use and care of the river and its biodiversity governed?

This is important to know because it may affect permissions, and it may affect who might make use of the results and potential threats identified to rivers and wildlife.

Questions might include:

- Are there any rituals or other practices through which communities care for the river and its biodiversity?
- What customary rules are there over the use of the river? For example, there may be customary rules about who can fish there, how, when, and how many fish they can take. These kinds of rules are often known as community bylaws.
- How are rules of this kind agreed and enforced? Are they working?

If new rules and restrictions have been introduced by the national government or other external actors, it may be useful also to gather information directly from these actors to present to the community for discussion.

Several of these questions are explored in more detail in *Ensuring the sustainability of customary use on indigenous and community-held lands*.[2] Please read through the documents if you are unfamiliar with it.

2 https://iccs.org.uk/wp-content/uploads/2024/10/Ensuring-the-sustainability-of-customary-use-on-Indigenous-and-community-held-lands.pdf

2.3 How has the river and its biodiversity changed over time?

A more detailed discussion of how the river and its biodiversity have changed in the past can help you reach a decision on what you monitor, based on any concerns that you have.

During this exercise the following questions may be useful to consider:

- What events have there been that may have affected the river and its biodiversity? When were they?
- What changes have you noticed in the river itself and its biodiversity? When did these changes occur? Some may have been sudden events (such as vegetation clearance along the riverbanks, fish die-offs, or episodes of human sickness that may be connected to the drinking water). Others may have been more gradual over several years, such as changes in the water quality, or changes in the abundance of certain types of animals and plants.
- For each change, what do you think caused the change?
- What concerns do you have about these changes?

One way to do this is to construct a timeline. This is often done initially in a small group of four to eight people and then checked back with the rest of the community. The small group exercise will normally take between 60 and 90 minutes. Here are the steps to follow:

1. In a community meeting or a meeting with community leaders and representatives, agree who will participate in the small group exercise, based on their knowledge of the history of the river and the local area, and how far back in time they should go. For example, the exercise could start at a time just before a significant event that affected the river or its use, such as the construction of a road, a major period of forest clearance, or the imposition of restrictions on community access.

2. At the start of the small group session, explain what the exercise will consist of and then draw a line down the middle of a large piece of paper. At the top of the line, write the date or event you have agreed to start from. At the bottom, write the current date. Divide the line into time periods by writing in the years.

3. Ask the group members to describe significant local events that happened at different points along the timeline and may have affected the river and its use. Start from the earliest date and move forward in time, writing them in on the left-hand side of the line. It may also be useful to write in some other local events, a change in national government, the arrival of a road or new infrastructure, or other changes that distinctly effected the community. These can serve as memory markers, helping people to think back to different points in time.

4. Now ask people to think of changes in the river and its biodiversity over the course of time. Write these changes to the right-hand side of the line, placing them in the correct time period. If it's not already obvious from what you have written so far, write down what may have caused these changes (the drivers of change).

Throughout the exercise, record any extra details that are mentioned by making notes or recording the discussion, if this is agreed by the participants. Below is an example of a timeline to illustrate the format. You can add more details about your river(s) and community events, and the timeline can begin as early as you like.

Construction of new road by the river	**2018**	
Construction ended	**2019**	Less natural vegetation growing by the river
Farm development started upstream	**2020**	
	2021	Changes in colours in river water
Farming irrigation system installed	**2022**	
Community monitoring program started	**2023**	Fewer fish caught compared to past years
Monitoring findings presented to governments	**2024**	

5. When the exercise is finished, take a photo of the timeline. This is your record of the session. The sketch of the timeline can then be presented back to the whole community and comments invited. Follow-up conversations with particularly knowledgeable participants may also be useful to gather further details. One or more people in the community can be appointed to arrange these conversations and make a record of the information gathered.

6. The sketch is then left in the community. If it is displayed in a public space, people will continue to discuss it, and more details may emerge over the following weeks and months. Again, one or more community members can be appointed to keep a record of these details.

2.4 How do you know whether a river is healthy or unhealthy?

- What characteristics or signs do you notice when the river you want to monitor is healthy? What does it look like, smell like, and sound like? What characteristics or signs do you notice when a river is unhealthy?
- How do you know if the water is safe to drink or swim in, or unsafe?
- What kinds of fish live in the river when it is healthy? Are there particular types of fish that you would like to monitor?
- How do you know if the fish are healthy? What are the signs of unhealthy fish?
- Which other animals live in or near the river when it is healthy? How do they change when the river becomes less healthy? Are there particular types of animals that you would like to monitor?
- What plants grow in or near the river when it is healthy? How do they change when the river becomes unhealthy? Are there particular types of plants that you would like to monitor?

Further details on the kinds of characteristics or signs that may be relevant are given in the following pages, so you should familiarise yourself with the rest of this guidance before exploring these questions in depth. In several sections, you will be asked to score the condition of different aspects of rivers and biodiversity, and this will work best if you base the scoring criteria on your knowledge about what is normal locally.

Development of your monitoring plan will also involve decisions about how often, when and where to carry out monitoring. For guidance on these matters, see stage 3 of the *Introduction to Community-Based Environmental Monitoring: A Practical Guidance for Monitoring of Natural Resources by Indigenous Peoples and Local Communities*.

SECTION 3.1:

Making a visual and sensory assessment of river health

Overview

Visual and sensory assessments are simple yet effective methods to monitor the health of your river. For these assessments, and when using your knowledge of what a healthy river looks like, you will record observations of different features, including water colour, transparency, and smell, to detect signs of pollution.

How this document is organised:

1. Draw a map

Create this once, reuse/update it each visit

→

2. Make a visual assessment

Look, smell, listen, photograph

Data collection

1. Draw a simple map of important areas

On your first visit, draw a simple map of the part of the river you want to watch. Show where the water flows, where the land around it is forest or farmland, and mark important things like pipes, shallow or deep spots, trees by the water, and any areas that look damaged or changed by people. Each time you come back, use this same map to see if anything is different—including new erosion or more waste.

2. Visual assessment

Each time you visit the river, use the simple principle of 'Look, Smell, Listen, Photograph':

Look: Observe the colour, surface, movement, and any signs of life or waste in the water. Look for any signs that the water's flow has changed recently. Note down any unusual changes in the river. Perhaps there's been heavy rain, or water has been released from a nearby dam, farmland, or factories upstream. Your own memories or stories from elders can help you identify river changes. Understanding why the flow has changed—whether it is due to weather or other causes—gives you clues about what might be affecting the water's health.

Smell: Close your eyes and smell the water. Does it smell like your typical healthy waters, or does it have any noticeable strong, unpleasant or unnatural odours?

Listen: Flowing water should sound clear and lively, with the presence of birds and insects. An unnaturally silent area - where you would expect natural sounds - or that has unusual noises may signal issues in the water. For example: muffled or sluggish water sounds (like stirring thick soup or porridge) may feel heavier, slower, and less crisp than clear flowing water, suggesting sediment buildup or pollution. Mechanical or industrial noises may indicate human activity or nearby machinery. A complete absence of natural sounds (e.g., birdsong or insect hums) where they are normally expected could signal pollution or long-term habitat disruption.

Photograph: Take a photo from the same place every time

Choose one good, easily identifiable spot that shows a representative view of your chosen river stretch. Stand in the same place every visit, facing the same direction, and capture a photo each time. If your stretch is longer (for example, 500m), you should also photograph anything unusual, including unusual colours, floating litter, recently cleared vegetation or areas of erosion on the riverbanks, pipes, or areas with strong odours.

You could use a simple table to record any important observations:

Date/time	Location	Unusual observations	Photo numbers (if not geotagged)
13 March 2025	River bend	Foamy water, plastic bag	1, 2
20 March 2025	River bend	No foam, water clearer	3

Scoring Features in the Water

This section describes several features of the water that you can assess. Each feature is scored using five-faces. Match your observation with the condition description that best fits and record the score. Consistency is key across observers and over time.

Score interpretation:

Very Poor (1) **Poor (2)** **Fair (3)** **Good (4)** **Excellent (5)**

The following table gives you a list of features to score, each of which is described in more details below. Before starting your data collection, decide which assessment features you want to use for your river, and agree with how to score each feature.

These indicators reflect overall river ecosystem health, including direct water-quality measures and surrounding habitat conditions important for maintaining good water quality. Feel free to include additional things you notice and rate them from what seems normal (usual) to not normal (unusual or concerning).

Assessment Feature	Score
1. Water Clarity and Colour	
2. Floating Debris and Pollution	
3. Channel Condition	
4. Riverbank Areas	
5. Algae and Plants	
6. Fish and Other Wildlife Cover	
7. Barriers to Fish Movement	
8. Add your own features. For example, they could include flow speed, water level, human activity or disturbance.	

Developing a scoring sheet for assessing features on your rivers

Use your initial scans of the water and knowledge of what healthy waters look like in your communities, to develop scoring for each feature. In the following sections, we outline scoring descriptions that can be used as a reference.

After you have scored all the features, the average score of each feature will indicate the health of the water. The average score is taken by adding all the scores, and then dividing by the number of features scored.

$$\text{AVERAGE SCORE} = \frac{\text{SUM OF ALL SCORES (STARS)}}{\text{NUMBER OF FEATURES SCORED}}$$

Compare the average score with the below score ratings to determine the health of your river:

Score Range	Face	Interpretation
< 2.0		Poor water health
2.0 – 2.9		Fair water health
3.0 – 3.9		Good water health
4.0 – 5.0	 / 	Excellent water health

1. Water Clarity and Colour

Healthy water may not look exactly the same everywhere. In your community, agree on some characteristics of healthy water and characteristics of unhealthy water. Then, use this as your guide for scoring water quality.

What to look for:

Clarity: Is the water clear enough to see the bottom, or is it cloudy or murky? Is this different than what is healthy for the river?

Colour: Does the water have its natural hue (perhaps tea-coloured, blue, or green)?

Huallaga River near Chazuta, Peru. Google Maps (2025).

This river is naturally brown and murky due to soil and sediment. If your river is always like this and people have used it safely, then this may be *normal*. But if it suddenly becomes cloudier or changes colour, that may be a sign to take a closer look.

In dry season, this river might be clearer (score  / )

During rains score  / 

Río Baker, Chile. Google Maps (2025).

This river is naturally bright blue due to glacial flour (fine rock powder) in the water. The colour means it comes from melting glaciers and is usually very clean, even if you can't always see the bottom clearly.

 or  (4–5) Excellent water quality, though it may not be drinkable without testing for microbes.

Musi River, Hyderabad, India. Google Maps (2025).

Grey-black water with a bluish tint, large amounts of surface foam and floating litter. No visible depth. The foam is likely from industrial runoff and detergents. Colour alone does not always mean danger, but here, the combination of darkness, foam, and waste is a strong warning sign.

(1) - Very Poor

2. Floating debris

Floating debris includes any items on the surface that shouldn't naturally be there. This can signal pollution or changes in the river's health.

What to look for:

Natural vs. human-made: Look for natural items like leaves or twigs versus human-made waste such as plastic, bottles, or bags.

Number: Is there just a few bits floating around, or is it a lot?

Change over time: In your community, discuss whether to determine if these items have increased recently, indicating possible problems.

3. Channel condition

The channel is the main path the water follows. It should flow naturally with gentle curves, not be forced into a straight line by human intervention.

What to look for:

Natural bends (meanders): Look for gentle curves that allow water to slow down and support life.

Human impact: Note any straightened sections, concrete walls, or heavy rock structures that might change water flow.

Signs of erosion: Watch for areas where the channel bed or banks are worn away unnaturally.

4. Riverbank areas

A riverbank area, known as a riparian zone, is the natural strip of plants and trees along the river. Think of it as the river's skin—a living barrier that nurtures and protects the water. This "skin" is essential for keeping the river and its ecosystem strength. It acts as a natural filter, stopping pollutants (harmful substances) from entering the water, and holds the soil in place to prevent erosion (when soil washes away). The shade from the trees helps keep the water cool, which is beneficial for fish and other water life. Additionally, tree roots form undercut banks (hidden spaces along the water's edge) where fish can hide, while fallen branches and logs create pools and safe spots. Even as the forest or woodland around might be cleared (for example, for farming), preserving this living barrier is crucial. Not only does it provide organic material (anything that comes from living things—including leaves, plants, animals) that feeds insects in the water and on land, but during floods, the riparian zone slows down the water's flow, giving fish safe shelter.

What to look for:

Vegetation width: Compare the width of natural vegetation to the river's channel.

Diversity: Look for a mix of aquatic plants (in the water) and grasses, shrubs, and trees on the banks.

Regeneration: Check for young plants or seedlings, as a lack of these may mean the area isn't renewing itself.

Buffer function: Notice if the vegetation is acting as a barrier to slow down fast-moving water, helping to prevent floods and bank erosion.

Terms (for scoring)

Active channel width: The natural width of the river where water usually flows.

Floodplain: The flat land next to the river that floods when water levels rise.

Río Aguarico, near Los Ribereños, Ecuador. Google Maps (2025).

The water looks brown because of suspended sediment, which is normal in many tropical rivers.

(3).

The forest along both banks is dense and provides natural protection, shade, and shelter for fish. Even though the trees don't fully cover the river, this is still a healthy riparian zone.

(5) - Excellent

River Chi, Isan Region, Thailand. Google Maps (2025).

The water appears brown because of natural sediment during the rainy season (3).

The banks are lined with bamboo and other native plants. This is a healthy riparian zone for a mid-sized tropical river.

(5) - Excellent

River Mersey, England. Google Maps (2025).

This river in a busy town has lost many of its natural features. The riverbank is mostly bare, with just short grass and few trees to give shade. This makes the water hotter and less healthy for fish and insects. On the other side, some trees remain, but not enough to cool the river. You can also see buildings and smoke nearby — signs of strong human activity. This is a good example of a river that could be helped by planting more native plants along the banks.

(1) - Very Poor

5. Algae and Plants

The amount and type of plants in the water can show how healthy a river is. Healthy water should be clear and have various plants without being overcrowded. Based on your initial conversations in the community, develop indicators based on what plants indicate a healthy river, what plants indicate an unhealthy river, and how the amount and type of plants in the water is different in healthy or unhealthy rivers. Then, use this as your guide for scoring plants in the water.

What to look for:

Balanced Growth: A modest amount of aquatic plants is good, but thick, dark green mats of algae suggest excess nutrients.

Blue-Green Algae: Be alert to blue-green algae. They can deplete oxygen in the water, making it hard for fish to breathe. Watch for bright green, blue-green, or turquoise-colored algae. It can form visible layers or mats on the surface, resembling thick paint or pea soup. This algae can produce harmful toxins (cyanotoxins) and deplete oxygen, harming fish.

Oxygen Levels: Notice if fish are coming to the surface, which may indicate low oxygen and/or high toxin levels due to heavy algae breakdown.

Figure: Illustration created using OpenAI (2025), based on author-generated prompts and validated by the authors and reviewers. The image contrasts a healthy river (left) with a nutrient-impacted, degraded system (right), designed to support visual assessment of river condition.

Take a photo from the bank and assess the conditions visually from there.

Left Side: Clear water and diverse aquatic vegetation, providing ample habitat and oxygen for fish and other wildlife.

Right Side: Thick algal mats indicating nutrient overload and reduced oxygen levels, which can harm aquatic life.

6. Fish and other wildlife cover

A healthy river should have different types of cover for wildlife, including fish. These cover types provide safe places for fish to hide, rest, and find food, helping them stay protected and thrive in the river. This can include overhanging vegetation that provide shade or cover, deep enough waters or dense aquatic plant beds for shelter, sections of rapidly flowing water to provide oxygen (known as riffles), and many more.

What to look for:

Cover Types: Look for overhanging vegetation (branches that provide shade), deep pools, logs or large woody debris, boulders or cobbles, riffles (shallow, fast-flowing areas that oxygenate the water), undercut banks, dense beds of aquatic plants, isolated pools, or any other natural features.

Variety: The more types of cover available, the better the habitat for fish and other wildlife.

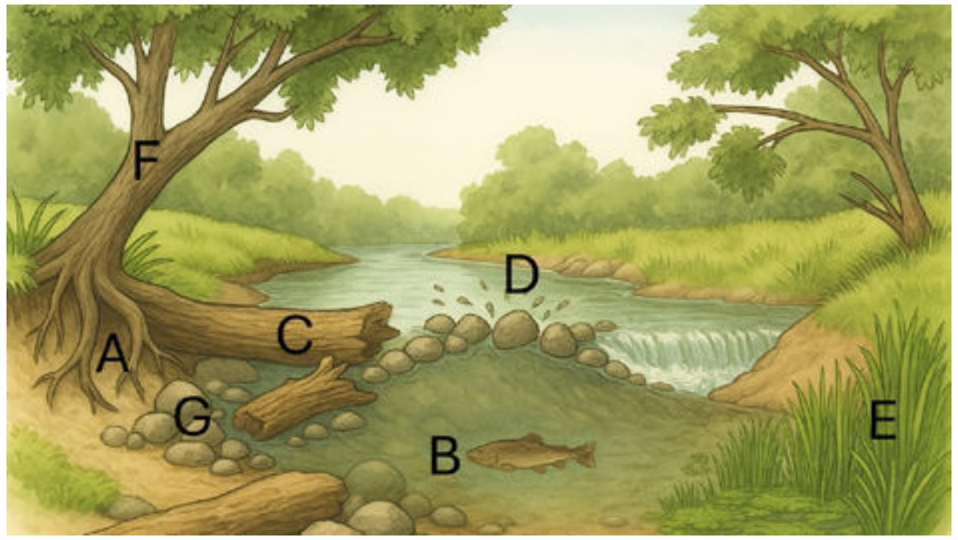


Image generated by the authors using OpenAI (2025), based on public guides listed in references and author prompts. All visual elements were reviewed and validated by the authors and project reviewers for ecological accuracy.

(A) Undercut banks ______ **(B)** Pools ______ **(C)** Logs/large woody debris ______ **(D)** Riffles ______
(E) Dense beds of aquatic plants ______ **(F)** Overhanging vegetation ______
(G) Boulders/cobbles ______**Other** ______

A healthy river is like a community of hidden sanctuaries for fish and other aquatic wildlife. In a well-cared-for river, there are many different types of cover that provide safe places for wildlife to hide, rest, and find food—just as people have long known is essential for life. This cover can include overhanging vegetation that offers cool shade, deep pools or dense beds of aquatic plants that serve as shelters, and even swift, shallow sections (known as riffles) that keep the water fresh and full of oxygen. Each of these “secret shelters” plays a vital role in helping wildlife, including fish, thrive.

7. Barriers to fish movement

What to look for:

Natural: These include waterfalls or boulder dams that naturally occur.

Man-made: Look for structures like dams, culverts (large pipes under roads), or other constructions that may block movement.

Hydraulic: Even without a steep drop, fast water or steep slopes in culverts or other man-made structures can be challenging for fish to swim through.

Scoring table

This table is your tool for keeping track of (monitoring) your river's health. It lists key features—including water clarity, debris, channel condition, riverbank health, nutrient levels, fish cover, and any barriers. Each feature has clear descriptions and a simple star rating that reflects how healthy it is, based on our local knowledge.

We have kept this table separate from the main text so you have a clear, dedicated space to record your observations every time you visit. Simply match what you see with the descriptions, mark the stars, and over time, you'll see how your river is doing.

Category	(Excellent)	(Good)	(Fair)	(Poor)	(Very Poor)
Water Appearance	Water looks clear and natural; no odd smells	Slight haze or mild colour change; no strong odour	Noticeable murkiness or foam/ scum	Strong discoloration; possible mild odour or algal mats	Very unnatural colour or thick scum; foul smell
Floating Debris	No trash—only natural items (leaves, sticks)	One or two small pieces of trash	Some plastic bottles/ wrappers, but not overwhelming	Frequent or larger trash items (bags, cans)	Surface covered in waste or pollutants
Channel Condition	Natural, stable banks; no large human-built changes	Mostly natural with minor modifications or slight erosion	Partly altered (rock walls, moderate erosion)	Heavily altered or eroding banks (concrete, steep walls, excessive sediment)	Channelized or severely eroded; water flow blocked or redirected unnaturally
Riverbank Plants	Lush, wide buffer of native plants; diverse growth	Good coverage of shrubs/trees; mostly native	Patchy vegetation; some bare spots	Very little healthy growth; banks partly bare	Almost no natural plants; banks heavily disturbed or replaced by structures
Algae / Nutrients	Clear water, minimal algae; balanced plant life	Slight green tint; moderate algae	Pronounced green colour or thick algae patches	Dense algae mats; water looks green or brownish	Overrun with algae; strong small or thick green appearance
Fish and Wildlife Shelter	Plenty of hiding spots (logs, roots, overhangs, deep pools)	Several good shelters for fish	Some cover available (a few logs, rocks, undercut banks)	Very few hiding spots; mostly open water	No shelter at all; fish fully exposed
Fish Barriers	No barriers; fish can travel freely	Small/seasonal obstacles, but still somewhat passable	Minor drop structures (<30 cm) or partial obstructions	Large barrier nearby (>30 cm) that likely limits fish movement	Major barrier right here (dam or high drop), blocking fish completely

Other observations:

SECTION 3.2:

Monitoring Small River Animals

Overview

Many rivers contain small animals that we may overlook, but they are an important part of the environment. These animals include flies, snails, and worms that spend some or all their life in rivers. Some types of animals are only able to survive when the water is very clean, so you can use their presence (or absence) to indicate when the water is polluted without the need for expensive tests. Three key groups of small river animals that can be found in your rivers and are sensitive to water quality are stoneflies, caddisflies, and mayflies. These animals live in the water when they are young, and then fly out of the water in adulthood. To monitor small river animals, you will collect them using nets from a site in the water, and then count them. Each type of animal will have a 'score' based on the principle that different groups have different tolerances to disturbance and pollution.

Data collection

Before monitoring small river animals, ensure the water is safe to enter. Check that it is shallow enough to stand in, the current is slow enough to maintain your balance, and the water is not toxic or harmful to your skin and health. If the water is potentially toxic, wear protective gear like latex gloves to minimize exposure. Remember to work as a team so help is on hand in case of any accidents.

What do you need?

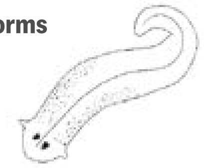
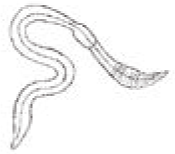
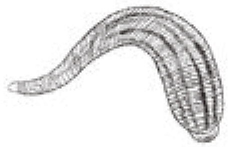
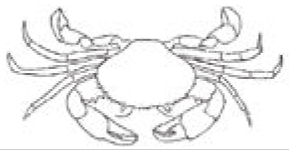
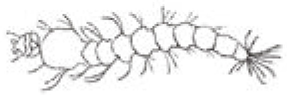
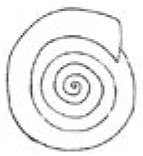
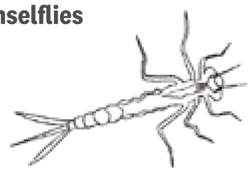
- ☑ A score sheet (provided below) and a pencil.
- ☑ A hand net. If you don't have one, take a piece of wire and bend it into the shape of a net, then tie 'netting' (material that will catch the invertebrates but let water through) to the wire with a piece of string.
- ☑ A white tray for sorting the sample, such as an empty old food tub.
- ☑ Footwear that you can wear in the water.
- ☑ Hand wash and/or protective gloves, especially if you think the water is polluted.
- ☑ *Optional:* A handheld magnifying glass can help with identifying smaller animals.

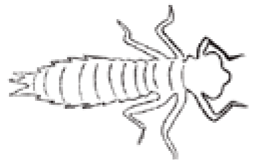
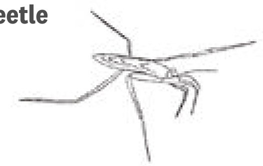
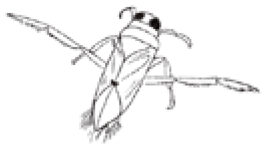
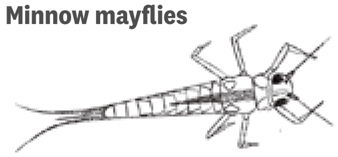
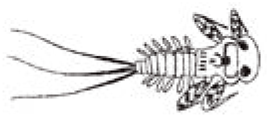
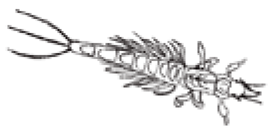
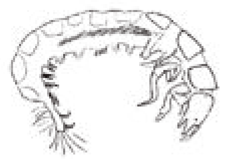
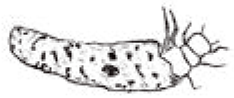
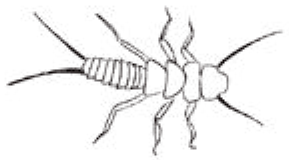
Collecting small River animal samples

- Sample by sweeping the water for 5 minutes in total. Cover as many different parts of the river as possible, including:
  - kicking up gravel and mud to dislodge the small animals and get them in your net
  - hand searching under rocks and plants (if it is safe to do so)
  - scoop your net around the banks and any vegetation
- Run some water through your net to filter out mud but make sure you don't lose any small river animals
- Add some water to the tray and empty your sample in it (also check for small animals stuck inside the net)

Identifying Small River Animal species

You need to identify all the different small river animals you found and record them on your score sheet. Once you are done identifying, put all the contents of the tray back into the river. The identification key below includes images and key features to help you identify small river animals. If you'd like to see more examples of each animal, please refer to the 'Sources of Further Information' section at the end of the guide, which includes websites with detailed photos and images of small river animals.

Group	Key features
Flat worms 	Flattened shape Soft bodied Arrow-shaped head Two eyespots
Worms 	Long and segmented
Leeches 	Segmented Flexible bodies Suckers on both ends
Crabs or shrimps  	4 or 5 pairs of legs Eyes on stalks
True flies  	Very variable Appearance of maggots Must have indistinct head
Snails  	Hard shell
Damselflies 	3 'tails' 'Mask' over the lower part of the face

Dragonflies 	Stout Large head and protruding eyes No tail Often the largest bug
Beetle  	Very variable Wings present (but may be tucked away) Includes water boatmen
Minnow mayflies 	3 'tails' Narrow head Small, slender body
Other mayflies  	3 'tails'. Large head. Well-developed mouthparts Often flattened.
Caddisflies  	Hard head and 3 pairs of legs. Elongated, soft body. Some construct portable shelters from gravel or bits of vegetation, others do not.
Stoneflies 	2 'tails'. Legs have claws at the tip. Tufts of gills on the body.

Scoring your river

Fill in this table by ticking the 'Present?' column in each row when you finish identifying animals in that group. For the final 3 groups, you will also count the total number of individual small river animals you find by tallying as you go.

Group	Score	Present?	Total number of individuals
Flat worms	3		
Worms	2		
Leeches	2		
Crabs or shrimps	6		
True flies	2		
Snails	4		
Damselflies	4		
Dragonflies	6		
Beetles	5		
Minnow mayflies	5		
Other mayflies	11		
Caddisflies	9		
Stoneflies	17		

Data analysis

After recording the small river animals present, add up the scores of the groups that you have marked as present to get your TOTAL SCORE. Then, divide this by the NUMBER OF GROUPS PRESENT to get your AVERAGE SCORE:

$$\text{AVERAGE SCORE} = \frac{\text{TOTAL SCORE}}{\text{NUMBER OF GROUPS PRESENT}}$$

Use the average score to give your river an ecological category. The scoring varies depending on river type, so first you need to identify if your river is mainly a rocky or sandy river.

Ecological category	Sandy, silty, and muddy river	Rocky river
Natural	>6.9	>7.2
Good	5.9-6.8	6.2-7.2
Fair	5.4-5.8	5.7-6.1
Poor	4.8-5.3	5.3-5.6
Very Poor	<4.8	<5.3

You can use this score to make comparisons to other rivers and monitor your river over time.

Add up the total count of the final 3 groups (other mayflies, caddisflies, stoneflies). **The higher the count, the higher the water quality**. This score will be useful for monitoring changes to your river over time.

SECTION 3.3:

Measuring water chemistry and contamination

Overview

Chemical tests of your rivers can give you more precise information about water health. For example, sometimes water will look clean and healthy, but testing the water chemistry will reveal unnatural levels of chemicals in the water.

This section explains how you can collect and analyse water samples, including for water nutrients and acidity, and for heavy metals that could come from nearby mines or factories. For these methods, you will dip an indicator strip into a water sample. Indicator strips are pre-treated pieces of paper that change colour to show measurements in water chemistry. Water nutrient and acidity indicator strips can be purchased online, at aquaria or pet stores, or may be available from government departments, universities or other research centres.

Water nutrients

Nutrients such as ammonia and nitrates are chemical compounds that support aquatic life and are naturally found in plants in and around water. However, a high level of these nutrients can cause imbalance in water systems, including unnaturally high levels of plant growth, which can make the water too toxic for other aquatic life like fish and small river animals. Unnatural levels of ammonia and nitrates can be signs of pollution nearby, such as sewage and farmland run-off. For example, farm fertilizers can have high nitrates to boost crop yields, leading to unhealthy nitrate levels in rivers near farmland. Ammonia and nitrate concentration in water is measured as parts per million (ppm), which means how much of the nutrient is found in a million parts of water. The higher the ppm measurement, the higher the concentration of these nutrients in the water, indicating poor water health. Also, testing for nitrate levels can tell you when you need to take action to make sure that farming and other activities won't harm river health.

Water acidity

When water is too acidic, it can disrupt many important biological and chemical processes in the water, and cause harm to aquatic life. Changes in water acidity happen for many reasons, including pollution from farming or industrial practices, or high amounts of decaying plants. Acidity is measured on a pH scale between 1-14, with values close to 1 being more acidic. Most aquatic life prefers pH values 6.5-8.0.

Heavy metals

Heavy metals including lead, mercury, copper, and cadmium are invisible. They can enter rivers through old pipes, industrial waste, mining, or even natural rocks. While small amounts of some metals like copper or zinc support aquatic life, too much can have a substantial impact on crops, fish, and people. Heavy metals are usually measured in parts per billion (ppb), which means the amount of heavy metals found in one billion parts of water.

Heavy metal test strips offer a quick method for detecting the presence of metals in water, including:

Iron (Fe) – Needed in small amounts by living things, but too much can stain water or cause health issues.

Copper (Cu) – Useful in pipes, but high levels can be toxic.

Lead (Pb) – Highly harmful, especially to children's development.

Mercury (Hg) – Very poisonous, builds up (bioaccumulates) in living creatures.

Nickel (Ni) – Toxic at high levels.

Zinc (Zn) – Needed in tiny amounts, but too much can cause problems.

Cadmium (Cd) – Poisonous, even at low amounts.

Test strips measure the total heavy metals in the area and cannot pinpoint specific metals. If test strips show the water is contaminated, contact a local health office, community leadership, or environmental agency to help you figure out what to do next. This might include sending water samples a lab to identify which metals are present in the water.

You will need to compare your river water test results to local or national water safety guidelines. These rules help you understand if the water is safe to drink or use. Sometimes it's hard to find these guidelines, but a good place to start is by asking a local expert, health worker, or community leader. It's important to know that **just because there are heavy metals in the water doesn't always mean it's unsafe**. The amount matters. That's why comparing your results to safety guidelines is so important.

Boiling water **does not** remove heavy metals from the water. Guidelines can also provide instructions for how to use potentially contaminated water, including filtration or alternative treatment methods if needed.

You will need to compare your river water contamination results with local and/or national water safety guidelines. Sometimes it's hard to find these guidelines, but asking a local expert or leader is a good start. Just because there is contamination in the water, doesn't mean water is not drinkable and useable. Water safety guidelines will help you determine if river water is drinkable and useable.

Microbes

Microbes are tiny organisms (e.g. bacteria, viruses, and parasites) that exist naturally in water and the environment. Most are harmless and even beneficial, playing essential roles in nature. However, some microbes can make water unsafe for drinking, fishing, or other activities. When water is polluted (for example, with human or animal faeces or urine, or other forms of waste), harmful microbes can grow. These microbes can cause illnesses including diarrhoea or stomach infections, which are especially dangerous for children and elders. They can also harm fish, turtles, and other wildlife, disrupting the ecosystem and contaminating food sources.

Common dangerous types of microbes

Bacteria: Certain bacteria may cause serious illness, leading to bloody diarrhoea and kidney problems. These include *Escherichia coli (E. coli). Salmonella* can result in fever, diarrhoea, and stomach pain, while Shigella is a highly contagious microbe that causes dysentery and fever.

Viruses: *Hepatitis A* affects the liver, causing fatigue, nausea, and yellowing of the skin (jaundice). *Norovirus*, often called stomach flu, leads to vomiting and diarrhoea.

Protists (tiny parasites): *Cryptosporidium* is a parasite that can survive even in treated water, causing severe diarrhoea that can be hard to recover from without medical care. *Giardia* is another parasite that causes cramps and diarrhoea, often caught from polluted water.

Why test only some microbes instead of all?

Directly testing for all the different types of harmful microbes is costly, time-consuming, and requires specialised equipment. Instead, testing for indicator microbes—organisms that signal contamination—provides a quicker, more affordable way to detect potential problems. Below are some indicator microbes that act as "warning signs".

E. coli is commonly found in the intestines of humans and animals. Its presence in water indicates faecal contamination and suggests that there may be harmful microbes in the water.

Total coliforms, a group of bacteria found in soil, plants, and water, indicate conditions that may allow harmful bacteria to thrive.

Enterococci, which survive longer in saltwater, are effective indicators for monitoring faecal contamination in beaches and coastal areas.

How to choose which test to use?

Before choosing a test, think about:

- What exactly do you need to know?
- How quickly do you need the results?
- What tools, skills, and budget do you have?
- Can you easily access the test kits?

Need fast results?
AquaVial gives results in 5–9 hours—ideal for quick checks.

Need high sensitivity?
Choose Faircap Portable Lab, SimplexHealth, or Aquagenx CBT EC+TC to detect even tiny amounts of bacteria.

Need simplicity?
AquaVial, Watersafe WS-831, Hach PathoScreen, and Leaping Lynx are all easy to use with minimal tools or training.

Need to count bacteria?
Go for Aquagenx CBT EC+TC or IDEXX Colilert—these provide actual bacterial counts.

Need wide detection?
Leaping Lynx checks for a range of harmful bacteria like E. coli, Salmonella, and Pseudomonas.

There is no single best method - different tools work best in different situations. You may need a quick check, a detailed count, or something in between. More methods are becoming available all the time. Try out a few options - take at least two or three test measurements and see what works best for you. Stay updated as new tools are developed.

The table that follows gives a detailed breakdown of several water test kits. Each has unique features to meet different monitoring needs. Most kits come with simple written instructions and video tutorials, so you don’t need advanced skills to get started.

Test Kit	How Easy?	Cost	What It Does	Time	Shows Amount?	Good For	Limits
Watersafe WS-831	Easy	~$20	Colour change (yes/no)	2 days	No	Very easy, no tools needed	Only yes/no, needs warm place
AquaVial	Easy	~$10	Colour change (yes/no)	5–9 hrs	No	Fast, finds small contamination	Doesn't count bacteria
Faircap Portable Lab	Medium	~$1	Grows bacteria you count	~15 hrs	Yes	Very cheap, portable	Needs USB power, slower
SimplexHealth	Medium	~$17	Grows + UV light check	1–2 days	Yes	Good for E. coli, reliable	Needs UV light
Aquagenx CBT EC+TC	Medium	bulk price	Bag test, counts bacteria	1–2 days	Yes	Good count, flexible use	Needs chart, takes practice
Hach PathoScreen	Easy	~$9	Colour change (yes/no)	1 day	No	Cheap, easy	Only yes/no
IDEXX Colilert	Hard	$4–7 (bulk)	Chemical + UV glow	1 day	Yes	Very accurate	Needs incubator + training
Leaping Lynx	Easy	~$35	Colour change	1–2 days	Limited	Finds many bacteria types	Expensive, less sensitive

Yes = Shows how much bacteria there is
No = Only shows yes/no result

Limited = Shows presence but not exact count
UV = Needs special light to confirm results

Further information on each test can be found at the links in the table below.

Feature	Link
Watersafe WS-831	https://www.watersafetestkits.co.uk/product/watersafe-bacteria-test-1-test/
AquaVial	https://www.aquavial.com/
Faircap Portable Lab	https://faircap.org/our-products/faircap-portable-lab/
SimplexHealth	https://www.simplexhealth.co.uk/
Aquagenx CBT EC+TC	https://www.aquagenx.com/cbt-ectc/
Hach PathoScreen	https://my.hach.com/pathoscreen-field-test-kit/product?id=59428534087
IDEXX Colilert	https://www.idexx.co.uk/en-gb/water/water-products-services/colilert/
Leaping Lynx	https://leapinglynx.com/

Data collection

What do you need?

- ☑ Paper and pencil or a prepared electronic datasheet (see below for details).
- ☑ Clean bottles or containers for collecting water samples.
- ☑ Indicator test strips for water nutrient levels, water acidity, and/or heavy metals.
- ☑ Hand wash and/or protective gloves, especially if you think the water is polluted.

Collecting and testing water samples

Collecting water samples from a river using a small container and protective gloves. Photo by Helen Newing and Anna Freeman.

Choose a safe and easy-to-reach spot to collect your water sample. You will need to wash out sample containers three times to remove contamination from previous samples. You can gently dip a clean container into the water without stirring up the mud or sediment from the bottom. If the water near the riverbank isn't clear or deep enough, safely use a bucket tied securely to a rope and carefully throw it a short distance into the water, or lower it from a bridge.

The water samples should be enough to dip the indicator strip into. Check the indicator strip package for how long to leave the strip in the water before removing, and how long to wait for a result. Each test kit has its own instructions, so always check the timing carefully - some tests need just a few minutes and show colour changes, while others might need longer incubation times (several hours or overnight).

You will notice a colour change after removing the indicator strip. You can then compare the colour change on your test strip or kit with the provided colour chart to interpret your results.

Simple on the spot water testing

STEP ONE
Collect your water sample. Remove the test strip from the foil.

STEP TWO
Dip the test strip in to the water sample for the required amount of time.

STEP THREE
Fold over the back of the strip and match with the closest colour on the colour chart.

Figure shows an example of collecting water sample and using indicator strips to determine water quality. Image from Simplex Health.

Data recording and analysis

Indicator strip packages will have their own categories for what colours show healthy or polluted waters. Below is an example of how you can record the data in a table and include "Water nutrient category" and "Water acidity category" if your indicator strip package provides labels for these results.

If your test shows unusual results (colours indicating high contamination), you might consider requesting further testing by local authorities or professional laboratories for a detailed analysis.

Example Table for Recording Water Nutrients, Acidity, and/or Heavy Metals

Your name	Date (dd-mm-yyyy)	Location	Water nutrient (ppm)	Water acidity (pH score)	Heavy metal indicator (ppb)
Maria Garcia	04-03-2025	44.5623, -76.3200	Good (0.5)	Medium (6.7)	Good (<10)

Guide for interpretation (traffic light system):

- **Green (Good):** No issues detected, safe conditions.
- **Amber (Medium):** Slight caution, monitor regularly.
- **Orange (Poor):** Indicates potential issues; closer investigation advised.
- **Red (Cause for alarm):** Serious issue detected; immediate action recommended.

SECTION 3.4:

Monitoring fish health and abundance

Overview

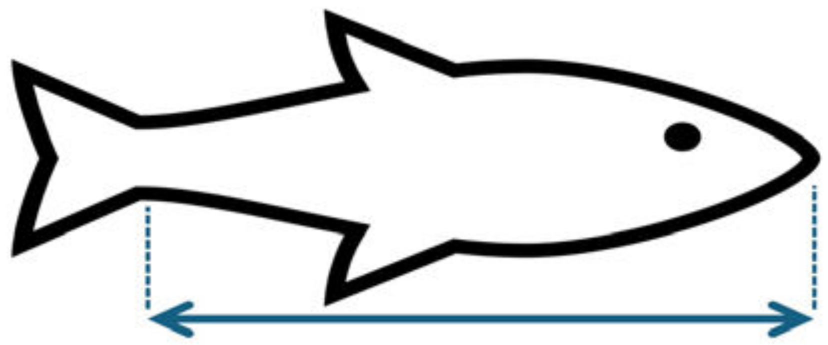
Monitoring water health can give you an indication of the likely health of fish and other wildlife, as healthy water is essential for thriving wildlife populations. To take your monitoring efforts further, you can gather knowledge directly from fishers in the community. You can ask fishers about how much time it took for them to catch fish. For this fish monitoring method, Catch-Per-Unit-Effort (CUPE) identifies how much effort is put into catching fish. If more effort is put into catching fish over time, then it can indicate fewer fish in the water. This method can help you track changes in fish population and health over time. You can also collect extra data on fish populations by measuring the size of the fish you catch and noting down any obvious signs of good or poor health.

Data collection

Fishing effort can be measured by **time**, where you record the number of hours spent fishing, or **equipment**, where you record what kinds of nets, traps, or other fishing equipment were used and, for example, how many times the nets were thrown, how many traps were set, or how often a line was cast into the water.

The number of fish caught can be recorded for all types of fish together, or separately for each type of fish you want to monitor. Recording different types of fish separately gives you much more detailed information. If you decide to do this, you can record the different types of fish using local names or scientific names. Any of these is fine as long as you always do it in the same way.

You can collect much more detailed evidence of the state of fish populations if you also **measure** the size of each fish that is caught. To do this, measure the length of their body, from the tip of the nose or mouth to the base of the tail.



It is also useful to record observations of fish health. For example, if the fish looks especially healthy, or if there are any parasites or injuries.

You will need to set up a datasheet in advance, like the one below. You can do this in a spreadsheet programme such as Excel or you can print paper copies and then enter the data into a spreadsheet later.

Helpful Tips

Use the same fishing equipment every time: For example, fishing with traps, lines, hand-held nets or throw nets.

Use the same measure of effort every time: This could be the hours spent fishing, or the number and type of traps or nets used.

Collect data at the same places every time: Mark the places where you will collect data on fishing on a digitised map or a simple sketch of the river, so you can always return to the same places. This means that you can compare results over time. Number the places (1, 2, 3...) for ease of reference.

Don't collect data more often than you need: For example, if you want to monitor long-term trends in fish health and abundance, you may only need to collect data once in the dry season and once in the rainy season each year.

If the same fish type is caught multiple times, measure the length of average looking fish: If you catch more than 5 fish of the same fish type, you can measure the average looking fish to save you time in data collection. If you catch less than 5 fish of the same fish type, write down the lengths of each fish.

Remember that CPUE is a very rough estimate of relative trends in fish numbers. There are lots of things that might cause CPUE to change that aren't to do with fish population sizes, and also the changes in CPUE might not directly reflect populations (for example. if fish move away from an area, or become harder to catch for other reasons).

The following example of a datasheet in collected CUPE data follows an example in Thailand rivers, monitoring two fish species - *Pla Rak Klauy* and *Pla Pluang*.

Example of datasheet for fisher's catch-per-unit-effort

Date	**Location**	**Fishing equipment**	**Type of fish** - Number of fish caught - Fish lengths (cm)*	**Average fish length (cm)**	**Effort (hours)**	**CPUE** (total number of fish count ÷ effort)	**Additional observations of fish**
15-05-2025	Site 1	Hand net	**Pla Rak Klauy** – 1 fish caught – 10cm **Pla Pluang** – 4 fish caught – 16cm, 8.6cm, 12.5cm, 17cm	**Pla Rak Klauy** – 10 cm **Pla Pluang** – 13.525 cm	2 hours	2.5	Parasite under left eye of Pla Rak Klauy.
15-05-2025	Site 2	Hand net	**Pla Pluang** – 8 fish caught – 16cm	**Pla Pluang** – 16 cm	1 hour	8	All fish looked healthy.

* If you catch more than 5 of the same fish type, measure the length of 1 average looking fish

Data analysis

Step 1: Calculating average fish length

This needs to be done for each type of fish separately. Calculate the average length by adding together the fish lengths you recorded and dividing by the number of fish:

$$\text{AVERAGE FISH LENGTH} = \frac{\text{THE SUM OF ALL THE FISH LENGTHS}}{\text{NUMBER OF FISH}}$$

For example, in the example above, 4 Pla Pluang were caught using hand nets. Their average length was 13.535 cm:

$$\frac{16+8.6+12.5+17}{4} = \frac{54.1}{4} = 13.525$$

Step 2: Calculating catch-per-unit-effort:

To calculate the catch-per-unit-effort, divide the total number of fish caught by the effort.

$$\text{CPUE} = \frac{\text{TOTAL NUMBER OF FISH CAUGHT}}{\text{EFFORT}}$$

For example, where 8 Pla Rak Klauy were caught in 1 hour, the CPUE will be 8.

$$\text{CPUE} = \frac{8}{1} = 8$$

Step 3: Comparing two or more sites and tracking changes over time:

To compare fish populations at different sites, compare the CPUE. For example, some communities are developing monitoring of fish in community conservation areas and outside them, to collect evidence on the effectiveness of the conservation areas. As long as you use the same fishing methods and units of effort at each site, a lower CPUE may mean fewer fish.

To compare changes in fish populations over time, compare the CPUE from one monitoring event to the next. If the CPUE is getting smaller, it may mean there are fewer fish in the area than there were. You can also look at the additional observations of fish that were recorded, to see if there are any obvious changes in the condition of caught fish over time. If so, these might explain variations in fish capture rates and provide insights into fish population size and health.

Sources of further information

Visual and Sensory Assessment:

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Forest Peoples Programme (FPP)
1c Fosseway Business Centre, Stratford Road, Moreton-in-Marsh, GL56 9NQ, UK

Tel 00 44 1608 652 893
info@forestpeoples.org
www.forestpeoples.org

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