



Working to restore & enhance our rivers

PRACTICAL GUIDANCE TO MONITORING

Short guidance document on how to set project
and monitoring objectives



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1. Why is monitoring important?

Monitoring your project is essential to demonstrate successes, reporting this to your funders and to identify areas that may need future adaptation. Demonstration of what has worked well should also help with future funding applications since it increases the overall evidence base. To generate useful monitoring data you need to be clear about what you can do within your time and budget. More detailed information about monitoring can be found in the RRC's 'Practical River Restoration Appraisal Guidance for Monitoring Options' which links directly to the approach outlined here (http://www.therrc.co.uk/rrc_pragmo.php).

2. Setting clear and useful project and monitoring objectives to support future funding opportunities.

Defining clear objectives will help you ensure that your monitoring is cost-effective and aligned to your targets. It will help funders understand what you are planning and demonstrate confidence that you will be able to demonstrate success and recognise where adaptation may be necessary. Defining project objectives will also help you identify what baseline data and resources are required for your monitoring.

Adopting the SMART approach (see **Appendix 1**) helps to ensure that your approach is designed to provide answers to specific questions and thus demonstrates that the most appropriate techniques and measures have been implemented.

3. How to organise your monitoring: using the Monitoring Planner

Even where clear project objectives have been defined, linking these to monitoring objectives that will show a clear trajectory of change can be difficult. A well formulated monitoring framework will help you ensure that appropriate monitoring techniques are chosen and the critical baseline data is collected (which would otherwise considerably limit successful project evaluation). This approach helps you think about not only why, what and when to monitor, but also costs, resources, how you are going to evaluate your results and prioritizes your strategy in terms of risk and priority.

A Monitoring Planner has been developed by the RRC to help set up robust monitoring schemes whilst ensuring you ask that right questions to achieve this. It is available to download from our website (<http://www.therrc.co.uk/monitoring-planner>). The key elements are summarised **Appendix 2**.

It should be recognised that monitoring every aspect of your restoration project is rarely realistic and a degree of prioritisation is therefore necessary. At the start of your project, think about what is realistic to achieve within your timeframe. Collecting pre-project or baseline data can be time consuming and within, for example, a three year project, you will probably not have more than one season before the on-the-ground works start. Baseline data collected by a third part can therefore be extremely valuable. However, ensure that the same techniques, standard methods, locations and timing (i.e. time of year/flow condition) are used for collecting the post-project monitoring data.

4. Techniques, timing and resources

All projects should carry out Fixed-Point Photography (FPP). This is an easy applicable, cost-effective monitoring technique which visually shows the progress of the project.

What other monitoring methods are **achievable** and **realistic** will depend on a combination of:

- **Targets and current knowledge** associated with your project (i.e. current knowledge of the river restoration/monitoring technique that is to be applied)
- **Resources and baseline data** – budget for data collection and analysis; number of people available to collect information and/or access to third part data
- **Timescale** – how long time you have to monitor after project completion

As a general rule, larger, more novel and complex projects require more comprehensive monitoring to demonstrate outcomes. Further discussion about this can be found at (http://www.therrc.co.uk/rrc_pragmo.php) including details about the most commonly used monitoring techniques for both physical and biological parameters (see chapter 7).

Direct and indirect measures

It is important to understand the limitations of some monitoring techniques and indicators. When choosing your monitoring, try to in first hand use direct measures. For example, if your project objective is to increase habitat diversity for fish, the direct measure would be a habitat survey, while monitoring the fish occupying those habitats is an indirect measure. If time and resources allow, monitoring both aspects are of course preferable.

When to monitor

After a major restoration project it **takes time** for both physical and biological parameters to adjust to the new condition. When monitoring biological parameters it is especially important to consider the time it takes for the species to re-colonise and also what is the local gene pool. It might take years for increases in diversity and disturbance from works could cause an initial decline in species richness and abundance. Fish and macro-invertebrates are both WFD quality elements and common monitoring parameters in river restoration. However, due to their mobility, seasonal variance and susceptibility to external pressures, it is important to collect a number of both pre- and post-samples, taken at the same location and during same season and conditions. To account for external factors that might affect monitoring results, a before-after-control-impact (BACI) design is also recommended.

Use other groups to support your monitoring

Engaging **volunteers**, **angling clubs** or **universities** in monitoring is often cost-effective and can considerably help to show positive trajectories of change.

5. Evaluating your results

Compiling and reporting your results is an important part of the monitoring process to inform funders and future projects of the benefits of the measures used. It is also good practice to evaluate your monitoring results on an annual basis and review if any adaptive management is required.

To help increase the evidence pools of information add your completed project and key evaluation information to the [RiverWiki](#). This interactive online database is an important platform for sharing knowledge, information and best practice on river restoration in Europe. (If you have any problems with uploading your project, please contact the [RRC](#)).

6. Check list

Set SMART project objectives with specific targets.	
Can your project objectives be measured (and thereby also monitored)?	
Check what baseline data already exist, if it is accessible to you and possible to replicate.	
Think about what the monitoring results will tell you. Is it going to tell you if you have achieved your objectives and targets?	
Complete the monitoring table as far as you can, then talk it through with the RRC.	
Add you completed project to the RiverWiki .	

Appendix 1: The SMART objective approach

Setting SMART project objectives should follow these steps:

1. Determine the overall aim of the project. For example: *Restore river dynamics by altering channel form and function*. You now know what you wish to achieve, but this does not define how you are going to do this or how to measure success.
2. Define project objectives with **Specific (S)** and **Measurable (M)** targets. Try to be as **specific** as possible when you set your objectives, this will help you to also make them measurable. For example: *Increase sinuosity and flow diversity by cutting a new, 20% narrower, sinuous course and import 8 tonnes of gravel to develop pool riffle sequences. Raise the new bed level with 30% to encourage more natural floodplain connectivity.*

Next, identify what can realistically be **measured** in terms of quantity, quality, equipment and expertise. This will help ensure you identify the most appropriate monitoring methods. Channel mapping, flow measurements, cross-sections, habitat surveys and fixed-point photography will, for example, help you to determine if you have increased sinuosity and hydromorphological diversity.

3. Once these two elements (**Specific** and **Measurable**) have been identified you need to ensure that your project objectives also are:
 - Achievable (A)** – based on a review of evidence of success on other, similar sites;
 - Realistic (R)** – based on resources (money, people, time) and;
 - Time bound (T)** – in terms of duration of the project works against allocated resources. Deadlines for actions should be set for the works which will then help identify when both pre- and post-monitoring should be completed.

Case: A 2m high weir, which is an obstacle to salmonid fish, is beginning to degrade in a flashy, high energy catchment with gravel-bedded channels. There is an opportunity to remove this weir. The amount and possible impact of extensive fine and gravel sediment accumulation behind the weir will need to be investigated. It is anticipated that additional work will be needed to narrow the channel where the weir pool is currently.



Main targets:

- Remove weir structure to restore fish passage to upstream gravel beds.
- Narrow the river to maintain clean gravels in weir location.



SMART objectives:

- Remove the weir structure by August 20XX and complete channel narrowing works within one month
- Reduce the channel width by 30% for 60m upstream of the weir using locally-sourced tethered wood
- Increase the total number of fish (abundance) passing through the reach in November
- Increase total number of Brown Trout spawning on upstream gravels within two seasons

Example of SMART project objectives for a weir removal project

Appendix 2: The monitoring planner

- **Why** – What are the project objectives and the specific targets to be monitored? (E.g. to increasing the area of riffles and clean gravel habitats by 80% over 2km of river).
- **What** – What is your monitoring objective and what are you trying to observe? (E.g. to monitor increased habitat diversity and change in macro-invertebrate assemblages).
- **How** – What techniques are being used to collect data and what assessment methods are you using? (E.g. habitat mapping, 3 min macro-invertebrate kick-sampling; α -diversity, PSI index).
- **Data** – Do you have access to any pre-project/baseline data? If not, this needs to be collected. (E.g. previously collected 3 min macro-invertebrate kick-samples from two locations in autumn).
- **When** – When are you collecting data – month/season, duration of monitoring, sampling repeats? (E.g. habitat survey: pre survey 1 month before works; post survey 1 year after. Macro-invertebrates: pre survey spring and autumn samples 1 year before; post survey 1 and 3 years after both including a spring and an autumn sample).
- **Who** – Who are the individuals and/or organisations responsible for monitoring? Ensure all data are comparable. (E.g. habitat mapping in-house by Jo Smith; macro-invertebrate pre survey by third part and in-house by Jo Smith, post survey in-house by Jo Smith).
- **Cost** – Are all costs for monitoring covered by the funding? Note that some techniques might require monitoring to be carried out a few years after implementation. If funding is insufficient, go back to 'how' and think about alternative techniques and methods.
- **Confidence** – How confident (High/Medium/Low) are you that the monitoring is robust, suitable and has potential to show what you are trying to observe within the project time limit? If your confidence is low, go back to 'how' and consider alternative monitoring techniques.
- **Evaluation** – How will your collected monitoring data be recorded and the analysis outputs reported? (E.g. standard protocols, report produced by end of each financial year)
- **Priority** (to be completed by SEPA): Prioritise (High/Medium/Low) the monitoring.

	Why	What	How	Data	When	Who	Cost	Confidence	Evaluation	Priority (filled in by SEPA)
1	What is the objective of the works which are to be monitored?	What is your monitoring objective/what are you trying to observe?	What methods are you going to use?	Add information on the baseline data you have collected (type, frequency, method used)	What periods over the year and how often? (to indicate variability)	Who is going to do this?	(Can be in kind)	High/ medium/ low robustness of monitoring	How/when/ who. Monitoring results collated and evaluated	High/medium/low importance of monitoring
2										
3			Fixed-point photography	None	Pre: June, October 2015 During: March 2016 After: April, June, October 2017; April, October 2018 All at five locations	In-house	In kind	Medium	Photos georeferenced and stored on server. Evaluated after every set of photos (in-house). To be included in final evaluation report	
4	To increasing the area of pool, riffle and clean gravel habitats by 80% over 2km (Works to take place in March 2016)	To monitor increased habitat diversity and change in macro-invertebrate and fish assemblages	Habitat mapping	None	Pre: September 2015 Post: September 2016	X environmental consultant	£400	High	Report from consultant after every survey. To be included in final report	
5			3 min macro-invertebrate kick-sampling; a-diversity, PSI index	Two 3 min macro-invertebrate kick-samples from two locations in autumn 2013, provided by XX	Pre: April and October 2015 at five locations + one control Post: April and October 2017, April and October 2019 at five locations + one control	In-house by XX	£12,000	Medium	Data recorded on standard sheets. Evaluated after survey (in-house). Separate pre- and post-monitoring reports to be included in final evaluation report	
6			Electro-fishing: taxa, age, weight, length	None	Pre: May 2015 at two locations Post: May 2017 at two locations	In-house by XX	£1500 plus equipment	Low	Data recorded on standard sheets. Evaluated after survey (in-house). Separate pre- and post-monitoring reports to be included in final evaluation report	
7			Electro-fishing: taxa, age, weight, length	None	Pre: November Post: November 1 and 2 years after removal	X environmental consultant	£2250 plus equipment	Medium	Report from consultant after every survey. To be included in final report	

Screen view of the RRC monitoring framework table with an example project (<http://www.therrc.co.uk/monitoring-planner>)

Applying these generic questions to each specific project objective will lead to a clear understanding of what level of motoring is actually achievable.