**“How to use” guide for the River Restoration Centre’s monitoring Protocol:**

**Key:**

* **Target/why –** What is the overall objective of the works which are to be monitored?
* **What –** What are you trying to observe from your monitoring? E.g. increased sinuosity and habitat heterogeneity through re-meandering and adding large wood / reduction in nutrient inputs by installing SuDS.
* **How –** What techniques are being used to collect data and what assessment methods are you using? E.g. electro-fishing monitoring diversity, abundance, density, length and age.
* **When –** When are you collecting data (month/season)? Duration/length of monitoring period, how many sampling repeats, how regularly?
* **Who –** Who is the individual and/or organisation responsible for monitoring? Will this be done by more than one organisation?
* **Data –** Do you have access to any pre-project data? E.g. monitoring data from the Environment Agency.
* **Cost –** Cost of monitoring. Are all costs in kind, or are there expenditures for e.g. external lab analysis.
* **Which WFD objective is this helping to achieve –** Which WFD quality element will be addressed by your works? If not WFD, does the work/undertaking aim to improve favourable conditions (for designated sites or species, e.g. SSSI/SAC/SPA/BAP) or does it relate to any other policy drivers (e.g. public engagement, socio-economics, flood management, ecosystem services)
* **Priority and confidence:**Priority: High/Medium/Low importance that your monitoring method can show potential improvement of the related WFD quality element; the favourable condition (i.e. designated site or species such as SSSI, SAC, SPA, BAP); and/or other policy drivers (e.g. socio-economics, flood management, ecosystem services).  
  Confidence: High/Medium/Low confidence that the monitoring is robust, suitable and has the potential to show what you are trying to observe within the CRF project time limit.

| **Target/Why**  What is the overall objective of the works which are to be monitored? | **What**  What are you trying to observe from your monitoring? | **How**  What methods are you going to use? | **When**  What periods over the year and how often? (to indicate variability)  And where if possible | **Who**  Who is going to do this? | **Data**  What existing data is available in addition to the monitoring being outlined here | **Cost**  (can be in kind) | **Which WFD quality element is this helping to achieve?**  **If not WFD specify (e.g. SSSI, SAC, BAP or other policy driver)** | **Priority**  High/medium/low linked to WFD or other designation | **On target**  Are the monitoring tasks outlined running to schedule?  (if no specify)  NOTE- can use RRC update questionnaires as a start. | **Key reporting tool and reporting output** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Confidence**  High/medium/low robustness of monitoring |
| **Will be different for each project – what is the project aim for the area being photographed?** | A visual change in (please specify) as a result of (please specify) | Fixed point photography – for methodology, refer to RRC’s Practical river monitoring guidance (2011)  X number of photos (state if known) & indicate if RRC have been provided with a map of points (Y/N) | E.g. Before, immediately after and post works recommended (state dates if known, e.g. month and year) | Project team/ Volunteers | State if fixed point photography or any anecdotal/ ad-hoc photography prior to CRF | Through project/  In-kind | State which of the following, the FPP demonstrates:  a) WFD targets,  b) designated river or  c) other e.g. social science targets | Priority: Please state (only grey if High) | Yes/ No | A time-series of fixed point photographs  State if any other analysis is being done |
| Confidence: Please state (only grey if High) |

* **On target –** Are the monitoring tasks outlined running to schedule? If no, why not?
* **Reporting tool and reporting output –** How will your collected monitoring data be recorded and the analysis outputs reported?

**Example of Fixed Point Photography:**

| **Target/Why**  What is the overall objective of the works which are to be monitored? | **What**  What are you trying to observe from your monitoring? | **How**  What methods are you going to use? | **When**  What periods over the year and how often? (to indicate variability)  And where if possible | **Who**  Who is going to do this? | **Data**  What existing data is available in addition to the monitoring being outlined here | **Cost**  (can be in kind)  NOTE: Costs are approximate. A detailed project budget is available if needed in our CRF bid | **Which WFD objective is this helping to achieve?**  If not WFD specify (e.g. SSSI, SAC, BAP or other policy driver) | **Priority**  High/medium/low linked to WFD or other designation  **Confidence**High/medium/low robustness of monitoring | **On target**  Are the monitoring tasks outlined running to schedule?  (if no specify)  NOTE- can use rrc update questionnaires as a start. | **Key reporting tool and reporting output** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Reduce nutrient runoff (especially P and N)** | Full WQ range at catchment base (related to effects of measures) | Automatic sampler | Before, during and post works | FHT/Oxford Brookes University | None | 50k | Phosphorous  Development of a WFD N standard is in progress | Priority: H | Yes | Modelling and comparisons of various WQ elements before and after works - interim report and final report |
| Confidence H |
| WQ being sampled at 4 to 6 tributaries in each catchment | Manual sampling | Twice monthly, before during and after works | FHT/Oxford Brookes University | WQ and ecology data from Defra PARIS project (for one trib only) | 50k | Priority: H | Yes | Modelling and comparisons of various WQ elements before and after works- interim report and final report |
| Confidence H |
| **Reduce rate of runoff)** | 15 minute flows | Flume and logger | Every 15 minutes | FHT/GWCT | None | 50k | No specific standards; reduced flood risk downstream | Priority: H | Yes | Input to modelling work; comparison before and after works implemented |
| Confidence H |
| **Reduce sediment loss** | Turbidity measured at catchment base | Automatic sensor; suspended sediment measurement in water samples | Every 15 minutes, before during and after works | FHT/GWCT | None | 50k | No standard for sediments yet; but there should be | Priority: H | Yes | Comparisons of sediment concentrations before and after works for similar rainfall/flow events - interim report and final report |
| Confidence H |
| **Reduce pesticide runoff** | Pesticide levels in rivers | Automatic sampler | Before, during and post works | CRD/Anglian Water/Uni York | None | 50k | Drinking water Directive | Priority: H | Yes | Modelling and comparisons of various pesticides before and after works for similar rainfall/flow events- interim report and final report |
| Confidence H |
| **Improve landscape wide freshwater biodiversity (all freshwater types)** | Increase in wetland plant and macroinvertebrate biodiversity whole across landscape | Standard plant survey, 3 min invert samples at c240 locations using standard FHT developed methods | Annually over three years to create baseline | FHT | This is a major new internationally relevant dataset | 25k (but note samples are being stored; funds not yet available for sorting and ID) | No standard metrics yet for landscape scale freshwater biodiversity | Priority: H | Yes | Assessment of changes in macrophytes and macroinvertebrate assemblages before and after works- interim report and final report |
| Confidence H |
| **Improve macroinvertebrate assemblages in streams** | Changes in macroinvertebrate assemblages | Kick samples | Annually (Spring) | FHT | Defra PARIS project (for one trib only) | 15k | Macroinvertebrates | Priority: H | Yes | Assessment of changes in macroinvertebrate assemblages before and after works- interim report and final report |
| Confidence M (within CRF limit; High - if continued) |
| **Improve macrophyte assemblages in streams** | Changes in macrophyte assemblages and percentage coverage | Biotope mapping | Annually (Late summer) | FHT | None | 15k | Macrophytes | Priority: H | Yes | Assessment of changes in macrophyte assemblages before and after works- interim report and final report |
| Confidence H |
| **Improve diatom scores in streams** | Standard WFD diatom metrics | Standard WFD diatom methods at 30 locations |  |  | none | 30k | Diatoms | Priority: H | Yes | Assessment of changes in diatom assemblages before and after works- interim report and final report |
| Confidence H |
| **Improve fish assemblage in streams** | WFD fish metrics | Electrofishing surveys at 30 locations |  |  | Some EA surveys | 30k | Fish | Priority: H | Yes | Assessment of changes in fish assemblages before and after works- interim report and final report |
| Confidence M (within CRF limit; High - if continued) |
| **Modelling** | Modelling catchment characteristics in terms of soils, geology, pesticides and hydrology to identify pollution sources | SWAT 2012 and possibly SPIDER | Pre and post restoration work | University of York | none | 20k |  | Priority: H | yes | Evaluating against baseline monitoring generated within the Water Friendly Farming project and comprising flow from rated section located in upper catchment, nutrient grab samples from locations within the upper catchment and from daily composite samples at the outlet of the upper catchment, pesticide concentrations from daily composite samples at the outlet of the upper catchment. |
| Confidence H |

**Restoration methods**

1. Fencing
2. Filed drain interceptors
3. MOPS style ponds to intercept polluted marginal drains
4. Storage ponds
5. Pesticide interceptor ponds
6. Bund in ditches
7. Installation of rural SUDS on crossing points
8. Review and upgrade of farm nutrient plans
9. Septic tank emptying
10. Habitat enhancements
11. Weir removal/ fish easements

SWAT (soil and Water Assessment tool)