**“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.
* **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?

| **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) | **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) & if points indicated on map (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: High (All CRF projects were encouraged to prioritise FPP) | Yes/ No | A time-series of fixed point photographsState if included in e.g. final report |
| Confidence: Please state (only grey if both confidence and priority are High) |

**Example of Fixed Point Photography:**

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| **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) | **Key reporting tool and reporting output** |
| **Confidence**High/medium/low robustness of monitoring |
| **River Deerness** (four sites). Ease fish movement + up to 4 additional sites | Enhanced fish movement and numbers by installing:- Rock ramp (Ushaw Moor bridge)-Twin box culvert (Broadgate Farm crossing)-Bypass channel (Broadgate Farm weir)-Drown out concrete step (Cornsay Colliery)+ replacement of 4 pipe bridges with single span bridges (box culverts). | Quantitative fish community and population surveys upstream (u/s) and downstream (d/s) of barriers over pre and post-easement periods, using electric fishing.Capture-recapture (electric fishing with PIT/VIE marking in multiple, contiguous 20-m zones d/s and u/s of barriers) method to assess dispersal and passage of multiple fish species (e.g. trout, bullhead) and multiple size/age classes as small as 60mm. Pre and post-easement.Radiotracking of sea trout adults (Browney-Deerness) to determine passage effectiveness of new passes, location of key spawning areas and occurrence of any further ‘pinch points’ on migration route. | Electro fishing surveys and mark-recapture in Aug-Oct 2013 (pre-intervention), July-Oct 2013 (pre and post-intervention). Total of in excess of 60 days of fieldworkSo far.Another 30+ days of fieldwork planned yet in summer 2014. Same month as pre-surveyRadiotracking to be carried out in 2014 (post completion of the key Deerness fish passes, Oct 2013). Ca. Aug-Nov 2014.  | PhD student, J. Tummers, under supervision of M. Lucas, Durham University + volunteer research and undergrad. Students from Durham Uni.Strategic cooperation from Wear Rivers Trust (WRT), esp. S. Hudson. | Some historical EA fish population data from sporadic sites and dates (standard EA monitoring programmes). | Durham Uni. Monitoring for this and all other Deerness CRF elements = £40K over whole CRF project period (+ > £35K in kind match) over same period.Monitoring enhancement £4.095K VIE, PIT marking and £11.58K for radio tags.  | GB103024077270 Fish: poorTarget: improved statusGB103024077280 Fish: moderate (by default), but waterbody action plan (WAP) shows no monitoring GB103024077290 Fish: Good (by default), but WAP shows no monitoring. (Durham Uni. baseline monitoring showed absence of smaller species prior to Cornsay fish pass construction) | Priority: High(where WFD fish quality is good – no deterioration) | Yes | Pre-implementation, baseline evaluation (MoU) Post-implementation evaluation (MoU) – Quarterly updates from Durham Uni (presentation of analysis and some written data)Final thesis and associated peer-reviewed material. Raw data archived with WRT. |
| Confidence: High |
| **River Deerness** (four sites) + up to 4 additional sites | Condition of habitat at barriers after works to improve passage.Suitability of local habitat condition before and after, in relation to fish passage and suitability as biological habitat.  | Instream and bankside habitat surveys u/s and d/s of barrier, including flow-velocity measurements at barrier and easement. | Pre-easement surveys (Aug-Oct 2012), post-easement survey for Cornsay in April 2013 + pre-and post-surveys (site dependent) in July-Oct 2013. | PhD student, J. Tummers, under supervision of M. Lucas, Durham University + volunteer research and undergrad. Students from Durham Uni. | Full habitat survey of Deerness catchment conducted by WRT outside CRF.WRT have conducted specimen fluvial survey with Prof. M Newson 500m above and below Ushaw Moor fish pass 6th Nov 2013. Some bankside protection will be required to counter discharge flow from fish pass under specific flow conditions. No significant fluvial impact expected at Cornsay or BroadgateArea of erosion revetted at Broadgate immediately upstream of by-pass channel sluice gate.  | As above | Hydro-morphological quality: status not high, not a reason for failing on WAPHydrology: not highMorphology: goodAlso, see above (biological status) as habitat condition, especially flow velocity, substrate etc can be intrinsic to passage success, and to biological habitat suitability. | Priority: High(for hydrology, but Medium for morphology as already defined as in good state) | Yes | As above  |
| Confidence: High |
| Fixed-point photography(substitute for morphological surveys) | Additional periodic site inspections and photographs by WRT | Surveying by WRT, esp. S. Hudson. | Priority: High |
| Confidence: High |
| **River Deerness** (four sites). +4 | State of benthic invert communities, as reference of suitability of habitat for fish community beyond improving physical access (e.g. this project will improve access, but fish community might not improve – due to impoverished fauna, perhaps due to poor water quality). The invert. sampling will also give more detailed biological water quality info. than that held. | Invertebrate surveys. Standard kick samples at each site spring and autumn. Qualitative analysis and summary interpretation by presence/absence family-level taxa lists, BMWP, ASPT. | Pre-easement, autumn 2012, pre-and post-easement (site dependent) spring 2013 and autumn 2013. | PhD student, J. Tummers, under supervision of M. Lucas, Durham University + volunteer research and undergrad. Students from Durham Uni. | Some historical invert data from sporadic sites and dates from EA sampling (standard EA monitoring programmes).Hope to get visibility of water company input apportionment data | As above | Phosphate: poor (sewage related GB103024077280 confirmed and GB103024077270 probable).Invertebrates: GB103024077270 and GB103024077280 high status, GB103024077290 good status (default) | Priority: High (for monitoring organic pollution, but Medium for WFD biological quality element as already defined as high) | Yes | As above |
| Confidence: Medium (within time limit of CRF, but High if monitoring continued for >3 years) |
| **Old Durham Beck –** Evaluate best potential for addressing barriers and other likely causes of failure (e.g. water quality)No current budget for works – but possible target of identifying top 3 barrier impacts | Baseline survey of potential obstructions through subcatchment to provide baseline fish data and prioritise restoration opportunities. Also, to use invertebrate samples to indicate fine scale variability, potential water quality impacts and provide baseline data. | Triple pass depletion fishing for 100m stretches d/s and u/s of each respective obstruction and at other ‘control’ sites distant from barriers. > 30 sites. | Depletion fishing and habitat surveys done in June-August 2013. Invertebrate samples taken spring 2013.Total in excess of 30 field days.Currently a one-off thorough survey, but WRT will include some sites for longer term, regular monitoring, and for development as longer-term restoration targets. | PhD student, J. Tummers, under supervision of M. Lucas, Durham University + volunteer research and undergrad. Students from Durham Uni. | Some historical fish population data, invert data and gather quality data from sporadic sites and dates from EA sampling (standard EA monitoring programmes). | As above | GB103024077540 Fish, inverts: poor (default status, but WAP shows no monitoring)GB103024077470 Fish, inverts: moderateGB103024077490 Fish: poor (default status, but WAP shows no monitoring) Inverts: no info. | Priority: Low (as not related to quality element improvement within CRF project time limit) | Yes | As above |
| Habitat surveys incl. photographs and flow diagrams d/s and u/s of each obstruction. Invertebrate samples throughout subcatchment. | Confidence: High (as a method of collecting baseline data) |
| **Newhouse Burn** 1 site (Additional) | Enhanced fish movement, in preparation for resolution of significant obstacle (flood defence culverts). Baseline survey to ascertain fish and invertebrate populations. | WRT electro fishing, semi-quantitative 30m stretches | Baseline electro fishing Aug 2012.Post implementation June to Sept 2014. | WRT staff and volunteers. | WRT walkover habitat survey. Durham University surface flooding research. WRT geomorphological survey 100m u/s and d/s of obstruction. | In kind | GB103024077330 Fish: moderate (but electro fishing results indicate poor). Invertebrates: High status on WAP. | Priority: Medium (as post-monitoring after CRF limit) | Yes | WRT analysis of electro fishing and riverfly results |
| Confidence: Low (within CRF time limit) |
| Riverfly monitoring | Priority: Low (as invert quality defined as high) |
| Confidence: Low (within CRF time limit) |