the River Restoration Centre

Working to restore and enhance our rivers

Delivering River Restoration: Recipes for Success

13TH ANNUAL NETWORK CONFERENCE

Restoring Europe's Rivers

ACE · AlaskA · ARUP · Cain · Halcrow A CH2M HILL COMPANY · LAND & WATER Services · Penny Anderson Associates Ltd Consultant Ecologists · ROYAL HASKONING Enhancing Society · rshydro · Salix · WILLOWBANK Erosion & Conservation Services · WLW

River Restoration Centre

Coordinated monitoring of the

Mayesbrook Park Restoration Project

Nick Elbourne

Environment Agency

London Borough of Barking & Dagenham

TRRT Thames Rivers Restoration Trust

River Restoration Centre

- Monitoring ecological restoration
- Practical River Restoration Appraisal Guidance for Monitoring Options *(PRAGMO)*
- Developing a monitoring strategy for Mayesbrook Park
- Implementing the monitoring strategy
- Key messages

River Restoration Centre

Monitoring ecological restoration

- Ecosystem restoration is among fastest growing industries[1] yet evidence-based assessment is poor
- **Only** 17% of completed projects monitored[2]
- Essential step to:
  - Developing scientific understanding
  - Improving best practice in the field
  - Meeting policy targets (e.g. WFD, EU Directives)

Sources: [1] UN Environment Programme

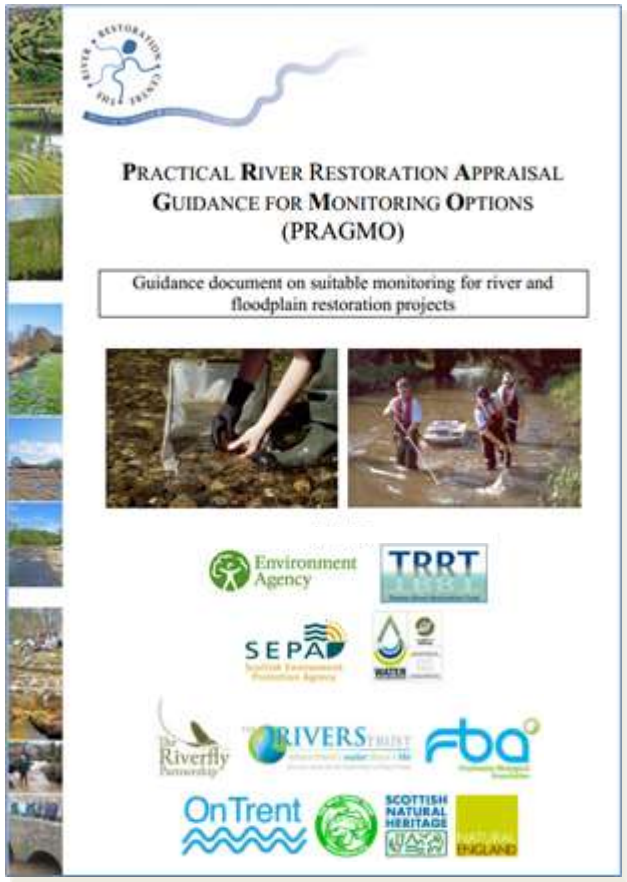
[2] RRC's National River Restoration Inventory (NRRI) – April 2012

River Restoration Centre

- Monitoring ecological restoration
- Practical River Restoration Appraisal Guidance for Monitoring Options *(PRAGMO)*
- Developing a monitoring strategy for Mayesbrook Park
- Implementing the monitoring strategy
- Key messages

River Restoration Centre

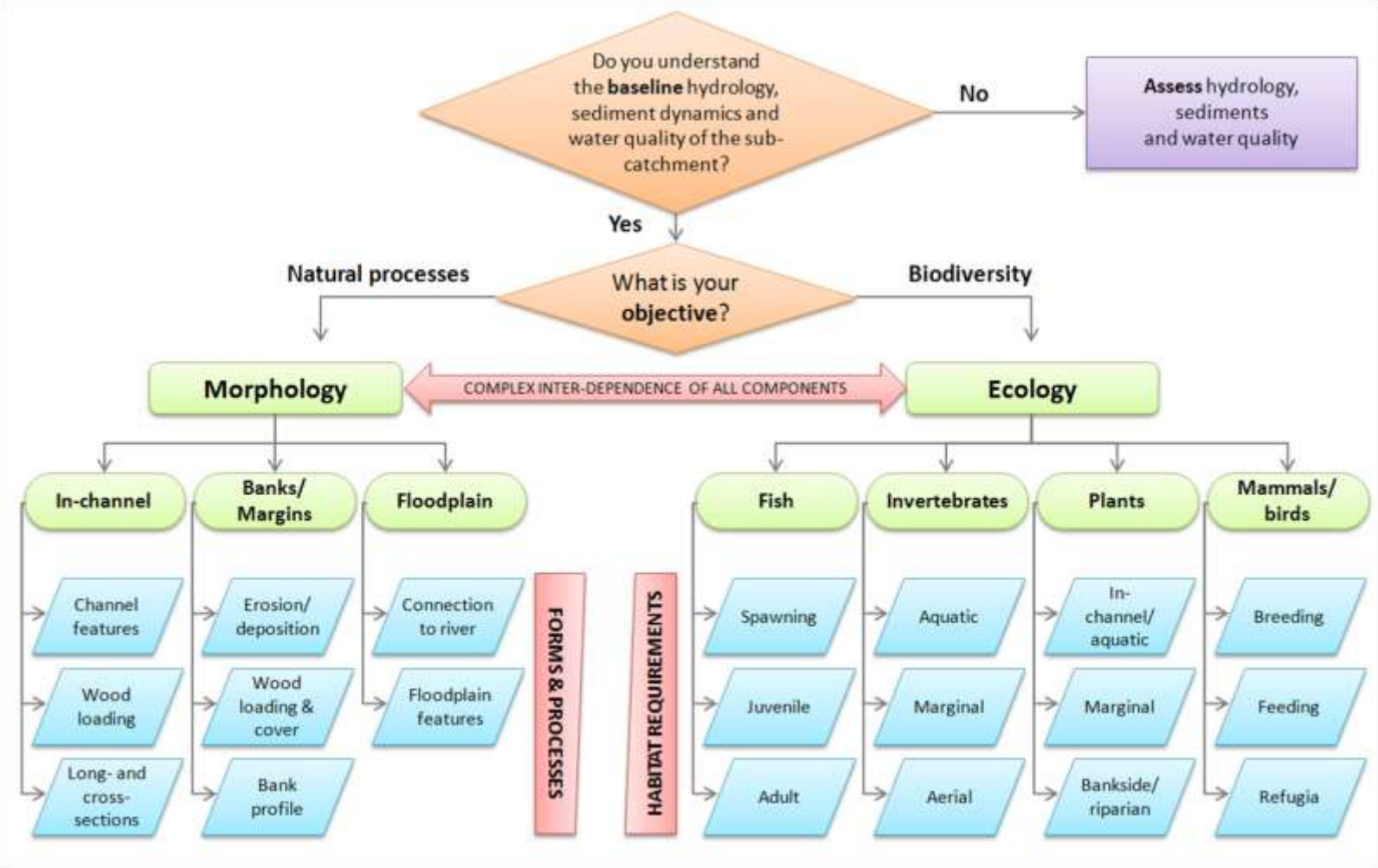
PRAGMO



- Assists *all practitioners* in monitoring river restoration from project inception to PPA
- *Practical, risk-based guidance* to determine most effective techniques and approaches
- Widely supported with input from *expert advisers*

River Restoration Centre

Objective setting



River Restoration Centre

Objective setting

Case: Opportunity to recreate meanders on a 2 km reach through open farmland in a lowland clay catchment, to increase connectivity with the floodplain. Floodplain can then be planted with new trees which, in time, should contribute woody debris to the channel and improve biodiversity.

Example 1: Restoring a floodplain

Main targets:

- Cut a new meandering river to encourage a more natural floodplain connectivity flow regime.
- Plant up the floodplain to create an area of wet woodland.
- Increase habitat diversity.

SMART objectives:

- Cut new meandering channel for target reach, to **increase** *channel length by 10%* from original channel length, **increasing** *sinuosity*, to be assessed after three years.
- Create **wet woodland in the floodplain** by planting with **native species found in the catchment, creating an** *area of wet woodland coverage of 20% of total land use*, whilst maintaining **open areas**, after five years.
- Increase **macro-invertebrate** *diversity* by *5% within* three years , by increasing **channel and floodplain** *morphological variability* (e.g., **riffles, pools, glides, permanently and seasonally wet floodplain areas**).
- Increase the *abundance* **and** *number of species* of **over-wintering wildfowl** over two seasons. Note: the 2010 survey is the pre-restoration baseline for abundance and number of species.

Specific

Measurable

Time-Bound

River Restoration Centre

Define monitoring approach

7	8	9	C
4	5	6	B
1	2	3	A

Scale

Small a b c Large

Risk (of failure)

High

A project involving a new technique, suite of techniques or one using an established technique in a new environment e.g. the use of large woody debris in an urban environment

Low

A project involving established techniques e.g. riffle creation in a lowland chalk catchment

River Restoration Centre

Examples of monitored schemes

11.6 Shopham Loop

11.6.1 The project

In 2004, on the Western River Rother in West Sussex, an 18th century canal which cut off approximately 850 m of meander loop was blocked with a dam, forcing the flow back round the loop. Previously, remnant flow in the loop had caused excessive sedimentation, and so this sandy material had to be removed. At the same time, parts of the floodplain were lowered and a levee augmented to encourage flooding on the inside of the loop; a scrape was excavated; and cobble and shingle fixed beds were installed just inside the up- and downstream confluences with the old canal. The inset figure shows the general layout of the site, as well as surveyed cross-sections.

11.6.2 Monitoring design

Monitoring of the project aimed to be a comprehensive programme sensitive to:

1. Changes in *geomorphology*, looking at the evolution of physical habitat features.
2. Changes in the *hydrology and hydraulics* of restored and adjacent reaches, to identify the impact on flood levels and enable analysis of in-channel hydraulic conditions within the restored reach.
3. The *ecological response* within restored and adjacent reaches, to document how the biota adjust to the changing physical habitat and, via habitat suitability models, identify driving mechanisms.
4. The ecological response of the surrounding landscape, particularly species in the floodplain.
5. The *drivers of changes* in channel morphology, substrate composition and the establishment of flora and fauna, to compare the restored physical habitat with design aspirations.

The following datasets were collected:

	Before	As built	2005	2006	2007	2008	2009
Topographic survey	+	+	+	+			+
Fixed-point photography	+	+	+++	+++	+++	+	
15-minutely water levels			+	+	+	+	+
Invertebrate kick samples	+		+	+	+		+
Electro-fishing			+	+	+		+
Macrophyte survey			+	+	+		+

11.6.3 Outcomes

Monitoring results led to the following basic conclusions, grouped according to the aims above:

1. Survey detected small changes in channel shape in some areas, and that the greatest changes happened very quickly (< 1 yr). This confirmed the loop was evolving greater complexity of form.
2. Cross-sections and flow data from downstream allowed modelling of hydraulic habitat, which was increasing in diversity in concert with increasing complexity in the cross-sections.
3. Fish numbers and diversity appear to have increased post-construction, when controlled for trends up- and downstream. The scrape is being well colonized, suggesting more flooding.
   Macrophyte cover has increased steadily, but species number peaked soon after construction.
   Invertebrate data show no clear trends except a peak in diversity and numbers in 2006 (as fish).
4. Coarse-scale changes in floodplain vegetation can be detected via the fixed-point photography.
5. The fixed cobble beds appear to be responsible for the greatest morphological changes.

11.6.4 Main lessons learnt

The project suffered from a lack of **clear objectives** and a **formal protocol** for reference. Though there are monitoring 'aims' (listed above), the project objectives did not meet SMART specifications and were in fact decided upon after the work had started, for the purpose of the monitoring. Consequently, it is difficult to appraise the success, or otherwise, of the project with hard evidence. The fact that methods to be employed were not explicitly detailed meant that this ambitious monitoring programme, in the absence of a consistent project manager, was greatly limited by apparently minor mistakes, misinterpretations and inconsistencies resulting from the involvement of many different members of staff. A significant amount of data had to be discounted from analyses as they were not comparable with previous and/or subsequent years.

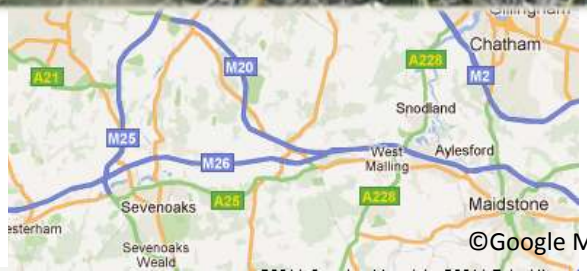
The fact that this was a rather experimental exercise in monitoring dictated that the programme did evolve over time, with gradually more sampling introduced. However, this is to be avoided, owing to inconsistencies between years and the fact that newly collected data will lack baseline (or 'before') **control data**. It is by far preferable to begin by sampling more points than can be sustained (ensuring a comprehensive baseline), and then eliminating those which may prove difficult to access in future, for example, or appear to be of less value or cannot be used with great confidence. The

River Restoration Centre

- Monitoring ecological restoration
- Practical River Restoration Appraisal Guidance for Monitoring Options *(PRAGMO)*
- Developing a monitoring strategy for Mayesbrook Park
- Implementing the monitoring strategy
- Key messages

River Restoration Centre

Where is Mayesbrook park



Case Study	Click on these dots on the map to view further details
Proposed Site	Click on these dots to view a PDF of the proposed project
Completed Project	Rollover the dots to view further project information

River Restoration Centre

Mayesbrook Park Restoration Project 2010-2015

Issues

- *Devoid of fluvial features and low ecological value*
- *'Out of sight, out of mind'*
- *Misconnections at outfalls – poor water quality*

Target

HMWB - Classified as MODERATE status – Objective to be GOOD potential by 2027

River Restoration Centre

Mayesbrook Park Restoration Project 2010-2015

© Quartet Design, 2009

Opportunities

- *Increase CC resilience: flood storage and flora*
- *Biodiversity improvements: mosaic of habitats*
- *Social amenities and visual enhancement*

River Restoration Centre

Devising a monitoring strategy

First things first!...

Listen to all stakeholders

- Project meetings
- Public consultation
- Local newspapers
- Social media

Collate responses

Public consultation event – July 2009

River Restoration Centre

Create a monitoring strategy

Establish working groups with specific experience

- Climate change
- Natural Environment (Aquatic)
- Natural Environment (Terrestrial)
- People (Social)

Integrate responses and prioritise objectives

Allocate resources *and fill in the gaps…*

Confirm all stakeholders consent with strategy

River Restoration Centre

Target / Why	What	When	Who	How	Data	Cost	Priority
Water and sediment quality							
2.7 Improve water quality & sediment quality ☺	Demonstrate a reduction in coliform levels & nitrates and phosphates by 2014	Summer and Winter 2012 & 2014	Queen Mary, University of London	Sediment samples- using Lune Corer to replicate previous sampling approach	Existing - Baseline survey (Queen Mary, University of London, 2009 & Environment Agency, 2010)	No additional	High
Lake monitoring – Pre-phase 2 baseline							
2.8 Improve lake water and sediment quality and prevent eutrophic algal blooms ☺	Coliform levels, nitrates and phosphates in lake Detailed post works survey	Quarterly surveys from October 2011 - repeated Jan, April, July &for the duration of the A2N Ranger project Phase 2 monitoring strategy	LBBD – A2N Ranger Student MSc project - prior to Phase 2 works TBC	6 locations TBC (part of Target 1.9) Sediment surveys	Existing - Historical 1998 survey data. MSc 2009 study 'Feasibility assessment & a development proposal for an urban fishery' Existing – survey data.	LBBD – A2N Ranger/ No additional Phase 2 only	Medium (Phase 2)
2.9 **Aim to improve marginal habitat around lakes as over-grazing by geese has led to an impoverished boating lake**	Improvement in marginal habitat around boating lake (following the proposed provision of reedbeds)	Prior to commencement phase 2 works estimated 2015 (suggested 2015) (Post-works survey to be detailed in phase 2 monitoring strategy)	Student MSc project - prior to Phase 2 works TBC	Baseline study of marginal and in-lake habitat surveys	Existing - Lakes are included in 2010 Phase 1 habitat survey with species listed in a target note. Submerged plants not surveyed.	£1k, (could be done as part of the wider park plant survey work)	Low

Template available on request from RRC

River Restoration Centre

SMART

- E.g. Non-native species

Time-bound

Target / Why	What	When	Who	How	Data	Cost	Priority
2.3b ☺ **To ensure that there are no invasive species present in or along the brook in 2015**	Ensure no non-native invasive species are present in 5 yrs time	RCS, RHS & Biotope mapping: Spring 2012 and 2014 (all 4 reaches)	Environment Agency	River Corridor Survey (RCS) will be sufficient in identifying all of the main plants and any plant invasive species	Invasive species reported absent in reaches 1-4 in URS report, 2009	EA in kind	High
	Species to look out for include - Floating pennywort - Water primrose - New Zealand pygmywort (crassula) - Japanese knotweed - Himalayan balsam - Giant hogweed.	Ongoing/ ad-hoc	A2N Ranger	Observe identification sheets using DEFRA guidance https://secure.fera.defra.gov.uk/nonnativespecies/index.cfm?sectionid=47		No additional cost	

Specific

Measurable

Achievable

Realistic –**YES!**
Monitoring partners agreed



River Restoration Centre

- Monitoring ecological restoration
- Practical River Restoration Appraisal Guidance for Monitoring Options *(PRAGMO)*
- Developing a monitoring strategy for Mayesbrook Park
- Implementing the monitoring strategy
- Key messages

River Restoration Centre

Implementing the strategy

- Communicate with project partners
- Coordinate data sharing
- Review achievements and issues *with an identified action*
- Analyse
- Report



River Restoration Centre

Key messages

1. *PRAGMO* ***is a practical guidance manual to assist practitioners with monitoring throughout***
2. Monitoring objectives ***are different*** to project objectives – these must be set prior to works!
3. Devising a monitoring strategy **not complicated**; what needs to be considered & why… finally be

SMART

River Restoration Centre

River restoration now complete

March 2011

Reach 4

January 2012

March 2011

Reach 3

October 2011



River Restoration Centre

Thank you

For more information, please get in touch:

Nick Elbourne

River Restoration Centre

Email: nick@therrc.co.uk

Telephone: 01234 752979

Environment Agency

London Borough of Barking & Dagenham

TRRT Thames Rivers Restoration Trust