Urban River Survey

Communicating the Bio-Physical Condition of Urban Rivers

Lucy Shuker*

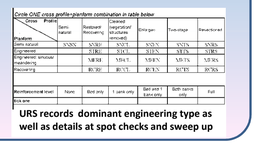
Collaborating Researchers: Angela Gurnell, Angela Boitsidis, May Lee , Mike Raco

*School of Geography Queen Mary University of London
l.shuker@qmul.ac.uk

Queen Mary University of London

1. Urban River Survey (URS) context

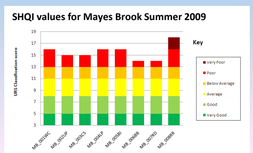
- The **Urban River Survey (URS)** is a modification of the Environment Agency's standard River Habitat Survey (RHS) methodology designed especially for urban or heavily modified (HM) rivers and streams[1]
- URS provides a semi-quantitative assessment of **channel and marginal habitats** in relation to **channel engineering and modifications**
- Field data are used to calculate 42 aggregate indices for key variables in three categories: **Materials (Bank/Bed), Physical Habitat, Vegetation Structure**
- URS is carried out on **500m stretches defined by the channel engineering** type in terms of their
  - **Planform**
  - **Cross Section**
  - **Level of Reinforcement**



URS records dominant engineering type as well as details at spot checks and sweep up

2. URS Classification method

- URS indices can be used to assign each surveyed stretch to **URS classes for** each **Materials, Physical Habitat, Vegetation** category using simple decision trees
- URS classification was developed using hierarchical cluster analysis and non-parametric (Kruskal-Wallis) analysis of variance[2]. Individual URS class scores can also be combined to give an overall **Stretch Habitat Quality Index (SHQI)**
- The URS classification method was developed through research supported by NERC studentships and trialled through the EU Life SMURF project[3]



- Further development and validation of this method is being carried out using data from London tributaries of the river Thames with the support of the Environment Agency and other partners including the London based River Trusts

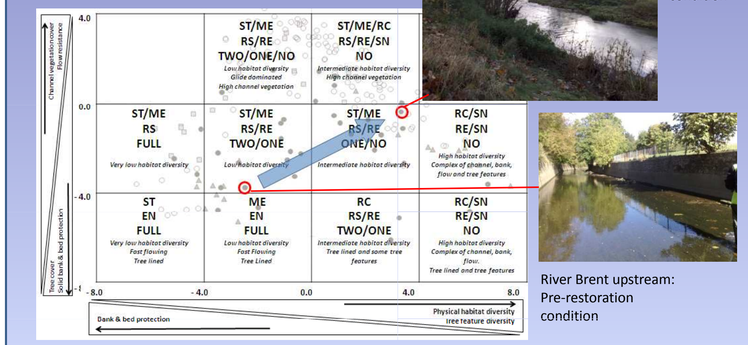
3. URS PCA / Matrix method

- Principal Components Analysis (PCA) of the URS indices has revealed significant **gradients of bio-physical habitat structure** which can be **associated with channel engineering**
- A PCA of the URS indices was applied to a Spearman's Rank correlation matrix to identify significant associations between the variables. These were then assessed further using Kruskal-Wallis tests and multiple pair-wise comparisons to validate the significance of these associations[4]
- A **scatter plot** of the first two principal components (PC1 & PC2) of the URS dataset **reveals the predominant characteristics for each individual location** in relation to the gradients along the x- and y-axes. The distribution of bio-physical and engineering characteristics along the axes is **summarised within the URS Matrix** to facilitate the PCA interpretation (see Example I).
- Comparison of individual survey locations can be compared as **paired reaches** or as **catchment data series** (see Examples I & II).

Reach to catchment scale comparisons

Example I - Paired reaches

River Brent at Tockyngton Park
(As a proxy for before / after restoration[5])

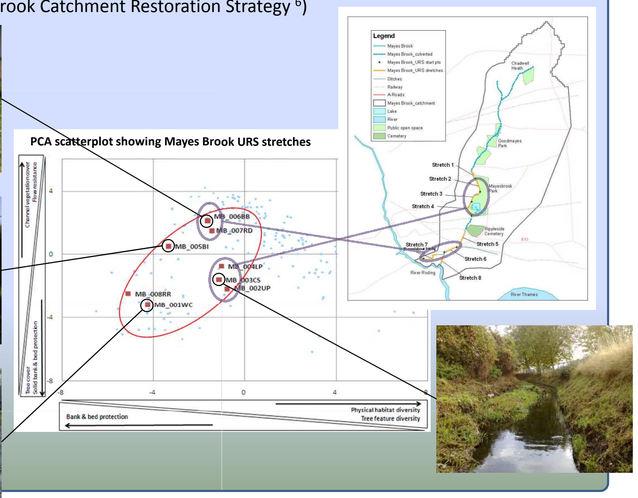


River Brent downstream: Post-restoration condition

River Brent upstream: Pre-restoration condition

Example II – Reaches across catchment and river corridor

Mayes Brook between Upney and Barking Creek, Summer 2009
(to support Mayes Brook Catchment Restoration Strategy [6])



References:

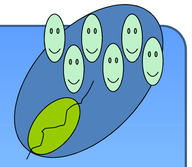
1. Davenport, A. J., A. M. Gurnell, et al. (2004) *Habitat survey and classification of urban rivers* River Research and Applications
2. Boitsidis, A. J., A. M. Gurnell, et al. (2006).*A decision support system for identifying the habitat quality and rehabilitation potential of urban rivers* Water and Environment Journal
3. EU Life Sustainable Management of Urban Rivers & Floodplains Ref: LIFE02 ENV/UK/000144
4. Gurnell, A. M., L. Shuker, et al. (2011) *Gradients in the biophysical structure of urban rivers and their association with river channel engineering* River Research and Applications
5. Shuker, L., A.M Gurnell & M. Raco (2011) *Some simple tools for communicating the biophysical condition of urban rivers to support high-level discussions regarding river restoration* (in review)
6. Environment Agency (2010) *Mayes Brook Catchment Restoration Strategy*

4. URS and Ecological Condition:

Can URS provide evidence to support policy for rivers and biodiversity?

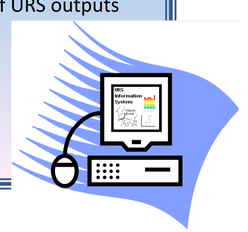
- Current research is testing the URS as a simple tool to support the requirements of the EC Water Framework Directive (WFD) in assessing the bio-physical condition of heavily modified urban rivers.
- URS outputs are also being tested in relation to species specific bio-physical habitat requirements and measures of biodiversity
- The London URS database aims to support the delivery of the London Rivers Action Plan (LRAP) regional targets at a strategic level by providing an overview of the bio-physical condition of urban rivers across London
- URS outputs for Baseline and Post Project Appraisals (PPA) can be used to reveal 'trajectories of change'

5. URS and Big Society:



Can URS outputs support decision making for partnerships and community based projects?

- URS Classification and URS Matrix offer simple visual tools to support **engagement, communication and knowledge exchange** within multi-disciplinary partnerships through the visual representation of urban river bio-physical assessment results supported by photographic evidence
- URS outputs can also provide **simple tools to support stakeholders** in a **decision making** context e.g. for the selection of the most effective sites for river habitat restoration or enhancement works
- Further opportunities for development exist at both local and regional levels and include using the URS to **support communication with the planning authorities**, for **community monitoring** and adaptive management strategies

6. Future for URS?

- Ongoing development and refinement of the URS methodologies will depend upon building up the URS database and testing URS outputs in the context of current and future river management aims and objectives
- Development of a **user-friendly URS survey method** for use by practitioners and volunteers is in progress with the support of the Environment Agency
- A **URS training workshop** is scheduled for summer 2011 linked to a pilot roll-out in the Wandle catchment with the support of the Wandle Trust
- The **URS Information System (URSIS)** is currently in the early stages of development and seeking sponsorship to realise a fully interactive web-based interface for the URS database and calculation of URS outputs
- The **URSIS** will provide users with easy to access search functions via keywords or maps to explore historic URS outputs; URS data upload functions for user-led Urban River Surveys will be linked to **on-line URS calculations tools** for rapid classification and assessment outputs