

Scottish Freshwater Group – Research Priorities for River Basin Management

The Scottish Freshwater Group met on 16th April 2015, in a meeting jointly-organised with CREW, to identify the most important knowledge gaps and research needs to support the development and implementation of the 2nd River Basin Management Plans (RBMP) for Scotland and the Solway-Tweed. Following an introduction by the Chair from SEPA, Willie Duncan and talks from invited experts, opinion was gathered from 46 attendees, who split into groups to discuss four topic areas:

1. Valuing Nature¹
2. Managing invasive non-native species (Invited speaker: Mike Dobson, APEM)
3. Improving the Physical Environment (Invited speaker: Trevor Hoey, University of Glasgow)
4. Water Quality: Diffuse Pollution (Invited speaker: Andy Vinten, James Hutton Institute)

Valuing Nature

The issue of valuing nature is not explicit, but runs through the RBMP process, particularly in assessing cost-effectiveness when developing the programme of measures (“disproportionate costs”). For example, what are the benefits of river restoration or invasive species management? Nature-based solutions for water quality improvements (buffer strips) and natural flood management are high on the policy agenda. Understanding value requires close collaboration between environmental and social scientists and economists.

Key Research Questions

1. *How can we incorporate non-monetary value into RBMP?*
2. *What are the multiple benefits of improving status? At what scales do these occur?*
3. *What are the barriers to delivering benefits identified from valuation of nature’s services?*

Data needs and knowledge gaps

- *Poor centralised data on usage and value of freshwaters.*
- *Lack of case studies which measure the benefits of intervention*
- *Lack of tools for valuation*
- *Gap in understanding of what interventions are needed to gain service benefits (not just improved ecological status)*

Managing invasive non-native species

Invasive non-native species have significant environmental and economic impacts. Because of Scotland’s climate and geology, the key species of concern to Scotland may not be the same as in England & Wales and may come from different sources. There is a need to understand pathways and mechanisms of arrival and their spread within and between catchments.

Key Research Questions

1. *Are current monitoring schemes (e.g. WFD) sufficient and frequent enough for invasive species surveillance?*
2. *Is citizen science a useful approach to assess and control invasive species?*
3. *Is there a point at which it is no longer possible to control the spread of an invasive species, and if so how do we assess this?*

Data needs and knowledge gaps

- *Unknown impacts in Scotland of some invasive species e.g. riparian plants.*
- *Knowledge of when control management is successful, e.g. recording of non-returns.*
- *Knowledge of which treatments are most effective for certain invasive species and sites, and where there are no known techniques, what approaches could be developed?*
- *A need to re-balance monitoring data to include before and after management interventions*

¹Nick Hanley (Univ. of St Andrews) & Katherine Simpson (Univ. of Stirling) were invited but unable to attend

Improving the Physical Environment

About 25% of Scotland's freshwaters are at less than good status because of physical changes to beds, banks or fish barriers. Two principles should be considered in RBM when designing effective improvements: (1) plan at the catchment scale and (2) support nature to do the work. Baseline knowledge is still being acquired and interpreted and urban rivers should not be over-looked.

Key Research Questions

1. *What is the biological response to physical changes?*
2. *How can we incorporate adaptive management in projects? What framework do we follow?*
3. *Understanding sediment transport in Scottish rivers. Which rivers are sediment-limited?*

Data needs and knowledge gaps

- *What level of physical monitoring is needed?*
- *Need to share information and data so as not to reinvent the wheel*
- *Need for improved tools e.g. develop MImAS further*

Water Quality: Diffuse Pollution

A catchment citizenship approach is needed. This incorporates understanding different stakeholders' perspectives, achieving shared values, mitigating real issues and living with uncertainty. Both rural and urban diffuse pollution raise significant challenges for research to identify effective solutions.

Key Research Questions

1. *What is the long term viability of urban SUDS?*
2. *What is the effectiveness of measures for mitigation of rural sources? Is source apportionment sufficiently understood?*
3. *How do we set accurate end points that are relevant and cost effective?*

Data needs and knowledge gaps

- *Long-term monitoring data (5+ years) from existing SUDS to assess effectiveness.*
- *Development of fine sediment reference values*
- *Understanding impacts from contaminated land*

General Points

A common theme running through all the topics was the strong need to improve the scientific evidence-base on the cost-effectiveness of restoration measures being adopted in RBMP. Are measures appropriate and sufficient to drive significant and lasting improvements? What are the ecological status and ecosystem service benefits gained from measures being adopted? Insights can be gained from long-term monitoring and partnership-working to ascertain and sustain recovery. Appropriate experimental design should also be adopted much more widely in RBMP (e.g. BACI design: Before-After monitoring of Control and Intervention sites).

The need for RBMP to address multiple pressures and deliver multiple benefits was clear. This requires multi-disciplinary research (ecology, hydrology, geomorphology) to understand pressures and their environmental impacts and cross-disciplinary research (environmental science, social and economic sciences) to identify costs and benefits for effective decision-making.

Background Information: The Scottish Freshwater Group (SFG) is a cross-disciplinary forum that promotes awareness of current research related to the freshwater environment in Scotland. This research briefing was prepared by Laurence Carvalho (CEH, SFG Coordinator), Pauline Lang (SEPA, SFG Publicity Officer) and four rapporteurs from the day: Helen Woods (CEH, Valuing Nature), Alanna Moore (CEH, Invasive Species), Anna Doeser (University of Stirling, Physical Environment) & Kenneth Porter (University of Stirling, Water Quality). The notes were reviewed by the invited speakers and Willie Duncan (SEPA, Chair of meeting).