ISSUE STUDY 2

MONITORING

FARMING FLOODPLAINS for the FUTURE

The main aim of Farming Floodplains for the Future has been investigation of practical issues around implementation of land use change for flood management benefit, with a necessary focus on processes. However, questions remain as to the impact that such an approach might have on flooding (and wildlife) at a catchment scale, and the project acknowledged that the anticipated delivery of schemes on the ground would provide an opportunity to try and quantify this. Monitoring would be necessary, not only to assess hydrological parameters, but also to record land use change itself and any associated major spin-off benefits for biodiversity. However monitoring is resource and time hungry, so the selection of methodologies was guided by a number of key issues / principles:-

- The 3-year life of the project imposed time constraints. As a pilot project, monitoring schemes could not be designed until likely impacts were understood, and, given the lead-in time for delivery, the majority of schemes would not be implemented until the last 12 months of the project. By implication, the scope for collection of meaningful datasets within the life of the project would be limited, both in terms of baseline data (against which change could be measured) and, following changes, data that could adequately reflect events that would either be unpredictable (e.g. flooding) or slow (e.g. the development of plant communities reflecting changes in land use).
- The project impacts would in general be relatively clear to see (e.g. differences between normal and flood levels; conversion of arable to wet grassland; or change of in-channel vegetation management from complete to partial removal), and monitoring could therefore be designed to record obvious change rather than subtle variation.
- Monitoring should be simple, repeatable and robust, utilising standard methodologies wherever possible.
- It should be realistic for monitoring methods to be continued or repeated beyond the life of the initial project.

Monitoring implemented by Farming Floodplains for the Future is considered in relation to three key areas:

Hydrology

Any quantification of the impact of project implementation on flooding would be the most important monitoring output. However, despite guidance throughout from JBA Consulting, the monitoring of hydrological parameters has proved problematic.

While a well-calibrated flood model exists for the main Rivers Sow and Penk, the conclusion that the project needed to take a catchment-wide approach focussed on headwaters and tributaries (see final report, section 3) meant that much of its work would fall outside the scope of this model, in locations without baseline hydrological information. In addition, individual schemes would consequently be relatively small, and therefore monitoring would need to be geographically proximate if specific impacts were to be isolated. Therefore initially, with a view to collecting baseline data that might inform scheme design (in association with computer models) and/or against which subsequent change could be monitored, equipment was installed (see Box 1) in two situations:-

- At the downstream end of all IDB drains subject to alterations in routine maintenance (see Case Study 9)
- On sites where it was deemed there was a strong likelihood of scheme implementation.

This approach eventually required a fundamental review, in light of problems encountered with the monitoring equipment (see Box 1); the conclusion that site-specific computer models would be of limited value to the project (see Issue Study 1: Data and Modelling); and the realisation that potential schemes on some selected sites were not going to be implemented. This necessitated a going ‘back to basics’ approach, re-considering the information required to effectively put the results of the project into context. The project decided that the established monitoring of IDB drains would be maintained. However, given that the ‘target’ for the project had been expressed as a reduction in floodwater volumes (see final report, section 3), it was concluded that the impact of the case study sites would be best assessed in terms of the volume of water storage created together with an indication of the frequency with which this was utilised. The former could be calculated reasonably straightforwardly through the analysis of topographical data. The latter, however, would require the monitoring of changes over time in key indicative water levels (e.g. in a watercourse relative to a spillway, or within a pond), this possible without the need for reference to a baseline. The remaining dataloggers have therefore been re-deployed as appropriate to collect revised datasets.

For the future, it is planned that monitoring (with automatic loggers) of case study sites will continue, to gain a better understanding of their functioning. It is likely however that monitoring of the IDB drains will be discontinued – with only a limited baseline collected (over a maximum of 9 months), on-going monitoring is considered unlikely to add to the results / conclusions drawn to date (see Case Study 9). Dataloggers made available as a result will be re-deployed to enhance the assessment of other schemes.

BOX 1: Hydrological Monitoring Equipment

Given the likely spread of sites to be monitored, and the need to avoid regular, time-consuming visits to collect data, the project decided to undertake hydrological monitoring using automatic dataloggers. Although relatively expensive to purchase, in the long term, and compared to manual methods, more continuous datasets would be collected with minimal time input. Two types of logger were initially purchased:-

- Divers (manufactured by Schlumberger) – which allow the calculation of water levels from recorded changes in pressure, used to record both surface water and groundwater levels.
- Starflows (manufactured by Unidata) – used to record flows and water levels within channels

Diver and typical mounting (suspended by stainless steel cable from a screw lid on 40mm diameter plastic drainage pipe)

Overall the Divers have proved reasonably robust, effective and easy to use, with data downloading undertaken every few months. However there have been a couple of issues:-

- Five Divers (19 were installed) stopped working (although stored data was retrieved and the logger replaced free of charge by the manufacturer).
- Suspected theft occurred on two occasions from one site, while at a second, the Diver was removed from its tube but left on site.

The Starflows proved more problematic. Despite trialling different methods of mounting (including direct onto a paving slab, metal legs and shaped blocks of wood), accumulations of silt or the growth of algae obscured the sensors. Not only did this require regular site visits to try and ensure continued functioning, but also had spin-off impacts in terms of shortened battery life and data storage. As the sensors became obscured, rather than shutting down, the Starflow continuously tried to scan, and once the battery was drained, all the previously stored data was lost. Consequently, what data was collected was erratic and patchy, such that (after damage to two of the Starflows during flooding) their use was discontinued.

Starflow and mounting prior to installation

Fixed Point Photography

As it was considered likely that the majority of changes brought about by the project would be quite ‘visual’ (see above), fixed point photography has been used to record such changes. This invovles taking ‘before’ shots from appropriate locations (these recorded on maps where necessary to aid effective repetition), which have subsequently been repeated, either at different times of year (e.g. to show seasonal vegetation growth) or following key events (e.g. after works, or during flood events). Comparison of photographs provides the record of change (see throughout the case studies), and fixed point photography has proved an easy and effective method of monitoring.

Modern digital photographic equipment makes it is easy to take large numbers of images, which subsequently take time to catalogue and manage. For the future, the use of fixed point photography will be maintained at key sites (although possibly rationalised), while the associated archives will be retained but consolidated where necessary.

Biodiversity

After its hydrological impacts, the secondary concern for Farming Floodplains for the Future is the impact of its delivery on the natural environment. As already suggested, the full extent of changes in floral and faunal communities arising from schemes are only likely to become apparent over a number of seasons. Therefore biodiversity monitoring has focussed on the establishment of appropriate baselines (which, unlike hydrological parameters, can be achieved by taking a 'snap-shot' in time), utilising standard, cost effective and repeatable methodologies.

Habitat / Vegetation – Extended Phase 1 Habitat Survey

While fixed point photography can record major visual changes, closer consideration of scheme impacts on habitats and the composition of associated vegetation communities has been deemed necessary. This is being monitored through Extended Phase 1 Habitat Survey[1], providing 2 key outputs: a standardised habitat map of all sites; and associated botanical species list with relative abundances, both recorded during a walk-over survey. Baseline data has been collected prior to delivery on case study sites.

In addition to the above, further monitoring has been implemented on some sites where the recording of other specific changes might be informative:-

Ditch Vegetation

On watercourses subject to changes in physical structure (e.g. re-profiling) or management (notably the IDB watercourses subject to changes in maintenance) a standard methodology for the survey of ditch vegetation[2] has been utilised to specifically record changes in ditch vegetation communities. A baseline was established in the summer of 2008.

Invertebrates

The above ditch vegetation monitoring is complimented by the monitoring of invertebrate populations associated with the same watercourses, using selected wetland *Diptera* (fly) groups as key indicators[3]. Again a baseline survey was undertaken in the summer of 2008.

Birds

The monitoring of birds has been restricted to sites where it is deemed that planned schemes might benefit waders. By chance it turns out that Church House Farm is covered by tetrads subject to long term monitoring by the West Midlands Bird Club, and both Fieldhouse Farm and Staffordshire Wildlife Trust's Radford Meadows reserve are subject to periodic bird survey. The only other site specifically monitored in this regard has been Seighford Moor, using standard methods both for wintering and breeding waders[4] again carried out under the auspices of the West Midland Bird Club.

Note that in the next couple of years, once biological changes resulting from Farming Floodplains for the Future work have had time to become apparent, the above surveys will be repeated to give more detailed records of their impact on wildlife.

Protected Species

It is noted that the project was prepared to undertake specific protected species surveys (e.g. for great crested newt (*Triturus cristatus)*, water vole (*Arvicola amphibius)*, white-clawed crayfish (*Austropotamobius pallipes)* etc) should evidence suggest this might be necessary. In the event no such surveys were required.

Conclusion

It is clear from questions raised in relation to Farming Floodplains for the Future, that further building of the body of evidence supporting the role of catchment-scale land use change for flood management benefit is required. Work undertaken by the project will undoubtedly add to this evidence base, but there is scope through implementation of carefully considered monitoring of other projects to additionally inform the debate.

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[1] Nature Conservancy Council (1990) *Handbook for Phase 1 Habitat Survey* (Revised by JNCC 2003)

[2] Alcock MR & Palmer MA (1985) *A Standard Method for the Survey of Ditch Vegetation* Nature Conservancy Council

[3] Jukes A (2009) *An Invertebrate Assessment of Central Staffordshire Drainage Ditches for the Farming Floodplains for the Future Project* Staffordshire Ecological Services Ltd

[4] Gilbert G, Gibbons DW & Evans J (1998) *Bird Monitoring Methods* RSPB