SEPA
Scottish Environment Protection Agency

WORKING TOGETHER
TO IMPROVE OUR
WATER ENVIRONMENT

Identifying river restoration sites to deliver multiple benefits in the River Dee

Summary Report

cbec eco-engineering

Walking the Talk

INTRODUCTION

The Scottish Environment Protection Agency (SEPA) is undertaking pilot projects in four river catchments in Scotland. The table below shows how these pilot projects will be implemented:

Project Phase	Summary
Pre-work	Catchment Selection
Phase 1	Scoping opportunities for river restoration
Phase 2	Detailed design of restoration work and preparation for Phase 3
Phase 3	Undertaking restoration work

The work described in this report is part of Phase 1 and scoping studies have been completed in each catchment to identify potential river restoration sites which could deliver multiple benefits. Each scoping study looked at potential sites where restoration work could lead to improvements in river morphology (i.e. physical shape and structure) as well as contributing to the management of flood risk. Ideally, undertaking restoration work at these sites would help to improve the Water Framework Directive ecological status for that stretch of river. Sites were also considered to see if they could contribute to other potential benefits, such as improving biodiversity or increasing public access opportunities.

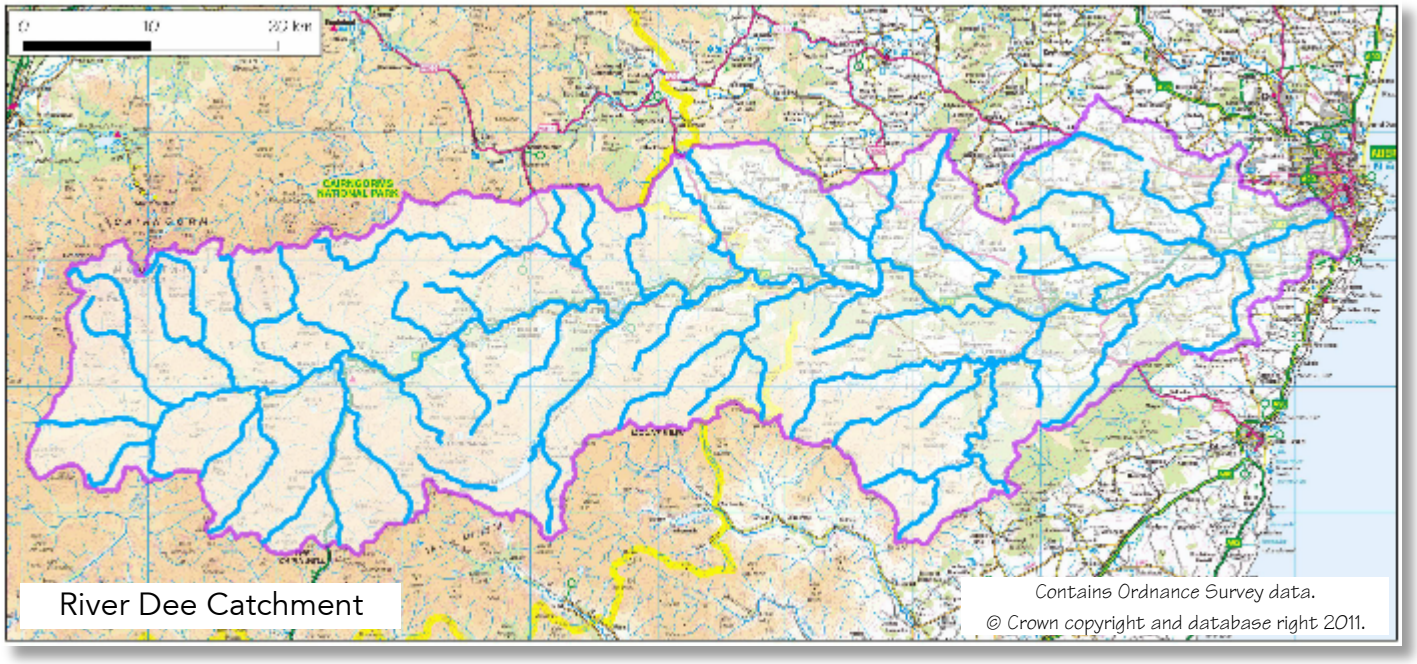
In the Dee catchment, this study took place between March and October 2013 and was delivered by a team of two contractors - cbec eco-engineering and Walking-the-Talk.

The Dee was selected as a pilot catchment because:

- it has a number of pressures on its physical structure, including embankments, realignment and in-stream structures;
- it has some potentially vulnerable areas (PVAs) where there is a risk of flooding;
- a lot of information about the river has already been collected.

The River Dee

The River Dee lies in the east of Scotland, with a catchment area of approximately 2,200 km^2. The river rises in the Cairngorm mountains and travels over 130km to enter the sea at Aberdeen. The catchment is predominately rural, with more intensive agriculture taking place in the lower, eastern areas of the catchment. The western upland section of the catchment is dominated by heather moorland with associated sporting estates. The river also flows through the urban area of Aberdeen, as well as through the smaller towns of Banchory, Aboyne and Ballater.



River Dee Catchment

The River Dee is renowned for its salmon fishery, which is of worldwide importance and is an important source of income and jobs in the area. Most of the river is designated as a Special Area of Conservation (SAC) for its Atlantic salmon, freshwater pearl mussel and otter populations.

The Dee has a history of flooding at several locations along its length. Potentially Vulnerable Areas (PVAs) to flooding have been designated on the Dee main stem at Ballater, Banchory and Aberdeen. There are also PVAs on several tributaries including the Culter Burn, the Brodiach/Ord Burn and the Beltie Burn.

The physical structure (morphology) of the River Dee has been changed over time by human activity. There are significant pressures on the river's physical structure in the lower (eastern) half of the catchment from embankments and the straightening / realignment of the river's course There are also engineering pressures related to fishery enhancements on the river (including croys, bank protection and weirs).

Most bodies of water in Scotland have been assessed to see if they are reaching Good Ecological Status (as required under the European Water Framework Directive). Within the Dee catchment, there are nine waterbodies which are failing to meet Good Ecological Status because of the impact of changes to their morphology.

METHODS

In order to complete the scoping study, the following process was followed:

Step 1 - gather existing data: this included existing survey data, information previously collected by SEPA and information supplied by other organisations working within the catchment.
Step 2 - gather new data: surveys along the river took place in summer 2013. Surveys targeted areas which were known to have impacts on the river´s physical structure.
Step 3 - combine data to establish where there are pressures on the river and ask stakeholders for any additional information on those sites.
Step 4 - assess potential restoration options for those pressures and examine the benefit each restoration option would bring to physical structure and reducing flood risk
Step 5 - produce a list of potential restoration options and assess other potential benefits from each option to create a ranked list of opportunities.
Step 6 - assess the list to see if any opportunities should be moved up or down the ranking due to issues with cost, adjacent land use etc. Ask stakeholders their views on the list.
Step 7 - provide more detailed information on the top 10 restoration options, which can be taken forward to the next project phase.

A number of stakeholders were involved in providing information and opinions throughout the process.

Collecting information on river morphology (physical structure)

The River Dee has been studied in great detail over the years. In order to identify potential restoration sites, much of the existing information on the river was gathered together. Some new information was also collected through surveys of parts of the main stem and some of the tributaries.

Information was collated for those parts of the catchment where the river is, or could be, failing to meet Good Ecological Status. In particular, information was sourced on pressures which could be affecting the river´s physical structure. Those pressures range from large impacts, such as embankments and straightening, to less obvious impacts, such as dredging and removal of vegetation. Information was also collected on the current physical structure of the river, looking at processes such as bank erosion and flow types.

Assessing flood risk

In order to assess the likely impact of restoration work on flood risk, potential restoration actions were modelled to see what effect they would have on the river downstream of these sites.

The physical structure of the channel can affect flow patterns of the river. For example, a straightened section of channel may allow water to flow through it very quickly, causing higher peak flows downstream (which could cause localised flooding). Slowing water flows within the catchment can reduce peak flows, and associated flooding, downstream. However, slowing water flows in one place can sometimes increase peak flows further downstream if water from various tributaries within the catchment then arrives at the same time, raising river levels and potentially causing flooding.

Predicting how river levels will respond to restoration work can be complex and hence computer models were used to see how river levels may respond over a period of time, usually testing differing levels of rainfall intensity. These computer models were used to assess impacts of potential restoration actions at a number of locations throughout the catchment. This modelling looked at the changes to downstream flow over time, to see whether or not peak flows were changed by the restoration action. Each potential restoration action could then be assessed on its ability to reduce or increase downstream flood risk.

Assessing other benefits of restoration work

Each site was then also assessed to see what other benefits it might deliver. These included environmental and socio-economic benefits (such as enhancing biodiversity or increasing recreational value) and a score was produced for each possible benefit, so that sites could be compared.

Additional benefits which were considered for each site included:

- Potential to improve biodiversity around the site
- Potential to reduce livestock poaching at the site
- Impact on critical infrastructure such as roads, sewage works etc
- Potential to link the site to recreational opportunities (paths etc)
- Potential to use the site to raise awareness of river restoration

Combining all potential benefits

Each section of the river was then scored, with the scores reflecting the potential for restoration work to deliver improvements to physical structure, to reduce flood risk and to deliver additional environmental and socio-economic benefits. Those scores were then combined to produce a ranked list of sites.

Review of ranked site listing

As a final stage in the process, the ranked site listing was "reality checked" to see whether or not the highest rank sites really did represent potential restoration sites. This reality check was undertaken by review by a wider group of stakeholders and by the project team.

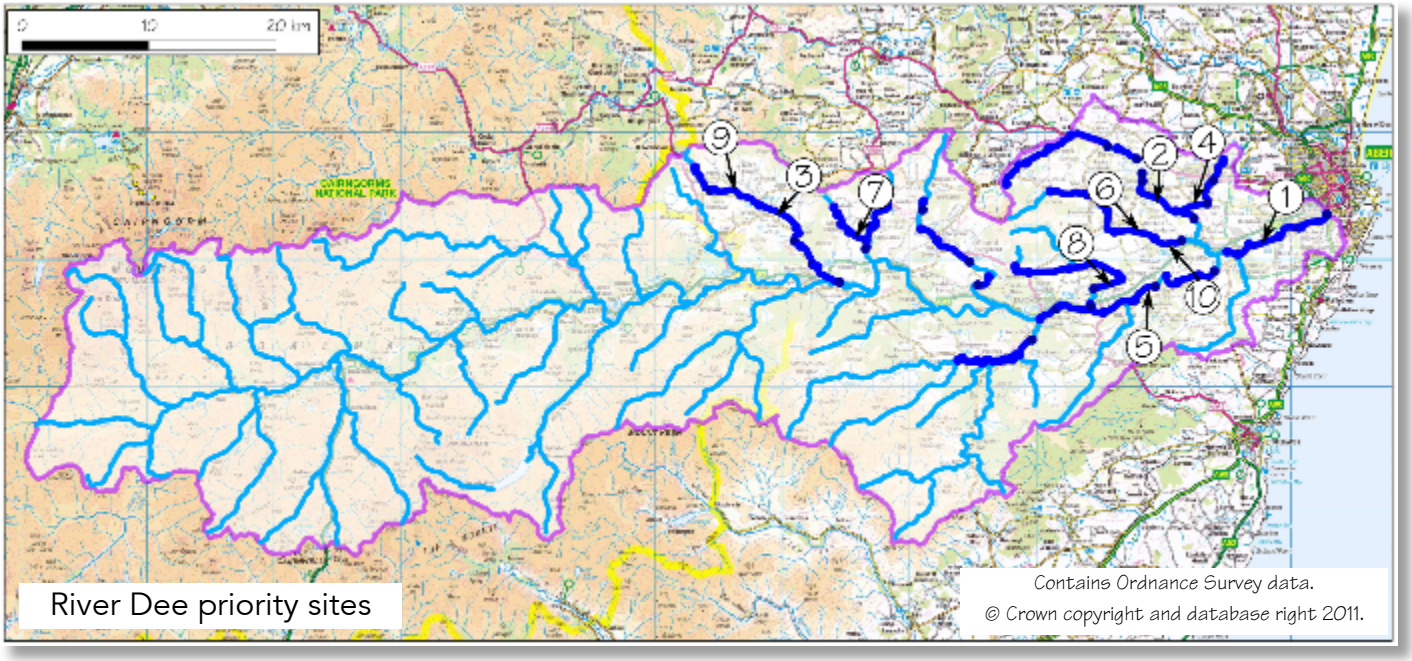
Factors which were considered included whether or not other restoration or enhancement work was already taking place in the area, likely land take of any restoration work, cost of works, potential for any conflicts with surrounding land use and other factors relevant at individual sites.

As a result of this reality check, some of the restoration sites moved up or down the ranked listing to produce a final site listing.

HIGHEST PRIORITY SITES

For the 10 sites which ranked most highly, information sheets were prepared which provided more information about the section of river, the restoration work which could be undertaken and the benefits which could be delivered.

These sites can be seen on the map and table below:



River Dee priority sites

Site	Water body name	Reach location	Potential restoration actions
1	Dee - Peterculter to tidal limit	Milltimber to Ardoe House Hotel	Remove embankments, rectify re-alignment, remove bank protection and restore vegetation
2	Leuchar Burn	Garlogie to Broadwater	Remove embankments, rectify re-alignment, remove bank protection and restore vegetation
3	Tarland Burn	Tarland to Bridgend Steading	Remove embankments, rectify re-alignment and restore vegetation
4	Brodiach Burn / Ord Burn	Downstream Easter Ord Farm	Remove embankments, rectify re-alignment and restore vegetation
5	Dee - Banchory to Peterculter	Park House	Remove embankments, remove bank protection, remove croys and restore vegetation
6	Gormack Burn	Milton of Cullerlie to Blackhall	Remove embankments, rectify re-alignment and restore vegetation
7	Dess Burn - upper	Downstream Mill Farm	Remove embankments, rectify re-alignment and restore vegetation
8	Bo Burn	Loch of Park to Coy Bridge	Remove embankments, rectify re-alignment, remove bank protection, remove culverts and restore vegetation
9	Tarland Burn	Hopeswell to Tarland	Remove embankments, rectify re-alignment, remove bank protection and restore vegetation
10	Gormack Burn	Blackhall to Mid-Anguston	Remove embankments, rectify re-alignment and restore vegetation

Constraints

It is important to be aware that this listing of sites is based on the available data and review by stakeholders and other experts. There are many possible methods which could be used to identify and prioritise sites and this is just one method. Different methods may come up with different sites and potential sites have not been discussed with landowners yet. However, this approach provides a list of restoration sites which clearly have the potential to deliver a number of benefits within the Dee catchment. The approach could also be repeated in other catchments.

Next steps

Individual site assessments will be required to establish whether or not it is feasible to undertake restoration work at the most highly ranked sites. The restoration work is voluntary, so a key factor which will dictate whether work can progress is landowner agreement. Therefore discussions with individual land owners and land managers will be an important next step. If landowners are agreeable, more detailed site surveys will be required to produce specific restoration plans.

Further information

You can see the full report from this scoping study on SEPA's website:

www.sepa.org.uk/implementingRBMP

You can also download the information sheets which have been completed for each of the top 10 restoration sites.

If you want to know more about the next steps for this project, you can contact the project co-ordinator by:

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