SEPA
Scottish Environment Protection Agency

WORKING TOGETHER
TO IMPROVE OUR
WATER ENVIRONMENT

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

Summary Report

cbec eco-engineering

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Walking the Talk

INTRODUCTION

The Scottish Environment Protection Agency (SEPA) is undertaking pilot projects in four river catchments in Scotland. These pilot projects aim to improve the physical condition of the water environment and contribute to flood risk management.

The Nith was selected as a pilot catchment because:

- the river has a number of pressures on its physical structure, including embankments, realignment and in-stream structures;
- the river has a history of flooding with some potentially vulnerable areas (PVAs);
- the catchment has not been studied in great depth previously.

The table below shows how these pilot projects will be implemented in each catchment:

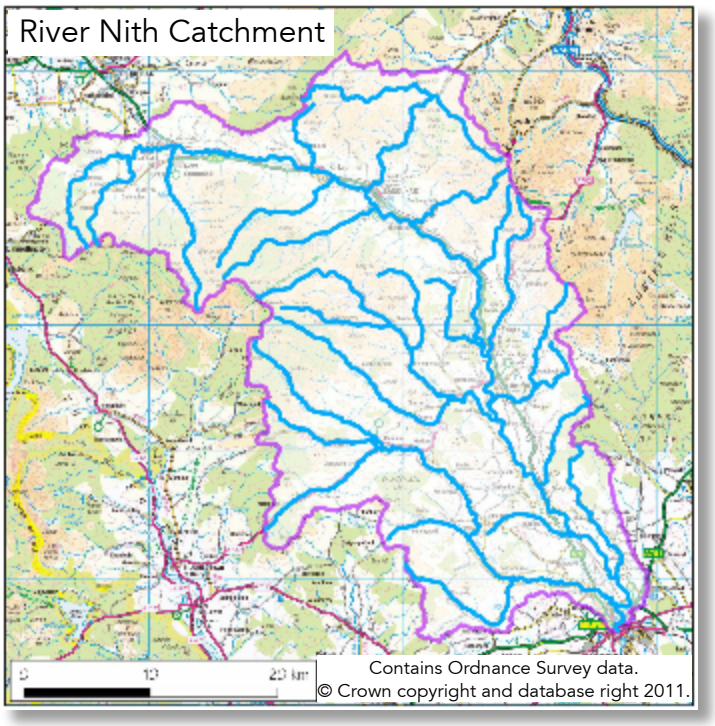
Project Phase	Summary
Pre-work	Catchment Selection
Phase 1	Scoping opportunities for river restoration
Phase 2	Detailed design of restoration work and preparation for Phase 3
Phase 3	Undertaking restoration work

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 Nith catchment, this study took place between March and October 2013 and was delivered by a team of three contractors - cbec eco-engineering, Mott MacDonald and Walking-the-Talk.

The River Nith

The River Nith is the largest river in south west Scotland, with a catchment covering an area of approximately 1,230 km^2. It rises in the hills of East Ayrshire, in an area known for its industrial landscape and coal mining and the river enters the sea at the Solway Firth, downstream from Dumfries. The catchment is predominately rural, with the main land uses being agricultural grassland, coniferous woodland and arable agriculture.



There has been a long history of flooding within the River Nith catchment, with the town centre of Dumfries flooded on a regular basis. The area of the catchment near Dumfries is designated as a Potentially Vulnerable Area to flooding as there is a potential risk from flooding to residential properties and transport links.

The physical structure (morphology) of the River Nith has been changed over time by human activity. There are significant pressures on the river's physical structure from embankments and the straightening / realignment of the river's course. Often these modifications have taken place to reclaim and protect agricultural land, but they can have a significant negative impact on the river.

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 Nith catchment, there are seven 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 within the Nith catchment, the following steps were undertaken:

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)

In order to identify potential restoration sites, information on the river was collected through surveys which took place in summer 2013. This information was combined with existing data for the river. Survey data was collected for those parts of the catchment where the river is, or could be, failing to meet Good Ecological Status. The survey method included the collection of information on the pressures which could be affecting the river´s physical structure.

Those pressures ranged from large impacts, such as straightening and embankments, 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 ranked sites really did represent potential restoration sites. This reality check was undertaken by a wider group of stakeholders and the project team.

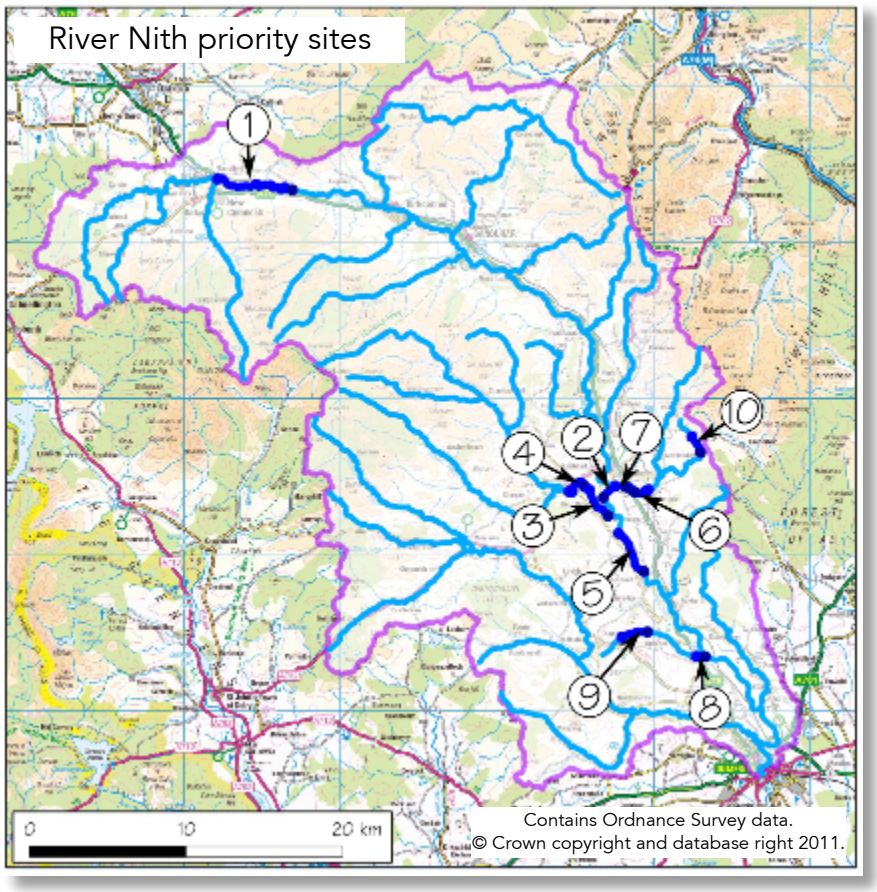
Factors which were considered included whether or not other restoration or enhancement work was already taking place in the area, likely land take of any restoration work, cost of works, potential for any conflicts with surrounding land use and other factors relevant at individual sites.

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:



Site	Water body name	Reach location	Potential restoration actions
1	Nith - Sanquhar to New Cumnock	Upstream Duncansburn bridge	Remove embankments and restore vegetation
2	Cample Water	Downstream Kirkbog Bank	Remove embankments, rectify re-alignment and remove bank protection
3	Lower Scar Water	Downstream half	Remove embankments, rectify re-alignment and remove bank protection
4	Lower Scar Water	Penpont	Remove embankments
5	Nith - Dumfries to Sanquhar	Upstream Auldgirth	Remove embankments, rectify re-alignment and remove bank protection
6	Cample Water	Cample to New Cample	Remove embankments
7	Cample Water	Gallows Knowe	Remove embankments
8	Laggan Burn	Downstream of A76	Remove embankments
9	Laggan Burn	Woodhead	Remove embankments, rectify re-alignment and remove culverts
10	Crichope Linn	Adjacent to forestry near Moch Hill	Rectify re-alignment and restore vegetation

Limitations

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. However, this approach provides a list of restoration sites which clearly have the potential to deliver a number of benefits within the Nith 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 the 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 part of Phase 2 of this project. 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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