

Riverbank protection using willow scoping study

The Environment Agency (Agency) has a duty to promote the conservation and enhancement of the natural beauty and amenity of inland and coastal waters, and the conservation of flora and fauna dependent on the aquatic environment.

A key area in which this duty can be performed relates to bankside vegetation, yet there can be potential conflicts between this conservation duty and the powers of the Agency in respect of flood defence. There is already a move towards using natural materials for bank protection wherever possible, rather than artificial materials such as steel piling or concrete revetment, but more information is needed on the suitability of such options, and the risks entailed in their use. The role of all vegetation in the river environment is complex, but the role of trees such as willows is especially so. Willows are all the more important because of their abundance in UK river corridors. The interactions between vegetation, water and soil processes are not well understood by the practitioner, and there appears to be little scientific basis for the way in which vegetation is used - or discounted - for river management projects.

In 1996 the Engineering and Physical Sciences Research Council (EPSRC) approved funding for a scoping study on River Bank Stabilisation with Special Reference to Willows, to which the Agency contributed additional funding.

This scoping study examined the existing information and data that had been gathered, on a world-wide basis, on the potential for and limitations of using vegetation for bank stabilisation, concentrating on the use of willows. The study was not intended to carry out any original research work, but to draw together existing knowledge from other researchers and practitioners in the UK and abroad, and in particular identify clearly and concisely areas where further research work should be concentrated.

The study covered three main topics :

- **Flow Erosivity** covered the effect of bankside vegetation on retarding velocities of main channel flow adjacent to a river bank, and its consequent effect on channel capacity. Floodplain conveyance was also covered in this topic;
- **Bank Erodibility and Stability** examined the potential for soils to erode, and how vegetation could affect this potential. This covered the effects of soil properties, plant health and bank hydrology on vulnerability of soil to erosion. On a slightly larger scale, this topic also addressed the positive effects of buttressing, and the negative effects of surcharge and wind loading on bank stability when the bank is considered as an entity; and,
- **Bank Accretion** addressed the problem of bankside vegetation encouraging siltation, which leads gradually to reduced channel conveyance. In addition large vegetation can create a source of large woody debris in a channel, again with the potential to reduce capacity, especially at existing bottlenecks.

The study included a comprehensive literature review, and the text contains many cross-references to other work. In addition a bibliography is provided for further information on matters not specifically referred to in the report text.

Data and information were gathered from a number of structured interviews and site visits, both in the UK and overseas. The interviewees and their responses are presented in tabular form in the report.

A number of site visits were also included in the study, and these were recorded on site assessment sheets, copies of which are also included in this report.

During the study sources of willow materials within the UK were identified, and these sources are listed in an appendix.

The report summarises the currently available information on vegetation, and particularly on willows, and identifies, under the three topics listed above (but covering eleven separate sub-topics), a total of 35 separate areas which are recommended for future research.

This R&D Technical Summary describes the output from Project W5A011.

R&D Project Record W154 - Riverbank protection using willows - Scoping study

Internal Status: Released to Regions

External Status: Public Domain

Project Manager: Andrew Pepper, ATP Engineering Consultancy April 1998

Research Contractor: Universities of Nottingham, Middlesex and Bristol

Further copies of this R&D Technical Summary are available internally from R&D Management Support Officers or the Scientific and Technical Information Service (SATIS).

Further copies of the R&D Technical Report are available externally from the Environment Agency R&D Dissemination Centre, c/o WRC, Frankland Road, Blagrove, Swindon, Wiltshire, SN5 8YF. Telephone: 01793 511711, Fax: 01793 514562

©Environment Agency

Rio House

Waterside Drive

Aztec West

Almondsbury

Bristol BS32 4UD

tel: 01454 624400

fax: 01454 624409