WILLOWBANK
Erosion & Conservation Services

The WILLOWBANK Guide
to Riverbank Restoration & Repair

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Problems & Solutions

Riparian owners and officials with responsibility for river management will be familiar with problems such as:

- Bank erosion and instability
- Low ecological, amenity or recreational value, including:

  Lack of bankside habitat

  Excessive weed growth

  Insufficient shade for fish

  Unsightly previous construction

The 1990's have seen a surge of interest in the value of our river corridors. This has not only generated pressure for improvements, but has made the choice of management techniques much more critical.

If you have any of these problems to solve, WILLOWBANK is keen to help you find solutions.

Bankside Erosion & Instability

Everybody who has taken even a passing interest in rivers knows what riverbank erosion is, and that the primary cause is the movement of water relative to the bank.

Less widely understood are the other factors which determine where and when erosion takes place, and at what rate.

These secondary factors include the type of material forming the banks, the slope of the banks, the susceptibility of the river to flood, the nature and extent of bankside vegetation, the presence or otherwise of any artificial protection systems, and whether or not the river has been disturbed in some other way – for instance by the construction of a bridge, an outfall, or even a protection system for another length of bank nearby.

Although observers are usually keen to volunteer a 'cure' for any particular example of erosion, regrettably few stop to consider the possible alternative strategies available, including whether the erosion actually needs controlling at all, and whether their scheme might cause damage elsewhere.

Rivers are extraordinarily complex and sensitive systems. Almost any artificial disturbance will result in a whole range of responses, sometimes many miles away from the point where the change has been made. Each response has its own timescale. And as rivers are never in equilibrium anyway it is very difficult to evaluate the consequences of any changes made to them.

Erosion also has benefits – it is usually an essential process for other important aspects of the river.

These are some of the reasons why it is so important to plan erosion control work carefully, to take professional advice and to discuss any proposals with other people whose interests may be affected.

Whose responsibility?

Riparian landowners are responsible for protecting their own banks, and have a legal right to do so.

However anyone carrying out works on a river is responsible for any damage they may cause to third party interests. This is why advice and consultation is so important.

Even where channel maintenance is carried out by the Environment Agency (Main Rivers) or by a Drainage Board, the channel and banks do not usually belong to them. Their powers are permissive and the work they undertake will be targeted at the common good rather than individuals.

Authorisations

Usually it is illegal to carry out any erosion control work without certain administrative preliminaries.

On Main Rivers a formal consent must be obtained from the Environment Agency before work starts. They have expert staff who are usually pleased to advise on the engineering and ecological aspects of proposals. They publish a number of excellent booklets on the subject – see 'Further information'.

Similar permission is required for works on Drainage Board watercourses. Contact the Clerk to the Board.

However the work is to be done, planning permission may still be needed. Any proposal involving the import of material from offsite may count as tipping and require a Waste

Control Licence. Unauthorised 'fly' tipping is a serious offence. Contact the Environment Agency.

If your site lies within an SSSI or other wildlife designation, other formalities will be needed. Contact English Nature.

Plan carefully before starting work!

Remedies

There are countless ways of controlling riverbank erosion and it has already been explained how important it is not to rush out and carry out the first scheme which springs to mind.

First consider whether any form of control is really necessary. Certain types of river, such as stony-bedded streams in hilly areas, are naturally very mobile and have traditionally meandered all over their floodplains. Control measures in such locations can at best be ineffective or at worst very counter-productive.

It may be that mechanical damage and vegetation loss due to grazing has exposed the bank to attack from the water flowing past. Fencing off a buffer strip will have a dramatic effect on the bankside vegetation and may be all that is required to reduce the problem to an acceptable level.

If after careful consideration physical protection measures are deemed appropriate, then the choice of a 'soft' solution, and particularly one involving vegetation, can have many advantages over a traditional 'hard' system such as sheet piling or concrete retaining wall. Although hard protection is sometimes unavoidable for practical or economic reasons there are many instances where a soft solution would have been preferable.

Advantages of Soft Protection Methods

• EFFECTIVE – Soft solutions can often give better results, particularly in the long term.

• SUSTAINABLE – Can be completely or partially self-sustaining, thus reducing future maintenance costs and responsibilities.

• ECONOMIC – May involve a lower capital outlay.

• ECOLOGICAL – Can provide significant habitat enhancement for many forms of wildlife.

• AESTHETIC – The riverside environment can be improved for all users.

• ACCEPTABLE – These days green solutions are strongly encouraged by most of the organisations who issue approvals.

• ADAPTABLE – Soft systems can be combined with traditional engineering techniques to produce versatile composite solutions.

The Role of Willow

As well as occurring naturally alongside rivers, Willow has been planted by mankind for over a thousand years specifically to stabilise river banks.

Willow thrives in wet conditions, is quick growing and has a very high proportion of root mass, making it particularly suitable for ground stabilisation.

See ‘Remedial Techniques’ for the various ways Willowbank can help to solve your erosion or instability problem.

Low Ecological, Amenity or Recreational Value

Attitudes

The 1990's have seen a great change in attitude to our rivers. Works involving new construction or engineering maintenance are now carried out with much more consideration for environmental issues than was usually the case in the past. In addition schemes aimed solely at improving the riparian habitat for both wildlife and human beings are now commonplace – 'river restoration' has entered the vocabulary. Over the centuries many of our rivers have undergone major changes to benefit milling, navigation, industrialisation, urbanisation, land drainage and flood protection. Often, but not always, this work was done with little or no regard for any other aspect of the river's function.

Problem Features

Realignment can cause instability and erosion, often badly remedied with unsympathetic bank protection systems using steel, concrete or stone. Banks may have been cleared of vegetation to improve conveyance or simply to facilitate maintenance, velocities reduced, causing siltation or excessive weed growth, or increased to produce scour. Disused industrial sites can be just plain ugly.

The Role of Willow

Willow, either alone or in conjunction with other techniques, can be used in many ways to improve the appearance or habitat value of such rivers. 'Live' or 'dead' willow systems can replace 'hard' revetments, trees can be planted simply to improve the landscape, or to provide shade for fish and to reduce weed growth, and willow planting baskets can be used to encourage the establishment of other aquatic vegetation. See the next section (Remedial Techniques) for the various ways in which Willowbank can help you solve these problems.

Remedial Techniques

WILLOWBANK employs a wide variety of techniques to help carry out the the sort of solutions identified in the previous section.

These will usually involve the use of willow. However we may well recommend approaches where, in order to order to provide the most effective and economic solution, willow is used in conjunction with other materials. We call these "composite solutions".

The photographs on page 19 illustrate a selection of the techniques we have used on jobs we have done.

Willow spiling is perhaps the most popular of the willow-based techniques and has certainly formed the bulk of the work carried out by WILLOWBANK. However it is important not to select spiling only because it is the best known 'green' solution to erosion problems. Although effective and economical in appropriate situations, there are many other circumstances where alternative approaches will be more cost effective.

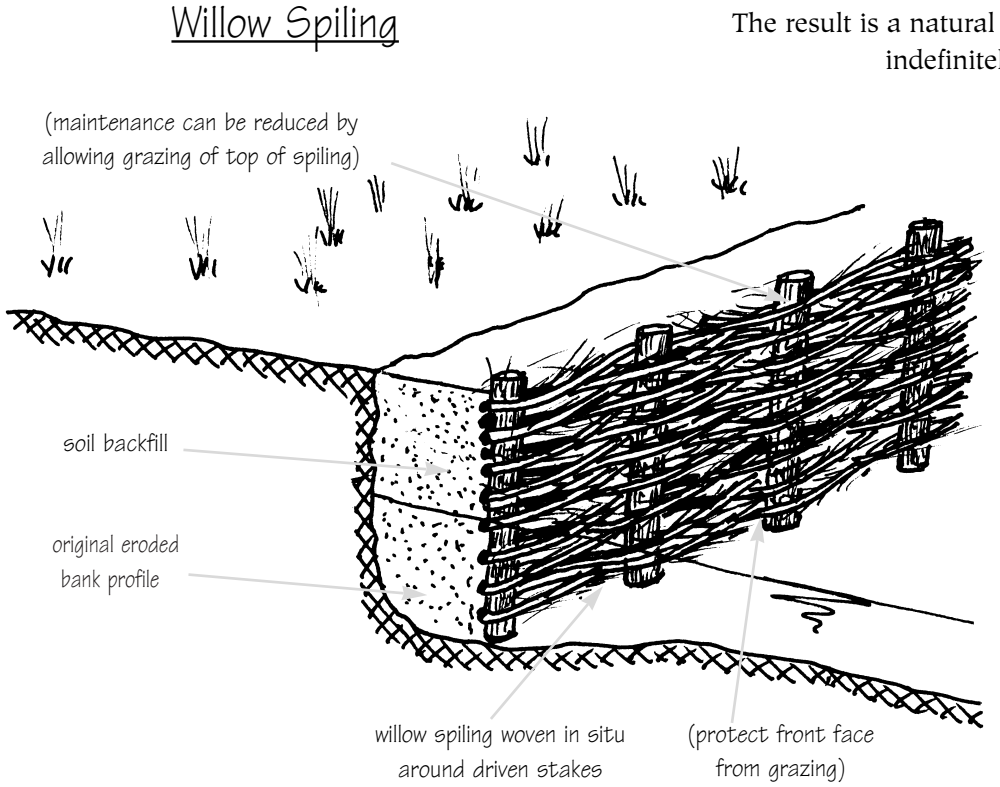
This section also illustrates some of these other techniques.

We are happy to discuss which of these, if any, might be most appropriate in your own particular case. Where we consider that a willow-based technique is not the best solution, we will not hesitate to say so; our reputation is very important to us.

Willow Spiling

Most of the work we have carried out to date has involved this technique. A vertical willow fence is formed along the face of the bank to be protected.

The technique involves driving vertical willow stakes at roughly 500mm centres along the river bank, and then weaving withies (willow shoots) horizontally between and around the stakes.



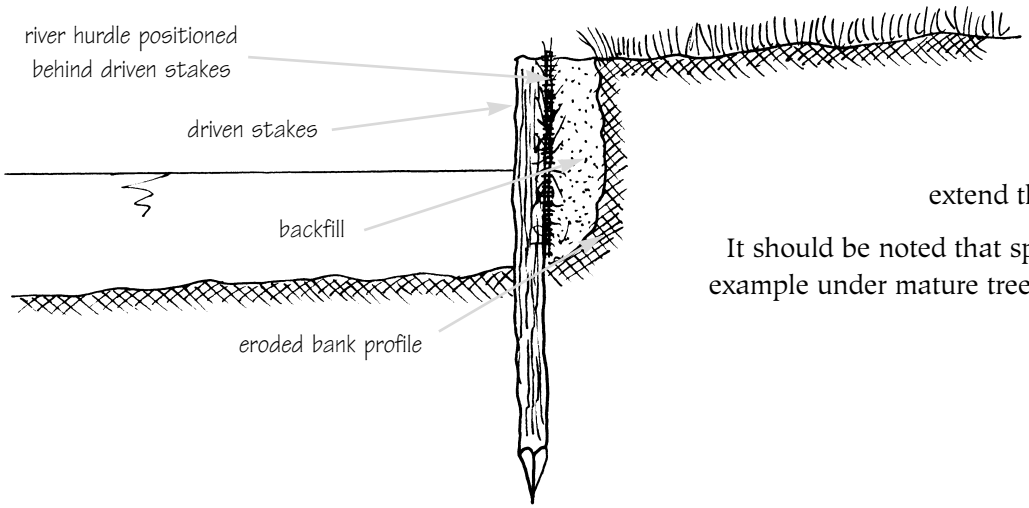
The result is a natural retaining wall, capable of regenerating itself indefinitely. Usually both the stakes and the withies are live and quickly establish a dense root mass and top growth. This provides protection to both the toe and upper bank against erosive forces.

Spiling requires continuing maintenance to control excessive growth and an initial balance must be struck between quick growth and maintenance. Growth can however be effectively controlled by grazing the top shoots, but the willow will not tolerate grazing of the vertical face from the river.

Maintenance requirements can also be controlled by appropriate choice of willow variety. We can supply a number of varieties, including those suitable for brackish conditions.

Follow-up planting can be carried out

River Hurdles Installed Vertically

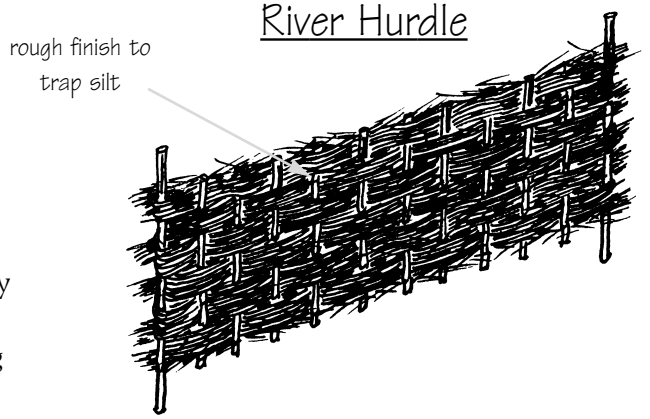


using slower growing varieties once the spiling has established.

Live willow is harvested in the winter between November and March and normally has to be used within about three weeks. This can cause programming difficulties for clients but WILLOWBANK is now able to offer a chilled storage service to extend the planting season into June or July.

It should be noted that spiling can be difficult to establish in shade – for example under mature trees.

River Hurdle



RIVER HURDLES

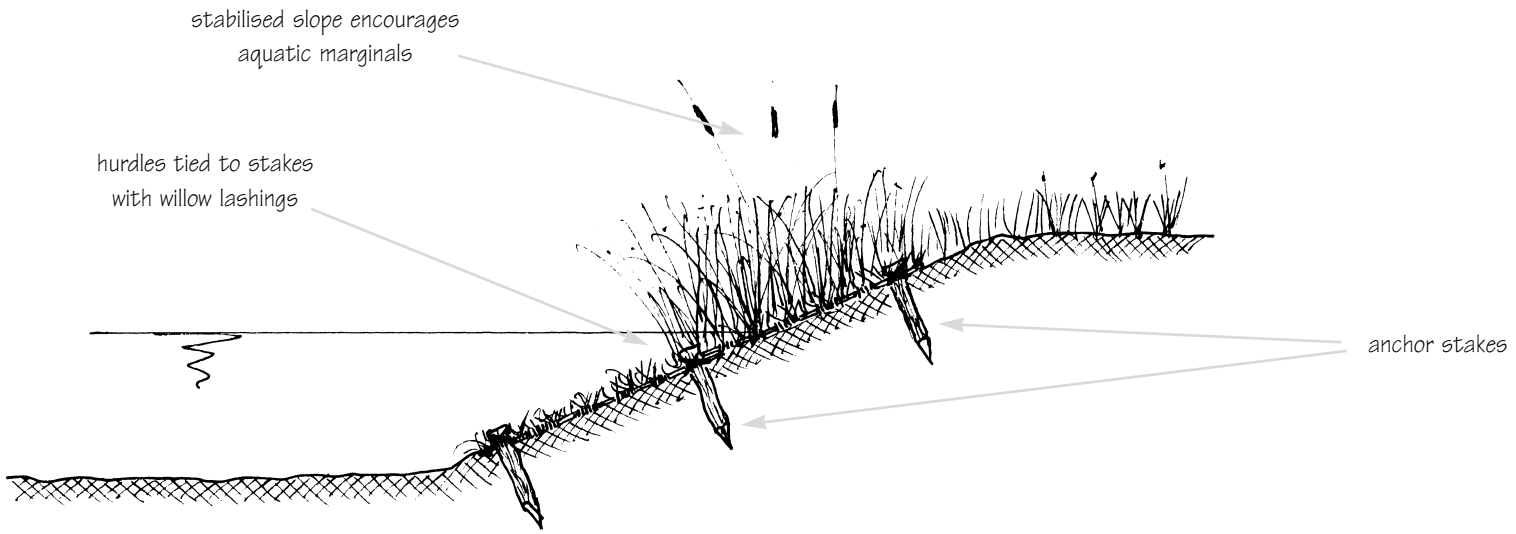
River hurdles are willow panels woven in the yard. Whilst similar in construction to normal hurdles, the willow shoots are only partially trimmed to leave a rough finish which is more effective at trapping silt. Prefabrication minimises site

work so that hurdles can be more cost effective than spiling, particularly as installation will usually be carried out during the winter when floods are more likely.

Hurdles can either be attached to vertical stakes to produce a similar result to spiling, or pegged out flat on a sloping bank to encourage silt deposition or to act as a natural alternative to geotextiles. Dead or live willow can be used, depending on requirements.

Again, choice of willow variety is important and we are well placed to meet your requirements in this respect.

Hurdles laid flat to protect sloping embankment

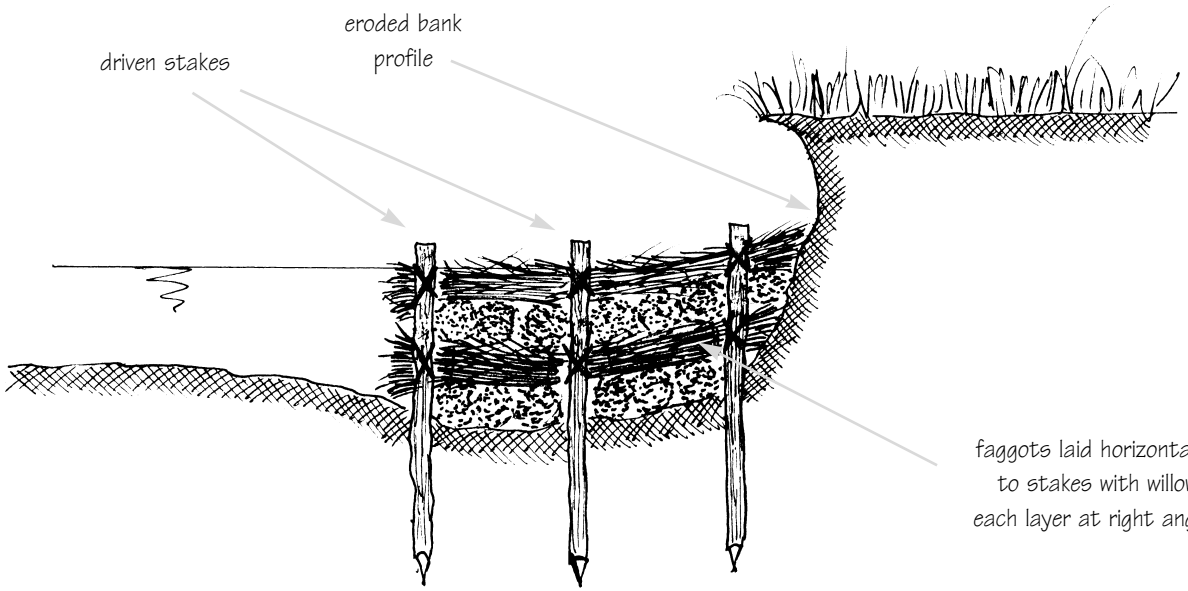


Faggoting

This traditional technique involves laying bundles of brashings in a horizontal plane. Dead shoots are more normally used, but live withies can induce colonisation of the bank which can be advantageous in certain circumstances. The faggots are secured to a grid of stakes driven vertically into the ground.

They can be laid in a line along the toe of a bank to provide scour protection or formed into a mattress which can be used as a foundation for a newly formed bank, or left uncovered to induce siltation naturally, either on an eroding bank or to provide scour protection to the river bed.

Willow Faggots for Erosion Control



Faggots can be particularly appropriate in tidal estuaries, where the usually heavy silt load ensures rapid deposition.

We can supply faggots using either dead or live withies. They are bundled and tied in our yard ready for delivery to site.

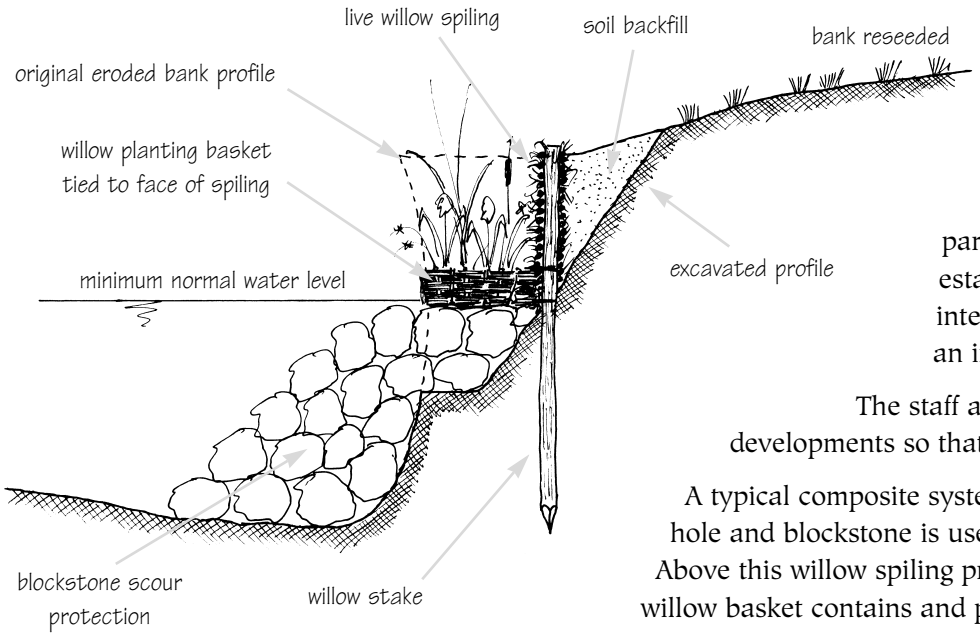
COMPOSITE SOLUTIONS

Although the use of natural systems for protecting river banks has been practised for many centuries, increasing awareness of the advantages of the approach over 'hard' engineering solutions has caused a surge of interest in re-adopting traditional techniques.

However these traditional methods were developed when labour was cheap, mechanical plant was non-existent and many manufactured materials were either unavailable or very expensive.

These days an endless variety of new products and materials is available, and in real terms both transport and mechanical excavation are cheaper than ever before.

Typical composite system



Opportunities have therefore arisen to design composite systems which combine the best features of both traditional and modern methods. This field is developing rapidly, and many leading river specialists are involved in experimental works and in studying and documenting the various new techniques. In particular the River Restoration Centre at Silsoe has been established to act as a focal point for all those with an interest in the field, and bank protection techniques form an important part of their work.

The staff at WILLOWBANK takes a close interest in these developments so that the best possible solutions can be offered.

A typical composite system is shown here. Severe erosion has cut a deep scour hole and blockstone is used to form a training wall below normal water level. Above this willow spiling protects the re-profiled upper bank, whilst a woven willow basket contains and protects new marginal aquatic plants.

Planting Baskets

For replanting aquatic plants, particularly in sensitive riverside locations.

The use of pre-planted woven willow baskets simplifies work on site and provides valuable protection whilst the plants become established. The baskets are made from dead willow and are therefore biodegradable.

We can produce baskets to your specification.

Amenity Planting

Trees may be planted for many reasons. For landscape or habitat enhancement, as a source of timber for further replanting, to provide shade for fish or to discourage weed growth, or to reinforce river banks.

Although many years may elapse before the full benefits of planting are realised, it is becoming more popular both as a result of increasing public awareness and the establishment of a number of schemes which provide financial incentives for this work.

Willowbank can supply suitable varieties of willow for the establishment of scrub, pollards or full trees and can undertake initial site work and ongoing maintenance as required.

Who We Are

WILLOWBANK EROSION & CONSERVATION SERVICES is a sister company of ENGLISH HURDLE, one of the UK's foremost producers of natural willow products.

English Hurdle has been supplying and installing willow-based bank protection systems for over ten years.

Increasing awareness of the ecological and economic benefits of willow-based bank protection systems has resulted in expanding demand and WILLOWBANK has been established to offer a specialist service in the field.

Our resources include extensive withybeds offering many different varieties, our own yard for processing the willow and manufacturing prefabricated products, skilled site staff for installation and a qualified civil engineer with considerable experience of river works.

How We Work

The WILLOWBANK approach is totally flexible. Services range from the provision of informal advice, through supply of materials to full project management.

TECHNICAL ADVICE

We are most anxious to ensure that our products and services give complete satisfaction.

The use of willow for bank protection is a specialist and developing subject and we inspect experimental sites and attend conferences to ensure that we keep abreast of the latest developments in the field.

Our partner in charge is Nigel Hector, who has many years' experience in the industry. He is available here to discuss your particular requirements.

We also offer the services of a qualified and experienced river engineer. He can provide anything from initial advice over the telephone to the full preparation and project management of a scheme to meet your needs.

Where required we offer a Preliminary Appraisal Package consisting of a site visit from our engineer with a written report. Further details of this service are available on request.

In certain situations willow-based techniques may not be appropriate, or satisfactory only in conjunction with other associated works. Our experience of bank protection and river training using both willow and other methods enables us to provide authoritative advice.

Planning & Design

Where planned work is extensive, we can if required provide fixed-price quotations for detailed appraisals, concept designs, detailed design and contract preparation. We can also negotiate and obtain relevant approvals from planning authorities, the Environment Agency, Drainage Boards, conservation bodies, etc.

Supply of Materials

There are many hundreds of willow varieties and to ensure success it is most important to use a species appropriate to the task in hand. We have over 100 acres of withy beds, plus connections with other suppliers in Britain and Europe.

Willowbank can therefore supply the most appropriate variety for any particular project including those suitable for brackish conditions.

Please remember that willow is a seasonal product and is harvested annually between November and March. If required live it should normally be replanted within about three weeks, depending on conditions. Where this causes difficulties we are now able to offer chilled storage so that live willow can be supplied for planting well into the summer.

Skilled Labour

We have our own skilled labour force based at our depot near Taunton in Somerset. We nevertheless do undertake installation work anywhere in the UK, either directly for clients or as specialist subcontractors where the willow work forms part of a larger project.

Site Supervision

Alternatively we can provide a skilled supervisor to assist your own labour force to undertake installation work.

Total Project Management

We would be pleased to undertake all elements of your erosion control or amenity planting work, including planning, obtaining approvals and consents, detail design, arrangement of subcontracts for any associated works, installing the willow revetment and preparing and implementing a maintenance regime. This approach may be helpful to clients where professional advice is not being sought from other sources.

How to get started

Telephone Nigel Hector on 01823 698418 for an informal discussion.

Many of you will have a pretty clear idea of your requirements, and ‘How We Work’ has already summarised the various services we can offer.

For others to whom these techniques are new, it may be best to start by visiting a site where willow has already been established for erosion control. We can arrange this, and will do our best to identify a location convenient to you. Our ‘initial appraisal’ service consists of a site visit followed by a short written report. Its cost will vary according to circumstances.

Projects Completed

WILLOWBANK began carrying out willow-based bank protection work in 1992. Since then projects in which it has been involved include:

- River Avill at Loxhole, Dunster, Somerset
  Client: National Rivers Authority
- R Wye at Willersley, Powys
  Client: National Rivers Authority
- River Blackwater at Farnborough, Hants
  Client: Wisley Golf Club
- River Thame at Whitton, Birmingham
  Client: Cisk Construction
- River Cole at Coleshill, Wiltshire
  Client: Phi Group
- River Brue at Highbridge, Somerset
  Client: Somerset County Council
- River Avon at Aveton Gifford, Kingsbridge, S Devon
  Client: National Rivers Authority
- River Avon at Limpley Stoke, Trowbridge, Wilts
  Client: Riparian owner
- Huntspill River at Bleak Bridge, West Huntspill, Somerset
  Client: Somerset County Council
- River Avon at Pewsey, Wilts
  Client: Riparian owner

Further information

- The New Rivers & Wildlife Handbook
  RSPB
  01 767 680551
- Riverbank Erosion
  Environment Agency
  0645 333 111
- Riverbank Protection Using Willows
  A Scoping Study by the Universities of Nottingham, Middlesex & Bristol
  Environment Agency
  0645 333 111
- Guidance Notes For Riparian Landowners
  Environment Agency
  0645 333 111
- Revetment Techniques Used on the River Skerne Restoration Project (RD W83)
  River Restoration Centre
  Water Research Centre

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