Advisory Visit

Annan Water - River Annan

Scotland

30/08/2016

1.0 Introduction

This report is the output of a site visit to a short section of the Annan Water at the request of Tony Donnelly, director of the River Annan Trust. The purpose of the visit was to assess bank erosion and riverine habitats and offer recommendations for future management at the site.

Normal convention is applied with respect to bank identification, i.e. the banks are designated left bank (LB) or right bank (RB) whilst looking downstream. Upstream and downstream references are often abbreviated to u/s and d/s, respectively, for convenience.

2.0 Assessment

When assessing river banks within pasture fields it is common to find over-grazing to be a major issue but at this site grazing pressure appeared relatively low (Fig. 1). Even so, light grazing still limits the diversity of herbaceous vegetation (and natural tree regeneration) that can establish, as only grasses are capable of withstanding continual grazing pressure (leaving only grasses and unpalatable species).

Less accessible reaches along the bank face and water's edge do support greater diversity and maximising the variety of species present is important in maintaining bank stability. It is the complexity and extent of root matrices that consolidate a bank and they are directly related to the abundance and diversity of cover above the ground. Some plant species have deep root systems while other have wide reaching roots and it is a combination of the various root types that will provide the greatest protection. However, grazed vegetation has to expend energy replacing lost foliage, rather than developing stronger root systems and reduced foliage above the ground also leaves a lack of protection from high flows. For these reasons, and to prevent trampling damage, it is usually beneficial to completely exclude livestock from at least a small buffer along a watercourse, even where grazing pressure is light.

In most areas, root structure within the banks remains sufficient to consolidate slumped bank material, retaining turfs intact at the toe of the bank (possibly less-so at times of greater grazing pressure)(Figs 1 & 2). This is important if the material is to remain part of the bank and facilitate natural regrading, rather than being washed away. Some of the slumped areas facilitate the formation of small grassy bars which encroach into the channel; these provide beneficial width variation and habitat features within the straightened and rock armoured (RB) channel. Modified channels invariably provide poorer habitat than sinuous ones, where meanders provide greater width and depth variation.

Figure 1. Signs of natural bank regrading where slumped bank material has remained in place long enough to become consolidated. Vegetation that then trails into the channel provides important cover and shelter for fish and invertebrates. Note the straight channel and hard, rock-lined/walled far bank. Some reasonable quality juvenile habitat is available but the area lacks the natural habitat diversity that would be expected within a sinuous channel.

Figure 2. A large clump of bank material that has remained intact due to the presence of good root structures within it. Some such pieces will be lost in high flows but others will be retained to form a more stable, sloping bank that is less susceptible to erosion than the steep vertical banks. If retained, such features also provide valuable channel width variation.

Where willow trees have become established they provide much needed cover and structure within the channel, creating refuge for fish from high flows and predators. The structure also helps to focus higher flows, driving scour into the bed to develop vital deeper pool habitat – something that is unlikely to occur otherwise within a straightened channel. It has to be conceded that structure within the channel may place some additional pressure upon the banks in high flows and could exacerbate erosion on the adjacent bank. For this reason, it is important to maintain a healthy diversity of vegetation on those banks by excluding livestock, if possible, but also by addressing other potentially significant issues such as Himalayan balsam (*Impatiens glandulifera*). Balsam often outcompetes native species but then dies back in winter, leaving a dearth of protection on top of and within the bank, thereby greatly exacerbating erosion issues.

Figure 3. Overhanging and trailing willows provide vital cover and structure within the channel and help develop deeper pool habitat.

It should also be remembered that the flows experienced last winter were exceptional and exerted excessive erosive force upon the banks. Other significant impacts upon the watercourse could have also played a part, with significant dredging undertaken u/s that interrupts sediment transport down the system. However, even in the area of more notable erosion (Fig. 3), the base of the bank has remained relatively intact and with a whole growing season since the major floods, has begun to naturally revegetate. Balsam was noted to be present and is likely, at least in part, to be contributing to the erosion. While pulling balsam can only eradicate it if undertaken from its u/s extent, it can still help control an infestation.

Figure 4. The area of greater erosion, likely exacerbated by high winter flows, balsam, dredging u/s, grazing (still limiting the root structure within the bank) and the willows on the far, RB (left of shot). Of these impacts they could all be addressed to the benefit of the surrounding habitat, except the willows, which provide vital in-channel habitat in their own right and should be retained. If the bank can be naturally protected with vegetation the erosion can be controlled and erosive forces will, instead scour the bed of the watercourse, developing and maintain the pool feature.

3.0 Recommendations

Whatever intervention is taken regarding the bank erosion, ensuring that Himalayan balsam is not allowed to become established along the banks will be vitally important and this can be achieved by simply pulling up the plants before they seed and composting or drying them out, well away from the river. This will be particularly pertinent if some basic stock exclusion fencing is undertaken along the bank as this could allow more balsam to establish. For the reasons already described, a small amount of additional balsam pulling would be a small concession for allowing a greater vegetation diversity to establish that will ultimately offer improved bank protection. Even a small strip along the watercourse would be an improvement that would benefit resident invertebrates, birds and small mammals, as well as fish.

Other than that, the habitat throughout the majority of the field is reasonably good and the banks are naturally stabilising. Planting the odd tree, out of the reach of the horses may also be beneficial to increase species diversity. At the upstream end of the reach, where the greater extent of erosion is occurring, some intervention may be desirable but is not necessarily required if the bank face can be encouraged to revegetate.

An alternative action may be to see how the bank regrades and stabilises over time. If intervention is undertaken, there are several options for 'green engineering' type bank protection that would not negatively impact upon habitat quality. The options are covered below:

3.1 **Willow planting** (minimal effort/intervention)

Planting the eroding section of bank, ideally along the waterline as well as the bank face is likely to increase bank stability. This would create additional low-level cover and flow dissipation. However, bank erosion was not considered to be a major issue from an ecological perspective, and some degree of erosion is beneficial, being a natural aspect of riverine processes.

The quickest and easiest way of establishing willow trees is by pushing short sections of freshly cut whip into the ground. This can be undertaken at any time of the year, but will have the greatest success during the dormant season, shortly before spring growth begins (ideally late Jan-March). Whips should be planted into soft, wet ground so that there is a greater length within the ground than out of it, to minimise the distance that water has to be transported up the stem; 30-40cm of whip protruding from the ground is sufficient. Whips of 5mm-25mm diameter tend to take best, but even larger branches can be used. Care should be taken not to leave excessive amounts of foliage on the whips as these greatly increase the surface area of the plant and can lead to their dehydration.

The species used in this instance should be the smaller shrubby ones, particularly grey willow and goat willow (*Salix cinerea* and *S. caprea*), which, being small, tend to create low, dense cover and better bank protection than the larger tree species. The major potential issue with this would be the possible requirement for future tree maintenance on what is a relatively narrow channel.

3.2 **Tree Laying and woody material**

Laying some of the willow shrubs on the RB down along the bank may also be beneficial to temporarily increase the channel capacity and assist stabilisation of the adjacent LB. This would potentially create a short-term reduction in habitat availability and quality but is likely to assist with the bank stabilisation.

The method used to lay a tree or branch is simple: it involves cutting part way through the stem/trunk, a little at a time (ideally while it is under light tension), until it can be forced over into the river (Fig. 5). The depth of the cut should be limited to only that which is required to bend the limb over,

as this will maintain maximum strength in the hinge and the health of the tree/shrub. On smaller shrubs, simply cutting the stem/trunk at a very shallow angle and then putting an axe blade into the cut and hitting it with a hammer can also help the laying while retaining a good strong hinge.

This method is often actually employed to increase low cover but as with any interventions should be employed sparingly so as not to detract from other valuable habitats. Willow whips could be strategically planted in other areas on the LB d/s in anticipation of employing this technique to improve habitat once they become established.

Figure 5. Laid willow.

3.3 Brash bank revetment

If it is considered that a greater level of intervention is required, a more formal brash (small branches) bank protection could be installed. The method involves securing a line of diffuse brash structure along the bank to dissipate flow energy before it hits the bank, encouraging suspended sediment to be deposited within the structure which will subsequently become consolidated by vegetation. The technique usually employs at least some live willow which will ultimately take root and form a line of shrubs along the bank. However, if the potential requirement for maintenance is considered particularly undesirable, the same technique could be used employing dead brash which would not take root. The idea being to simply protect the bank long enough for it to fully revegetate and become stable. Posts are driven into the bank, to which the brash is wired.

Figure 6. Mixed brash bank protection.

Figure 7. Dead brash bank protection employed to create a diffuse barrier along the bank.

Again, this could be undertaken in conjunction with some laying of the willows along the far bank to ease pressure from the bank until it fully revegetates.

In addition, the WTT website library has a wide range of free materials in video and PDF format on habitat management and improvement:

www.wildtrout.org/content/library

We have also produced a 70 minute DVD called 'Rivers: Working for Wild Trout' which graphically illustrates the challenges of managing river habitat for wild trout, with examples of good and poor habitat and practical demonstrations of habitat improvement. Additional sections of film cover key topics in greater depth, such as woody debris, enhancing fish stocks and managing invasive species.

The DVD is available to buy for £10.00 from our website shop www.wildtrout.org/product/rivers-working-wild-trout-dvd-0 or by calling the WTT office on 02392 570985.

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