A REPORT INTO THE IMPACT OF SMALL DAM CONSTRUCTION AT DELFORD BRIDGE, DE LANK RIVER.

Introduction.

On 15 October 1996, whilst leading a field-trip for Kingshott School at Delford Bridge on the De Lank River, I witnessed the impact of a series of small dams, that had been created for the purpose of creating swimming pools, by members of the public. The dams were creating an artificial flow regime for a 300m stretch of river. The dams were made mostly of granite cobbles and boulders that had been transported from various parts of the river substrate. Large sections of turf had also been cut or broken from the bankside and used either to plug holes in the stone dams (photos 4,6) or in an attempt to create a dam entirely of peat (photos 11, 12). The peat used in construction had either been cut or broken from the river bank (photos 11, 12), or had subsided into the river as a result of undercutting by the elevated water level created by the dams (photos 13, 14, 15, 16).

Impact on the river habitat.

The De Lank River is noted for its diverse and abundant flora and fauna. There are records of two Red Data Book species of invertebrate immediately downstream of Delford Bridge (photo 1) and there are a number of nationally rare plants also recorded. The river is a proposed Site of Special Scientific Interest (SSSI). Many of the plants and animals typical of the De Lank are associated with fast-flowing areas of riffle/run over a clean substrate of granite boulders, cobbles, pebbles and gravel. This habitat typically supports a 60-80% cover of flora such as *Myriophyllum alterniflorum, Ranunculus sp., Myosotis scorpioides, Oenanthe crocata, Juncus bulbosus* and a diversity of mosses and liverworts (photos 1, 2, 18, 19, 20). During the Summer low flows, vegetation is exposed, forming a series of braided channels (photos 1, 18).

Dams are built annually during the Summer months, when easily accessible parts of the river (namely, Delford and Bradford Bridge) are popular with tourists. The creation of dams seems to be a natural reaction for many people when taking their recreation near a river. Dams also provide pools for swimming and the use of inflatable boats and lilos.

The removal of the larger stones from the riverbed deprives plants and animals of a micro-habitat. The stones are incorporated into the dam in a habitat with is unlikely to be suitable for the flora associated with the stone. The use of turf exacerbates the erosion of the riverbank and contributes towards the siltation of the substrate. Many of the animals that the De Lank support rely on the interstices between stones as their habitat. Peat and soil clog these gaps and reduce the surface area available for invertebrate colonisation.

The dam creates an area of pooled water upstream (photos 3, 4, 5, 6, 7, 9, 10,13, 15, 17). This deep and slow-flowing habitat is unable to support the flora and fauna associated with shallow, fast water, which is typical of much of the De Lank River. The new habitat encourages the growth of *Potamogeton natans* (photos 17, 23), which is normally poorly represented in the typical floral assemblage. *Potamogeton natans* is associated with deep, slow-flowing habitats. Most of the substrate is covered by benthic diatoms (photos 16, 21, 22), which appear to utilise the organic matter from decomposing macrophytes and cattle faeces, which has settled due to the slow flow regime.

The retained water behind the dams erode the soft riverbank, causing slumps (photos 13, 14, 15, 16). This exacerbates the siltation problem upstream of the dams. The pooled water and eroded riverbanks attract cattle, which further increases the erosion, siltation and enrichment. The receding riverbank causes the river to widen, which further reduces the flow rate. Bankside erosion would be particularly apparent during high winter flows, when the soft banks either side of the dams would be particularly vulnerable.

In conclusion, what may be perceived as an innocent recreation is actually destroying significant stretches of one of Cornwall's most pristine river habitats. Its impact can be regarded as far more significant that a polluting discharge, for instance.

With the help of the pupils and teachers of Kingshott School, a comparison was made of kick samples above and below the lowest dam. The samples confirmed the impoverished nature of the upstream habitat when compared to the diverse community downstream.

Stones and turfs were removed from the dams to allow the water level to return to a near natural state. Pupils were excluded from this activity on health and safety grounds, though they did assist by singing the theme music from 'The Dambusters'!

The breaching of the dams created an accelerated flow, which was seen to scour some of the detritus and diatom growth from the substrate (photos 10, 24). The water level fell by as much as 20cm (compare photos 9 & 10, 13 & 14). The flow stabilised to a visibly more turbulent system (compare photos 17 & 23).

Conclusions.
1. The creation of small dams for recreational use is affecting the river habitat over significant areas of valuable watercourse.

2. The practice causes damage by siltation, accelerated erosion, altered flow regime and reduce habitat diversity and availability.

3. Removal of the dams would allow the flow regime to return to a more normal state. But the erosion and siltation are more long term problems.

Recommendations.
1. The remains of the dams should be demolished. Stones should be returned to the river bed (but not where they could be easily reassembled into dams) and turfs should be removed. This work should be performed by the Flood Defence workforce. Action: Flood Defence

2. English Nature and the West Country Rivers Trust should be made aware of the problem and their assistance encouraged in dealing with preventing the reestablishment of the dams. Action Conservation Section.

3. Signs should be erected, explaining the value of the habitat at these sites and the damage dams have on it. Action: Conservation Section.

4. Dams should be identified as an issue in the Camel LEAP. Action: LEAP Planner.

5. Consideration should be given to the restoration of damaged and eroded banks. Action Flood Defence and the Conservation Section.

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Photo (1). The De Lank River at Delford Bridge. Note the rich patchwork of flora, forming a braided channel.

Photo (2). Downstream of Dam 1. A riffle/run habitat supporting a rich assemblage of plants and invertebrates.

Photo (3). Dam 1.

Photo (4). Dam 1, after it had been breached. Note the lack of detritus and diatom growth, removed by the increased flow rate.

Photo (5). Dam 3.

Photo (6). Dam 4. Note the use of turfs in dam construction.

Photo (7). Dam 3.

Photo (8). Dam 3, after breaching. Note the size of turf used in construction.

Photo (9). Dam 3.

Photo (10). Dam 3, after breaching. Note the fall in water level and substrate scouring.

Photo (11). Severe bankside damage from turf cutting.

Photo (12). Dam 2. Cut turfs used in an attempt to create a dam.

Photo (13). Area of pooled water upstream of Dam 3.

Photo (14). Area upstream of Dam 3 after breaching. Note the reduced water level. The effects of bankside undercutting can now be seen.

Photo (15). Erosion.

Photo (16). Bankside slumping. Note the lack of macrophytes and the covering of benthic diatoms on the substrate.

Photo (17). Deep and slow-flowing habitat created by the dams. Note the *Potamogeton natans* to the right.

Photo (18). Diverse floral assemblage in the riffle/run habitat downstream of Delford Bridge. Note the small dam in the foreground.

Photo (19). Diverse floral assemblage.

Photo (20). Diverse floral assemblage.

Photo (21). Substrate upstream of a dam dominated by Diatom growth.

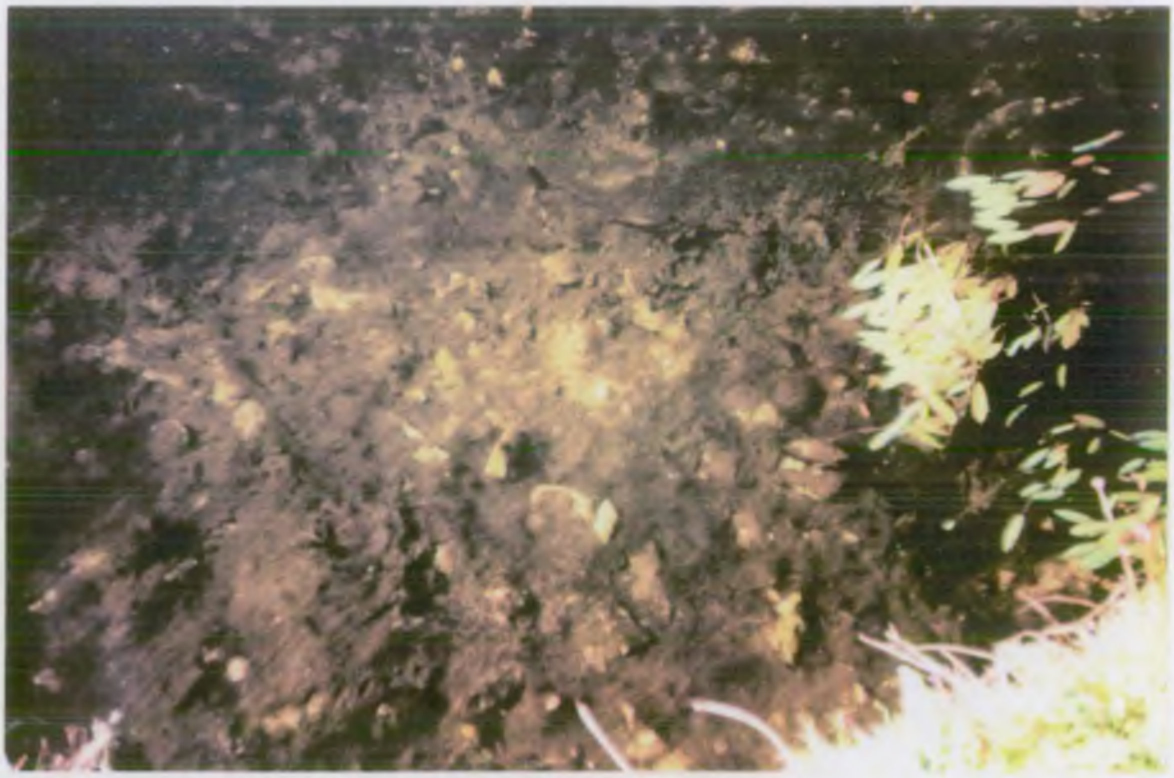

Photo (22). Thick Diatom growth with *Potamogeton*.

Photo (23). Turbulent flow created by breaching upstream dams.

Photo (24). Substrate scoured of Diatom growth by dam breaching.