

RIVER ROEBURN RESTORATION

Water in rivers is, if you like, a gift which the community higher in the watershed hands down to the communities lower on the river.

The society which acts as the bearer of such a gift should not try to plunder it, but should pass it down in a fit and cared-for state.

M.Kravcik



River Roeburn
at peace



Roadway after
6 mins rain
5/7/12

River Roeburn Restoration

Project overall aim;

To catch and slow the river water high in the catchment area to alter the River Roeburn from a spate – flash flood hydrology towards a steady more reliable flow.

Action 1;

To stabilise the small bare peat gullies near the top of the catchment. By building small check dams that will catch the sediment and be colonised with initially, *Eriophorum* – cotton grass and then with bilberry, heather and crossleaved heath.

This vegetation will protect the peat and help slow down the water flow.

Where these peat gullies have steep sides they may need re-profiling.





Wooden check dam collecting sediment.



Stone check dam



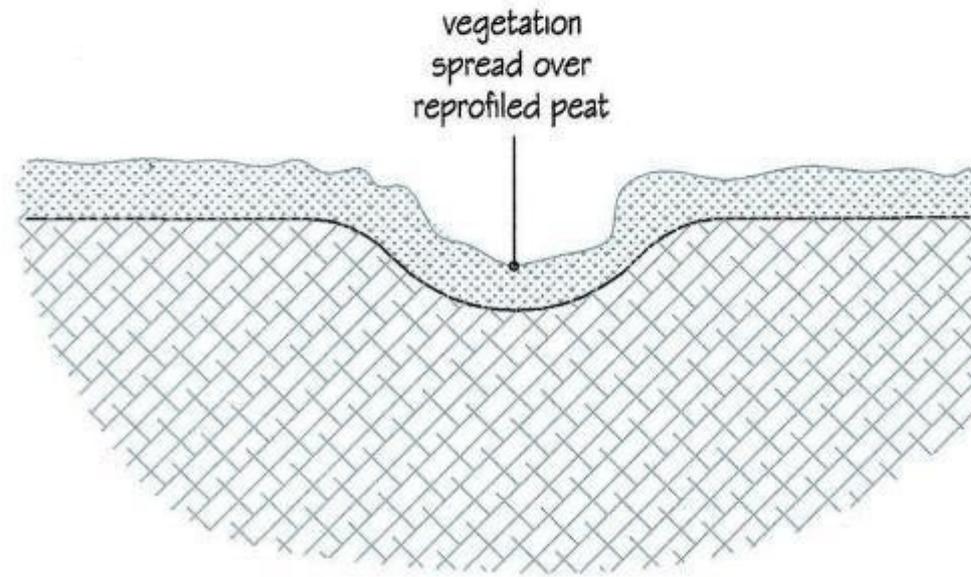
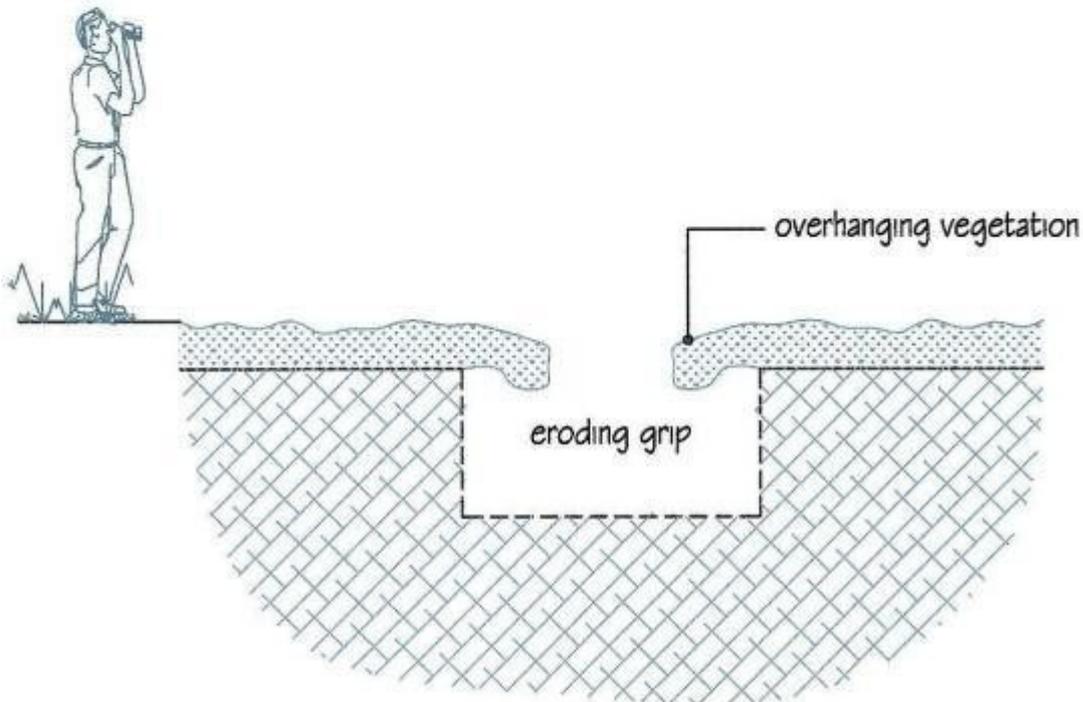
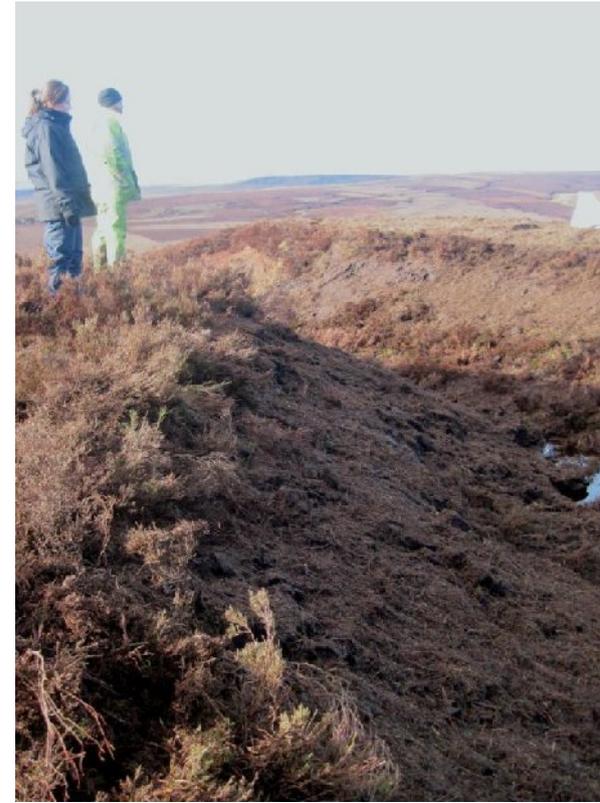
Cotton grass Eriophorum



Aim is to create vegetation cover on exposed peat. Examples from the Moors for the Future project in Peak District include peat cover with cotton grass, with bilberry and after using plastic check dam.

Where there are steep sided and overhanging
Edges to grips and small gullies, re-profiling will
Reduce the slope and allow re-vegetation. In addition
This will reduce the hazard of sheep getting stuck
In these areas.

Reprofiling in
Yorkshire



Action 2;

To stabilise vegetation in the highest catchment areas to slow the run off of storm water. Encouraging the development of blanket bog with dwarf shrubs and sphagnum species.



Eroding areas on Mallowdale pike may need some contour support such as laying brushwood along the contour.



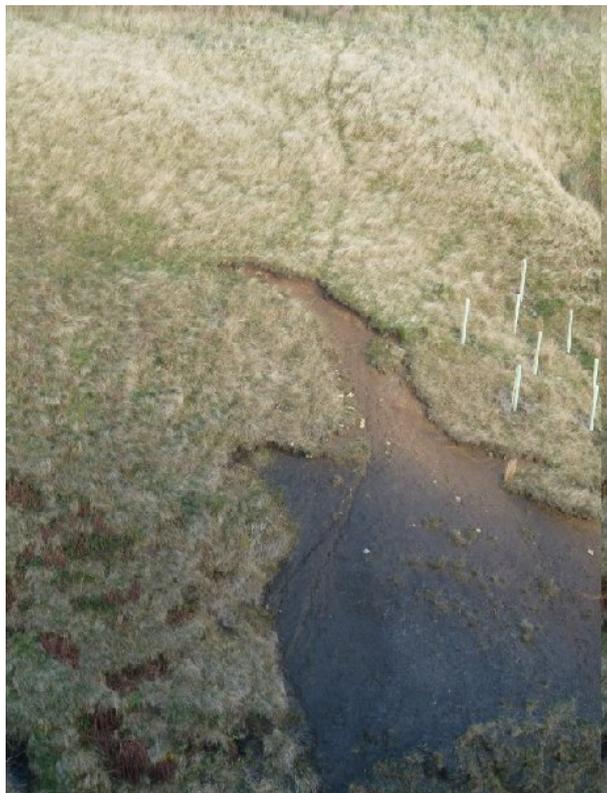
These vulnerable areas will need fencing to remove grazing until the vegetation stabilises.

Blanket bog developing on Whitmoor with low grazing pressure



Action 3;

Fencing unstable areas to remove grazing pressure until the land is restored.



Sheep tracks can initiate erosion



Sheep grazing on steep bare slopes contributes to continuing erosion

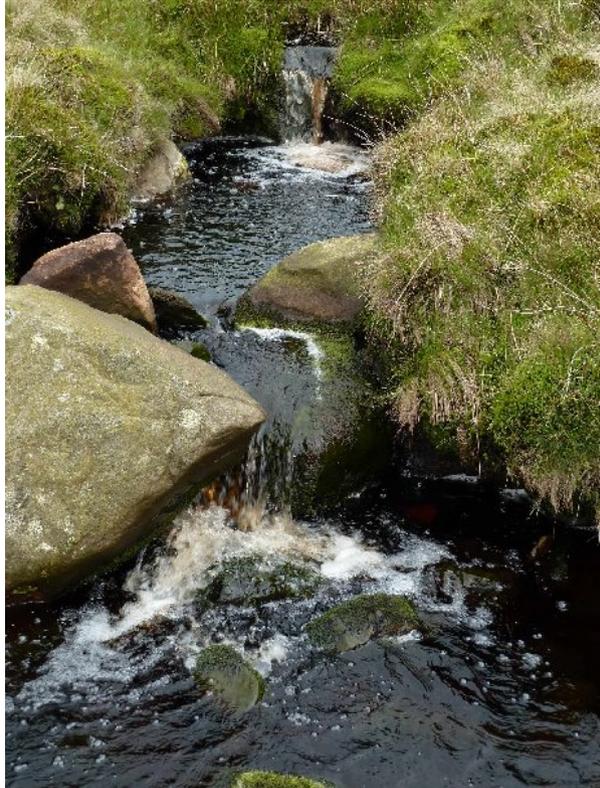
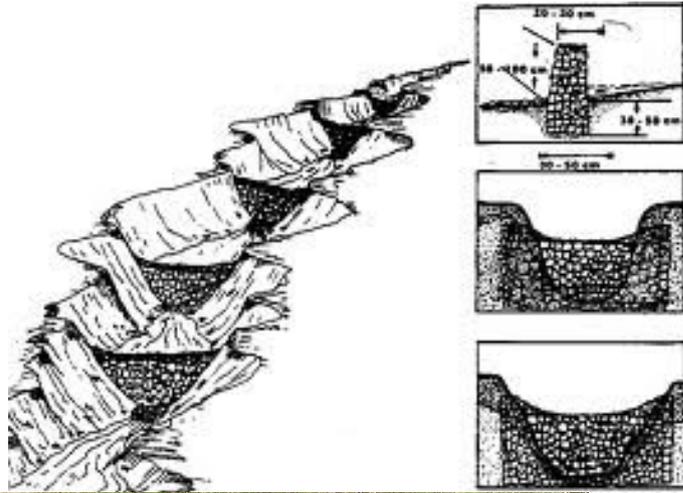
Fencing, where possible along the contour allows vegetation to recover



Action 4;

To slow down water flow in deep gully bottoms with check dams.

Check dams are stable leaky dams.



Natural check dam Mallowdale

Stone check Dam



Timber Check dam

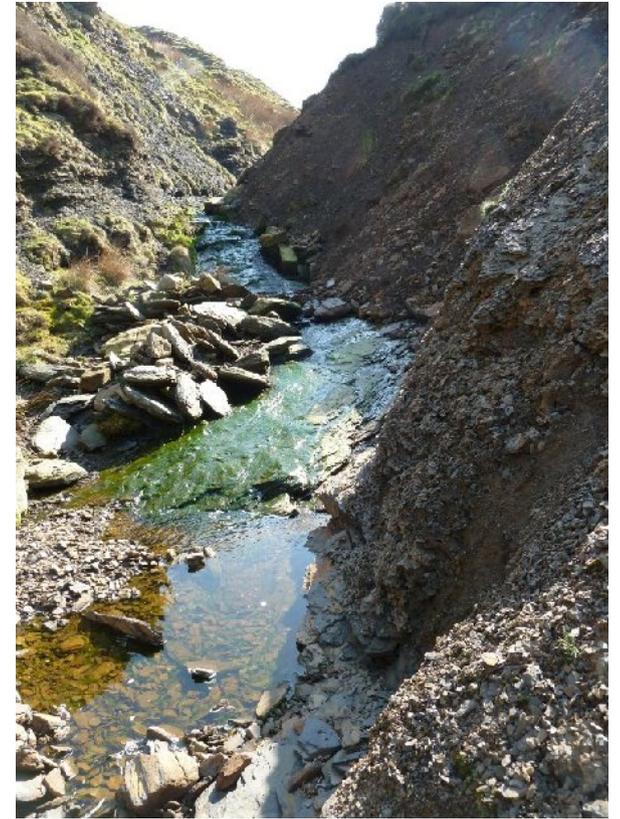


These check dams would be most effective made from stone, anchored well into the bank and will a lower spill area in the centre. The bottom of the higher dam needs to be at a similar level to the top of the dam below.

Steep sided gullies are caused by the water
Eroding and undercutting the slope. Some gullies
From Roeburndale are shown below.



Gullies in Colros
Beck Mallowdale



Warm Gill
Beck Gully
running off
Whitmoor



Action 4;

Try to re vegetate the gully sides, once the stream at the base has been stabilised. With steep sides planting seeds Alongside natural re-vegetation may be best.

Care needs to be taken not to create a heavy tree crop that may collapse and block the stream in the future.

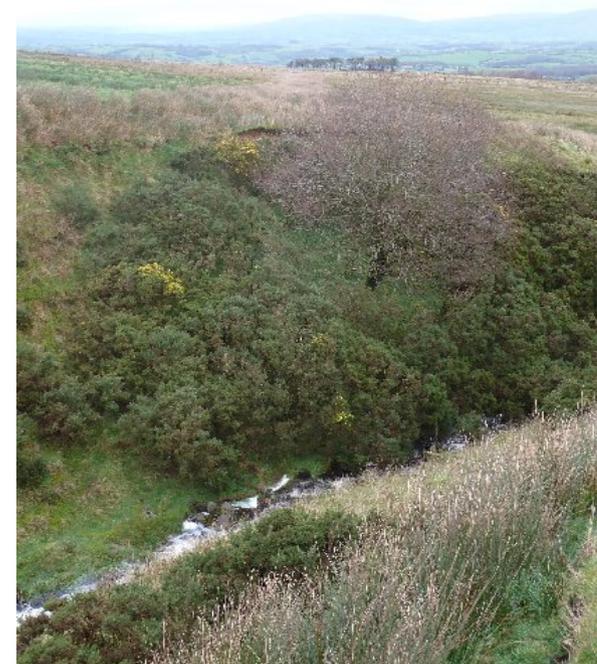


On less steep slopes
Planting trees such
as are alder, rowan,
birch, holly and oak.
These are
growing naturally on
Some of the
higher gully sides.



Tree planting in Warm Gill Beck.
To survive this needs the gully
bottom to be stabilized to
prevent undercutting and
subsequent Landslip.

Gorse has reclaimed
the eroded banks and
has protected the
young tree growth
from grazing on the
gill next to Back Farm



Action 5;

Protect the highest point where gullies begin, so that the erosion doesn't eat back the peat or substrate and extend the gully further upstream.



This is the top of Warm Gill Beck gully which is fairly stable. Photographs a year apart show some of the upper peat has fallen away. Once this is lost it cannot be replaced by nature.

Possibly a stone abutment could be made for the water to flow over rather than over the softer peat. The channel above here has steep sides and is about 0.8m deep, extending up for about another 50 Metres. This makes it a trap for weak sheep. Profiling this ditch and putting in small check dams would reduce the erosion. These check dams could be made from Rush (Juncus) rooted sods which would be available from re-profiling the ditch.

Action 6;

To divert and catch the excess flash flood water to hold it in the landscape. This will allow the water to infiltrate into the underground aquifers and be available to feed the deep spring cycle.

This is water that only appears with heavy rain



Ponds holding water on Whitmoor

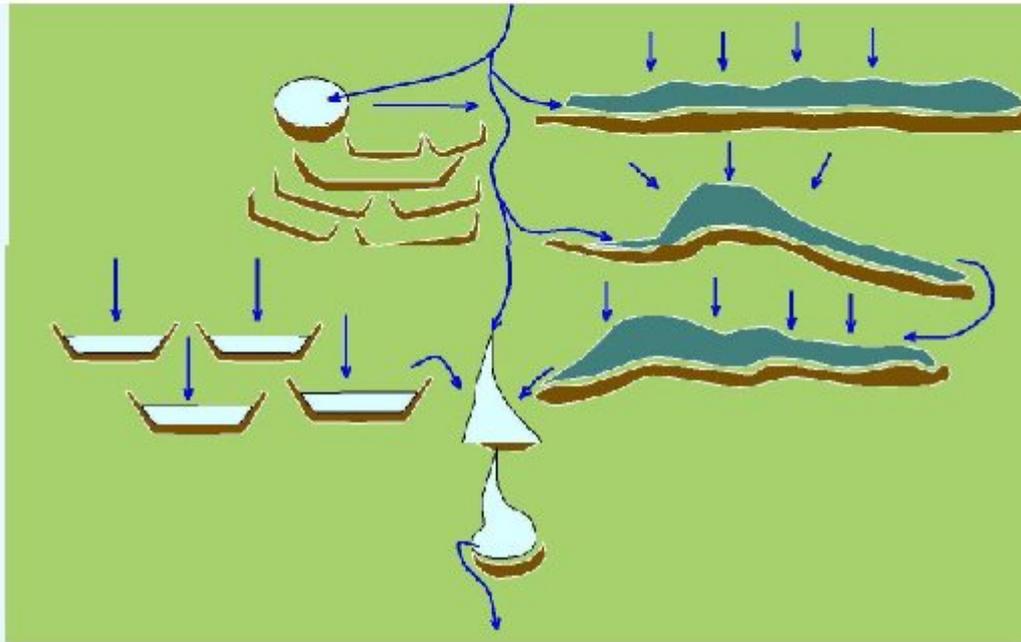


Any new ponds or other water retention features need to be carefully designed and located on stable land, so that they cannot fail creating more erosion.

In some places it might be possible to create contour swales (ditches that follow the contour) that catch water and take any excess into a pond or small lake.



Combination of different rainwater harvesting technologies



Contour swales and ponds away from the main stream can be created to catch excess flood water. Some of this water will infiltrate into the ground water and some will be released slowly back into the main stream.



Action 7;

The current river profile is fairly flat. This encourages rapid flow and bank erosion. Deepening the river profile by the careful placement of boulders in the river has been used by Otmar Grober in Austria. These funnel the water and create deeper channels away from the river banks. The waters energy is guided in and downwards, swirling sediment from the bottom and depositing it towards the river banks. As Otmar Grober seems to be the only expert using this technique, his advise would be needed to implement this action.



Action 8

In past times, maybe 500 years ago, some of the higher land in Roeburndale was covered in broadleaf woodland. This would have protected the ground from erosion, and would have held back the rainwater to give the River Roeburn a steady flow. There may be some areas where erosion is high where woodland could be re-established. Low slope ground high in the catchment would be best for this tree planting. Such woodland might contain oak, alder, rowan, birch and holly. (At the time of removal of livestock from many parts of Roeburndale for foot and mouth, many young oak trees reappeared on the fell land.)



Ancient tree remains
on Goodber Common.
Similar remains are evident
on Whitmoor.

Oak seedling on
whitmoor.



These actions will have multiple benefits, whose impact will only become evident when we step back and see The larger picture they contribute to.

It is up to us to make sure our rivers survive and thrive. Water is our most precious resource and it needs its own space. Otherwise our source of life might just disappear. Otmar Grober.

If we focus on each separate activity, It is easy to dismiss it by thinking “That won't do much”. To see the power of a step, we need to ask “ What is it part of?”

An action might seem inconsequential by itself. It adds to and interacts with other actions in ways that contribute to a much bigger picture of change.

J.Macy and C.Johnstone

The following section highlights the multiple benefits for the local Community from Roeburn restoration.

Benefits from Roeburn Restoration

Slower run off

*Aquifers
refilled*

Reduced erosion

*Increased potential
For water based
energy*

*Reduced sediment
Loss and discoloration*

*Reduced likelihood
of peat fires*

*Fish numbers
And diversity
increased*

*Increase
In wildlife*

*Natural
Springs
restored*

*Reduced
Pollution
Down river
And on beaches*

*Fishing
viable*

Education

*Climate and
Weather
moderated*

*Minimise
Flood damage
To Property*

*Livestock
marketing*



Benefit 1 **Reduced erosion**

Reduced erosion down river. Landslips and undercutting of banks should be reduced
This will benefit farmers down stream who are losing soil.

“A farmers wealth is in the soil. Don't lose it”.



River undercutting bank at Backsbottom.

Woodland landslide next to Back Farm.
Most of the wooded streams are eroding
and undercutting the banks



Roeburndale woods SSSI being undercut causing a landslide.

Reduced erosion and gully formation throughout Roeburndale.



Undercut fence

Roeburn Mill Cottages
Walkway undercut
5/7/12



Benefit 2 **Reduced sediment**

Reduced water discolouration and sediment loss from the upper catchment and the river banks further downstream. Included in these sediments are valuable soil nutrients.

These sediments use up oxygen in the river making it less able to clean any pollution reducing the rivers ability to support a rich aquatic life.



Benefit 3 **Slower run-off**

By protecting the ground surface and re-vegetating the land the water run-off is slower. Bare ground heats up and dries out. In a warm dry condition it throws water off without it sinking in. This is similar to water rushing off a hot stove surface.

Benefit 4 **Refilled aquifers**

By holding the water longer in the landscape it gives it more chance of infiltrating into the underground aquifers and into the soil structure. (The underground and soil water is hundreds of times larger than the water visible in lakes and rivers). This water is important for growing grass and the deeper water provides water for springs and boreholes.

“It is also paradoxical that soil partially saturated with water is capable of better absorbing more water than dried out soil. If precipitation falls on compacted and dried out soil, infiltration to deeper layers occurs only after a period of ten minutes or more. In the first minutes, however, the soil behaves like an impermeable surface. During extreme rains, there is a rapid runoff and concentration of rainwater to river beds. This same rainfall--- would be easily absorbed in land healthily saturated with water.” Kravcik.

Benefit 5 **Spring water**

Once the spring water is flowing regularly then small streams will not dry out. In recent years some side streams that have never been dry, have in recent years been empty of water for weeks. When this happens all the aquatic life dies. It may also remove areas important for fish spawning.

These springs are important for grazing livestock as they provide mineral rich water. Recent boreholes have been getting deeper indicating the depletion of our valuable underground water resources.

Benefit 6 **More diverse fish, larger numbers and size**

With a more stable water flow and less scouring of the river by flash floods, the successful spawning of brown and sea trout should improve. Leading eventually to restored fish stocks similar to those in the 1920,s.

The hope is that eventually eels and bullheads might re-establish in the river



Benefit 7 **Viable fishing**

Once the fish have returned then fishing would become a viable activity. This would give potential added income for farmers and landowners down the river.



Benefit 8 **Potential livestock marketing**

Restoring the river catchment will give opportunities for livestock marketing.

In Wales the Pontbren farmers group (a group of 10 neighbouring small farms located in the heart of the Welsh countryside) have restored their water catchment to bring otters back and have developed a marketing group based on their highest possible standards of environmental management, particularly around water management and slowing water runoff.



Benefit 9 **Reduced Pollution**

Reduced pollution down river and onto the beaches around Morecambe Bay.

With flash floods, animal manures are picked up from the land and washed into the river.

In Flash floods, the river water flow has horizontal rolling flow instead of the normal Longitudinal vortex flow down the river. With the horizontal rolling flow the manure does not get cleaned as it moves down the river and causes pollution problems (This is one of the prime reasons for setting up the Lower Lune Catchment Sensitive Area).

With a steady river flow and longitudinal vortices, the light harmful anaerobic bacteria get thrown to the outer edge of the vortex where they are killed by high levels of oxygen. Within a few hundred yards the river can be cleaned.



Longitudinal flow- Cleaning



Horizontal rolling flow
Polluting

Benefit 10 **Increase in Biodiversity.**

A steady flow of water in the river would benefit wildlife.

Birds like dippers would increase with less acid input from the peat.

Dragon flies and amphibians like newts, would make use of any water held in the landscape.

Otters would return with increased fish stocks.

The steady flow would enable the fresh water limpet to re establish in the side streams.



Benefit 11 **Reduced risk of peat fires**

More water in the soil and more moisture in the blanket bog will help to reduce the Risk of fires in very dry conditions. Fires that remove the top vegetation and get into the peat are very damaging to the long term stability of the upper catchment area. A fire in the 1940's is likely to have been the destabilising factor on Mallowdale Pike that Led to the flood disaster in 1967 down the valley.

Benefit 12 **Reduced flood damage to buildings and highways**

Reduced risk of flood damage down river. This damage can be to buildings – such as the Wray Flood, or to highways with flooding and undercutting roads.



Backsbottom farmhouse
Destroyed

Wray village Houses
lost



Benefit 13 **More stable potential for water power**

Increased potential for water power and water use further down the river.



More stable water flow
will make the Halton Hydro more viable.

Benefit 14 **Education**

Understanding how to honour and love your river will be very important in education of our younger generation. This project will help develop educational resources.

Potential wider benefit of **Climate moderation.**

M Kravick argues that this form of river restoration is vital for climate moderation. He has instigated similar work throughout Slovakia.

The upper catchment will hold more water. This will enable evaporation into the atmosphere in warm conditions. This has a moderating effect on temperature and weather and will protect the ground from overheating.

“a surface with no ability to evaporate water creates not only favorable conditions for the origin of extreme weather, but also exacerbates the effects of such weather.”

The weather effects will be both, local and towards the drier east side of the country. In addition a reduction in the loss of peat reduces the release of CO₂ and methane. These gases contribute to contribute to global warming.

“The draining of the land is like living on debts. Water falling from the large water cycle is like a state subsidy. It comes for free but not regularly, often to wrong recipients and in the wrong amounts. It sometimes brings more harm than good. To rely on it is risky because today it is here, but tomorrow it may not be.”

Draining does not specifically relate to farmers drainage of fields it is more that the whole catchment is losing water by fast run off. It isn't being held in the landscape, underground aquifers or the vegetation. Thus overall the catchment is depleting the amount of water over time. Reinstating the short water cycle where local evaporation helps to protect the land is important for our future.

For full details see M. Kravcik Water for the recovery of the climate – a new water paradigm. Available on the internet.