Building partnerships: integrated catchment management – promoting water quality, biodiversity, conservation and farm sustainability in the Northwest of the England

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Title Page

Long Title - Building partnerships – promoting water quality, biodiversity, and supporting farming in the Northwest of England.

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Abstract

Water is generally plentiful in the UK, however, there is an emerging water quality issue driven by agricultural intensification. Poor land management over generations has contributed to the degradation of upland peat deposits leading to discoloration of potable water and the loss of valuable habitats. Employing agri-environmental schemes operated by the UK Government and private capital one water company in the North West of England is achieving water quality gains as well as landscape, conservation and habitat benefit at the same time as supporting tenant farm incomes. We describe the pressures on the uplands and how innovative partnerships are achieving sustainable change.

Key words: peat, upland, restoration, agri-environmental, water

Words 102

Learning Outcomes

This case study examines an example of integrated catchment management involving collaboration between the private sector, governmental bodies and non-governmental organisations to achieve landscape scale conservation change. These disparate groups have come together to tackle multiple issues found in north-west of England water catchments. Whilst the overall aim is to improve the raw water quality the associated environmental, biodiversity and socio-economic benefit illustrates the benefit of promoting sustainable farming and the targeted employment of agri-environmental programmes.

Words 76

Introduction

The United Kingdom is a crowded isle. By necessity land has multiple uses, agriculture, forestry, conservation, recreation and the sourcing of water. It is the pressure on the latter from the former which has driven one water company to adopt a radical rethink of how it manages land and its relationship with its farming tenants and the wider conservation world.

United Utilities (UU) is the United Kingdom's largest listed water company. Operating in the north-west of England it provides water and waste water services to three counties and the urban areas of Greater Manchester and Merseyside, a combined population of around seven million people[1] (Figure one).

Over the last thirty years the cumulative impact of EU agricultural policies encouraging upland farmers to drain land, over stocking, air pollution, and climate change has negatively impacted the stability of the upland ecology and hydrological performance. This has led to a decrease in the raw water quality drawn from these upland catchments, in particular in relation to colour, taste and odour. The removal of this taint incurs additional treatment costs and power usage. Expanding a water treatment plant to meet increasingly demanding regulation and customer expectation can cost up to £200 million. Faced with this need to improve water quality, United Utilities turned to land management rather than a hard engineering solution to tackle the cause and effect of the issue.

SCAMP (Sustainable Catchment Management Project) is an integrated land management undertaking which combines ecosystem service provision from both the farming community and habitat management with wider socio-economic goals – farm incomes, and the provision of community access and engagement. The recognition by UU of the wider socio-economic elements and its engagement with conservation NGOs to develop this project is

[1] United Utilities (2016) Corporate Overview available from http://corporate.unitedutilities.com/united-utilities-business.aspx

an important development in expanding eco-system services. Without support of credible conservation NGOs like the Royal Society for the Protection of Birds, UU would have faced barriers as a corporate body in promoting and validating the wider public understanding of these activities.

Figure one here

The geography of the region.

The north-west of England is renowned as one of the wettest parts of the UK, with average rainfall around 810 mm per year (31.9 inches/year) compared to London which averages some 594 mm per year (23.4 inches/year)[2]. While the region has large metropolitan areas such as Liverpool and Manchester, much of the region is rural and is regarded as being of some of the highest quality landscapes in the country having two National Parks – the Peak District and The Lake District.. The landscape is very varied from the flat plain of Cheshire with its fertile soils in the south to the thin acidic soils of the uplands in Cumbria to the deep upland peat deposits in Lancashire and Derbyshire moorland bordering the Pennines; the rocky spine of northern England. . Peatlands are considered to be rarer than rainforests and form a unique eco-system. The peat deposits have been formed over thousands of years from partially decomposed plant matter, commonly sphagnum moss which has accumulated in a water saturated environment and in the absence of oxygen[3]. Agriculturally the grass species which dominate such environments such as sedges are tough and yield little energy for livestock so these landscapes have often been agriculturally improved through drainage and re-seeding to improve livestock production. In general they are best suited to extensive livestock grazing by sheep and beef cattle. It was the region's topography, which during the 18th Century enabled the development of the woollen and later the cotton spinning industry using water power, then coal to drive the looms in the mills. . Surrounding this industrial activity is a matrix of agricultural holdings which can generally be divided into two distinct types. The southern part of the region is dominated by dairy, , while the northern upland half is predominantly livestock farming – sheep and cattle. It is in this zone that UU own some 56,385 ha of upland farmland which they use as a catchment for the water supply. To enable water to be collected, stored and transported UU operates a series of 184 reservoirs across the region connected to 94 water treatment works and properties by 42,000Km of water pipes. UU's land holding includes some 17,500ha designated as Sites of Special Scientific Interest (SSSI). This affords them some of the highest conservation status in the UK. To further complicate the designation status,

[2] Meteorological Office (2016) How much does it rain in the UK available from http://www.metoffice.gov.uk/learning/rain/how-much-does-it-rain-in-the-uk

[3] Briggs, D. and Smithson, P. (1986) Fundamentals of Physical Geography, Routledge, Bristol

much of the SSSI area is further designated under European legislation as Special Protection Area (SPA) or Special Area of Conservation (SAC) which protects habitats and species[4].

Although UU was formed in 1995 (a merger of North West Water and a power company NORWEB), the company and its land holding has a much longer history. North West Water had been one of ten regional water companies created by the 1973 Water Act[5] which was privatised by the UK Government in 1989. Prior to this water had been supplied to the region by 24 independent water companies – mostly created in the Victorian era as water corporations and governed by the local councils. It was these local bodies which owned the land from which water was drawn to supply the populations. The land was managed through tenant farmers and over multiple generations the tenancy provided income and water to the local council. With the privatisation of the water industry in 1989 the tenancies passed to the private sector. The privatisation also initiated a greater level of regulation with the creation of the Environment Agency (formerly the National Rivers Authority) and the Drinking Water Inspectorate.

Since World War Two the upland catchment now managed by UU has suffered from increasing agricultural pressure. Declining farm incomes and the EU's Common Agricultural Policy – an agricultural subsidy system which encouraged greater stock numbers has led to changes to grassland composition, erosion and the loss of ground cover revealing large areas of bare peat. Attempts to improve the agricultural productivity of the uplands through drainage have also impacted the landscape, changing vegetation and extending grazing further up hills. The impact upon the peatlands has been extensive. While the physical impacts are visible to the naked eye, some of the most damaging impacts are invisible. Peat lands are huge carbon stores, indeed UK peatlands are estimated to store more carbon the all the forests in the UK and France. When peatlands are damaged they oxidise releasing this carbon back to the atmosphere contributing to climate change. Additionally, across the uplands there had been a loss of native trees, principally to the grazing by sheep.

For UU the degradation of the peatlands has bought other issues. As the peat degrades it colours the water giving it a brownish tinge. While the water is potable it does affect consumer satisfaction in the water and also limits its use in industrial processes where it can taint products. Since the 1990s the colour of the water drawn from the peatlands has got increasingly darker. This means the water has to undergo additional treatment. As the peatlands degrade not only does it damage the ecology of the SSSI it also exposes UU to potential prosecution. For a publically listed company with commitment to Corporate Social Responsibility (CSR) this would be a damaging occurrence.

[4]United Utilities (2016) Monitoring programme available from http://corporate.unitedutilities.com/cr-scamp-monitoring-programme.aspx

[5] The North West Water Authority Constitution Order 1973 Statutory Instruments (1973 No. 1287) London, HMSO

Bringing about Change

While UU is focussed on the supply of potable water it was changes to the CAP and the agricultural support regime which provided the opportunity to tackle both the degraded peat lands and the tainting of the water supply. In 1991 the Government introduced a pilot scheme called Countryside Stewardship[6] with the aim of improving the environmental value of English farmland. This scheme was expanded in 1996 with the roll out of an extended agri-environmental scheme across a wider range of landscapes which paid farmers for the production of non-farm environmental goods and supporting conservation. Environmental change was achieved by developing whole farm plans which considered how the farming enterprise could operate alongside conservation and sought to de-conflate issues. Farmers who entered into the scheme received payments for work they did and were 'contracted' to be in the scheme for a period of 10 years. In 2004 the scheme was split into two and renamed 'Environmental Stewardship' (ES) a five year agreement and the Higher Level Stewardship (HLS) which lasted 10 years. ES was a basic environmental management agreement while HLS demanded a greater level of environmental and conservation work which was recognised in higher payments. The average payment under a HLS agreement in England during the key period of SCAMP activity was around £19,000/ year per holding.

The second change came in 2003 with a change to the CAP system which sought to reduce the market distorting impact of subsidies in line with the Uruguayan round of World Trade Organisation (WTO) talks. This Single Farm Payment (SFP) decoupled the subsidy regime from production and linked payments to keeping land in good agricultural and environmental condition[7].

For UU and its tenants the SFP and ES scheme were opportunities to re-evaluate their relationship with the land and engage in long term and sustained change in land management for the benefit of uplands and peatlands while at the same time developing a catchment management approach to the land holding to benefit water quality. In addition for UU it would enable them to improve the SSSI condition and contribute to UK Biodiversity Action Plan (UKBAP) targets. The UK BAP was published in 1994, and was the UK Government's response to the Convention on Biological Diversity (CBD), signed in 1992 in Rio de Janeiro. In 2007 Conserving Biodiversity – the UK Approach was published which outlined the key species and habitats which required action to halt decline and promote recovery, this became the key driver for the conservation of biodiversity for each of the devolved nations of the UK[8].

[6] Countryside Stewardship (2015) available from https://www.gov.uk/government/collections/countryside-stewardship-get-paid-for-environmental-land-management

[7] European Commission(2013) CAP Reform – an explanation of the main elements available from http://europa.eu/rapid/press-release_MEMO-13-937_en.htm

[8] JNCC (2016) Country Biodiversity Strategies available from http://jncc.defra.gov.uk/page-5701

SCaMP – Integrated catchment management

The Sustainable Catchment Management Project (SCaMP) began in 2005. SCaMP 1 as it was known was focussed on two catchments in the Peak District and the Bowland area (Lancashire) (Figure 1). Both these areas had SSSIs in need of rehabilitation. SCaMP had three key objectives;

- Meet UK targets for SSSI condition
- Improve raw water quality
- Deliver UK Biodiversity Action Plan Targets[9]

Working with Partners

From the outset UU approached the development of SCaMP from an integrated manner. As a private company it could have simply worked with its tenant farmers to achieve change. However, this would possibly have had little traction with the tenants and may not have achieved its wider aims. In particular communicating the programme and results to UU's customers and the market may have been viewed with a degree of scepticism. From the outset UU built upon its relationship with the Royal Society for the Protection of Birds (RSPB)Founded in 1889 in Manchester as the Plumage League, the RSPB has now over 1 million members and is a large land owner and manager in its own right. As one of the oldest conservation charities it holds a distinct place in the public consciousness[10]. Within SCAMP they act as monitors, advisors and public communicators[11] For UU this relationship has clear advantages but it also has risks as the RSPB 'pulls no punches' when reporting on activities. In addition the partnership included the local councils, the Forestry Commission, Natural England (who are responsible for the protection of flora and fauna on behalf of the UK Government), the National Park authorities and the Moors for the Future partnership an NGO which works for moorland restoration and conservation. These groups bought expertise, contacts and resources to the project as well as important buy in from tenants, recreationists, conservationists and local residents. Most importantly it aided the accessing of agri-environmental financial support from the UK Government, to which UU added a further £22.3 million over the period 2005-15[9]

Achieving the vision

These objectives were to be achieved by undertaking three action pathways. The first was in relation to the wider estate management to rehabilitate the peatlands. This took the shape of 'grip blocking'. A 'grip' refers to the drainage channel system dug on the uplands in the 1960-80s. These channels were blocked by driving plastic corrugated sheeting down into the

[9] United Utilities (2016) SCaMP 1 and 2 available from http://corporate.unitedutilities.com/cr-scamp.aspx
[10] RSPB (2016) About the RSPB available from https://ww2.rspb.org.uk/about-the-rspb/
[11] RSPB (2015) Farming with nature at RSPB Haweswater available from https://www.rspb.org.uk/Images/HWR-0629-15-16%20Haweswater%20management%20plan%2016pp%20low%20res_tcm9-412269.pdf

channel, or using stones or bales of cut heather[12]. The result of this blocking is to slow the water flow and raise it to near surface level. This encourages the recolonization of sphagnum moss. The increased water availability also increases invertebrate numbers which provides food for grouse and wading birds such as curlew, snipe and lapwing. Additionally, to the re-wetting of the blanket bog, areas of bare peat were re-sown with heather (*Calluna vulgaris*) and native grass species including Sheep's fescue (*Festuca ovina*), Hard fescue (*Festuca ovina var. duriuscula*) and Wavy hair grass (*Deschampsia flexuosa*). The installation of fencing in these upland areas excluded grazing and recreational allowing them to re-establish vegetation and stabilise the peat[13]. For many who use the uplands recreationally, while they welcomed the restoration work, some found the restrictions difficult. Similarly within the tenant farming community the changes brought about by SCaMP have bought opportunities as well as challenges. One of the biggest challenges has been the de-stocking of the uplands. Over 2000 sheep have been removed and while farmers have been compensated for this ex-tensification by the agri-environmental programme it has changed the nature of what is being undertaken by farmers to a degree. They now have to adjust to being not only pastoralists but delivering eco-system services.

The second pathway was to improve the productivity and environmental management of the farms themselves. This work included new slurry stores to reduce pollution, fencing, and new water troughs and livestock accommodation for overwintering. These developments not only reduced pollution and pressure on the land, particularly in winter, but also improved stock handling and well-being.

The third pathway was aimed at enhancing, rehabilitating and extending habitats. The majority of this work focussed on planting native woodlands in stream side 'cloughs', a clough being a valley. Planting in these areas replaces trees lost progressively since the industrial revolution and while they create and extend habitat they also act as a natural barrier to flood water, slowing it down and promoting infiltration.

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In 2010 the SCaMP 2 project was initiated. In addition to existing works the project moved to create larger scale woodlands and scrub habitat alongside moorland restoration. Importantly for the tenants UU supported them in their application to the Higher Level Stewardship (HLS) scheme which sought to promote and deliver 'more active and environmentally beneficial management practices' and included capital works to farm buildings and structures.

By 2015 SCaMP 1 and 2 had;

[12] RSPB (2003) Grip Blocking Farming for wildlife, RSPB, Sandy, Beds
[13] Pilkington M. (2015) Restoration of Blanket bogs; flood risk reduction and other ecosystem benefits, Moors for the Future Partnership, Edale

- Planted over one million trees across nearly 600 hectares in the West Pennines and Lake District catchments
- Blocked over 130 km of drainage grips to restore peat hydrology and promote recovery of blanket bog habitats
- Enrolled ver 40 tenant farmers and commoners in agri-environment schemes
- Placed over 3,750 ha of deep peat moorland under restoration or maintenance through Higher Level Stewardship
- Placed over 2 square kilometres of bare peat under re-vegetation and restoration

In 2015 SCaMP entered a new phase. SCaMP 3 is a programme to establish drinking water safeguard zones (SZ) across the region between 2015-2020, focussing on areas where water quality is deteriorating due to land management practice in particular focussing on colour, algae and pesticides in surface waters; and nitrates, pathogens and solvents in ground waters (UU). SCaMP 3 also works with UU owned and privately owned land.

Has SCaMP made a difference?

Monitoring has been core to the SCaMP programme. Much of the work such as restoration of the bare peat and rewetting of bogs has been experimental and ground-breaking. The physical changes to the landscape have been quite distinct (Figure Two). Changes to vegetation and the greater availability of invertebrates have led to increased number of Curlew and Lapwing in particular. Chick survivability due to better nutrition may be a factor in this as well as improved cover from the elements and predators.

Figure Two here

However, as the sites are all used for potable water they all have gauging stations which allow pre and post activity to be evaluated. One of the key metrics relates to the levels of Dissolved Organic Carbon (DOC) from degraded peat. Considering the Goyt catchment where early work was undertaken to stabilise the peat and reduce the run off it is clear that the remedial work is having a demonstrable impact on DOC[14] (Table One).

	Total DOC loss per year	DOC loss kg/year/ hectare
September 2006- September 2007	69,562kg	92kg
September 2007- September 2008	49,590kg	66kg
September 2008- September 2009	39,491kg	52kg

Table One : DOC loss from Goyt catchment adapted from RSPB (2011)

[14] RSPB (2011) Sustainable Catchment Management Project (SCAMP) unpublished monitoring report, RSPB, Sandy, Beds.

Across the catchments changes have also been noted in turbidity, with work not only reducing the mean turbidity but also reducing the peaks caused by increased run off following storm events (Figure Three). Water is now being held in the catchment longer, moving more slowly through the land and so attenuating peak events (Figure Four). It can be concluded that SCaMP has succeeded in reducing the deterioration in raw water quality and as such has lessened the need for investment in additional water treatment.

Figure Three here

Figure Four here

SCaMP has also had an impact on farm incomes, UU's tenant farmers on average have gained an income of >£30k p.a. through improved access to environmental stewardship schemes. This is some £10k p.a. more than the average English HLS payment, largely due to the involvement of UU and partners in liaising and designing the projects at both holding and catchment level. Integration has allowed larger environmental and economic gains to be made, rather than individual farms applying. The improvement to farm buildings especially lambing conditions has reduced stock losses and contributed to improved prices for lamb and fleece. For the wider local economy there have also been gains as local suppliers and contractors have been used to carry out work which has also developed and retained specialist skills. For UU there is an added benefit the £20m is a fraction of the cost required to build or improve a water treatment plant. Additionally a broader view of SCAMPS's economic value can be considered as it has contributed to climate regulation, recreation and landscape, amenity, and biodiversity[15] all elements of UU's wider CSR agenda.

Conclusions

SCaMP serves not only as a model of integrated catchment management achieving landscape scale conservation benefit but also as a model of the value of eco-system services. In addition it has successfully bought together what on the face of it are disparate groups – united in a purpose but each achieving a desired individual outcome. Most of all it shows the value the private sector can gain working alongside NGOs and Government bodies to achieve a measurable positive outcome. However, given the Brexit vote of 2016 and the uncertainty of the continuation of agri-environmental payment system such approaches made need to seek alternative funding or re-address the nature of farming from

[15] Tinch, R. (2009) Socio- economic benefits of Natura 2000 – Case study of the ecosystem services provided by a sustainable catchment management programme in the UK uplands.

agricultural production to provision of ecosystem services, with profound implications for the nature of farming and farming communities.

Case Study Questions

- Is this approach to integrated catchment management applicable to other agricultural landscapes? Is it economically sustainable?

- If agri-environmental payments come to an end with Brexit, what other mechanisms can be adopted to achieve the goals of SCAMP?

- Does a move to environmental services fundamentally change the nature of farming and the farming community?

- What do you think of paying farmers to reduce stocking rates to achieve environmental goals?

- How much would you be willing to pay for eco-system services as a percentage of your food bill or tax? Should we pay farmers for such activity?

- Does the involvement of conservation NGOs make such programmes more acceptable and why?

- Do you think this approach should be adopted across areas of land not used for potable water supply? What advantages and disadvantages would it bring to the consumer and to the farmer?

Acknowledgements

I am indebted to Mr Glynn Haworth of the United Utilities - Water Resources Team for his assistance supply information for this case study and United Utilities for allowing reproduction of their material. I would also like to acknowledge the Harper Adams placement students who over the years have worked on SCaMP. Finally I would like to acknowledge the invaluable feedback from the two reviewers.

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Figure Legends

Figure One : Figure one : United Utilities Region, North West England map courtesy of United Utilities (2016)

Map shows the boundaries of the water supply region, the main cities supplied and the SCaMP catchment management project areas.

Figure Two : changes to the SCaMP landscape – image courtesy of United Utilities (2016)

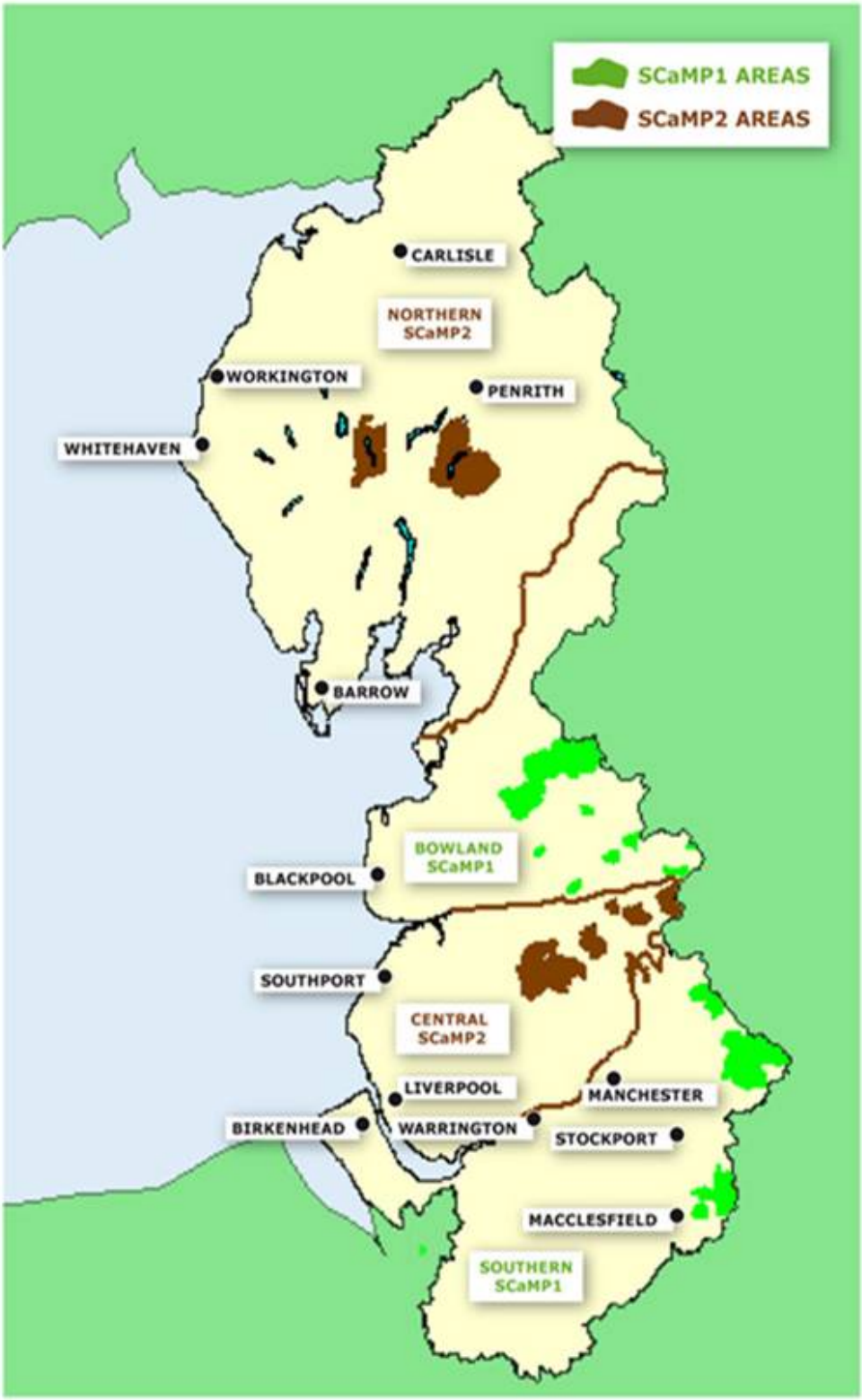
A montage of images from a fixed point showing the changes in vegetation in the Peak District project areas with remedial work undertaken to stabilise the peat and re-seed, and with the exclusion of livestock.

Figure Three : Fernlee Reservoir Turbidity source United Utilities (2016)

The graph shows the changes in turbidity in the reservoir over time, with a decrease in turbidity after SCaMP works have been undertaken. The repaired peatlands are holding the water longer and there is less erosion of organic matter.

Figure Four: Brennand Bield Field Dipwell 2 – Mean Daily Peat Water Table Depth (2007-2013) (Works undertaken in December 2008) Source United Utilities (2016)

The graph shows the increased retention of water in the peat after grip blocking in December 2008. June and July 2010 was one of the hottest and driest periods of the year which appears to have had an impact on water levels. August was in contrast a cool month with high rainfall levels.


SCaMP1 AREAS
SCaMP2 AREAS
CARLISLE
NORTHERN SCaMP2
WORKINGTON
PENRITH
WHITEHAVEN
BARROW
BOWLAND SCaMP1
BLACKPOOL
SOUTHPORT
CENTRAL SCaMP2
LIVERPOOL
MANCHESTER
BIRKENHEAD
WARRINGTON
STOCKPORT
MACCLESFIELD
SOUTHERN SCaMP1


May 2006
Aug 2009
Aug 2011
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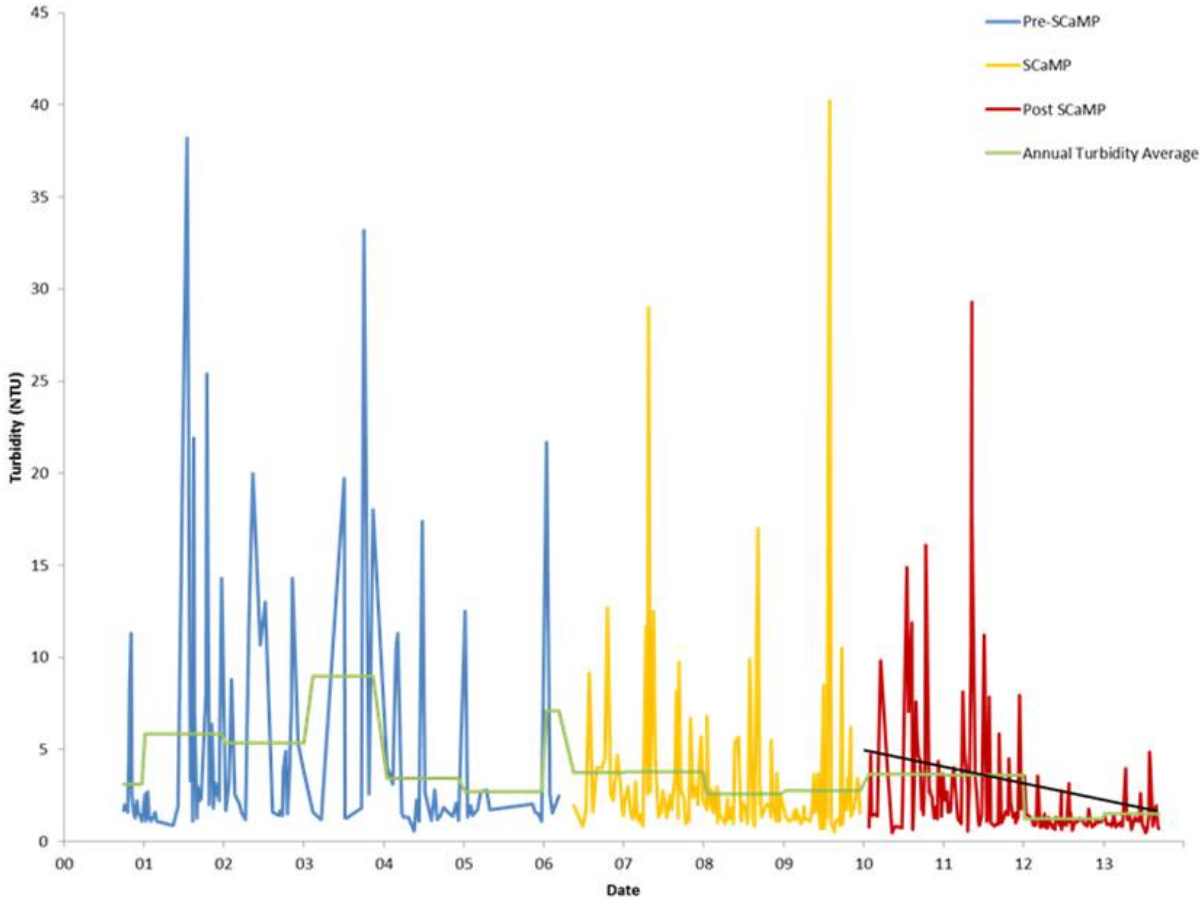
Pre-SCaMP
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Annual Turbidity Average
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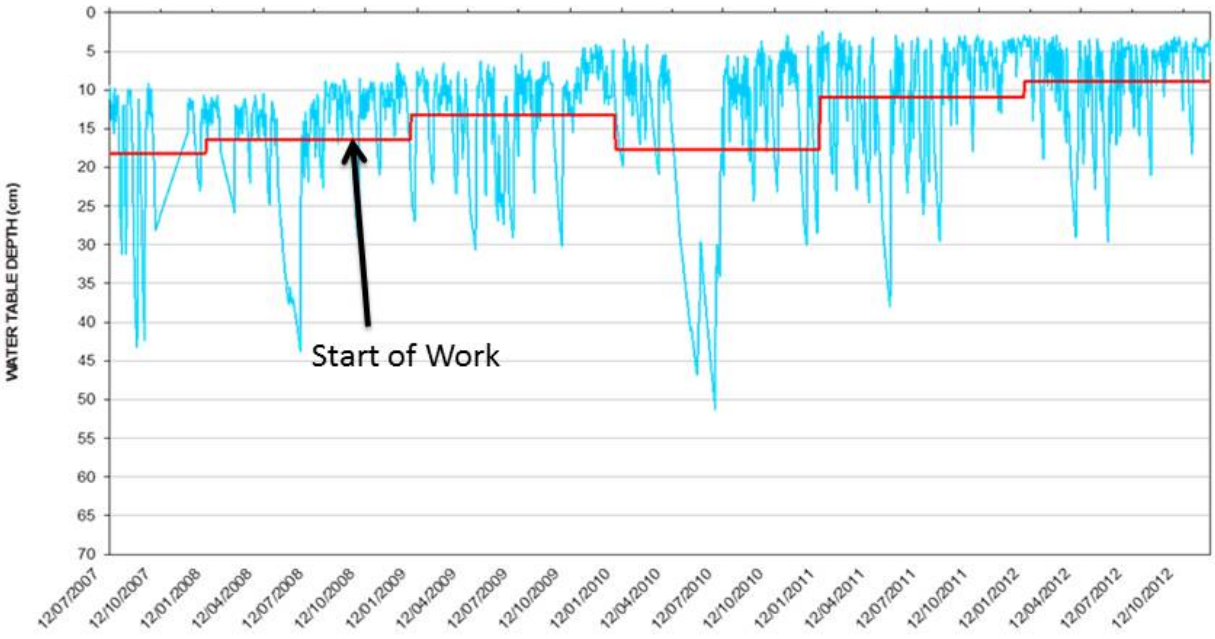
WATER TABLE DEPTH (cm)
0
5
10
15
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35
40
45
50
55
60
65
70
Start of Work
12/07/2007
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