



WWT Wetlands for life

A Wetland Futures Conference

Bridging the conservation gap between
freshwater, saltwater & transitional wetlands

A Summary of Proceedings



Kindly sponsored by National Trust, Frog Environmental and OTT Hydrometry



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Wetland Futures Conference 14th/15th October 2015

Bridging the conservation gap between freshwater, saltwater & transitional wetlands

An introduction

Wetlands are beautiful and inspiring places, important for wildlife and people. They can store floodwaters, control erosion, provide us with clean water, influence the climate, and provide food, medicines, and building materials, all of which can be assigned some kind of value.

[The National Ecosystem Assessment](#) (NEA) economics analysis suggests that the aggregate annual benefits for UK wetlands amount to £2,531million - £5,734million depending on assumptions. It is much more difficult to assign a value to the rich diversity of wildlife dependent on them. Wetlands are also important to human health providing a resource for recreation and tourism, physical and mental health benefits.

Although wetlands were once common in the English landscape, only about 10% of the area present 1,000 years ago remains due to years of drainage, development and pollution. Our impoverished and fragmented wetlands, and the wildlife they support, are struggling to survive just as we are beginning to understand how vital they will be in helping people and wildlife adapt to an uncertain future.

Wetland Futures aims to improve conservation, creation and protection of wetlands and wildlife through increased communication across sectors and providing a safe space for discussion and sharing of best practice and knowledge, specifically around multiple benefits.

Wetland Futures focuses on the conservation of wetlands in their broadest sense, from ephemeral ponds and wet meadows to lakes, rivers and estuaries, constructed and natural, in urban and rural landscapes. We want to put in place practical ideas that will help deliver healthy wetlands for people and wildlife in the long term.

Climate change raises sea levels, pushes salt water inland and changes the nature of freshwater habitats. At the same time, land management, farming practices and erratic weather increases pollution in our waterways, which eventually ends up in marine habitats. Action on saltwater and freshwater habitats is completely separate, despite this dynamic interaction between the two. A joined up, whole catchment, source-to-sea approach to decision making could save money and protect our natural heritage.

The aims of the conference were:

- To raise awareness of the lack of join up between freshwater, transitional and marine policy and conservation and discuss the problem and solutions.
- To consider why there are gaps in the current policy and management framework and discuss how these can be bridged.
- To consider the latest research, results and experience from larger scale landscape projects and explore opportunities for wetland creation and restoration and frameworks and funding mechanisms to facilitate this.
- To develop the case for a “source to sea” approach to policy and management and a strategy for engaging the right people to achieve a holistic framework.

The Presentations

Martin Harper, RSPB – Conference Chair podcast

In October 2015 I spent a couple of days in the home of the Quakers in Birmingham chairing the 2015 Wetlands Futures conference organised by WWT. It was hugely enjoyable and instructive. And while this meant I was unable to participate in DEFRA's launch of its big conversation about the promised 25 year plan for the environment, much of what we discussed was apposite.

The focus of our conference was on how to improve the way in which we plan, deliver and join up action to improve our freshwater and marine environments (and the bit in between). A series of presentations covered the parlous state of these wet and salty ecosystems, the growing pressures they face (especially from nutrient pollution, climate change and invasive non-native species) and the plethora of landscape/seascape initiatives which are trying to make things better (from the Severn to the Thames, from the Broads to Poole Harbour and from Steart to Medmerry and Wallasea).

A summary of these talks was provided rather brilliantly in illustrative form by one of the delegates, Carlos Abrahams. As Debbie Pain, Director of Conservation at WWT drew together the conclusions of the event it struck me how well they chimed with the ten point plan that we had produced in our Response for Nature report. I hope that DEFRA folk responsible for our wet and salty environment have read our report because...

...we need ***an inspiring vision for nature***. This means governments need to be honest about the scale of the environmental challenge and find creative ways to inspire action. Professor Penny Johns said that when it came to dealing with nutrient pollution, we were the best in the world. Wouldn't it be nice if within 10 years the UK is no longer in, say, the top 20% of nutrient polluting countries?

...we should ***set goals for nature and natural capital*** and these must include challenging goals to achieve good ecological condition/potential of all Water Framework Directive waterbodies.

...we should ***defend and implement the laws that conserve nature***, including full implementation of the EU Invasive Alien Species Regulation, and develop a list of problem species for which action must be taken.

...we should ***deliver a coherent ecological network on land and at sea***. We may want to go further and find ways to allow us to join up our work across the whole of an estuary rather than have separate approaches on land, at the coast and in the marine environment.

...we should ***continue to safeguard species*** and be prepared to intervene when fragmented landscapes mean species will be doomed unless we help them colonise new areas. The successful translocation of the Fen Raft Spider in the Broads was given as an example.

...we should ***provide smarter financial instruments*** to ensure that polluters pay for nutrient pollution and use funds to , to restore wetlands, ensure appropriate (more frequent) levels of monitoring and to support innovative schemes like nutrient offsetting. In addition we must use agri-environment funds in a smarter way across landscapes to deliver all the things we want, especially for water and wildlife.

...we should **develop greener institutions and embed nature across Government**. This may even mean much closer working between some agencies such as plant and animal health and those working to tackle invasive non-native species.

...we should **set five-year milestones with accountability to Parliament**. These could include milestones for the delivery of a UK ecological network of connected sites from 'source to sea' as well for the restoration of intertidal areas that can deliver on multiple fronts (carbon sequestration, fisheries, water quality, reduce flood risk etc.).

...we should **support people working together for nature** and this may mean we need to better integrate the existing coastal and catchment networks to deliver an integrated restorative approach to the management of whole water catchments – from source to sea.

...and finally, we should **improve people's connection to nature** – the wet and salty bits of our islands are some of the most inspiring places to visit. They are good for our health and lift our spirits. As the Quakers tell us, 'Spirituality is part of who we are, it is part of being human'.

So, it's time I visited a wetland near the coast...



Saltmarsh ponds. Copyright 2016 Graham Hann / WWT. All rights reserved

Professor Brian Moss, University of Liverpool

Opening Presentation - From here to eternity: all things are connected.

The arts and humanities can sometimes express important truths more succinctly than the sciences. *'From here to eternity'* carries the message that there are fundamental ecological principles, governed by the rules of chemistry and physics, which are unavoidable. *'All things are connected'* illustrates the fundamental importance of an intact biodiversity in maintaining the essential cycles of water and elements on which all organisms depend. In contrast, policy is an ephemeral thing, the propaganda of the current management. In using it to try to avoid the fundamental rules, we condemn ourselves to ultimate decimation. By taking cognisance of the fundamentals, no matter what inconvenient truths they may embrace, we can turn from being the most aggressive invasive species that evolution has ever produced, to a constructive cog in an eternal machine.

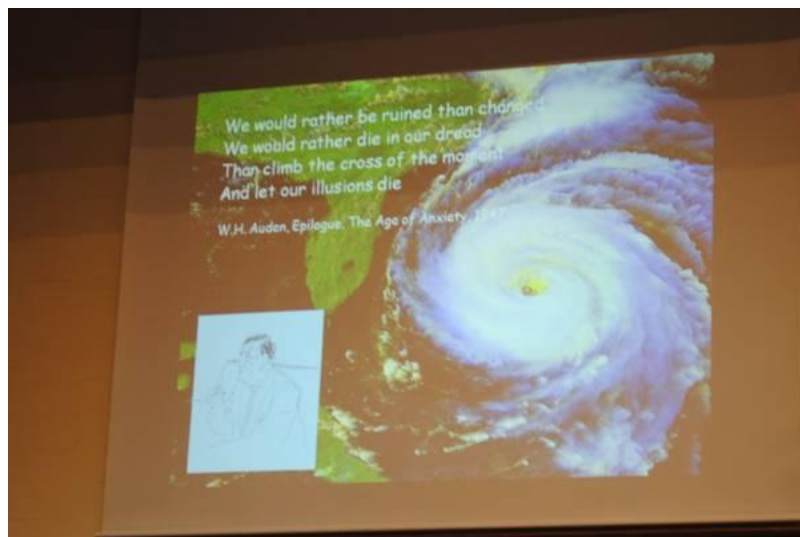


If there is a discontinuity in the operation of policy concerning the connections between freshwaters and the ocean (and perhaps more importantly, if one can assign relative importance to absolutes, between the aquatic systems and the land), it is not for want of evidence that these connections exist, where they have not been disrupted by human exploitation. Energy is processed as carbon compounds, are moved and metabolised from the land through freshwaters to the estuaries and ocean. Scarce key nutrients, like the compounds of nitrogen and phosphorus, are efficiently recycled within the land systems so that production in the waters draining them is strongly limited, but short circuits involving migratory fish and birds, and the movements of large herds of mammals, formerly compensated for this parsimony. Clearance of natural vegetation results in major leakages of these nutrients because agriculture has no recycling mechanisms that are even modestly efficient. Once land is cleared, eutrophication is inevitable and only minimally controllable.

We do not appreciate these connections because in Europe, and particularly in the UK, we have disrupted continuity through five thousand years of clearance and enclosure, drainage and damming, pollution and manipulation. Our early conservationists formulated their ideas and policies from within a bounded system and left us with a tradition of disconnected thinking. We attempt to manage the unmanageable in tiny nature reserves that have lost

most of their fundamental structure and features. Our response is a limited gardening and zoo-keeping that is laudable but harmless, inoffensive, uncontroversial, and diversionary. Our world is dominated by power structures that seek immediate gain through exploitation, without paying the costs of what they myopically hope is a free lunch. Virtually none of 196 world leaders has any background in ecology and environment; most come from business, the financial sector, law, politics, the military and hard engineering. The Boards and Trustees of most of our governmental and non-governmental conservation and environmental organisations are planted from the same soil. Our present boundary approach to conservation suits them very well.

But fundamentals cannot be ignored forever. Our current climate-change problems are pervasive. To stop the global temperature rising we must accommodate an excess in emissions of around 4.2 gigatonnes of carbon per year, from a total emission of 9.2. There is little expectation that this will be achieved by reduction in emissions and thinking has turned to geoengineering, with as yet not invented, untested or potentially very dangerous global interventions in the climate: a dangerous treatment of symptom rather than cause. But we have the solution in the 70% of biomes that we have modified and destroyed for settlement and agriculture. Natural biomes, and particularly wetlands, if they are intact, store carbon very efficiently. They also offer many other true ecosystem services that we have lost. We would need to change the land use for about one third of current agricultural land to create enough carbon storage, if we are unable to reduce carbon emissions very significantly. The implications are considerable for governance, land use and ownership, food security, diet and health and the problems have to be tackled collectively. Isolated tweaking of policies will not work. Climate change changes everything. The main losers to this approach will be a minority in the existing power bases, and in the short term. The winners will be the majority of the world's population in perpetuity. What stops us is lack of courage and our biological nature as an invasive species. As W.H. Auden perceptively wrote in two beautiful, alliterative sentences: *'We would rather be ruined than changed. We would rather die in our dread than climb the cross of the moment and let our illusions die'*.



Dr. Marco Boeri, Lecturer in Environmental Economics, Queen's University of Belfast

Cultural benefits of coastal wetlands

I fully agree with the previous talk: if we do not consider the fundamental rules of our ecosystems we will condemn ourselves to ultimate decimation. I also agree on the fact that we cannot expect conservation of coastal wetlands to be based solely on economic interests and/or valuations. We do need to change the way we think and act to create the sort of revolution needed in the management of the coastal resources to allow wetland to be intact and efficiently store carbon; to restore a third of the UK coastal wetland would indeed have major implications in terms of **governance, land use and ownership, food security, diet and health**, and these may heavily impact on our lifestyle.

As an economist, I have an explanation to the sentences by Auden cited by Professor Moss: individuals act following their utility, and this is often focussed on the present: we prefer to keep our lifestyle rather than to give up our goods and services (which create utility now) to preserve ecosystem services (which create less utility now, but ultimately more for a long time in the future). This might seem an incorrect choice in terms of our preservation, but it appears to be our choice in everyday life. I agree on the fact that an economic valuation, based on utility models and discounting benefit from the future, is not enough to value the conservation of our environment, and I am trying to explore other solutions as proposed by Kenter et al. (2015). However, I also believe that a discussion on those issues can start from a well done economic and ecological valuation. So, why do we need to highlight value and stress on cultural benefit? Because we must avoid only considering the benefit of activities that threaten the existence of coastal wetlands such as tourism, farming, housing development...

The Water Framework Directive gave the real opportunity to change something, but then other interests took over and most of the changes that in theory could happen did not take place. Within the [CBESS project](#) salt marsh and mudflat ecosystem services are considered. Coastal Biodiversity & Ecosystem Service Sustainability (CBESS) focuses on the ecosystem services from cultural benefits including human well-being, linked to health, social relations, material for a good life and security (Millennium Ecosystem Assessment 2005). The ecosystem services provided by salt marsh are many: wave attenuation, habitat provision, recreation (e.g. wildfowling, bird watching), fish nursery, carbon sequestration, sink for nutrients and pollutants... as well as the production of high value salt marsh lamb. CBESS is mostly focused on recreation along the Essex coast and in Morecambe Bay. Our strategy is to collect information from the general public, main stakeholders and experts on benefits from conservation of coastal wetlands and its biodiversity. We are then going to compare across different types of benefits and different types of respondents. Most of the work I personally will undertake will be based on the concept of Total Economic Value (Use and Non-Use values)(TEV), looking mainly at bird biodiversity.

We will try to integrate an experiment on use value and non-use value of salt marsh and mudflat (decay effect on non-use values). We will use different approaches: travel cost for recreation; contingent valuation focussing on managed realignment; coastal housing development, pollution and provision of infrastructure to allow people to get close to coastal wildlife; and a discrete choice experiment using bird biodiversity (in terms of number of types

and individual birds, rarity and presence of wildlife spectacles) to understand the cultural value of biodiversity. We will include a cost to understand benefits from each attribute.

The reason why most of the studies focus on recreation is that this is the most evident of the benefits that humans can get from the environment and relatively easily valued in monetary terms. Indeed, how do we include aesthetic and landscape? Health? Education? Is TEV enough? What are the risks and benefits? We need a different method of valuation.

A good paper on how to value ecosystems (Kenter et al. 2015) shows that the current framework is not enough. We need to consider different dimensions of value. We need to consider the type of elicitation process, the value provider, the concept of value investigated, the intention and the scale. There is still a lot of work to be done to address the valuation of environmental benefits in this way and we need inputs from interdisciplinary work. It is an exciting moment as there is definitely space for a good research agenda and contributions from different subjects and expertise are needed. Hopefully discussion in events like this one will enable us to take up the challenge and make a step further in finding a solution.

Reference:

Kenter, J.O, O'Brien, L., Hockley, N., Ravenscroft. N., Fazey, I., Irvine, K.N., Reed, M.S., Christie, M., Brady, E., Bryce, R., Church, A., Cooper, N., Davies, A., Evely, A., Everard, M., Fish, R., Fisher, J.A., Jobstvogt, N., Molloy, C., Orchard-Webb, C., Ranger, S., Ryan, M., Watson, V., Williams, S. (2015) What are shared and social values of ecosystems?, Ecological Economics, Volume 111, Pages 86-99.



Nutrient flux to inland and coastal waters: nature, origins and impacts

Nitrogen (N) flux to waters is increasing worldwide. Despite significant reductions in fertiliser use across much of Europe and reductions in atmospheric N deposition rates in many areas, surface water concentrations have hardly decreased since the 1980s and in some catchments an increase is reported. A rising trend in Dissolved Organic Carbon (DOC) and Nitrogen (DON) flux to upland temperate and boreal freshwaters and in enclosed seas such as the Baltic is also widely reported. Although reductions in phosphorus (P) flux to waters from water treatment facilities are recorded across Europe, in rural catchments and outside Europe P flux continues to increase. In rapidly developing areas of the world N, P and Carbon flux to coastal waters are rising even more rapidly.

Impacts on ecosystem health are extensive and undesirable in inland and coastal waters, requiring action to bring nutrient enrichment under control. The scale of the challenge in UK waters is substantial, given many decades of population expansion and intensification of food production in the British landscape. This raises complex questions regarding the specific sources of this enrichment within the landscape and therefore the key foci for management intervention and policy direction. This presentation addressed these issues, using evidence from the [DEFRA Demonstration Test Catchments programme](#), and the NERC funded [DOMAINE programme](#). Key conclusions included the following:

1. The scale of the nutrient enrichment problem in UK inland and coastal waters is greater than previously thought
2. Mitigation efforts focused on '*limiting*' nutrients, '*bioavailable*' nutrient fractions and '*ecologically relevant loading*' are flawed
3. Planned measures to tackle nutrient pollution do not go far enough
4. Response times to mitigation efforts will vary, ranging from weeks to decades

Controlling nutrient enrichment impacts in inland and coastal waters requires a holistic and joined-up approach if stable, improved ecological health is to be attained.

Fiona Bowles, Chair of Poole Harbour Catchment Initiative

Reversing nutrient levels in Poole Harbour- from aquifer to avocets

The Poole Harbour Catchment Initiative, developed from the Frome & Piddle Catchment DEFRA pilot, was built on the strong ethos of partnership work in this heavily protected area of Dorset. The catchment plan highlights key issues with nutrients - nitrogen, phosphorus and sediment - which arise from the largely rural catchments of the two main chalk rivers that feed Poole Harbour. Rising nitrate trends in the chalk aquifers can be seen since the 1960's and this has led to increased cost of treatment and reduced resources for public water supply.

Through increasing algal coverage of the mudflats this nitrogen has also led to failure of favourable condition targets for the Poole Harbour Special Protection Area (SPA), resulting in an objection under the Habitats Directive to further built development. Following provision of additional nitrogen removal at the Poole Sewage Treatment Works, the primary source of nitrogen from freshwater is currently from diffuse sources, primarily loss from farming activities.

A strategic plan for nitrogen reduction via nitrate neutral development and farming measures was developed by the Environment Agency, Natural England, Local Authorities and Wessex Water to achieve favourable condition in Poole Harbour. One of the challenges is that in this aquifer fed system, the legacy of nitrogen will take some years to clear, even though use of chemical nitrate has reduced anyway due to its high cost. So in tandem with the strategy, the catchment initiative has supported a farmer led agriculture group to help implement the changes needed.

The agriculture group is made up of farmers and their industry representatives who can provide pragmatic help in agreeing how to achieve the reduction targets. They have been frustrated by the rising tide of nutrient plans within the catchment, each requiring consultation. There are at least eight regulatory plans for nutrients in Dorset, in addition to the Wessex Water programmes and there are still some debates over the provenance of nitrogen data and targets. However, there is agreement between the regulators and the farming industry over the direction of travel that is needed and having considered the agricultural measures available, some members of the agriculture group are now trialling cover crops. These hold nitrogen in situ, minimising its loss to the aquifer over winter.

The catchment initiative has improved delivery of advice by the agri-environment advisors, including Catchment Sensitive Farming, Farming and Wildlife Advisory Group, South West and Wessex Water, who are now sharing the same messages but allowing farmers choice in who they get help from. This successful new cooperation was demonstrated in a recent jointly hosted forum on DEFRA payments which attracted a full house of farmers.

In prioritising the measures needed to meet the catchment targets, partners have looked at the wider benefits of actions and there has been greater support for measures which deliver against several targets, such as changes in land use, rather than those that deliver only one, like sewage treatment to reduce nitrogen or phosphate. So the future increases in sewerage input of nitrogen will be offset by funding further land use measures in a pilot trial by Wessex Water, in addition to their existing programme of catchment management advice around drinking water sources to avoid nitrogen treatment.

The County Council Highways Flooding team are also piloting land use measures to see whether ditch clearance costs and flood risk can be reduced by removing sediment laden run off. There continues to be a tension between the need for food production and measures such as replacing arable crops with woodland, which are more effective but less popular. Woodland can also offer biodiversity and flooding advantages, especially wet woodland. Green energy schemes for solar farms reduce nutrient and CO2 emissions, whereas those for biomass plants, particularly maize in the Frome valley, increase the potential for diffuse pollution.

Looking forward, there are some ethical issues to resolve about where best practice stops and where payments for offsetting should start for farming measures and how the measures agreed are guaranteed into the future. Implementation planning needs to consider not only the delivery of measures and monitoring of their success but also an accounting system for reductions against the targets set for the different sectors. A broker such as the Pembroke Eco Bank may be needed. Whilst reducing nutrient loss would initially seem to be self funding, new economic mechanisms are needed to fund significant land use change and mitigation if we are to approach more natural levels of nutrients or resolve historic flood protection and river channel modifications. The catchment partnership offers a great opportunity to link businesses, landowners and river users locally, whilst we continue to work nationally on common problems and solutions.

For more information see [catchment management](#)

Dr. Matt Simpson and Tim McGrath, Wildfowl & Wetlands Trust (WWT) and Consultancy

Wetlands within a landscape approach to improving downstream and coastal water quality

Significant improvements over the past few decades have occurred particularly in tackling point source water pollution, yet, diffuse pollution from multiple sources continues. For example, faecal pathogens, nitrogen, phosphates, pesticides from agriculture and polycyclic aromatic hydrocarbons and heavy metals from road runoff. These pollutants continue to degrade freshwater and coastal systems. Wetlands in the form of constructed wetlands, sustainable drainage and habitat restoration projects can be used within a landscape approach to treat diffuse and point source pollution.

Wetland restoration and creation also provides a wider contribution to achieving 'good ecological status' under the Water Framework Directive by restoring ecological, geomorphological and hydrological functioning. Wetlands deliver a range of ecosystem services providing additional benefits at a local and landscape scale such as flood attenuation, carbon sequestration, increased biodiversity and public recreation and amenity spaces. Case studies¹ presented at various scales from agricultural runoff treatment systems to retrofitting of sustainable drainage systems (SuDS) into schools to riverine floodplain restoration, demonstrate how designs undertaken by WWT Consulting have

¹ Examples of case studies can be found at <http://www.wwtconsulting.co.uk/projects/>

achieved these additional benefits, on top of water quality improvements, in both a rural and urban context.

WWT Steart Marshes – a landscape scale Working Wetland



Steart Wetlands, Copyright Sacha Dench / WWT

Having been tasked with compensating for the loss of internationally important intertidal habitats throughout the Severn Estuary, the Environment Agency identified the Steart Peninsula as an opportunity to create 500 hectares of intertidal and freshwater wetland habitats whilst reducing coastal flood risk. As partners the WWT saw this not only as a landscape scale exemplar of wetland creation but also as place where multiple wetland functions could be practically demonstrated and directly interpreted to people.

A living natural flood defence has been created which also captures hundreds of tonnes of carbon each year - a working landscape underpinned by extensive grazing over 300 hectares of new salt marsh habitat, 150 hectares of freshwater wetlands designed to attenuate flood waters work alongside redesigned drainage channels that allow greater storage capacity reducing fluvial flood risk to local properties. SuDS and constructed wetlands feature across the site and ongoing research work is being applied to help us understand the benefits of these features in improvements to both water quality from diffuse pollution upstream within the catchment and the health and wellbeing of visitors and local communities.

As site managers WWT will continue to celebrate the successes of Steart Marshes and look at ways to prove that multifunctional wetlands can not only benefit a wide range of communities but also support an exceptionally rich wildlife resource.

Panel and Workshop: Communication and Engagement



Andrew Walker, Yorkshire Water

Upland Catchment Management – a Case Study

Over 40% of Yorkshire Water's raw water derives from upland catchments, dominated by internationally important blanket bog habitat. The UK holds 13% of the world's blanket bog, which if properly managed, has the potential to sequester and lock up carbon. This is significant in terms of mitigating against climate change. Blanket bog is comprised of peat soils, which are thousands of years of organic material (mosses and sedge grasses, in the main) which has accumulated in anaerobic conditions. As such, it retains the carbon the plants drew in whilst they were alive. Some of this carbon is released through natural processes, either in gaseous or particulate form or dissolved in the water passing through the peat. We see this as colour in the water.

Colour (or dissolved organic carbon - DOC) in the water has been rising steadily since records were available in the 1980's. Our wastewater treatment works are designed to remove certain concentrations of DOC. Levels higher than this can increase the amount of chemicals and energy needed, reduce the throughput of the works and lead to increased volumes of sludge. In certain circumstances, where the DOC is not fully removed during the treatment process, it can react with chlorine (needed to sterilise the water) to form harmful disinfection by-products (DBP's).

In 2003 we started investigating why DOC was increasing in our upland raw water sources. We noted that in 1995, when there was a drought in Yorkshire, DOC increased markedly, but never returned to its pre-drought levels. This suggests that the peat hydrology was significantly impacted by severe weather and demonstrated a need to keep the water table as high as possible for as long as possible. The investigation also concluded that the composition and management of vegetation on the peat also played a critical role in the levels of DOC released from those catchments.

Subsequent research has led us to the following conclusions:

- Peat comprises bog mosses and grasses.
- The uplands are now dominated by heather, primarily for grouse moor management.
- The heather is rotationally burnt. This management practice provides habitat diversification for the grouse, and helps to regenerate heather, often to the detriment of other moorland plant communities.
- Heather dries the peat out, thereby increasing the amount of DOC and particulate organic carbon (POC) released into watercourses.
- An increase in heather cover in the uplands was a key target for Government agri-environment schemes in the 1990's, along with a prescription to burn 10% of the land each year.

From the above, it would be a reasonable step to ban burning on Yorkshire Water's land holdings. However, we do not own all our catchment land, and even where we own the freehold, we do not necessarily hold the sporting rights, which often determine the land management used on that particular piece of land. With that in mind, a further step might have been to lobby for burning to be banned across all blanket bog. Whilst these landscapes may appear to be "wild", they are very much managed, and need to be looked after. Wildfire is a very real risk in the uplands that would and has significantly damaged these habitats. Furthermore, a lack of management could lead to an increase in shrub woodland which would, in time, dominate and dry out the peat bogs, thereby releasing the carbon they have sequestered over thousands of years.

Whilst we know that the growth and management of heather on deep peat is not beneficial for a range of services this habitat provides, there have been government incentives to do so, and the sporting rights' owners are unwilling to give up this management tool. The most pragmatic solution was to work together with all interested parties to see if a compromise could be reached. Our challenge was to see whether grouse moors could be managed in a more sensitive way, whilst still delivering grouse, but also improved water quality and other key services.

The way we manage our land holdings is open and inclusive. It is important that we recognise our tenants' aspirations for their business, whilst they appreciate our interest in holding the land. It is this approach which is demonstrated most effectively in our catchment management pilot work on Keighley Moor reservoir catchment. Here we have sought to balance all interests in the land, whilst using the project as a forum for debate on how the uplands should be managed. This has given us the opportunity to talk about our work at Ministerial level, and has bought us a seat at two Government stakeholder groups: the Best Practice Burning Group (now the Uplands Management Group) and the Uplands Stakeholder Forum. We are the only water company represented on those forums.

Through our involvement with the Best Practice Burning Group (BPBG), we have effectively played a significant role in ending over a decade of conflict between Natural England and the Moorland Community. We did this through suggesting that rather than arguing over one management tool (burning) we look at why it was perceived to be a problem i.e. the impacts of burning on blanket bog. So we felt that it was more important to focus on the health of blanket bog, and to see what we could all agree on.

In the summer of 2014, after us attending just one meeting of the BPBG, a small number of that group undertook a three day field trip to a range of moors across the Pennines. The group comprised Yorkshire Water; Moorland Association; Natural England; National Farmers Union (NFU); Gamekeepers Organisation; Heather Trust and the RSPB. This field trip visited the Raby Estate in Teesdale; Yorkshire Water Estate at Keighley Moor, and the National Trust's Estate in the Peak District. In order to develop a process that could be replicated elsewhere, we identified the services we were individually most interested in. For us, that is water quality and for Natural England biodiversity (healthy blanket bog) and carbon storage & sequestration; for the Moorland Association it was grouse, and for the NFU it was grazing. We called these Outcomes. Initially we identified three (water, biodiversity and carbon) plus two lesser ones (grouse and sheep). However it quickly became apparent that, if we were to agree on a way forward, it was essential that each one of those outcomes had equal weighting.

By challenging current perceptions and, importantly, talking to the people who managed each of those sites on the ground, it became apparent that the only habitat which consistently delivered all five outcomes was a healthy active blanket bog with a significant reduction in heather cover and an increase in sphagnum mosses. Through this process we have developed a consensus which all parties have signed up to. Equally importantly, nobody won, or lost. The only winner will be the habitat and through Bogathon we have helped develop the Government's Blanket Bog Restoration strategy that will help protect and enhance internationally important habitats from Exmoor to the Scottish Borders. The Outcomes Approach developed and implemented through Bogathon has also formed the basis of a new way of engaging with landowners by Natural England, and it is currently being rolled out through that organisation.

So, looking back, our research identified what the issues impacting on upland water quality were, but our approach was looking at the bigger picture. It is possible that banning burning on the bits of land we could control may have had a benefit on water quality. However, it would most likely have alienated the very people we wanted to influence, and by sharing evidence and working with key stakeholders, we have collectively concluded that wetter moors with less heather and more sphagnum will actually deliver the grouse the moorland community wants, but importantly because it's wetter, the heather grows much more slowly and therefore requires less burning, if any.

Bogathon helped us identify the habitat that we all need from the uplands and the underlying Government strategy needed to deliver it. We were asked to lead on the next phase of this process: identifying which techniques work best for increasing sphagnum and water tables, and suitable ways to limit and reduce heather cover. This involved the same group of people and a further three day field trip, and took place in November 2015. Unsurprisingly, it was called Sphagathon and will report its recommendations to the Uplands Stakeholder Forum in early 2016.



Peat bog, Copyright Sacha Dench / WWT

The Catchment Based Approach (CaBA)

- A DEFRA initiative originally piloted in 2011 and rolled out nationally in 2013.
- 109 Catchment Partnerships across England & Wales.
- Underpinned by the Water Framework Directive (WFD) but a wider remit which varies across Catchment Partnerships.
- Stakeholder-led partnerships, bringing local knowledge and expertise together with statutory agencies and NGOs.
- More than 150 organisations engaged with CaBA nationally, including NGOs, water companies, local authorities, Government agencies, landowners, angling clubs, farmer representatives, academia and local businesses.
- Supported by a National Support Group and Secretariat, with various sub-groups.

Things CaBA does well:

- Bringing together a wide range of different stakeholders.
- Leverage of money – several times the initial investment.
- Developing a ‘bottom up’, partnership approach to delivery.
- Driving cost-effective practical delivery on the ground.
- Integrating multiple benefits within fluvial systems, including improvements to water quality, enhanced biodiversity, reduced flood risk, resilience to climate change, greater community engagement and healthier soils.

Things CaBA could do better:

- CaBA has been very effective in freshwater, riparian systems. However, many catchment partnerships are not yet active in the estuarine/coastal environment, even though CaBA is ‘source to sea’. This is for a variety of reasons, including a lack of confidence around coastal issues, a different set of stakeholders in coastal areas, a lack of data flow on coastal issues etc. There is a growing understanding that coastal waters are part of the CaBA remit. To try and help Catchment Partnerships work better in estuarine and coastal waters, the CaBA National Support Group has recently established a Transitional and Coastal Waters working group.

Amy Pryor, Coastal Partnerships Network and Thames Estuary Partnership

There are over 40 Coastal Partnerships in England with strong links to Coastal Partnerships in the devolved administrations. Most Coastal Partnerships have been working for over 20 years to generate social capital and information networks. Most are neutral, non-lobbying with an ability to work across sectors, build consensus and resolve conflict. They help to integrate policy and wider coastal initiatives within and between sectors across the land-sea boundary for sustainable management of coastal resources. The [Coastal Partnership Network](#) is a network of experienced Coastal Community hubs with expertise in stakeholder engagement, awareness raising and information dissemination.

Key engagement point: Integration is rarely achieved and future efforts need to respond to the following:

- Coastal regeneration: Many coastal boroughs focus on regeneration from a landward facing perspective - tourist attractions, housing, roads and industry are developed in an isolated way separate from the natural resources that are the real draw for tourists.
- Disconnection: communities (including businesses etc) are socially, physically and psychologically disconnected from their natural resources through flood defences and heavily built up environments.
- Funding streams: can cause competition between NGOs and rarely encourage collaboration; contribute to territoriality e.g. Catchment Partnerships Vs Coastal Partnerships; they are rolled out in silos e.g. Coastal Communities Fund - environment is seen as a barrier to economic growth instead of fundamentally underpinning the economy and our societal/individual health and well being.

Many Coastal Partnerships have developed or are looking to develop integrated approaches to alleviating the deprivation and low income/high unemployment rates and lack of skills common in coastal communities nationally. This will help to link the residents back to the nature which is the main draw for tourists to coastal towns.

Examples include:

[Morecambe Bay Partnership](#) - training for hospitality staff to learn better interpersonal skills and facts about the local natural attractions to tell visitors.

Hastings - [Clean Seas Please](#) is working with hotels, plumbers and restaurants to stop inappropriate products being flushed down the toilet and poured down the drain to improve coastal water quality.

[Thames Estuary Partnership](#) - boat trips with disadvantaged communities to take them downstream away from London to see the estuary landscape and hear about Thames wildlife and issues and how their communities are linked to the sea. Message include simple things they can do to help - don't drop litter, no fats, oils and greases down the sink etc.

James Grisceff, Principal Advisor, Terrestrial Biodiversity, Natural England

Catchment Sensitive Farming (CSF) has been running for almost 10 years and has a proven track record of working with farmers to reduce diffuse water pollution from agriculture, targeted to deliver reductions in pollution pressures as required under the Water Framework Directive and to support the delivery of the Biodiversity 2020 strategy. CSF has been particularly successful in reducing sediment and Phosphate pollution, but has also seen significant reductions in Nitrate, Pesticides and Faecal Indicator Organisms. These reductions have been realised by the implementation of mitigation measures to reduce the **source** of pollution, break the **pathway** for pollutant travel and by protecting/ buffering the water course **receptor**. However the success of CSF and the appropriate deployment of the above measures are most significantly attributable to the skill of **LISTENING**.

By Listening I mean:

1. Listening to DEFRA policy leads who explain the context of our operations and allocate the resources to operate
2. Listening to the Environment Agency evidence teams, SSSI (Sites of Special Scientific Interest) Officers and catchment scientists who explain what the pollution problems are in a catchment and from where they are derived
3. Listening to engineers and research scientists who explain the most relevant mitigation measures and how they might be best deployed
4. Listening to national NGOs and industry bodies who guide the project at a national level and support co-ordination
5. Listening to the local community, industry leads and stakeholders to explain how best to run a locally focused campaign;
6. And (most importantly) listening to farmers who once convinced of the problem can decide how best to solve it using the above (and other) measures, with specialist advice on how to solve targeted pollution problems in ways that make most sense to the land holding and the farming system.



Somerset, Copyright Nick Upton

Paul Tame, National Farmers Union, East Midlands Region

Nutrient pollution statistics:

- 75% of the country is farmed.
- 75% of farmers are NFU members.
- 70% of farmland was in agri-environment schemes.
- 18-28% of phosphorus in rivers comes from soil.

Farmer communication and engagement:

- The benefits to farmers need to be clearly explained.
- Farmers only get paid for producing food and fuel and from Basic Payment Scheme, agri-environment schemes and diversification.
- It takes time, unsocial hours, courtesy and understanding.
- But it's all been done successfully before.
- Farmers must be consulted with and "brought on side".
- Catchment Sensitive Farming (CSF) has provided plenty of lessons in how to do this.
- Countryside Stewardship take-up is currently low and must be increased by making the options easier to understand and apply for.
- CSF and catchment pilots have produced a list of things that farmers need to do/look at to reduce diffuse pollution. Of course, each measure may not be suitable on each farm. It's a menu to choose from.
- Regulation can be hugely costly and can take farmers, especially small ones, out of the industry. Nitrate Vulnerable Zone rules, much vaunted by some, will risk viability of small dairy farms.

Day 2: Presentations

Tim Collins, Principal Specialist – Coasts & Flood Management,
Natural England

Flood management and coastal squeeze of fresh water and salt water
wetlands



Too often we tend to see the land/sea transition as a sharp dividing line, with fresh water habitats to landward and salty ones to seaward. This is reinforced by the ‘un-naturalness’ of many of our seawall dominated estuaries. The reality is different; there is a gradation from salty to freshwater habitats with a brackish zone that is often overlooked.

The pressures of climate change present challenges for both conservation and flood management, leading to loss of habitat and increased flood defence cost. To address these issues we need a strategic approach to shoreline management that recognises the challenges involved over the long term (at least 100years). We are making progress in some areas; the strategic approach adopted by the Environment Agency on the Humber is a good example. While new intertidal habitats will soon support abundant bird populations, salt marshes take considerably longer to become comparable to natural ones.

There are large areas of coastal grazing marshes behind flood defences in much of the country. It is already proving challenging to conserve some of these in situ and this challenge will increase as sea levels rise. The conservation community needs to embrace the reality of this situation and accept that offsetting the most significant losses through habitat creation in sustainable locations inland represents the best solution. There is often a tendency to want to preserve the familiar and to be suspicious of change. Future generations won't thank us if we pass on to them all of these adaptation challenges.

In conclusion:

- We need imaginative approaches to designing and funding schemes.
- In some areas ‘unmanaged’ realignment may be the best option.
- Accept hybrid options that allow for occasional flooding in uninhabited areas over seawalls that are designed to over-wash.
- Rise to the challenge of explaining why coastal adaptation is needed now.

Andrea Kelly, Senior Ecologist, Broads Authority

Fresh and Salty – the Broads National Park

Historically the Broads National Park was a large estuary and although it may appear to us that development, designations and management has locked the landscape, nothing ever stays the same for very long in the Broads if we look back and forecast the future.

The Broads is a unique and internationally important wetland, a member of the UK family of National Parks, an area of 303km² between urban areas of Norwich, Great Yarmouth and Lowestoft. 95% of the Broads is wetland and 60% is below sea level. The Broads is one of England's most extensive industrial monuments.

Managed mainly by farmers, only around 15% is owned by conservation organisations.

The area is home to over 11,000 recorded species, including over 1500 priorities for conservation. 66 species are restricted largely or entirely to the Broads within the UK.



Despite much investment and significant improvements in water quality and reductions in nutrient pollution over the past 30 years, our map is at best moderate with some significant areas of poor and bad. SSSI condition: 89.7% is in favourable or recovering but 758 ha are not meeting target condition and over 40% of this is open water.

Broads Authority and its partners have used many lake restoration techniques over the past 30 years. The majority of restorations have been successful and have been completed in the past fifteen years.

The next project in the pipeline is the £4 million restoration of Hoveton Great Broad, led by Natural England. The Broads Authority is currently applying for £1.4 million to enhance Hickling Broad. However lake restoration needs more than gardening. Understanding, prioritising and minimising the inputs is perhaps the only long term solution.

As with many areas we set up the Broadland Rivers Catchment Partnership in 2012, co-hosted by the Broads Authority and Norfolk Rivers Trust. An officer was appointed to coordinate and write a plan in 2013. Since then we have worked on building the network and relationships, and mapping for prioritising activity. Delivering 'slow the flow' projects with up to 100% grants to farmers and landowners to retain sediment and water on land and stop it getting into rivers. Targeting and prioritisation over the relatively large catchment (3200km²) has involved Sci-Map and ecosystem value mapping to highlight potential run-off pathways.

The catchment work will benefit from the outputs of the Wensum Defra funded Demonstration Test catchments and the recent WaterLIFE award for Water Sensitive Farming funded by Coca Cola, directed by WWF and delivered by Norfolk Rivers Trust and Broads Authority.

The Broads is a 'predominantly freshwater ecosystem. Adaptation scenarios and projects include the Broadland Flood Alleviation Project: a 20 year, £120 million scheme of strengthening and setting back the river banks, creating more space for the river and greater protection from salt water for the freshwater wildlife and farming systems. The banks are designed to overtop at high flood events, but there is no consensus that the grass marshes are saline washlands and the Broads remains protected as a predominantly freshwater wetland.

Adaptation also includes the translocation of species at threat of extinction to give them a wider range of sites and more robust populations e.g. Fen raft spider translocation - probably the most ambitious and successful invertebrate translocation project in the UK.

Another partnership project example is the Brograve Partnership Project which is trialling drainage systems to reduce salt water input into the Upper Thurne Broads via the pumped drainage system into the lakes.

In addition, the Hickling Wetland Project provides new freshwater reedbeds as compensatory habitat for loss of habitat protected by the Birds and Habitats Directives elsewhere, as well as plans to connect areas of marsh to the broad over a longer time frame.

The Broads adaptation plan is a mechanism for encouraging debate, focusing on future possibilities rather than trying to retain the past. It is flexible enough to cope with climate uncertainties and addressing climate impacts alongside other pressures, such as changes in food production or trends in tourism. The adaptation plan also considers what to do locally within the context of the wider landscape as well as avoiding adaptation actions that actually make things worse. The plan includes 3 adaptation scenarios - 'Business as usual', 'Seeking to control and restrain the water', and 'Making space for water'. A "Do nothing" option would be unacceptable. Partners seek to not worsen impacts and to achieve equal or greater value by short-term 'low-regret' actions, where these would not have unacceptable costs or adverse knock-on effects, or severely restrict future adaptation choices.

A video on the public engagement, 'Broads Community', provides an overview of the key topics of debate. <https://www.youtube.com/watch?v=8RL9meFrxqo>

Phil Dyke, Coast and Marine Adviser, National Trust

Shifting Shores – Living with Change

The first ever National Trust property was at the coast, a tiny patch of hillside behind Barmouth, gifted to the Trust in 1895 to protect it from development as this seaside resort grew. The early part of the 20th Century saw the Trust acquiring more coast to give protection to wildlife, at a time when legislation to achieve this was still missing. Through the 1960s to the mid 80s and with huge public support, the Trust was again acquiring “pristine” coast, to protect it from inappropriate development, a coast still under pressure in spite of a stronger planning system. Today, there are question marks once again around the strength of the planning system but the biggest challenge for the future is tackling the impacts of climate change at the coast.

Within our 775 miles of coastline we’ve got rocky cliff, soft cliff, salt marsh, sand dune, mud flats – all the different landscapes that make up the coast. They will all be impacted differently in the future by climate change, in particular sea-level rise, increased erosion and flooding. Change is constant on the coast, and some of it is driven by natural processes. For instance, if it weren’t for constant erosion, over thousands of years the White Cliffs would wear back into gentle slopes and vegetate over, and they’d become the Green Slopes of Dover.

In the last decade, the world has really woken up to the impact we’re having as a species on the planet by pouring millions of tonnes of greenhouse gases into the atmosphere. In 2013/2014 the Intergovernmental Panel on Climate Change (IPCC), an international panel of politicians and scientists, came together with the best evidence on climate change, and agreed that it is ‘very likely’ that sea level rise will exceed that of the 20th Century (19cm globally). Dependant on greenhouse gas emissions, global warming could lead to a rise in sea levels on a range between 0.39m and 1m over the course of the 21st Century. We need to plan for this and in the National Trust we are doing this under the banner of our [Shifting Shores](#) initiative.

Shifting Shores is a shorthand for the Trust’s approach to coastal change management, and involves thinking about that 1m of sea level rise and what erosion and flooding would mean for our places. We’ve got over 80 locations where we will have to think very hard about how we are going to manage coastal change in the future, so we have established some principles to work by. Key to this approach is using natural processes to manage change, rather than solely relying on building sea defences, which in the future will become increasingly prone to failure. We need to be prepared to adapt and move out of harm’s way where ever we can at the coast, as ‘holding the line’ is going to become more difficult in the face of rising sea levels and increased storminess.

Working with the grain of nature gives us the best chance of maintaining a healthy and beautiful coast for the future, a coast that is great for people and for wildlife.

Olaf Booy, GB Non-Native Species Secretariat

Tackling invasive non-native species in the aquatic environment

Invasive non-native species are a significant threat to native species and habitats. They cause direct impacts, for example through predation and competition, as well as altering ecosystems, spreading diseases and modifying ecosystem services. While the majority of non-native species in Britain are terrestrial, aquatic non-natives are more likely to become invasive and cause significant damage. Of the non-native species established here approximately 10% of terrestrial species have known negative impacts, compared with approximately 25% of marine and 40% of freshwater.

The rate that new non-native species establish in Britain is increasing as a result of increasing trade, transport and travel. Approximately 10-12 new non-native species now establish in Britain every year compared to only 1 per annum before the industrial revolution. In the aquatic environment, invasive species from the Ponto-Caspian region of south-eastern Europe pose a particularly significant threat since canal construction linked a number of previously isolated major water catchments. This route has facilitated the recent arrival of the killer shrimp (*Dikerogammarus villosus*, discovered 2010), demon shrimp (*D. haemobaphes*, discovered 2012) and quagga mussel (*Dreissena rostriformis bugensis*, discovered 2014) and experts predict around 20-100 more Ponto-Caspian species threaten Britain's waters, including a number that could have significant impacts in transitional environments. However, it is not just Ponto-Caspian invaders to be concerned about and recent trends indicate an increased rate of introductions from North America and Asia through a wide range of pathways including ornamental introductions, aquaculture, ballast water, boat hulls and via contaminated equipment.

Preventing these species from getting into Britain is the most effective response, followed by early detection and rapid response and lastly long term control. Once freshwater, estuarine and marine species have arrived they are very difficult to eradicate and therefore prevention is especially key. This principle is enshrined in the newly updated [GB Invasive Non-native Species Strategy](#) (2015) which sets the high level aims, objectives and actions for invasive species work across Britain.

A considerable amount of progress has been made under the auspices of the Strategy (originally published in 2008), including seven rapid responses (primarily in the freshwater environment), awareness raising campaigns ([Check, Clean, Dry](#) and [Be Plant Wise](#)) to prevent new introductions and slow the spread of existing species, the introduction of new legislation in England, Scotland and Wales and the development of biocontrol agents to tackle Japanese knotweed and Himalayan balsam.

The UK has played a key role in the development of new European legislation which introduces restrictions on listed high risk invasive species and requires all EU Member States to introduce management measures for priority pathways by the end of 2018. However there is much more to be done. Of particular importance is improving aquatic biosecurity to reduce the risk of introducing and spreading new species to this sensitive environment. Awareness is crucial and we need to work together to make sure land owners, staff, volunteers, water users and members are aware of the issue and follow three simple steps: [Check, Clean, Dry](#).

Dr Katy Owen, Coordinator of the Norfolk Non-native Species Initiative & Technical Coordinator of SEFINS (Safeguarding the Environment from Non-Native Invasive Species), Norfolk County Council
Landscape scale action on invasive non-native species – the Wash



Safeguarding the Environment from Invasive Non-native Species (SEFINS) is a cross-border cluster project bringing together partners from successful previous EU projects RINSE, MEMO and Invexo, to focus on estuarine invasive non-native species (INS).

INS are species which have moved outside of their natural range (usually with the aid of humans) and are causing environmental or economic

damage. INS are a significant cause of declines in global biodiversity, second only to habitat destruction. Their economic impact is also substantial, estimated by the European Environment Agency to cost approximately €12 billion each year.

Despite this, there is little coordinated effort to reduce their impact and spread across Europe. SEFINS combined scientific and practical management expertise from Belgium, France, the Netherlands and the UK and used it to assess the current status of INS management across the Two Seas area, identifying a gap in INS knowledge, action and funding in estuarine habitats.

The project then focused on improving INS management in case study areas across Europe, including the Wash estuary in the UK. Activities included trialling low-tech sustainable hard substrate early detection techniques alongside complex, cutting edge eDNA monitoring methodology. Targeted training approaches were used to inform priority estuarine users in order to aid compliance with new EU INS legislation and embed a 'prevention not cure' approach. Further information and project outputs are available at www.sefins.eu



Parrot's feather, Copyright Ed Waldron/ WWT

Panel on Multiple Stressors



Andrew Bell, Devon Council/North Devon Biosphere reserve

North Devon Biosphere is a UNESCO World Biosphere Reserve that operates under UNESCO intergovernmental science programme. It has been operating since 2002. The Biosphere Reserve covers all of the catchments that drain to the north Devon coast and includes the sea area out to 12 nautical miles offshore. It is a true source to sea approach, with the functions of conservation, sustainable development and knowledge generation and sharing.

The partnership that oversees and coordinates the programmes in the Biosphere Reserve is made up of 28 organisations and it is multidisciplinary in its approach. The Biosphere Reserve is the catchment planning body under CaBA. It works with universities, NGOs and the industry sectors in its planning and execution of catchment sensitive farming, Nature Improvement area, Shoreline management plan and Marine conservation zones as well as marine spatial planning in the area.

The Biosphere Reserve strategy is threaded throughout the joint local plan for the district which has embedded the ecosystem approach in its strategy. Looking at wetlands specifically, these approaches have enabled us to deliver a range of programmes of managed re-alignment, floodplain grazing marsh, Culm grassland and upland peat bog restoration as well as designation of marine conservation zones.

The coordination of the Biosphere Reserve is largely funded by the local authorities, but the project funding drawn in with all of the partners is 25 fold greater than the original core funding. There are 5 Biosphere Reserves in the UK which now operate in a similar fashion.

Key lessons in dealing with the multiple stressors include having a strong partnership that has high levels of reciprocity. The partners give and take, they share projects and funding for the greater good of the area. The biosphere facilitates and is facilitated by having a clear strategy with a strong base of ecosystem service planning. The ecosystem service assessment itself is enabled by good data, strong local participation and sound science derived through the partnership and with national initiatives such as the UK National

Ecosystem Assessment. This allows us to embed the work in the planning authorities' key documents (we intersect with 4 district and 1 county council, and 2 national parks).

Alison Briggs, Shire Group Internal Drainage Board

The key point in regard to the implementation of the Eels Regulations is how politics can affect raising a drainage rate required to fund compliance.

Making a pumping station “Eel Regulations compliant” is extremely expensive. Internal Drainage Boards (IDBs) can raise their own income from landowner/occupier ratepayers in the district and through the Local Authority that collects special levies on its behalf. Most IDBs have local authority members, nominated by the Local Authority that collects special levies. They, in effect, have a seat to represent developed land within the board district.

The IDB special levy is included within a council tax increase that can trigger a referendum under the Localism Act 2011. This is not something local authorities welcome: trying to deliver its own range of services and incorporating any associated increase in costs together with increases from the Police Authority, IDBs and other outside bodies.

To make one pump “eel friendly” and alterations to associated pipework, sumps can be from £250,000 upward. Larger Boards may have 18 stations that need to be compliant before 2020.....a huge amount of money!

Dr Rachel Brown, Marine Management Organisation (MMO)

When we begin the marine planning process in an area a significant amount of time is spent working with stakeholders to gather evidence and identify particular issues for the area we are working in. Most of these issues are a result of multiple stressors because of the nature of the environment we are working in. We work with stakeholders (including other departments and public bodies) to identify whether there is a way that marine planning can help solve an issue, whilst also admitting that there are issues that we can't affect with the plan, for example diffuse water pollution.

For the south plan area (which runs from Dover to the river Dart), there were two particular issues that were the result of multiple stressors: coastal squeeze and poor estuarine water quality. The marine plan could go some way to address coastal squeeze, as the plan is applicable up to mean high water. However, despite many stakeholders identifying poor estuarine water quality as an issue, the sources were diffuse and outside of mean high water. Through our engagement with the Environment Agency we highlighted a gap in their current measures and they took steps to fill the gap.

Although marine plans cannot solve all of the issues in transitional and marine waters if sources of the problems are multiple and diffuse, the process of planning can highlight problems at the marine end of the system. I also think that the process of marine planning itself brings together a wide range of stakeholders at several points in the process to agree the direction of the plan. This bringing together of very different stakeholders can be very helpful in understanding the multiple stressors affecting a system. It can also highlight gaps in existing regulation or areas where a policy is needed.

Some points from the discussion:

- There are too many plans and it's too difficult to view them all
The MMO has developed the Marine Information System (MIS), which allows everyone to view the marine area and determine whether there is a marine plan and which policies are applicable to them. MIS is available [here](#)
- Often the most up to date evidence isn't used
There will always be a lag between evidence being gathered and it being used to develop policy. However, the MMO is working with the academic community to ensure that research can be applicable to management of the marine environment.

Dr Stewart Clarke, National Trust

The concept of multiple stressors is problematic for policy makers, practitioners and the wider public. It is always easier to have a single problem to solve and a single party to blame.

As an example, in the mid 2000's the iconic southern chalk streams were experiencing a worrying decline in the abundance of water-crowfoot (*Ranunculus* spp). Both conservationists and anglers were concerned because water-crowfoot plays an important role as an 'ecosystem engineer' modifying flow and sediment patterns and hence fish and invertebrate habitat. Beyond this important ecological role, water crowfoot pretty much defines chalk stream character and the decline threatened landscape and cultural heritage associations too.

A range of causes were identified and studied: nutrient enrichment; siltation; low flows and abstraction; climate change; herbicides; inappropriate weed-cutting regimes; grazing. The finger was pointed at a range of groups: the regulators; the water companies; farmers growing maize in the upper catchment; marauding groups of juvenile swans; and over-enthusiastic river keepers. Everyone wanted to find the 'main' cause and tackle it head on: first it was abstraction, then herbicides, then siltation....

The next few years were wetter and to some extent water-crowfoot has recovered without the actual cause of decline being identified. The general consensus among scientists seems to be that in many chalk streams there was no single cause and all of these pressures came together, perhaps a period of low flows providing the tipping point that led to the apparent collapse. These pressures still exist and safeguarding our chalk streams requires sustained and parallel action on all of them.

The philosophy of tackling pressures together or at least in turn, rather than chasing the single biggest problem, defined the concept of 'Limits of Liability' that Chris Mainstone and I adopted for setting conservation objectives for designated rivers and lakes (Mainstone and Clarke, 2008). This sets targets for each important attribute (e.g. phosphorus concentrations or loads) and seeks action from each contributing sector in a proportional way. Limits of liability are set for all important attributes and stressors (e.g. flow, nutrients, sediment). The approach depends upon robust and defensible targets which in turn places demands on scientists to develop clear pressure-response relationships e.g. between nutrients and algal biomass. Getting sectors to accept their liability tends to depend on there being a

mechanism for them to act. For example, the water company periodic review process is a route through which improvements in water treatment can be pursued.

Much of the discussion during the panel session focused on the multitude of plans that affect the water and wetland environment and how we might streamline these or at least improve the read across. I would argue that catchment scale plans that attempt to bring together water improvements (WFD), flooding and biodiversity under one umbrella are more likely to address multiple stressors and identify multiple benefit solutions than individual plans that compete with one another for attention and funding. Whether our decision-making processes are sophisticated enough to deal with all of these issues at the same time, remains to be seen.

Mainstone C.P & Clarke S.J (2008) Managing multiple stressors on sites designated for freshwater wildlife – the concept of Limits of Liability. *Freshwater Reviews*1(2) 175-187

Simon Wightman, RSPB

We have multiple strategic plans designed to steer work in our catchments, including River Basin Management Plans and Flood Risk Management Plans. We have then got local authority plans that set out further guidance on how and where projects should be delivered that affect the water environment and Site Improvement Plans setting out what needs to be done to improve the condition of our most important wildlife sites.

There is a real risk of stakeholder fatigue as people try to provide useful feedback to consultations and identify opportunities to link their own projects with the strategic priorities in the plans. This is a problem for those of us whose job it is to engage in this framework but is almost impossible for stakeholders who want to engage in their spare time. The risk is that we don't hear what people have to say, or worse, we miss opportunities to identify and deliver projects that could deliver multiple benefits such as new wildlife habitat alongside improved flood risk management.

We need to achieve better integration. Part of the solution must lie in better integrated mapping software so that people can see, at a glance, what the priorities are in their patch and begin to think about how they might contribute to solutions.



Concluding remarks

The conference brought together excellent speakers with some great case studies highlighting how important it is that we truly make the connections right from source to sea. Although there is much good practice out there, there are ways we could be doing things better, especially around recognising how everything is connected.

We need both a long-term vision of a more sustainably managed planet and to identify much short(er) term actions that will be appropriate stop-gaps while we work for global societal change towards sustainability.

Government needs to be honest about the scale of the environmental challenge and ensure that the right things are monitored at the right time and in the right way

Much of what we discussed during the conference has the potential to be delivered through an ambitious 25 year plan for the environment, currently being considered by DEFRA.

We would like to see a 25 year plan that:

- Sets milestones for the delivery of a UK ecological network of connected sites from source to sea
- Set challenging goals for good ecological condition of all wetlands
- Within 10 years ensure that the UK is no longer in the top 20% of nutrient polluting countries
- Integrates ecosystem services fully into cost benefit analysis and decision making adopts a multi-benefit approach and engaging with all sides from the outset

We need funding mechanisms which:

- Initiate multilateral discussions towards a trade system that encourages consumers to pay the true price of food production in a socially equitable way
- Provide financial instruments that ensure that polluters pay for nutrient pollution and use funds to (1) ensure appropriate (more frequent) levels of monitoring to capture episodic events (2) restore wetlands and (3) support innovative schemes like nutrient offsetting
- Make the agri-environment regulation work well across landscapes to deliver multiple outcomes

The importance of effective communication across sectors and with the general public was continually highlighted. Conservation is about engaging people effectively. If we want to convince farmers to reduce nutrient pollution, or help/show communities why they need to care about wetlands, we need to make a clear case to them. This means:

- Being positive about the impact that interventions will have
- Achieving consistency over the long term, many feel disillusioned with the process. We need to develop short term changes which also help to achieve long term goals.
- Clear messages and pathways to action are essential. The number of policy initiatives, partnerships and strategic action plans in some places is bewildering. People need clear, focused and simple messages, with locally focussed action plans they can engage with.

- We need to use the right language for the audience we are approaching; we could be making better use of communication experts to do this effectively.
- We need to encourage thinking big but ensure actions are realistic to demonstrate the art of the possible; practical examples help to develop local champions and showcase thinking/best practice actions/examples.
- We need to learn from each other; being imaginative and aligning our plans and priorities; pooling our knowledge of effective communication techniques and messages.
- We need to listen and engage better to find common ground and ignite interest in order to get people's ownership and support as part of the solutions.
- Reconnect people with nature and demonstrate the value of these natural processes. We need to raise awareness of how working with nature can help us achieve so much more; to be constructive in our communications and build engaged and informed communities. We need people to understand the issues in their locality, how the problem affects them and how they are a key part of the solution(s).
- We need to use demonstration projects as these are visual and show a positive outcome.

A separate workshop report considering communication in particular builds on these points further.

Freshwater is connected to saltwater is connected to land; we need nature and we need to better communicate its value.

<http://www.conservation.org/nature-is-speaking/Pages/default.aspx>



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Appendix 1: Delegate List

| Name | | Job Title | Organisation |
|----------------|-----------|---|--------------------------------------|
| Abrahams | Carlos | Technical Director | Baker Consultants Ltd |
| Bell | Andrew | Manager | North Devon Biosphere |
| Bell | Charlie | CaBA Secretariat | Shropshire Wildlife Trust |
| Blyth | Sarah | Land Management Advisor (Wetlands) | RSPB |
| Boeri | Marco | Lecturer | Queen's University, Belfast |
| Booy | Olaf | | GBNNS |
| Bowles | Fiona | Chair Poole Harbour Initiative | Poole Harbour Initiative |
| Brennan | Jonathon | Lead Marine Adviser | Natural England |
| Briggs | Alison | Environmental Officer | Shire Group IDB |
| Brown | Rachel | Marine Planner | Marine Management Organisation |
| Burn | Alastair | Principal Specialist, Environmental Impacts | Natural England |
| Clark | Stephanie | Exe Estuary Office | Exe Estuary Management Partnership |
| Clarke | Stewart | Freshwater & Estuaries National Specialist | National Trust |
| Collins | Rob | Head of Policy | Rivers Trust |
| Collins | Tim | Principal Specialist – Coasts & Flood Management | Natural England |
| Cooper | Glen | Senior Specialist - Water Programmes | Natural England (Worcs) |
| Cottington | Paul | SW Environment Adviser | NFU |
| Crossley | Amy | Conservation Officer | RSPB Cambs & The Fens Area Office |
| Denham | Laura | Coastal Engineer | Havant Borough Council |
| Downes-Tettmar | Naomi | Marine and Freshwater Lead Advisor | Natural England |
| Dyke | Phil | Coast and Marine Adviser | National Trust |
| Ellison | Matthew | | Ott Hydrometry Ltd |
| Gerring | George | Senior Advisor, Strategic Catchment Partnerships | Environment Agency |
| Gilmour | Kirsty | Biodiversity Technical Officer | Environment Agency |
| Green | Amy | Alun & Chwiler Living Landscape Project Officer | North Wales Wildlife Trust |
| Grischeff | James | Catchment Sensitive Farming, Technical Lead | Natural England |
| Haine | Richard | Director | Frog Environmental |
| Hall | Clare | Social Science Research Fellow | Cardiff University |
| Hall | Jilly | Specialist Lead Adviser | Natural England |
| Harper | Martin | Conservation Director | RSPB |
| Harrison | Anne | Senior Wetland Research Officer | WWT |
| Hawley | Sue | Isle of Wight Estuaries Officer | Isle of Wight Estuaries Project |
| Hoccom | David | Area Manager | RSPB, Cambs & The Fens |
| Isaac | Dawn | Senior External Funding Advisor | Natural England |
| Johnes | Penny | Professor of Biogeochemistry | University of Bristol |

| | | | |
|-----------|-----------|---|---|
| Jones | Alan | Fisheries and Biodiversity Specialist | Environment Agency |
| Kay | Martin | PhD | Manchester Metropolitan University |
| Kelly | Andrea | Senior Ecologist | Norfolk Broads Authority |
| Laver | Alys | Site Manager, Steart | WWT |
| Little | Sally | Senior Lecturer in Geography | Nottingham Trent University |
| Lovell | Bethany | Biodiversity Advisor | Environment Agency |
| Madgwick | Gen | Lake Restoration Specialist | Natural England |
| Marsh | Maija | Marine Ecology Specialist | Natural England |
| Matkin | John | Site Supervisor | Severn Trent Water |
| McGrath | Tim | Working Wetlands Manager | WWT |
| Millard | Anna | Lead Adviser | Natural England |
| Money | Russ | Senior Environmental Specialist – Freshwater and Wetlands | Natural England |
| Morris | Joe | Prof, Cranfield University | Cranfield University |
| Moss | Brian | Professor Emiritus | Liverpool University |
| Neale | Matt | Community and Individual Giving Executive | WWT |
| O'Dea | Leela | Freshwater Aquatic Ecologist | Frog Environmental |
| Orgill | Kate | PhD Student | The University of Sheffield |
| O'Riordan | Roisin | Project Officer | Ecosystems Knowledge Network |
| Otley | Peter | Site Manager | RSPB |
| Owen | Katy | Coordinator | Norfolk Non-native Species Initiative & SEFINS |
| Pagett | Natalie | Project Officer | RSPB (Water for Farmers & Wildlife) |
| Pain | Debbie | Director of Conservation | WWT |
| Pryor | Amy | Projects Manager | Thames Estuary Partnership, Secretary Coastal Partnership Network |
| Relf | Christina | Lead Marine Adviser | Natural England |
| Sadler | Chloe | Water for Wildlife Officer | Kent Wildlife Trust |
| Scott | Crispin | National Trust, Wildlife & Countryside Adviser | National Trust |
| Shirres | Richard | FCRM Technical | Environment Agency |
| Simpson | Matt | Associate Director | WWT Consulting |
| Skinner | Ann | Senior Conservation Advisor Fisheries and Biodiversity | Environment Agency |
| Tame | Paul | East Midlands Regional Environment Adviser | NFU |
| Tarbet | Anna | Ecosystems Development Coordinator | Tidal Lagoon Power |
| Tosney | Jonah | Project Manager | Norfolk Rivers Trust |
| Vickery | Abigail | Farm Conservation Adviser | FWAG SW |
| Walker | Andrew | Catchment Strategy Manager | Yorkshire Water |
| Wightman | Simon | Land Use Policy Officer | RSPB |
| Woodhall | Adrian | Ecologist | Independent |
| Wyatt | Rachel | Coastal Pollution Officer | Marine Conservation Society |