

# **Defra Strategic Evidence And Partnership Project**

## **Component B Report**

### **A Review Of Current Policy Tools And Funding Mechanisms Available To Address Water Pollution From Agriculture In England**

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**Disclaimer**

This report has been produced under contract by Alex Inman (Consulting), an independent consultant, on behalf of Defra and The Rivers Trust. All analysis and observations contained within have been derived from verbal information provided by project participants, complemented by quantitative data provided by participants where possible. Much of the analysis is based on opinions expressed by individuals which may not necessarily represent those of the organisations they represent. Whilst the author has taken all due care to interpret and collate participant input accurately, any party relying on the results of the analysis shall do so at their own risk and neither the author, Defra or The Rivers Trust shall be liable for any loss or damages (excluding personal injury) arising there from.

**Maps**

Maps displaying Environmental Stewardship options kindly produced by Natural England's Geographical Information and Analysis Team, Telford. Reproduced by permission of Ordnance Survey on behalf of HMSO. Crown Copyright and database right 2011.

## **Executive Summary**

This report contains findings from 'Component B' of a Defra Strategic Evidence and Partnership project (DSEPP) designed to assess the ability of current policy tools (regulation, agri-environment incentive payments, advice) to address water quality impacts from agriculture. The potential for private sector funding to compliment public funded agri-environmental payments targeted at water quality improvement was also explored. Evidence and analysis provided in this report originates from participatory research with on-the-ground practitioners and farmers in three case study catchments on the western side of England: the Caudworthy Water (Tamar), the Lugg (Wye) and the Rea (Severn). The research was undertaken between January and September 2011.

Across the study catchments, diffuse soil and phosphorus pollution were considered by project stakeholders to be the key agricultural pollution issues requiring attention. Whilst sediment and nutrient pollution is often referred to as a 'diffuse' or 'non-point source' problem, stakeholders were largely of the view that the problem is the result of 'multiple point source' pollution incidents from specific fields, tracks, gateways and stretches of river bank which can be identified and systematically addressed.

Specific instruments evaluated included Cross Compliance, Anti-Pollution Works Notices, Environmental Stewardship and the Catchment Sensitive Farming advice and grants programme, these mechanisms representing the key policy instruments currently available to address agricultural pollution. The EA has at its disposal Section 85 of the Water Resources Act 1991 ('Knowingly causing pollution') which enables prosecution for various offences where pollution of surface and/or groundwater occurs. The limitation of this mechanism is that it tackles the effect rather than cause of a problem and can only be invoked once a pollution incident has occurred. It cannot be used to prevent water pollution taking place and has not, therefore, been evaluated within this project.

## **Assessment Of Current Regulatory And Financial Mechanisms Relevant To Soil Pollution**

### *Cross Compliance*

The identification of soil erosion risk and the adoption of suitable control measures is a fundamental feature of cross-compliance, most notably within the revised Soil Protection Review (SPR) which all farmers receiving the Single Farm Payment must have completed by December 2010. However, whilst it is too early to evaluate the impact of the revised SPR, views expressed by EA Enforcement Officers and farm advisors suggest the mechanism is unlikely to provide adequate protection against soil erosion. Firstly, it is possible that many farmers will not correctly identify risk levels on high risk fields; and secondly, EA Enforcement Officers believe the SPR is an unenforceable mechanism because provided a farmer has completed his SPR, identified a risk level for each field and allocated the appropriate number of optional measures, he cannot be deemed non compliant even if he is causing a significant soil erosion problem on his farm. Whilst there is provision within the cross compliance enforcement process to prevent farmers from failing to take action once an issue has been pointed out to them, this process is not a standard operating procedure at the current time.

There are currently no mandatory requirements within cross compliance for farmers to prevent degradation of river banks from livestock, a common cause of soil erosion. There is an option within the SPR grassland management measures to 'minimise damage to riverbanks by providing managed access to water for livestock' but farmers do not have to select this option.

Aside from the workability or otherwise of the SPR as an enforcement tool, interviews with farmers showed that the SPR processes has not engaged them in a broader sense regarding the importance of soils to their business and the negative consequences of soil erosion to the environment.

#### *APWNs*

The EA has the ability to issue Anti Pollution Works Notices (APWNs) served under Section 161 of the Water Resources Act to deal with soil related water pollution. The difficulty with APWNs is that they can be time consuming to prepare and deliver with recent EA guidance specifying APWNs should only be issued where it is possible to demonstrate a category 1, 2, or 3 level incident. Because of the resource implications surrounding the issuing of APWNs for soil pollution, the EA has been extremely reluctant to make widespread use of this instrument to date. However, new guidance information provided to Enforcement Officers and acquired during the fieldwork for this project outlines that the process of issuing APWNs has recently been streamlined. EA staff believe these reforms will make the use of APWNs far more practical for tackling soil and nutrient run-off problems, albeit APWNs should only be used as a last resort where a farmer refuses to take appropriate action.

#### *Environmental Stewardship*

The Environmental Stewardship programme in the form of the Entry Level and Higher Level Schemes offer sources of funding to farmers to adopt changes in land use which can, in certain situations, protect watercourses from soil erosion. In recent years new ELS buffer strip options have been introduced with a resource protection focus. However, land management experts interviewed across the case study catchments were of the view buffer strips, unless very wide (12m+) are not capable of preventing soil reaching watercourses from fields with anything greater than a 7-10 degree slope. The new ELS options that are potentially capable of dealing with the problem are unlikely to be taken up by farmers because the loss of income from implementing these measures is perceived as too high due to the extensive loss of productive land involved. The evidence suggests farmers will tend to sight buffer strips on marginal land which is not necessarily at greatest risk from soil erosion.

Under the current programme, several individuals were of the view that a way to engage farmers to adopt effective resource protection measures within ELS would be to re-weight the allocation of points away from hedgerow management options towards resource protection measures. Currently, the majority of farmers derive most of their points from hedgerow management and do not need to undertake broader land management options. However, farmer opinion pointed towards a scenario where they would choose not to enter the scheme at all if they were required to undertake measures involving taking productive land out of agricultural production.

Feedback from farmers within this project has reaffirmed a commonly held view within the farming community that ELS payments are effectively a way of recouping modulated funds to top up the Single Farm Payment. In other words, ELS is seen as an entitlement payment for delivering basic environmental standards under cross compliance, not a payment which is sufficient to warrant adopting additional activities which involve taking land out of production. To do this, farmer respondents were adamant that payment rates will need to be considerably higher than current levels. Alternatively, farmers pointed out land reversion obligations would need to be tied to receipt of the Single Farm Payment.

Higher Level Stewardship is targeted at specific areas of countryside considered to be particularly important for a range of Biodiversity, Landscape, Historic Environment and Resource Protection delivery objectives. According to Natural England personnel engaged with the project, HLS currently covers 10% of agricultural land across England and is increasingly focusing on SSSI sites and Habitats Directive designated areas. An examination of the HLS scheme demonstrates there are a small number of appropriate measures with the potential to combat soil erosion from high risk arable land. The difficulty with these measures in terms of providing effective soil erosion protection is that many arable farmers do not consider the financial payments available a sufficient incentive to stimulate adoption. Discussions with Natural England HLS officers also suggest they view HLS as a multi-outcome scheme and tend not to focus on resource protection accordingly. As a result, the evidence points to a situation where HLS officers rarely concentrate on resource protection outcomes or working up HLS applications on farms where biodiversity or heritage outputs are unlikely.

#### *Capital Grants*

Capital grants exist through the Environmental Stewardship Programme and the Catchment Sensitive Farming initiative to facilitate the adoption of farm infrastructure improvements (fencing, tracks, hard standing areas for livestock) which can lead to significant reductions in soil erosion. However, take up of these options has not been high thus far and there is evidence grants require greater targeting. It is noteworthy that there are no agri-environmental payments currently available for winter housing, considered by many farm advisors as extremely important for keeping animals away from vulnerable fields during the wetter (winter) months of the year.

### **Assessment Of Current Regulatory And Financial Mechanisms Relevant To Phosphorus Pollution**

#### *Cross Compliance*

At the current time, there are no requirements within cross compliance for farmers to limit the application rates of phosphorus on their land and there are no requirements regarding the timing and method of phosphorus applications. Farmers within Nitrate Vulnerable Zones (which includes much of the Lugg catchment) must adhere to nitrogen limits which involve monitoring the application levels and timing of slurries and manures. Whilst this process is likely to indirectly result in a limit on phosphorus applications, NVZ rules do not specifically target phosphorus applications.

#### *APWNS*

APWNS are not suitable for tackling excessive phosphorus levels in soils or for specifying requirements for timing and methods of application due to the need for establishing source, pathway and receptor impact which is very difficult for phosphorus. Other than indirect measures as outlined above, there are no statutory measures designed to enforce phosphorus limits.

#### *Environmental Stewardship*

Reducing phosphorus levels in soils is not an explicit objective of the Environmental Stewardship programme but there are measures within the schemes which stipulate a reduction of cessation in the application of manures. For example the ELS maize management options (EJ2 and EJ10) require appropriate rates and timings of manure applications both to the maize crop and the subsequent crop planted. The difficulty with these measures is that they tend to be adopted by farmers who are already extensive in their operations and are unlikely to have high phosphorus indices on their farms.

### *Capital Grants*

For livestock farmers, applying phosphorus at appropriate time windows (when crops require nutrients for growth) very largely depends on the availability of sufficient storage capacity. Since the creation of the CSF capital grants programme, there has been a valuable introduction of grant aid to fund the construction of manure storage (CSF023) and slurry storage (CSF026) roofing areas. However, CSF and other advisory personnel on the ground are of the view many farms require fundamental increases in storage capacity, necessitating the building of new stores for which CSF grants are not available. South West Water is investing significant funding to increase on-farm slurry storage which is providing much needed private funds to boost the money available through the CSF grant pool for store roofing.

### **Catchment Sensitive Farming Programme Review**

Feedback from Catchment Sensitive Farming Officers (CSFOs) suggests targeting CSF grants and advice has proved difficult to deliver on the ground due to incomplete data sets and uncertainty regarding the nature and scale of water quality problems in their respective catchment areas. The level of information (data) exchange between the CSF programme and EA 'data gatekeepers' regarding water quality monitoring and assessment analysis appears to vary between catchments. Observations from CSFOs suggest there are often strong differences of opinion between national and local EA staff regarding which water quality issues should be targeted for WFD compliance which, in turn, is leading to confusion amongst CSF delivery teams.

Based on observations from the CSFOs interviewed, it does not appear the CSF programme has been successful at reaching the 'difficult to engage' farmers i.e those farmers who tend not to proactively seek advice and who are often believed to have significant pollution issues on their farms. Lack of time and a reluctance on the part of CSFOs to cold-call these farmers are cited as reasons for lack of engagement with this cohort of the farming community. Cold-calling training is being provided to CSFOs to equip them with the confidence to undertake this difficult activity more widely.

Revisions to the CSF grant application process have resulted in applicants standing a better chance of receiving funding if they have already engaged with CSF (e.g attended a CSF clinic) or become involved in the Environmental Stewardship Programme. The difficulty with this approach is that 'difficult to reach farmers' by definition have not engaged with these programmes. By reducing the likelihood of these farmers to obtain CSF grant, it is possible they will become even more marginalised and isolated from the programme and its broader objectives.

An examination of the measures eligible for CSF funding within the three study areas suggests these measures are broadly appropriate for dealing with the soil and phosphorus problems identified. However, whilst the measures eligible for grant appear well conceived, the evidence suggests the grant has not been targeted effectively so far. Feedback from CSFOs indicates they have limited time available to visit farms to identify measures for funding and the scoring of CSF applications has historically been undertaken by a centralised administrative team in Nottingham who are not necessarily best placed to judge optimal grant allocation. However, it appears CSF managers have recognised this shortfall in the current system because from 2012, CSFOs will be given much greater opportunity to score applications.



It is uncertain at the current time how well integrated the CSF programme and its staff are with the Natural England Environmental Stewardship initiative. Rather than having separate staff delivering CSF, ELS and HLS schemes, some CSFOs questioned whether it would make more sense to merge the various schemes under a single delivery team to promote internal co-ordination and allow a single point of contact with farmers to facilitate relationship building.

Following on from this, there are a large number of extension providers operating at various levels across the farming sector, seemingly with different remits and modes of operation. Not surprisingly, the end customer i.e the farmer, is often receiving different messages regarding what is expected from them; which is leading to confusion and often disillusionment with the environmental agenda. It is crucial, therefore, that all deliverers sing from the same hymn sheet. This will require leadership from Defra to bring the various providers together to agree a common objective and working practices.

### **Overarching Observations**

A reoccurring theme that emerged across all three study areas was a clear lack of consensus regarding the nature and extent of local water quality problems. Almost without exception, the farmers engaging with this project were of the view the farming community must be presented with evidence that a problem exists before they will be willing to take action. Farmers do not appear to have been adequately involved by the catchment management community in jointly understand the problems. Consequently, this has led to many farmers remaining disengaged from the subject and, in some cases, becoming overtly hostile to the agencies involved.

There was universal agreement amongst the farmers that regulation to protect water quality is needed and justified. Farmers were quick to point out, however, that it is vital they understand what constitutes an offence and the regulatory process must be perceived as fair. A warning or series of warnings followed by prosecution through failure to act on these warnings is deemed a balanced way forward.

A fundamental finding of this project generated from stakeholder feedback is a need for clear demarcations between the roles, responsibilities and operating practices of the statutory agencies and advice providers (public, private, NGO) operating within the catchment management space. Each organisation involved in the mix should have a defined and well communicated terms of reference and be experts in their respective fields of operation to generate trust amongst themselves and wider stakeholders.

Evidence from a plethora of research studies (strongly reaffirmed by farmer opinion expressed in this project) highlights the need for farmers to develop an on-going confidential relationship with a trusted farm advisor before they are willing to voluntarily discuss pollution problems on their landholdings and be receptive to new ideas and working practices. For this reason, it seems the EA is not well placed to act as a first port of call for farmers seeking advice on pollution issues. Not surprisingly, farmers have an inherent fear of the EA due to its regulatory and enforcement function.

Whilst the EA should not necessarily be precluded from maintaining an advisory capacity, there is a clear need for a confidential arms length highly skilled extension advice service capable of helping farmers tackle water pollution issues within the context of running profitable farm businesses. Given the CSF programme is already established, it would make sense to develop the skills base and capacity of this initiative, complimented where available

by independent organisations such as ADAS, The Rivers Trusts etc. With an effective and trusted extension service in place, this would leave the EA with a clear regulatory focus. Based on feedback from EA local managers, there appears to be a skills shortage within the Agency regarding knowledge of farming systems and the farming sector in general. EA managers believe this is a major problem regarding the ability of Enforcement Officers to correctly identify pollution issues, understand the causes of these problems, and command the respect of farmers when engaging with them on these matters. When asked to express their views on the EA staff they have dealt with, farmers were impressed with their professionalism but, with one exception, were of the opinion they lacked sufficient knowledge of the industry over which they were regulating. It appears the EA is planning to address this issue by developing a training system designed to produce Enforcement Officers who are specialists in agricultural systems although it seems this is currently planned to happen in the Midlands region only.

Feedback from EA Local Managers suggests Enforcement Officers spend considerable amounts of time 'processing paperwork rather than undertaking on-farm visits'. The view from managers is that a considerable volume of paperwork could be dealt with by administrative staff, freeing up Enforcement Officers to work on-the-ground.

### **Current Common Agricultural Policy Reform Proposals**

It is clear from the EU Commissions 'CAP towards 2020' communication that the share of the CAP budget allocated to Pillar II is not envisaged to expand further which has disappointed many environmental groups who see Pillar II as an efficient mechanism of targeting payments to farmers to deliver specific environmental outcomes. Rather the Commission's proposal is to introduce a 'greening' element to Pillar I involving 30% of Pillar I funds being ring fenced to fund a range of green measures including crop diversification, maintenance of permanent grassland and the establishment of Ecological Focus Areas (at least 7% of the farm, excluding permanent pasture, must be left fallow or put into extensive management).

In terms of helping to mitigate the types of soil and nutrient run-off issues highlighted within the study areas for this project, it would appear the Ecological Focus Areas (EFA) offer the best opportunity. Given a need in some cases for the strategic arable reversion of land, the EFA measure potentially offers a valuable tool to protect water resources and deliver WFD outcomes. Importantly, it has the potential within a given catchment to protect specific land areas at risk of soil erosion and run-off and, importantly, reduce the budget needed to fund the uptake of these measures from the agri-environmental pot (Pillar II or private funds) which can, therefore, be diverted to delivering other environmental outcomes.

However, the success of this measure will entirely depend on the detail of how it is implemented. In particular, it will be vital to ensure farmers position their EFAs on areas of their farm which are likely to produce greatest resource protection outcomes. For this reason, farmers should not be left to their own devices when selecting this land but should be required to refer to some form of catchment risk map which stipulates areas where EFAs should be selected.

### **Potential For Private Sector Investment In Catchment Management**

An effective combination of regulation, advice and CAP derived funds (both Pillar I and II) should be able to bring about many of the necessary changes but it is likely that more money will be required, particularly for capital infrastructure payments and land retirement in specific areas of ecological and/or drinking water importance.

In recent years, a growing interest has developed in what have generically become known as Paid Ecosystem Services (PES) models for environmental protection' defined as involving a voluntary transaction where a well-defined environmental service (or a land use likely to secure that service) is 'bought' by a (minimum one) service buyer from a (minimum one) service provider if, and only if, the service provider delivers appropriate levels of service provision. A review of the literature has identified a small but growing number of instances where private (non-government) entities have funded payments direct to landowners to deliver specific environmental outcomes. In some cases, these markets have been initiated and managed completely independently of the state whilst in most cases, the state has played a major role in their development, funding and on-going administration. Indeed, private funding contributions have, thus far, been relatively small compared to the other sources of funding such as donors or public resources. A key problem with PES markets is the potential for high transaction costs, highlighting the importance of good intermediaries who can reduce transaction costs to an economically efficient level.

Water companies in the UK are increasingly being seen as a potential source of private sector investment for catchment management initiatives. During the fieldwork for this project it has been possible to identify different trajectories within the water industry regarding water company involvement. A small number of water companies are already working with landowners to deliver improved water quality at the farm level. For example, during the PR09 funding round, South West Water is spending £9m on moorland and farmland projects and £1m on catchment investigation projects which totals 1% of total CAPEX between 2010-2015. In PR14, South West Water plans to spend between £30-£50m on catchment management projects, split approximately 66% on moorland rehabilitation projects and 33% on wider farmland. The majority of water companies have not invested in catchment management thus far, but are currently investigating the likely efficacy of on-farm measures to mitigate water quality pollution issues and the likely propensity of farmers to take up the requisite measures on a voluntary basis.

It is interesting to note that both South West Water and Severn Trent Water whose operational regions overlap with the DSEPP project study areas have chosen to work with local Rivers Trusts who act as neutral brokers between the water company and local stakeholders particularly farmers. This arrangement closely resembles the 'trusted intermediary' model referred to in the academic literature as being a prerequisite for successful PES market formulation and delivery.

Ultimately, the key issue that will determine the geographical scale of water company investment in catchment management is commercial self-interest. Based on discussions with water company representatives, it is clear that water companies will only invest in catchment management where this approach will provide value to their customers and shareholders. The role of OFWAT, the Water Industry Regulator, is also vitally important regarding water industry investment in catchment management as it is ultimately OFWAT which sanctions this investment through the Periodic Review process. Discussions with OFWAT representatives for this project suggest OFWAT is broadly very supportive of catchment management as an approach but is cautious regarding whether catchment initiatives will work and, therefore, whether water customer money can be spent in this way.

It will also be vital from the point of view of both OFWAT and the individual water companies, that a clear regulatory baseline is established for farm environmental compliance standards, underpinned by effective enforcement. This will give the water

industry confidence that investment made in farm level activities will not be delivering outcomes which should already be being delivered to comply with legal requirements. And importantly, this appears to be a necessary prerequisite before water customers can be asked to pay land managers for the delivery of additional ecosystem services.

As part of the DSEPP project, interviews were conducted with a small number of companies from outside the water industry in each of the three study catchments to determine their attitudes towards a conceptual PES model for catchment management and whether they could foresee their respective company's funding catchment management initiatives in the future. In general, there was a very positive response to the principle of investing in a locally based catchment management scheme. For example, one company interviewed currently supplies Marks & Spencers with food items and explained M&S is increasingly examining the sustainability of its own food and drink supply chain. If the company could demonstrate to M&S it was investing in a food supplier network which was delivering multiple environmental benefits, it was felt this might well provide a competitive advantage over other food processing businesses.

However, respondents were quick to point out that unless existing tax systems are modified to allow these schemes to be funded or unless businesses are required by law to invest in them, the funding for these schemes generated organically is likely to remain very low. As demonstrated by international experience, it seems fiscal and regulatory intervention will be required by government if localised PES schemes capable of delivering water resources protection are to become a widespread reality.

#### **Paid Ecosystem Services Mapping**

To deliver both food and multiple other ecosystem services within a catchment, there is a need for a variety of land uses capable of delivering these outputs. Some areas will be more suitable for growing food and some more suitable for providing other services including water quality, flood alleviation, recreation and biodiversity. Where a farmer is producing food from a unit of land likely to cause soil erosion but where this unit of land is crucial for the provision of multiple other ecosystem services, an argument exists to divert land use away from food production toward the provision of these other services. If a market can be developed where beneficiaries of multiple ecosystem services derived from the land unit are prepared to pay the farmer more for these services than he is currently deriving from using that land for food production, it is possible to envisage an optimal societal outcome.

If suitable market mechanisms could be established, it is possible that funds from beneficiaries could be targeted at land parcels causing water quality pollution problems where these parcels have a high multiple ecosystem service value. These private markets could be used to supplement payments made from Common Agricultural Policy or other public funds thereby producing a significant incentive for landowners to divert land away from agricultural production activities with a high probability of causing pollution problems. Farmers will need to be convinced, however, of the merits of PES markets. Indeed, becoming suppliers of a wider range of ecosystem services remained an esoteric concept for many members of the farming community interviewed during this project.

The governance and management of these funds would need to be co-ordinated to deliver maximum benefit, with international experience suggesting a 'neutral broker model' is likely to be the best institutional arrangement for achieving this outcome.

## **Conclusions and Recommendations**

### **Improved Governance Of The Catchment Management Planning Process Is Required**

There is a need to co-ordinate understanding surrounding the state of waterbodies, for uncertainties to be clearly communicated and agreed on, and for solutions and delivery plans to be developed which have a mandate from the farming community, delivery agencies, the water industry and other catchment stakeholders. Clear problem definition will allow development of targeted mitigation solutions.

To facilitate the development of a co-ordinated catchment plan, information flow between stakeholders must be transparent and accessible. This requires the development of open access catchment scale data repositories which become the one-stop-shop for all parties involved in the delivery of WFD objectives.

There is a need to clarify the roles and responsibilities of the various parties involved (public, private, third sector) in the delivery of WFD objectives to avoid institutional conflict, encourage efficiency, and ensure the whole is greater than the sum of the individual parts.

### **Transparent, Equitable And Enforceable Regulation Of An Environmental Baseline Is Needed**

Farmers are currently confused, both about their legal responsibilities and about the enforcement process that accompanies the regulation of environmental compliance matters. Conversely, there also appears to be confusion amongst the regulatory authorities regarding process and application of regulation relevant to the agricultural sector.

There is a clear need for this situation to change. The evidence suggests that an unambiguous enforcement process needs to be established and, most importantly, clearly communicated to the agricultural sector. Cross compliance measures should not be increased in number. What is needed is for the existing requirements to be adhered to and for a process of stepped enforcement (repeat visits) to be implemented to ensure pollution problems are successfully mitigated once identified.

Similarly, outside the cross compliance process, EA enforcement procedures also need to be capable of identifying problems on a catchment scale and able to follow through a problem from identification to successful mitigation. Walkover surveys and follow up farm visits offer a route to achieve this, backed up by an appropriate monitoring. Increased resource will be required for the EA to implement walkover and follow up visits but the evidence suggests the costs of doing this will not be orders of magnitude greater than existing resource availability. A distinct advantage of a proactive walkover approach undertaken by the EA is that those farmers which the CSF programme has struggled to engage with thus far will very likely be identified by the EA and referred to CSF advisors for assistance.

To improve the effectiveness of EA delivered regulation, consideration should be given to a national roll out of the specialist training currently being provided to agricultural Enforcement Officers in the Midlands region.

### **Investment In Agricultural Extension Is Required**

There is an urgent need to invest in the expansion and skills base of extension providers in England. The Catchment Sensitive Farming initiative should be invested in by government, to provide a highly skilled and credible hub for future extension provision, working with other delivery partners (including the third sector) where these are available, locally accepted and have the requisite skill sets.

Focussing on the three study catchments for this project, with the exception of the Caudworthy catchment, current CSFO capacity would need to be increased; from 0.3 to 0.6 FTE in the Rea and from 0.5 to 2.4 FTE in the Lugg. Whilst representing increased costs, numerous research projects focusing on farmer behavioural change have identified a central role for one-to-one advice delivered by a trusted and skilled advisor, often over an extended period of time. The importance of this issue has been formally recognised by the EU Commission in relation to forthcoming reforms of the Common Agricultural Policy which is stressing the need for member states to put in place enhanced advice provision.

Farmers must play a central role in the design and constitution of locally delivered advice to ensure provision is tailored to need. Consideration should also be given to fully integrate CSF, ELS and HLS advice provision within Natural England to avoid the dangers of fragmented advice delivery and encourage a common vision for the delivery of support to the rural landscape.

### **Financial Support To Deliver Water Resource Protection Needs Reform**

It is possible that targeted Ecological Focus Areas (EFAs) under the proposed greening of the Common Agricultural Policy could deliver many of the necessary land use changes from Pillar I (Single Farm Payment) without the provision of Pillar II agri-environment payments. However, should targeted EFAs not be possible, or where these would not be sufficient within a given catchment, additional payments to farmers will be needed. In this case, it is recommended that the current ELS scheme is fundamentally reshaped to focus payments on targeted resource protection measures. Where income forgone rules limit the payment levels that can be offered to farmers to adopt bespoke land use change options, additional financial resources should be sought from the private sector through the development of PES markets.

The capital works budget under the CSF programme, if targeted and if continued at current levels, appears to have the potential to deliver many of the needed changes by the end of the second WFD cycle. However, it is very unlikely significant infrastructure improvements such as new slurry stores or cattle housing either can be, or will be, funded under RDP funding streams. As with selective land use change above, it appears, therefore, that private sector money – either as lump sum grants or in the form of low/no interest loans – will be needed to deliver the necessary scale of change required. There is a need for the co-ordination of different funding streams to deliver one set of targeted objectives at a catchment scale, set out in a single integrated management plan agreed by all parties.

### **Need For A Participatory Phosphorus Management Strategy**

It is understood that Defra has agreed not to propose the implementation of new measures within Water Protection Zones before first a) developing a catchment approach that targets the use of existing regulatory, advice and incentive mechanisms b) determining the efficacy of this approach; and c) assessing whether additional measures are required. This would appear to be a balanced approach in line with the government's better regulation agenda. However, there has been no clear roadmap and timetable presented to farmers setting out

an overarching process for addressing agricultural impact on the water environment; a much needed set of milestones which should be communicated to all stakeholders. A clear plan is required setting out basic compliance measures together with additional incentivised measures that will be available in certain areas – while making it clear that if farmers do not engage with the process, additional regulation will become a necessity. This certainty is needed for farmers to understand what is required of them and to plan effectively for the future.

Should phosphorus restrictions be implemented, it will be crucial to ensure a very long lead time is given (at least 5 years) for farmers to be able to make appropriate financial plans surrounding their businesses, which, in many cases may require significant structural adjustments.

Financial assistance to farmers to put in place storage capacity should also be given serious consideration. Whilst it is probably not possible for public money to be made available in England - due to a combination of state aid rules and a precedent of no financial assistance being offered with NVZs - this should not preclude assistance being made available from the private sector through Paid Ecosystem Service markets where feasible to establish.

## 1.0 Introduction

Solving the problem of water pollution from agriculture and meeting the requirements of the EU Water Framework Directive (WFD) represents a significant challenge; particularly in an era of growing food demand world-wide, changes in climate patterns, global financial instability and pressures on public finances. Indeed, for Defra, the issue of agricultural pollution of water represents a 'wicked problem' (Rittel and Webber 1973) involving technical uncertainties, a diverse range of interest groups often with different values, a lack of definitive problem formulation and a need for a multi-stakeholder response at a local level which precludes a top-down centrally managed process. It is no surprise a solution to this problem has been slow to emerge thus far.

This document contains the findings from 'Component B' of a Defra Strategic Evidence and Partnership project (DSEPP)<sup>1</sup> designed to assess the ability of current policy tools and funding mechanisms to address water quality impacts from agriculture and offer policy relevant recommendations for any changes required to the current system. It is envisaged that the outputs from the project will have relevance to Defra's ongoing WFD policy agenda in addition to the implementation of objectives outlined in both the Natural Environment and forthcoming Water White Papers.

Readers should note the information presented in this report should be distinguished from the activities of Component A of the DSEPP which focussed on matters relating to waterbody assessments, data management and collection of information relevant to the development of river basin management plans. The outputs of Component A have been reported separately by Alistair Maltby of The Rivers Trust.

The evidence and analysis provided in this report originates from participatory research with on-the-ground practitioners and farmers in three case study catchments on the western side of England: the Caudworthy Water (Tamar), the Lugg (Wye) and the Rea (Severn). It is, therefore, important to note that the analysis and conclusions from this project have been derived from a sample of predominantly livestock and mixed farming catchments, albeit with arable farming having a significant presence in particular sections of the Lugg and Rea catchments. An assessment of particular problems associated with intensive arable catchments, where agro-chemical pollution can predominate, has not been the focus of this project. However, many if not all of the overarching conclusions from the project have generic policy relevance to the management of all catchments in England irrespective of their geographical location.

Section 2.0 briefly outlines the Objectives and Methodology used for the project whilst Section 3.0 details the main water quality problems reported in the study areas together with the underlying reasons behind these problems. Sections 4.0 and 5.0 provide an assessment of the current policy instruments available to address the problems encountered whilst Section 6.0 presents an overview of a number of observations relevant to the governance of these policy instruments. Section 7.0 offers a discussion on required changes to current policy instruments, followed by Sections 8.0 and 9.0 which assess how Common Agricultural Policy reform and private investment in catchment management might best be leveraged to deliver WFD objectives. Finally Section 10.0 contains conclusions and recommendations emanating from the project findings.

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<sup>1</sup> DSEPP is a co-funded project with funding sources provided by Defra, The Rivers Trust and WWF UK



## **2.0 Objectives and Methodology**

### **2.1 Objectives**

The overarching objective of Component B of DSEPP was to bring Defra, The Rivers Trust and other key stakeholders together in three case study catchments to seek a pragmatic and cost effective strategy for meeting Water Framework Directive water quality goals. Specific objectives were effectively two-fold:

#### **Primary objective:**

- To assess the ability of current policy instruments (regulation, agri-environment incentive payments, advice) to deliver water quality improvements within the three catchments selected for the study

#### **Secondary objective:**

- To assess the potential for private sector funding to compliment publicly funded agri-environmental payments targeted at water quality improvement

### **2.2 Methodology**

#### **2.2.1 A Multi-Stage Approach**

From the outset, it was agreed that the information needed to meet these objectives would be collected via primary research with 'on-the-ground' stakeholders in three study catchments: the Caudworthy Water (Tamar), the Lugg (Wye) and the Rea (Severn). These catchments were chosen due to their association with agricultural pollution problems (all three are within Catchment Sensitive Farming priority areas), the existence of local Rivers Trusts at different stages of development and the presence of water companies involved with a range of catchment management initiatives. Further details relating to the physical characteristics of the three study catchments can be found in the Component A report.

A bottom up approach was adopted to ensure information was obtained from either individuals directly involved in the delivery of current policy instruments or individuals on the receiving end of these policies (currently or potentially), most notably members of the farming community. A summary of individuals engaged by the project are outlined below:

- Local farmers, many of whom had engaged with the Environmental Stewardship (ES) and Catchment Sensitive Farming (CSF) programmes. Several had experience of cross-compliance visits
- Environment Agency personnel: Local Team Leaders, Enforcement Officers, Land Use Experts
- Natural England Personnel: ES Officers, CSF Officers
- Water Company Catchment Managers
- Farming and Wildlife Advisory Group advisors (FWAG)
- National Farmers Union (NFU) representatives
- Wildlife Trust and Area of Outstanding Natural Beauty (AONB) representatives
- Local businesses representing potential sources of funding for Paid Ecosystem Services (PES) schemes

Information gathering was achieved through the following four-stage process undertaken between January and September 2011:

### **Stage 1**

#### **Initial kick-off workshops in each of the three study catchments to explain the objectives of the project and gain buy-in to the initiative**

These one day meetings enabled a discussion around a number of topics including: attitudes towards current public funded agri-environment schemes; attitudes towards the role of regulation in tackling diffuse pollution from agriculture (inc. cross-compliance); attitudes towards actual and potential water company lead catchment management schemes; catchment governance and the role of the public, private and NGO sectors

### **Stage 2**

#### **Problem identification and solutions workshops**

These one day workshops were structured to gain a collective understanding of the nature and scale of water quality problems in each study catchment and a steer from stakeholders on how best to deal with these problems. This discussion was facilitated by focussing debate on whether sources, pathways or receptors should be targeted and how this might be done. Large scale catchment maps were used to provide a vehicle for capturing opinion and determining where effort should be focussed.

To assist stakeholders in their thinking, the ECM+ Model<sup>2</sup> was applied (Caudworthy and Rea catchments) to enable a quantitative analysis of the levels of change required within the study catchments - both in terms of cross compliance adherence and take up of agri-environment measures – to reduce Phosphorus loadings to WFD compliant levels. The ECM+ Model provides stakeholders with an opportunity to construct different land use and management scenarios within a given catchment, thereby facilitating a discussion around the trade-offs that might be required to meet WFD Good Ecological Status (GES).

### **Stage 3**

#### **Assessment of current policy tools**

A series of interviews were subsequently undertaken in each of the three study catchments to determine the ability of the current suite of regulations and agri-environment schemes (public funded and water company funded) to deal with the problems identified at Stage 2. In total, 47 interviews were undertaken across the three catchments with representatives of the farming community, Environment Agency, Natural England Water Companies and FWAG.

### **Stage 4**

#### **Assessment of Potential Private Sector Funding**

In order to gain an idea of whether private sector funding might be leveraged to fund catchment management activity, a small number of exploratory interviews (n=7) were undertaken across the three study areas with private sector businesses; comprising energy intensive businesses interested in carbon management or food and drink businesses with an interest in sustainable food chains. Environment managers from these businesses were interviewed to assess the potential for their organisations to invest in land management

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<sup>2</sup> The ECM+ model has been developed by Tobias Krueger at the University Of East Anglia under RELU Project RES-229-25-0009 to enable an understanding of the effects of land use and land management changes and changes in sewage treatment options (inc septic tanks) on water quality. At the current time, the model is capable of forecasting Nitrogen and Phosphorus loadings, not all water quality parameters.

schemes designed to deliver multiple ecosystem benefits including water quality improvements.

In addition to the four stages outlined above, a series of four interviews were also held with academics known to the author specialising in the field of Common Agricultural Policy reform and agri-environmental policy design. These interviews were helpful in providing a strategic context to assist in the interpretation of the on-the-ground evidence coming from stakeholders in the case study catchments.

### **2.2.2 Confidentiality**

In order to encourage candid dialogue in open meetings and one-to-one interviews, individuals taking part in the case study level research were assured that their specific comments would remain confidential to the author. This report, therefore, presents synthesised findings and does not directly attribute individual comments or points of view made.

### 3.0 The Problems And Reasons Why The Problems Occur

#### 3.1 Key Problems Identified By Stakeholders

As outlined in Section 2.0, Stage 2 of the project involved convening workshops in the case study catchments to identify key factors impacting on water quality and the underlying reasons behind these factors. A revealing finding from these workshops was a lack of concrete evidence regarding the nature and extent of water quality problems in the study catchments which made building a consensus opinion of the problems very difficult. A further discussion of this issue is provided in Section 6.1.

However, through dialogue between workshop participants, stakeholders reached broad agreement across all three study areas that sedimentation and excessive phosphorus entering watercourses were the two key problems that need to be addressed. Table 1 below summarises the problems and underlying reasons cited.

**Table 1. Summary of problems encountered and underlying causation**

Problem Identified	Reason Why Problems Occur
Excessive sediment entering watercourses causing turbidity and smothering gravels	<p>Growing crops (e.g potatoes, maize, winter cereals) in certain high risk fields without appropriate management practices in place</p> <p>Overstocking of livestock in certain improved grassland fields at certain times (particularly winter) causing poaching and compaction</p> <p>Animals poaching and breaking down river banks</p> <p>Farm tracks funnelling water into fields</p> <p>Mechanical compaction of soils (e.g caused by taking feed out to animals or spreading slurry and manure in wet weather)</p>
Excessive phosphorus entering watercourses causing nutrient enrichment	<p>Mobilisation of soil particles (soil erosion)</p> <p>Overly stocked farms building up excessive phosphorus indices in their soils which increases volume of phosphorus reaching waterways via runoff</p> <p>Inappropriate timing of slurry and manures or too much being applied in a single application</p>

It should be noted that whilst the relative weighting of reasons behind the problems appears to vary between the study catchments, all catchments involved with this project were considered to exhibit all of the reasons outlined in Table 1 to a certain degree. It should also be noted that the reasons cited for pollution problems in Table 1 is not an exhaustive list with stakeholders mentioning several other issues including, for example, strip grazing of winter fodder crops (e.g stubble turnips) which can cause poaching, compaction and runoff problems. However, it was felt by project participants that the items summarised in Table 1 represent the main issues requiring attention and likely to yield the greatest benefits if put

right. On a positive note, it appears some significant problems within the study catchments have been addressed in recent years; for example, soil erosion from soft fruit grown under polytunnels in the Lugg where infrastructure improvements made by growers have significantly reduced pollution problems historically associated with these sites.

Sediment pollution and nutrient enrichment from phosphorus have been cited in numerous WFD evaluations as representing a problem across large areas of the UK<sup>3</sup>. Indeed, 'diffuse' phosphorus pollution is considered a significant problem for nearly 50% of rivers and 25% of lakes in England and Wales. Sediment (from eroded soil) pollution has been identified as posing a risk for 21% of rivers, with a 75% contribution expected from agricultural sources<sup>4</sup>. In terms of standards required to meet WFD requirements, there is a prescribed standard for phosphorus but not for sediments.

With the exception of the Lugg where 30% of waterbodies are officially failing the WFD phosphate standard of 0.06mg/l, WFD waterbody classifications do not flag phosphorus as being a problem in the other waterbodies across the three study areas. This stimulated significant debate amongst stakeholders regarding the sampling method used by the EA to measure phosphorus which is undertaken once each month and is likely to miss peak rainfall events when the majority of phosphorus movement occurs. By applying a probability to the EA data in the Caudworthy and the Rea<sup>5</sup> waterbodies, phosphorus levels move from a WFD pass to a fail which, therefore, corroborated local stakeholder opinion that phosphorus levels are likely to be a problem.

It is interesting to note that whilst sediment and nutrient pollution is often referred to as a 'diffuse' or 'non-point source' problem, stakeholders were largely of the view that the problem is often the result of 'multiple point source' pollution incidents from specific fields, tracks, gateways and stretches of river bank which can be identified. This view is of fundamental importance when considering policy approaches to dealing with sediment and nutrient pollution and is directly relevant to the debate surrounding the appropriate targeting of measures to deliver optimal cost:benefit outcomes (see Section 4.0).

### **3.2 Soil Pollution Processes**

Soil erosion is a naturally occurring process involving the mobilisation and deposition of soil particles, mainly by water and air. However, whilst soil erosion is a feature of any natural ecosystem, the rate at which it is taking place has been significantly accelerated by anthropogenic influences, often associated with inappropriate land use activities associated with agriculture. The volume of erosion can be striking. For example, in the Tamar catchment, a gross erosion rate of 5.3 t/ha/year has been estimated (Quine and Walling 1991). In terms of associated key impacts on freshwater ecosystems, excessive sediment entering watercourses can smother gravels preventing fish eggs and invertebrates from accessing sufficient oxygen to survive.

As outlined above in Table 1, soil erosion is often caused by a combination of activities which leave the land unprotected and vulnerable. During erosive rainfall events, soil may be

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<sup>3</sup> The Protection of Waters Against Pollution from Agriculture. Defra Consultation on diffuse sources in England, August 2007

<sup>4</sup> The Protection of Waters Against Pollution from Agriculture. Defra Consultation on diffuse sources in England, August 2007

<sup>5</sup> Probability calculations are undertaken within the ECM+ Model. Five-year average SRP concentrations were calculated from EA monitoring data for the period 10/2005-09/2010, i.e. the Water Years 2006-2010. The uncertainties around these average figures were estimated using Bayesian Inference

detached, transported, and deposited into watercourses which, in turn, compromises the health of freshwater fish, invertebrates and macrophytes. Sediment eroded from the top of a field may become deposited where the gradient slackens until a subsequent erosion event remobilises this material. Soil eroded from agricultural land will often find its way into a main river channel from where it can be transported downstream as far as the sea.

In terms of ecological service provision, soil performs many ecological functions including nutrient cycling, regulating water and nutrient flows, filtering toxic compounds and supporting the growth of a variety of animals and soil micro-organisms by providing a diverse physical, chemical and biological habitat. Crucially, it provides a medium in which crops are grown for human consumption. As such, it is a vital natural resource and forms a key building block upon which life on earth depends.

The effects of soil erosion can be sub-divided into on-farm and off-farm impacts. On-farm impacts are predominantly borne by the farmer and are essentially related to loss of production capacity. As soil erosion takes place, the ability for cereal crops and grass to flourish is reduced which, in turn, has a direct impact on the productivity of the land. The upper soil horizon or 'top soil' is the most productive component of any soil series and it can take upwards of 150 years for 1cm of topsoil to develop.

Off-farm impacts of soil erosion are largely borne by wider society and take a number of forms such as flooding, declining water quality and pollution of air; involving emissions of greenhouse gases such as carbon dioxide, methane and nitrous oxide.

### **3.3 Phosphorus Pollution Processes**

Phosphorus has been identified as a nutrient which should be prevented from reaching surface water bodies in excessive amounts as biological productivity in watercourses is usually limited by P availability. Too much P input can contribute to algal blooms (often toxic to both aquatic animals and humans) and watercourse oxygen deficiency which can be fatal for fish and other aquatic fauna.

Phosphorus entering watercourses from agriculture does so in two forms a) attached to soil particles and organic matter including animal manures (Particulate phosphorus which usually comprises over 75% of Total Phosphorus) and b) dissolved in water run-off (dissolved P, approximately 25% of Total Phosphorus). Fine textured soils (e.g clay loams, silty clay loams) have a particularly high risk of generating phosphorus transport to watercourses due to their high affinity to phosphorus combined with a high erosion potential. These soils typify much of the land covering the three study areas chosen for this project.

The proportion of total phosphorus (comprising both dissolved and particulate phosphorus) available to plants at a given moment in time is known as reactive phosphorus (or bioavailable phosphorus) which is made up primarily of dissolved phosphorus plus a small proportion of the particulate form. Some observers have commented that given the particulate form of phosphorus makes up a small proportion of reactive phosphorus, it should not be the focus of attention from policy makers concerned about water quality objectives. However, although not immediately available to plants, particulate phosphorus represents a major reservoir of potential reactive phosphorus which can become soluble over time through natural transformation processes in rivers, lakes and estuaries, particularly when dissolved phosphorus levels are depleted.

Phosphorus entering watercourses has multiple sources including agriculture, sewage treatment works, septic tanks, naturally decaying plant materials, stream bank erosion and wildlife excreta.

To reduce phosphorus transport to watercourses, it is imperative to ensure mobilisation of mineral soil and organic matter is minimised (prevents Particulate phosphorus transport). Methods to reduce soil mobilisation have been outlined in Section 4.2 and include contour cultivation and sowing, the planting of cover crops and arable reversion. Whilst these methods prevent mineral soil and organic matter mobilisation and therefore Particulate phosphorus, they are less likely to prevent dissolved phosphorus loads.

To prevent dissolved phosphorus loads, it is important to ensure that phosphorus build up in the top-soil is kept to a minimum to prevent this being dissolved in water passing over and through the top-soil e.g through drains. Where excessive application of animal manures occurs, high concentrations of phosphorus accumulate in the top layer of the soil which provides higher risk of dissolved phosphorus loads occurring during periods of run-off. When the spreading of manure is immediately followed by rainfall and runoff, then incidental transport can lead to loss of fresh manure-bound phosphorus.

Loss of phosphorus in runoff is influenced by the rate, method, and the timing of phosphorus application, source of phosphorus used, amount and duration of rainfall and the type of crop being grown. For example, the dissolved phosphorus concentrations can be considerably reduced if manures can be applied a few inches below the soil surface. Phosphorus is far less likely to run off the land if it is given time between application and rainfall events to be absorbed into the soil profile.

Phosphorus loads are also likely to vary considerably from farm to farm and field to field. High erosion risk land which is intensively farmed with high levels of manure application is likely to yield more phosphorus to water courses than a low intensity farm on flat land.

## 4.0 Current Policy Instruments

This section of the report revisits each of the underlying causes of pollution identified in Section 3.0 and systematically assesses whether currently available policy tools are appropriate and capable of dealing with these issues. A brief overview of relevant regulatory<sup>6</sup> and financial incentive mechanisms is provided first before going on to assess the efficacy of each tool to address each problem identified. An assessment of the current advice service available to farmers on pollution matters in the form of the Catchment Sensitive Farming (CSF) initiative is dealt with separately in Section 5.0.

### 4.1 Overview Of Current Regulatory And Financial Mechanisms Available

The following mechanisms represent the main policy tools currently available in England to address soil and phosphorus pollution from agriculture:

#### Cross Compliance

Since 2005, all farmers receiving the Single Farm Payment must adhere to a set of Statutory Management Regulations (SMRs) and Good Agricultural and Environmental Condition (GAEC) practices across their landholdings. Whilst there are a large number of SMRs and GAECs within cross-compliance, it is only the Soil Protection Review (GAEC1), Ground Water Regulations (SMR2), Sewage Sludge Regulations (SMR3) and Nitrate Vulnerable Zones (SMR4) that have relevance to the problems identified by stakeholders in the study areas for this project and of these, it is only really the Soil Protection Review that is directly targeted at managing soil and phosphorus pollution. Under EU regulations, 1% of farmers claiming the Single Farm Payment receive a cross-compliance inspection each year with compliance failures incurring losses of between 1% up to 100% for extreme and persistent failures. In England and Wales, The EA currently carries out cross-compliance inspections for Ground Water Regulations (SMR2), Sewage Sludge Regulations (SMR3) Nitrate Vulnerable Zones (SMR4) and Water Abstraction (GAEC18) with The Rural Payments Agency (RPA) inspecting compliance with the other land management cross-compliance requirements including the Soil Protection Review (GAEC1).

#### Anti-Pollution Works Notices (APWNs)

The EA has at its disposal Section 85 of the Water Resources Act 1991 ('Knowingly causing pollution') which enables prosecution for various offences where pollution of surface and/or groundwater occurs. The limitation of this mechanism is that it tackles the effect rather than cause of a problem and can only be invoked once a pollution incident has occurred. It cannot, therefore, be used to prevent water pollution taking place.

In addition to Section 85 of the Water Resources Act 1991, there is a plethora of environmental legislation on the statute books relevant to the protection of freshwater water systems including, but not limited to: The Nitrate Vulnerable Zone (NVZ) Regulations 1998; Anti-Pollution Works Notices, Section 161A, Water Resources Act 1991; Water Protection Zones, Section 93, Water Resources Act 1991; The Control of Pollution (Silage, Slurry and Agricultural Fuel Oil) 'SSAFO' Regulations 1991; Groundwater Regulations 1998; The Waste Management (England and Wales) Regulations 2006; Environmental Protection

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<sup>6</sup> The scope of this project focused on statutory law and not common law rights developed through precedents e.g. "A riparian proprietor is entitled to have the water of the stream on the banks of which his property lies, flow down as it has been accustomed to flow down to his property, subject to ordinary use of the flowing water by upper proprietors, and to such further use, if any, on their part in connection with their property as may be reasonable under the circumstances." (John Young & Co. v. Bankier Distillery Co. 1893 Appeal Cases 691)



Act 1990; Pollution Prevention and Control Regulations 2000; EU Environmental Liability Directive 2003; Wildlife and Countryside Act 1981; Salmon and Freshwater Fisheries Act 1975; The Sludge (Use in Agriculture) Regulations 1989; and the Town and Country Planning Act 1990.

Whilst a wide variety of legislation exists as outlined above, it is only Anti-Pollution Works Notices (APWNs) that are currently available to address soil and phosphorus pollution issues on open farmland in any location. APWNs served on a person require that person to carry out works and operations to prevent, or remediate the consequences of the entry of any poisonous, noxious or polluting matter or any solid waste to controlled waters and have been used to a limited extent within the agricultural sector (see below). Water Protection Zones Section 93, Water Resources Act 1991 are also available in principle to target soil and nutrient run-off and in a similar way to APWNs, Water Protection Zones can be applied anywhere they are necessary. This mechanism goes one step further than APWN legislation by having the potential to specify area based designations within which all farmers must undertake mandatory activities. However, due to the complexities of setting up WPZs including the need for the collection of robust evidence that justifies imposing costs on one group of land owners over others<sup>7</sup>, only one WPZ has been designated to date on the Dee catchment, largely to deal with industrial pollution. EA personnel consulted within this project did not consider WPZs to be a practical policy instrument for use in the foreseeable future.

### **Agri Environmental Schemes**

The Environmental Stewardship Scheme (ES), incorporating the Entry Level Scheme (ELS), Organic Entry Level Scheme (OELS), the Uplands Entry Level Scheme (UELS) and Higher Level Scheme (HLS) provides payments to farmers to undertake specific management practices or capital works designed to deliver environmental public goods. These schemes are offered to farmers on a voluntary basis and are promoted as multi-objective schemes covering a range of biodiversity, heritage and natural resource protection objectives, including soil and water protection. The ELS, OELS and UELS are non-competitive schemes and are open to all farmers whilst the HLS is a competitive scheme within which farmers must effectively bid for a share of a finite budget. According to Natural England personnel engaged with the project, HLS currently covers 10% of agricultural land across England and is increasingly focusing on SSSI sites and Habitats Directive designated areas.

In addition to ES, the CSF programme also provides grants to farmers within priority catchments (currently totalling 50 in England) to install capital items specifically targeting pollution from farmyards, intensive grassland and cultivated fields. The annual budget for 2011 totals £10.5m and is awarded to farmers on a competitive basis who must fill out an application form. Financial assistance is provided for a variety of works including clean and dirty water separation infrastructure, track maintenance, watercourse fencing, roofing of manure storage areas and the resurfacing of gateways.

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<sup>7</sup> WPZ designation also requires ministerial approval

## **4.2 Assessment Of Current Regulatory And Financial Mechanisms Relevant To Soil Pollution**

Having provided a brief overview of the main policy mechanisms currently available to address soil and phosphorus pollution, this section of the report reviews the capability of these mechanisms to address the soil pollution issues outlined in Section 3.0.

### **4.2.1 Addressing The Growing Of Crops In Certain High Risk Fields Without Appropriate Soil Management Practices In Place**

Growing crops such as maize, potatoes and winter cereals can be a high risk exercise, particularly on sloping land in fields with soils sensitive to capping and erosion. The late harvesting of maize and potatoes means bare earth can be exposed to autumn and winter rainfall events resulting in significant mobilisation of soil from land to nearby water courses<sup>8</sup>. If winter cereals or cover crops are not established early enough in the autumn to establish sufficient root growth and land cover, similar outcomes can become manifest.

#### **Cross Compliance**

The identification of soil erosion risk and the adoption of suitable control measures is a fundamental feature of cross-compliance, most notably within the revised Soil Protection Review (SPR) which all farmers receiving the Single Farm Payment must have completed by December 2010. Farmers must classify each field in terms of erosion risk (scale of low, medium and high) and then select a prescribed number of management options from a list of measures (Part 3 of the SPR) to manage this risk. Precisely which options the farmer selects is up to him. There is already, therefore, a toolkit in place to address the issue of high risk cropping in the form of the SPR. However, whilst it is too early to evaluate the impact of the revised SPR, views expressed by EA Enforcement Officers and farm advisors suggest the mechanism is unlikely to provide adequate protection against soil erosion. Two main reasons were given. Firstly, it is up to the individual farmer to assess the risk of his fields; the higher the risk identified, the more measures he must put in place to manage the risk. Given most farmers are not trained soil scientists, it is possible that many farmers will not correctly identify risk levels on high risk fields, thereby under scoring risk (e.g scoring a high risk field a medium or low risk field) and adopting a sub-optimal profile of measures to manage the risk.

Secondly, EA Enforcement Officers believe the SPR is an unenforceable mechanism because provided a farmer has completed his SPR, identified a risk level for each field and allocated the appropriate number of optional measures, he cannot be deemed non compliant even if he is causing a significant soil erosion problem on his farm. Whilst it is true a farmer cannot be initially deemed non-compliant provided he can demonstrate he has completed his SPR and adopted the appropriate number of measures, discussions with the RPA highlighted there is provision within the cross compliance enforcement process to prevent farmers from failing to take subsequent action. On encountering a soil erosion problem, RPA inspectors have the option to refer the case to Natural England land management specialists who will visit the site to make an assessment. If considered a serious enough case, Natural England will then refer the case back to the RPA who will write to the farmer with guidance on how to rectify the problem. Whilst no further action will be taken, it is understood from RPA inspectors that the probability of that farm being selected for subsequent cross compliance inspections will increase although this is not guaranteed. If the farmer is selected for re-inspection and it is found he has not adopted the guidance issued by the RPA, the RPA will then request action is taken and levy a financial penalty. However, whilst this referrals system does appear to be in place, consultation with the RPA reveals very few referrals are

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<sup>8</sup> There are, however, a number of management practices that can be adopted to reduce erosion risk such as rough ploughing after a maize harvest to improve rain infiltration rates and reduce overland flow

made by RPA inspectors to Natural England suggesting the process is not a standard operating procedure at the current time.

In addition to the above, observations made by both farm advisory staff and farmers themselves suggests RPA staff check for the existence of the SPR booklet when making a cross compliance inspection but not whether the measures within it have been applied. It is uncertain whether this is due to RPA inspectors being aware of the lack of enforceability cited above, a lack of resources or whether RPA inspectors lack confidence in being able to identify soil related non-compliances.

Given the revised SPR and related enforcement process is still relatively new, it is difficult to make a definitive judgement on whether this instrument is an effective mechanism to improve soil management in high risk fields. However, the evidence presented by respondents within this project suggests it is not. For the process to have credibility and purpose, it will be important to ensure inspectors have the skills and resources to check measures identified within a farmers cross compliance booklet have been implemented. Clearly, where soil management problems still prevail, it will be necessary for inspectors to have sufficient expertise to identify these problems and for a referrals process to be put in place which ensures farmers take appropriate action where current measures are proving ineffective.

Aside from the workability or otherwise of the SPR as an enforcement tool, interviews with farmers showed that the SPR processes has not engaging them in a broader sense regarding the importance of soils to their business and the negative consequences of soil erosion to the environment. When asked whether the SPR had raised awareness of the importance of soil management, one farmer dryly commented his 'awareness was raised for the time it took to fill out the book and put it in the drawer'. In many cases, it transpired respondents have employed land agents and advisors to fill out their SPR booklet and have played no active role at all in its development. The emergence of specialist cross compliance consultants (e.g Cross Compliance Solutions Ltd in Hereford [www.cxcs.co.uk](http://www.cxcs.co.uk)) is testament to this hands-off approach.

#### **Anti Pollution Works Notices**

As introduced in Section 4.1 and informed through discussion with EA staff, the EA does have the ability to issue Anti Pollution Works Notices (APWNs) served under Section 161 of the Water Resources Act to deal with soil related water pollution. APWNs can be issued when a) the EA can apportion responsibility to the source(s) contributing to the soil erosion that leads to pollution (a person has caused or knowingly permitted the pollutant to enter controlled waters) and b) specific land management actions are available to the land holder in order to achieve the desired environmental outcomes written into the APWN.

To serve an APWN, the EA must identify the source of the pollution, the pathway of the pollution to the receptor (the watercourse) and they must also demonstrate the pollution is causing an impact on the receptor. Details of which management activities are causing the problem need to be listed together with the specific improvements required to address the pollution risk. EA guidance to Enforcement Officers states that Officers should avoid unsuitable or unreasonable actions which may leave the Agency open to legal action. The guidance suggests SPR measures from the Cross Compliance Manual are recommended for use unless these are likely to be insufficient to deal with the issue at hand.

The difficulty with APWNs is that they can be time consuming to prepare and deliver with recent EA guidance specifying APWNs should only be issued where it is possible to

demonstrate a category 1, 2, or 3 level incident. Clear identification of the source of pollution is required which makes APWNs unsuitable if there are multiple holdings contributing to the polluting load.

Because of the resource implications surrounding the issuing of APWNs for soil pollution, the EA has been extremely reluctant to make widespread use of this instrument to date. Indeed, all but one of the EA enforcement staff engaged in the three study areas had never issued a works notice to a farmer. Notwithstanding the resource implications, there appears a clear case that APWNs represent an existing tool which could be applied more widely to pollution incidents arising from the inappropriate management of high risk crops. Clearly identifiable gully or rill erosion leading from a potato or wheat field directly into a watercourse is one such example.

### **Agri-Environmental Payments**

The Environmental Stewardship programme in the form of the Entry Level and Higher Level Schemes<sup>9</sup> offer sources of funding to farmers to adopt changes in land use which can, in certain situations, protect watercourses from soil erosion.

### **The Entry Level Scheme**

The Entry Level Scheme has been criticised historically for being too focussed on biodiversity and habitat measures at the expense of soil erosion and water pollution management options. However, in recent years new measures have been introduced with a resource protection focus, most noticeably *Measure EJ5 In-field grass areas to prevent erosion and run-off (New in 2010)*, *Measure EJ9 12m buffer strips for water courses on cultivated land (New 2009)*, *Measure EJ13 Winter Cover Crops (New in 2010)*, *Measure EE9 6m buffer strips on cultivated land next to a watercourse (New 2010)* and *Measure EE10 6m buffer strips on intensive grassland next to a watercourse (New 2010)*. These new measures add to the existing suite of 2m-6m buffer strip options under *Measures EE1 to EE6*.

Whilst the ELS scheme now contains a broad spectrum of resource protection measures, land management experts interviewed across the case study catchments were of the view buffer strips, unless very wide (12m+) are not capable of preventing soil reaching watercourses from fields with anything greater than a 7-10 degree slope. This view is backed up by the guidance in the Cross Compliance Guidance for Soil Management 2010. Most buffer strips within ELS are, therefore, not capable of preventing the type of soil erosion cited as emanating from sloping potato, maize and cereal fields across the three study catchments. If the ELS options referred to above are considered in this light, only the new options *EJ9 (buffer from 12m minimum up to 24m)* and *EJ5 (up to a third of any given field can be sown to grass)* are likely to offer adequate protection from soil erosion in anything other than very low risk fields. The difficulty with relying on these options as a mechanism for solving soil erosion is that the evidence suggests from numerous farmer interviews undertaken that voluntary take up of these options will be low because the loss of income from implementing these measures is perceived as too high due to the extensive loss of productive land involved. Given the recent introduction of these two measures it is too early to provide any quantitative analysis of actual take up rates. However, if we examine the take up rates for the buffering options which have been in ELS for some time (which involve taking land out of production), these have been very low across all three study areas as demonstrated in Table 2.

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<sup>9</sup> OELS and UELS are not focussed on within this report due to the very low uptake of these schemes within the study areas

**Table 2. Coverage Of Buffer Strips In Lugg And Rea Catchments**

Buffer Category	Total Length Of Buffer (km) <sup>(1)</sup>	Estimated Length Against A Watercourse (km) <sup>(2)</sup>	% Of Watercourse Bank In Catchment Buffered By ELS <sup>(3)</sup>
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**ELS buffer strips on cultivated land**

	Lugg	Rea	Lugg	Rea	Lugg	Rea
EE1 2m buffer strips on cultivated land	131	33	26	7	0.68	0.82
EE2 4m buffer strips on cultivated land	98	98	20	20	0.50	2.42
EE3 6m buffer strips on cultivated land	183	105	37	21	0.94	2.58

**ELS buffer strips on grassland**

	Lugg	Rea	Lugg	Rea	Lugg	Rea
EE4 2m buffer strips on intensive grassland	25	7	5	1	0.13	0.17
EE5 4m buffer strips on intensive grassland	67	28	13	6	0.35	0.70
EE6 6m buffer strips on intensive grassland	19	20	4	4	0.10	0.48

1. Data based on ELS and HLS Agreements current at March 2011. Source: NE Geographical Information & Analysis Team
2. NE ES staff estimate only 20% of buffers occupy watercourse bank locations
3. DRN online lengths are Lugg 1936651m and Rea 405270m (Source: EA Directives Reporting Services Team)

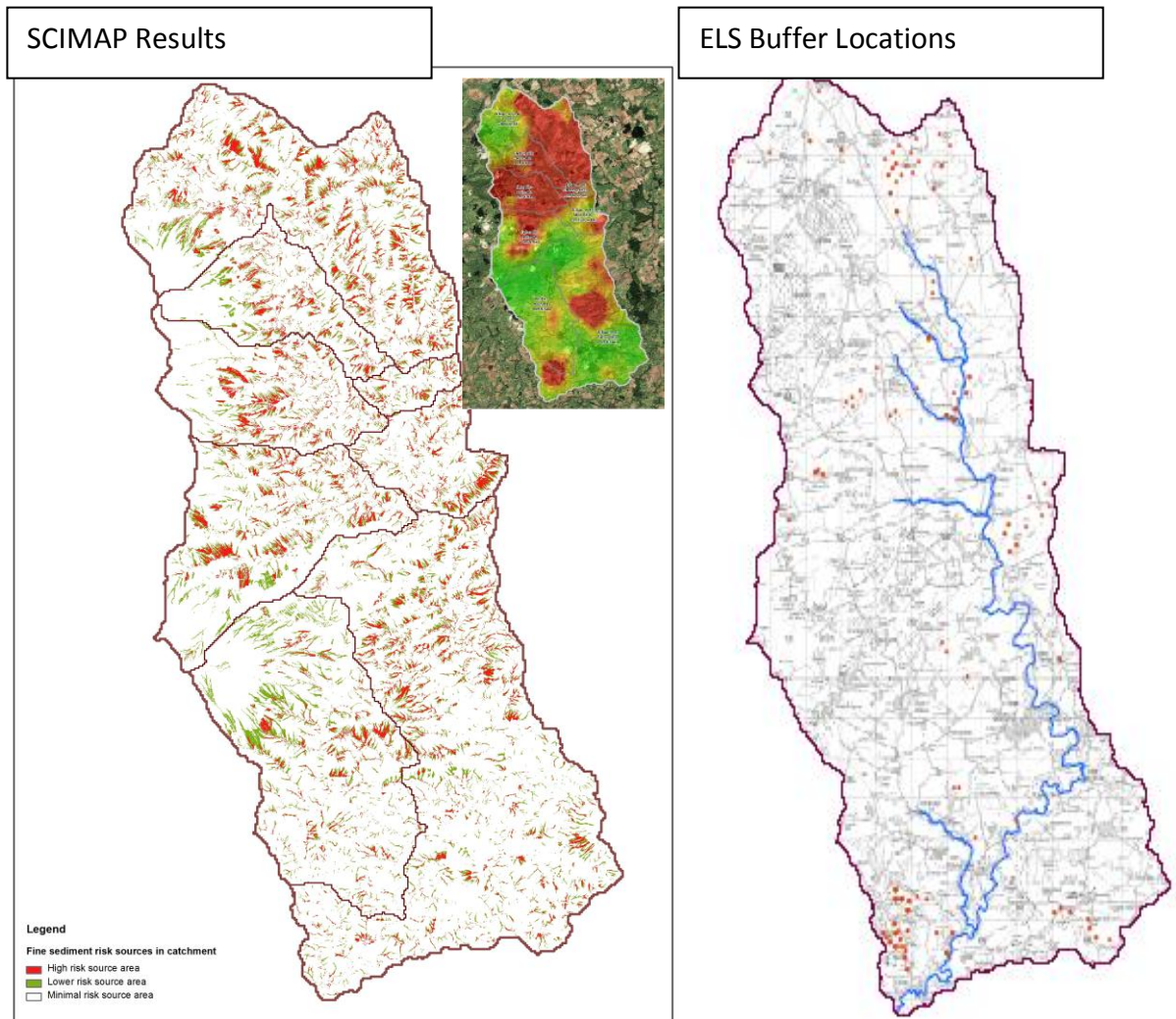
Where farmers have been prepared to enter land into buffer strip management, evidence from the farmer interviews shows they have only been prepared to give up marginal land which is difficult to farm anyway and produces low outputs from an agronomic perspective. Prime intensively farmed agricultural land is not being volunteered but it is precisely from this type of land that many of the soil erosion problems cited by stakeholders in the study areas appear to arise. Indeed, it is possible to infer from the current geographical distribution of ELS buffer strips within the project study areas that buffer strip options are not necessarily situated in areas at greatest risk from soil erosion. As can be seen in Figure 1 with regard to a SCIMAP risk analysis for the Rea catchment<sup>10</sup>, ELS buffer strip options on cultivated land are either absent or very thinly spread on many areas considered to represent a high erosion risk. Conversely, there is a relative concentration of ELS buffers on cultivated land in the bottom left hand corner of the catchment which the SCIMAP model and expert opinion on the ground suggest is a lower risk area. This strongly suggests ELS resource protection measures are not delivering targeted outcomes which has implications for the cost effectiveness of the scheme going forward.

Under the current programme, several individuals were of the view that a way to engage farmers to adopt effective resource protection measures within ELS would be to re-weight the allocation of points away from hedgerow management options towards resource protection measures. Currently, the majority of farmers derive most of their points from hedgerow management and do not need to undertake broader land management options. However, farmer opinion pointed towards a scenario where they would choose not to enter

<sup>10</sup> SCIMAP is a hydrological modelling tool capable of combining land use, slope and rainfall data to produce visual maps showing areas of a catchment that are hydrologically connected to a watercourse and thus represent diffuse pollution risk zones.

the scheme at all if they were required to undertake measures involving taking productive land out of agricultural production.

**Figure 1. Rea SCIMAP Sediment Source Risk Analysis And ELS Cultivated Land Buffer Distribution**



1. Insert in above risk map demotes key cereal growing areas
2. ELS buffer locations relate to 2,4 and 6m buffers on cultivated land as at March 2011 – Source: NE Geographical Information & Analysis Team

### The Higher Level Scheme

Higher Level Stewardship is targeted at specific areas of countryside considered to be particularly important for a range of Biodiversity, Landscape, Historic Environment and Resource Protection delivery objectives. According to Natural England personnel engaged with the project, HLS currently covers 10% of agricultural land across England and is increasingly focusing on SSSI sites and Habitats Directive designated areas. Both the Lugg (*Target Area Statement WM18 Wye and Lugg River Valleys Target Area*) and Rea (*Target Area Statement WM10 River Teme Target Area*) fall within HLS prioritised areas and have attracted a fair amount of HLS funds accordingly. The Caudworthy is just outside the HLS Target Area for the *North Tamar Catchment* and is characterised by only one HLS agreement focussed on a very small SSSI site in the northern fringes of the catchment. Priorities in each

target area are defined by a Targeting Statement which specifies farmers must undertake at least one of a number of land management activities, depending on the objectives for the Target Area. The *River Teme, Wye/Lugg* and *North Tamar Catchment* targeting statements all include soil erosion protection as one activity farmers can choose to deliver in return for HLS payments.

An examination of the HLS scheme demonstrates there are a small number of appropriate measures with the potential to combat soil erosion from high risk arable land. These include measures *HF14 Unharvested, fertiliser free conservation headlands with a width of 6m-24m (£440/ha)*, measure *HJ3 Arable reversion to unfertilised grassland to prevent erosion or run-off (£280/ha)* and *HJ4 Arable reversion to grassland with low fertiliser input to prevent erosion or run-off (£210/ha)*. The difficulty with these measures in terms of providing effective soil erosion protection is that many arable farmers do not consider the financial payments available a sufficient incentive to stimulate adoption, particularly with high projected prices for cereals over the medium to long term. By way of an example, a farmer interviewed in the Lugg catchment described how he had recently entered the HLS scheme and had adopted arable reversion but only because this suited his farm business plans to increase livestock production and reduce his arable acreage. He stated categorically that he would not have selected arable reversion had he planned to maintain his focus on arable production.

Other farmers within more of a mixed farming system do appear to view the HLS reversion payments as sufficient provided they are not asked to give up their prime agricultural land. The costs of reverting marginal arable land are considered to be offset by the overall income from the HLS agreement and the value of the new grazing land created. This is not perceived to be the case where prime arable land is concerned.

In all, the evidence shows the take up of HLS soil protection measures has not been widespread across the study catchments as indicated in Table 3 below<sup>11</sup>:

**Table 3. Uptake of HLS Erosion Management Measures in Lugg and Rea Catchments**

Measure Category	Total Area Under Measure (ha) <sup>(1)</sup>		Area Under Measure As % Of Land In Arable Rotation <sup>(2)</sup>	
	Lugg	Rea	Lugg	Rea
HJ2 Management of maize crops to reduce soil erosion	0	0	0	0
HJ3 Reversion to unfertilised grassland to prevent erosion/run off	85.3	8.72	0.293	0.002
HJ4 Reversion to low input grassland to prevent erosion/run off	80.2	11.42	0.276	0.002
HJ5 In field grass areas to prevent erosion or run off	7.48	15.99	0.024	0.003

1. Data based on HLS Agreements current at March 2011. Source: NE Geographical Information & Analysis Team

2. Figures based on area of land in arable rotation (Lugg 29,000 ha / Rea 5,600 ha). Source: June 2010 Agricultural Census

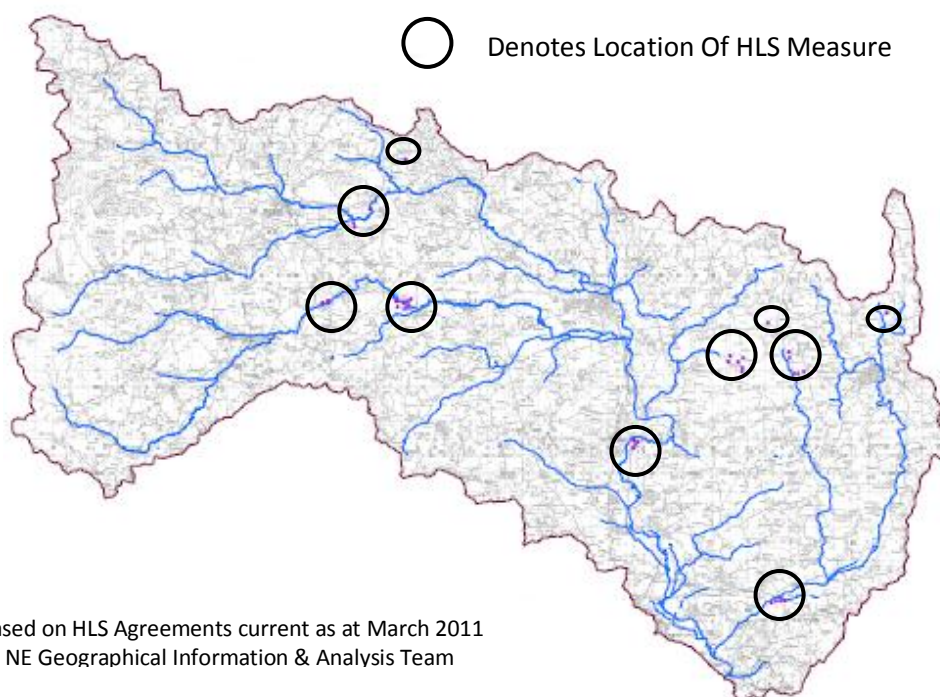
<sup>11</sup> No take up of these measures exists in the Caudworthy catchment

An illustration of the spatial distribution of these measures within the Lugg is provided in Figure 2.

Aside from payment levels, it appears HLS option uptake can be strongly influenced by the preferences of individual HLS advisors who may or may not prioritise resource protection measures within a given HLS application, depending on their technical backgrounds and conservation interests. Given HLS advisors explained persuading farmers to adopt resource protection measures – particularly arable reversion – can be difficult and sometimes unpopular, it was also possible to detect a lack of enthusiasm to promote resource protection through fear of losing farmer buy-in and, therefore, failing to hit HLS scheme adoption targets.

Discussions with Natural England HLS officers also suggest they view HLS as a multi-outcome scheme and tend not to focus on resource protection accordingly. As a result, the evidence points to a situation where HLS officers rarely concentrate on resource protection outcomes or working up HLS applications on farms where biodiversity or heritage outputs are unlikely. A noticeable exception was encountered in one of the study areas where a specific HLS officer has focussed on resource protection outcomes due to a personal commitment to reduce the soil erosion problem in the locality. In the round, feedback from HLS officers in the three study areas suggests that whilst HLS target statements can theoretically permit an HLS application to focus on resource protection outcomes, it is unlikely such an application will be successful.

**Figure 2. Distribution Of HLS Soil Protection Measures HJ 3, 4 & 5 In The Lugg**



Where resource protection focussed HLS applications have been successful is in the Clun catchment (near neighbour to the Rea) where Habitats Directive targets to protect the freshwater pearl mussel have necessitated HLS agreements to focus on water quality protection measures. Here, the driver for resource protection measures has been species protection rather than improvements in water quality per se.



#### 4.2.2 Addressing Overstocking Of Livestock In Certain Grassland Fields At Certain Times (Particularly Winter) Causing Poaching And Compaction

Large numbers of livestock on grassland fields can at times (particularly when wet) cause poaching and associated mobilisation of soil to rivers. Poaching tends to take place, although not always, on intensive livestock farms where animal densities can be high.

##### **Cross Compliance**

Under the SPR, there is an optional measure specifying that farmers should 'remove grazing livestock from grassland when the soil is too wet and poaching occurs' (Measure I7).

Measure I8, also optional, specifies that if it is necessary to out winter livestock, farmers should 'locate any sacrificial fields on freely drained soils and not on fields that will lead to erosion'.

There are, therefore, provisions within cross compliance to manage soil erosion caused by poaching. A difficulty arises, however, regarding enforcement thereof because if a farmer does not select option I7 above in his SPR for a given field, he cannot be deemed non compliant if poaching occurs on that field. Similarly, if he selects option I8 but causes an erosion problem on a given sacrifice field, it is very difficult for an enforcement officer to judge whether a farmer has selected an inappropriate field through negligence or through a genuine mistake.

Movement of livestock to prevent soil erosion is, therefore, not technically mandatory under cross compliance on improved grassland fields. Potentially, RPA inspectors can refer a case to Natural England and follow the enforcement process outlined in Section 4.2.1 but, according to RPA personnel consulted, this practice is not carried out in reality.

##### **Anti Pollution Works Notices**

EA personnel confirmed that APWNs could potentially be used to stop farmers poaching fields. However, as outlined in Section 4.2.1, the cause, the pathway and receptor damage would need to be determined in each instance which can be a resource intensive process. As a consequence, APWNs have not been used for this purpose thus far. For further details on the mechanics of serving APWNs, see Section 4.2.1.

##### **Agri-Environmental Payments**

There are currently no ELS measures targeting the alleviation of poaching on intensive livestock farms. There are, however, a selection of HLS measures that have the ability to achieve this outcome; specifically *HJ6 Preventing erosion or run-off from intensively managed improved grassland (£280/ha)* which requires restricted supplementary feeding and *HJ7 Seasonal livestock removal on grassland with no input restriction (£40/ha)* which applies on a whole field basis. There are also HLS measures which seek to reduce the grazing intensity on certain fields, particularly *HK7 Restoration of species-rich, semi natural grassland (£200/ha)* which precludes any heavy poaching by livestock.

Despite their existence, the evidence shows the coverage of these measures has been very low. No uptake can be found at all for *HJ6 Preventing erosion or run-off from intensively managed improved grassland* and *HJ7 Seasonal livestock removal on grassland with no input restriction* across any of the study catchments. Regarding *HK7 Restoration of species-rich semi natural grassland*, there are 205 hectares registered under this option in the Lugg catchment but none in the Rea or Caudworthy.

As outlined in Section 4.2.1 when assessing HLS soil erosion measures for arable land, it appears insufficient payments are the key reason why so few intensive livestock farms have adopted HLS measures capable of preventing soil erosion from their livestock operations. Feedback from HLS officers also suggests it is difficult for intensive livestock farms to meet the necessary criteria to qualify for entry onto the HLS scheme.

Poaching and compaction of land can often be particularly acute around drinking and feeding areas. The CSF grant scheme provides two funding options to tackle this problem, *CSF07 Hard bases for livestock drinkers and feeders* and *CSF010 Livestock troughs with associated pipework*. However, take up of these options has not been high thus far. For example in the Tamar catchment for the 2011/12 wave of CSF applications, only 7 out of 166 applicants applied for option *CSF07 Hard bases for livestock drinkers and feeders*.

It is also noteworthy that there are no agri-environmental payments currently available for winter housing, considered by many farm advisors as extremely important for keeping animals away from vulnerable fields during the wetter (winter) months of the year. Insufficient housing means farmers are often forced to place their stock in fields at times when a heightened risk of poaching and compaction exists. South West Water is currently funding winter housing, with a proviso that the farmer has enough land and manure/slurry storage to accommodate the nutrient flows from the number of animals owned. Subject to state aid rules, there would appear to be an argument for adopting this mechanism within the CSF grant scheme to fund winter housing where private funding sources (e.g water companies) are not available.

#### **4.2.3 Addressing Animals Poaching And Breaking Down River Banks**

Animals gaining direct access to river banks can severely damage bank structure, causing banks to collapse and soil to enter the river channel.

##### **Cross Compliance**

There are currently no mandatory requirements within cross compliance for farmers to prevent degradation of river banks. There is an option within the SPR grassland management measures to 'minimise damage to riverbanks by providing managed access to water for livestock' but farmers do not have to select this option. Evidence from farm advisors suggests farmers only select this option if they already have their watercourses fenced off and therefore do not have a problem with bankside poaching.

As with the crop risk management and in-field poaching issues already referred to, RPA inspectors can potentially refer riverbank degradation cases to Natural England and follow the enforcement process outlined in Section 4.2.1 but it does not appear RPA personnel have adopted this procedure thus far.

##### **Anti Pollution Works Notices**

According to EA personnel consulted, APWNs could be used to stop farmers allowing their animals to overgraze and destabilise riverbanks. However, as in outlined in Section 4.2.1, the cause, the pathway and receptor damage would need to be determined in each instance which can be a resource intensive process. EA staff explained there is not a 'culture' to do this at moment due to the perceived scale of the riverbank poaching problem.

### Agri-Environmental Payments

An obvious solution to the riverbank degradation problem is precluding animals from accessing watercourses with stock fencing. This, however, is expensive to erect and maintain which is why many farmers do not voluntarily adopt this management option. In terms of financial assistance for fencing off watercourses, there is currently no grant available under the ELS scheme for new fencing although financial assistance is possible to obtain through the ELS scheme for fencing maintenance<sup>12</sup>. There is grant funding available for sheep fencing (£1.80/m) and post and wire fencing (£1.20/m) for farmers managing to get into the HLS scheme but this fencing is mainly used for keeping animals out of hedgerows and other non-riparian habitat restoration projects and is rarely used as a water protection measure. To give an indication of HLS fencing available, a listing of the fencing options currently funded under HLS contracts in the Rea catchment is provided below in Table 4:

**Table 4. HLS Fencing Options Adopted In Rea Catchment**

Fencing Category	Total Length (m)
Permanent Electric Fencing	1,135
Sheep Fencing – Newly Restored Boundary	65,895
Sheep Fencing (Other)	54,373
Post And Wire Fencing – Newly Restored Boundary	1,886
Post And Wire Fencing (Other)	250

Data based on HLS Agreements current as at March 2011. Source: NE Geographical Information & Analysis Team

The HLS fencing itemised in Table 4 totals 123,539m (123.5km) but it is estimated that only 10%, or 12km, of this fencing will be alongside watercourses<sup>13</sup>. Whilst this makes a valuable contribution to watercourse protection in the catchment, HLS fencing is not in place for the majority of the 405 km of on-line watercourses which makes up the Rea catchment<sup>14</sup>.

In recent years, the Catchment Sensitive Farming Initiative has provided funding for capital items including watercourse fencing (*measure CSF003*). Funding rates available are £2.50/m for sheep netting, £1.25/m for high tensile fencing and £2.50/m for post and wire fencing. This has been a valuable additional source of finance for farmers but feedback from both farmers and local farm advisors suggests very little fencing has been installed under CSF thus far. An examination of the 2011/12 contract data confirms this with the length of watercourse fencing contracted being 600m in the Lugg, 556m in the Teme and 868m in the Tamar. Indeed, when the estimated required fencing coverage for each of the study catchments is taken into consideration (see Section 7.4.2), it appears uncertain at the current time whether the ES and CSF programmes are sufficient to deliver the necessary quantity of installations.

Fencing grants to farmers in the three study areas have been made available through private sources, particularly the Rivers Trusts. The Westcountry Rivers Trust, The Wye and Usk Foundation and Severn Rivers Trust have been extremely successful at raising money to fund watercourse protection but these sources of funding are sporadic and not guaranteed on an on-going basis.

<sup>12</sup> There is provision for new fencing against watercourses under the UELS scheme

<sup>13</sup> Estimation derived from HLS Officer assumption

<sup>14</sup> On-line figure from DRN data provided by EA Directives Reporting Services Team

#### 4.2.4 Addressing Farm Tracks Funnelling Water Into Fields

Farm tracks can be the cause of significant soil mobilisation as they provide a channel for runoff to gain velocity. If water from tracks flows directly into a field, the force of the water can cause significant soil erosion.

##### **Cross Compliance**

There are no measures within cross-compliance which place a responsibility on the farmer to manage run-off from tracks.

##### **Anti Pollution Works Notices**

APWNs can be used to stop tracks acting as sources and pathways for soil pollution of watercourses according to EA enforcement staff. However, whilst APWNs have been used to mitigate soil erosion from tracks in the quarrying industry, they have not been applied thus far to the farming sector. As with other pollution sources highlighted previously, sufficient evidence must be accumulated in order to serve a APWN which can be a resource intensive process. See Section 4.2.1 for further detail on APWNs.

##### **Agri Environment Schemes**

Grant assistance is currently available to remedy erosion problems from tracks under both the CSF programme and the HLS scheme. *Measure CSF011* funds cross drains on or in farm tracks whilst *Measure RDD* within the Higher Level Scheme capital grants section also provides financial assistance for putting in track drains. There is also funding available under the CSF programme to build swales and check dams (*CSF013*) to manage run off from existing tracks and to build new tracks which can circumvent pollution pathways caused by existing track pathways (*Measure CSF021A/D*). Given that both the HLS and CSF grant pools are competitive schemes, farmers are not guaranteed access to the funds which means an individual with an erosion problem caused by a farm track may well not be able to gain sufficient funding to fix the problem.

Take up of measures under CSF and HLS to manage farm tracks has not been widespread across the study catchments thus far (<20 farms adopting relevant options under the CSF 2011/12 funding round across the entire Lugg, Teme and Tamar area). It is uncertain whether this is due to lack of demand from farmers or lack of availability of funding for these measures.

#### 4.2.5 Addressing Mechanical Compaction

It is widely agreed by soil scientists, agronomists and farm advisory personnel that compaction of soils from mechanical operations is a major cause of erosion and is a widescale problem. Compacted soils prevent infiltration of rainfall resulting in increased overland flow and associated erosion and run-off.

##### **Cross Compliance**

Theoretically, the SPR provides a regulatory vehicle to address compaction from mechanical operations in that farmers should identify fields at risk of being compacted and then adopt appropriate measures to manage this problem. The difficulty here is that the SPR process assumes farmers are able to diagnose they have a compaction problem and it assumes they have the necessary knowledge to put in place effective management measures. There is also a question over whether it is possible for an RPA inspector to determine whether a farmer has taken adequate precaution to manage compaction. This assumes the inspector is capable of identifying compaction and able to make a judgement on appropriate management practices. Given that the identification of compaction often requires

inspection holes to be dug with a spade, it does not appear RPA cross compliance Officers have a sufficient remit to detect compaction effectively as they do not have the authority to undertake 'invasive' investigations i.e dig holes on farmers land. It, therefore, seems likely that EA walkover surveys offer a better opportunity to identify soil compaction issues and engage with farmers accordingly (see Section 7.2).

There is also a requirement within the SPS for farmers to note any mechanical operations undertaken on waterlogged soils and then take actions to repair any compaction caused. Again, the difficulty here is that farmers may fail to recognise when a field is waterlogged and they may not take appropriate actions to rectify a problem even if they identify one. Accurately identifying a farmer has caused a problem on waterlogged land without having performed appropriate restoration is extremely difficult, making meaningful enforcement of this element of the SPR almost impossible.

#### **Anti Pollution Works Notices**

APWNs could theoretically be used to address pollution caused by underlying soil compaction. However, due to the scale of the problem and the difficulties involved in assessing both the cause and the remedy, EA staff were of the view a regulatory approach to tackling soil compaction represents a major challenge.

#### **Agri Environmental Schemes**

Mechanical compaction is not specifically targeted within the Environmental Stewardship Scheme. However, within the CSF grant scheme, there is financial assistance for farmers to roof over slurry and manure stores, which can increase storage capacity thereby reducing slurry/manure spreading frequency. This in turn reduces machinery traffic across fields which reduces the likelihood of these fields becoming compacted. There is also funding within CSF to put in place hardcore farm tracks which has the potential to reduce compaction from farm traffic by diverting machinery movements away from vulnerable soils, particularly in wetter weather when compaction is most likely to occur.

Given the apparent lack of awareness of soil compaction expressed by many farmers, there is a distinct need for extensive advice and training on this issue, both in terms of compaction recognition but also management of the problem post recognition. The EA's Think Soils manual is available to farmers, together with the Codes of Good Agricultural Practice and supporting literature to the SPR. Evidence from farmers, however, suggests face-to-face and hands-on training is the best form of knowledge transfer which has considerable cost implications in terms of providing sufficient training and demonstration resource.

### **4.3 Assessment Of Current Regulatory And Financial Mechanisms Relevant To Phosphorus Pollution**

This section of the report reviews the capability of current policy mechanisms – cross compliance, APWNs and the Environmental Stewardship Scheme - to address the phosphorus pollution issues outlined in Section 3.0.

#### **4.3.1 Addressing Phosphorus Transfer To Watercourses Via Soil Erosion**

An analysis of current policy mechanisms relevant to tackling soil erosion is presented in Section 4.2.

#### **4.3.2 Addressing The Build Up Of Phosphorus Levels In The Soil Surface**

##### **Cross Compliance**

At the current time, there are no requirements within cross compliance for farmers to limit the application rates of phosphorus on their land. Within the Sewage Sludge Regulations (SMR3) there is a stipulation that farmers should 'take account of the nutrient needs of plants when applying sewage sludge' but there are no mandatory limits for sewage sludge application rates per se. The Code of Good Agricultural Practice and RB209 recommendations exist for farmers to apply appropriate application rates but these are advisory documents and are not accompanied by any regulatory requirements. Farmers within Nitrate Vulnerable Zones (which includes much of the Lugg catchment) must adhere to nitrogen limits which involve monitoring the application levels and timing of slurries and manures. Whilst this process is likely to indirectly result in a limit on phosphorus applications, NVZ rules do not specifically target phosphorus applications. Obviously, outside NVZ areas, the NVZ legislation has no influence over phosphorus usage.

##### **Anti Pollution Works Notices**

APWNs are not suitable for tackling excessive phosphorus levels in soils due to the need for establishing source, pathway and receptor impact which is very difficult for phosphorus. Other than indirect measures as outlined above, there are no statutory measures designed to enforce phosphorus limits.

##### **Agri Environmental Schemes**

Reducing phosphorus levels in soils is not an explicit objective of the Environmental Stewardship programme but there are measures within the schemes which stipulate a reduction or cessation in the application of manures. For example within the Entry Level Scheme, there are habitat improvement measures which prohibit manure applications including the buffer strip options, measures *EK1 Take field corners out of management*, *EK2 Permanent grassland with low inputs*, *EK3 Permanent grassland with very low inputs* and *EK4 Management of rush pastures*. There are also stipulations within the ELS maize management options (*EJ2 and EJ10*) which require appropriate rates and timings of manure applications both to the maize crop and the subsequent crop planted. Within the HLS scheme, there are a range of measures specifying a reduction or cessation of manure applications including *HJ6 Preventing erosion or run-off from intensively managed, improved grassland* and *HK6 Maintenance of species-rich, semi-natural grassland*.

The difficulty with these measures is that they tend to be adopted by farmers who are already extensive in their operations and are unlikely to have high phosphorus indices on their farms. As already noted in Section 4.2.1, the HLS scheme is not available to the majority of farmers who either lie outside the HLS target areas or do not have sufficient habitat or heritage interest on their farms to qualify for entry into the scheme.

#### **4.3.3 Addressing The Timing And Method Of Phosphorus Application**

##### **Cross Compliance**

As is the case with levels of phosphorus application, there is no requirement within cross compliance specifying the timing and method of phosphorus application. As with application rates, the Code of Good Agricultural Practice and RB209 recommendations provide guidance on timing and methods but these are advisory documents and carry no regulatory standing. Farmers within NVZs must adhere to nitrogen limits and spreading windows which have an indirect control on the timing of phosphorus applications.

### **Anti Pollution Works Notices**

APWNs are not suitable for tackling inappropriate timing and methods of phosphorus application in soils due to the need for establishing source, pathway and receptor impact which - as already pointed out above - is very difficult for phosphorus. Other than indirectly through NVZ legislation, there are no statutory measures designed to enforce the timing or method of phosphorus applications.

### **Agri Environmental Schemes**

For livestock farmers, applying phosphorus at appropriate time windows (when crops require nutrients for growth) very largely depends on the availability of sufficient storage capacity. Since the creation of the CSF capital grants programme, there has been a valuable introduction of grant aid to fund the construction of manure storage (CSF023) and slurry storage (CSF026) areas. These capital works prevent rainwater entering these stores, thereby increasing the capacity of existing farm infrastructure to house more manure and slurry material, improve timing of applications and reducing the chance of leakage of nutrients from the farmyard. Evidence suggests grant funding for storage roofing has been welcomed by farmers with over 80 projects being funded across the three study areas during the 2011/12 CSF funding period. Whilst the CSF roofing grants are delivering significant benefits, CSF and other advisory personnel on the ground are of the view many farms require fundamental increases in storage capacity, necessitating the building of new stores for which CSF grants are not available<sup>15</sup>. In the Caudworthy catchment, South West Water is investing significant funding to increase on-farm slurry storage which is providing much needed private funds to boost the funds available through the CSF grant pool for store roofing<sup>16</sup>. This innovative project presents a model which may well have application much more widely across the UK and is addressed in more detail in Section 9.0.

There are provisions within a small number of Environmental Stewardship measures to influence the timing of manure application to land. For example in ELS, measures *EJ2 Management of maize crops to reduce soil*, *EJ10 Enhanced management of maize crops to reduce soil erosion and run-off*, *EK2 Permanent grassland with low inputs* and *EK3 Permanent grassland with very low inputs* specify manures should be applied at appropriate times as part of the ELS management agreement. The difficulty with these measures is that very few farmers appear to have adopted the maize management options (mainly because of the 01 October harvesting deadline) and those farmers adopting the grassland management options tend to place these options on fields which are being farmed extensively and are unlikely to have high phosphorus indices.

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<sup>15</sup> In any event, even if CSF grants were available, a funding ceiling of £10,000 is not considered high enough for the building of new stores

<sup>16</sup> South West Water has projected a 65:1 payback ratio for the investments it is making in catchment management activities, resulting from reduce water treatment costs

## **5.0 Catchment Sensitive Farming Programme Review**

During the fieldwork for this project, a number of opportunities arose to engage with staff involved with the delivery of the Catchment Sensitive Farming (CSF) initiative within and outside the three study catchments. Given delivery of advice to farmers in the form of CSF is a key plank in the current policy toolbox to combat agricultural pollution, CSF officers and managers were consulted to obtain their views on the strengths and weaknesses of the current operational aspects of the programme. Farmers interviewed during the project who had come into contact with CSF were also asked to comment on their experiences.

### **5.1 Targeting Of CSF Activity**

In each CSF target catchment, CSF activities are shaped by a process that begins with an examination of WFD waterbody classifications and supporting data, followed by the development of an action plan to identify target areas and specific groupings of landholdings. This process is overseen by a panel of local stakeholders (including farmers) and supported by access to nutrient models such as PSYCHIC to further assist the targeting of effort.

Feedback from Catchment Sensitive Farming Officers (CSFOs) suggests this targeting exercise has proved difficult to deliver on the ground due to incomplete data sets and uncertainty regarding the nature and scale of water quality problems in their respective catchment areas (see Section 6.1). For example, CSFOs feel ill equipped to communicate the relative contribution of agriculture and other sectors to the phosphorus problem due to a lack of source apportionment data being available. There also appears to be variations across the study catchments regarding the level of information (data) exchange that exists between the CSF programme and EA 'data gatekeepers' regarding water quality monitoring and assessment analysis. Some CSFOs believe they have poor access to data which they perceive to be 'centrally controlled' whilst other respondents felt data sharing between the EA and CSF was relatively good due to the initiative being a joint delivery programme which is fostering closer collaboration between the two organisations. Access to data appears, in some cases, to depend on the strength of personal contacts. Observations from CSFOs suggest there are often strong differences of opinion between national and local EA staff regarding which water quality issues should be targeted for WFD compliance which, in turn, is leading to confusion amongst CSF delivery teams. CSFOs on the ground are of the opinion the EA needs to establish a coherent centralised data repository for WFD classification and targeting planning which is not disputed by EA staff and other WFD delivery organisations.

### **5.2 Reaching Farmers**

Evidence from CSFOs indicates that between 30%-50% of farmers within each of the three study catchments have come into contact with the CSF programme thus far<sup>17</sup>. Contact has mainly been achieved through clinics, arranged by CSFOs to introduce the programme to local farmers and, in particular, to promote the CSF grants available. Farmer motivations to attend these events have very largely been driven by a wish to obtain grant rather than a wish to gain knowledge on pollution mitigation techniques and the broader ethos behind the CSF initiative.

Based on observations from the CSFOs interviewed, it does not appear the CSF programme has been successful at reaching the 'difficult to engage' farmers i.e those farmers who tend not to proactively seek advice and who are often believed to have significant pollution issues on their farms. The reasons for lack of engagement with these farmers appears two-fold:

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<sup>17</sup> CSF has operated in the Tamar and Lugg since 2006 but only started in the Rea in 2010



firstly, CSFOs believe they have not had time thus far to 'seek out' these farmers and secondly, there appears a reluctance on the part of CSFOs to cold-call farmers who they believe are unlikely to be welcoming or receptive to the CSF message. Lack of cold-calling has been recognised by CSF managers who have recently initiated cold-calling training at a national level to provide CSFOs with the skills and confidence to undertake this difficult activity more widely.

Revisions to the CSF grant application process have resulted in applicants standing a better chance of receiving funding if they have already engaged with CSF (e.g attended a clinic) or become involved in the Environmental Stewardship Programme. The difficulty with this approach is that 'difficult to reach farmers' by definition have not engaged with these programmes. By reducing the likelihood of these farmers to obtain CSF grant, it is possible they will become even more marginalised and isolated from the programme and its broader objectives.

### 5.3 Grant Funding

An examination of the measures eligible for CSF funding within the three study areas suggests these measures are appropriate for dealing with the problems outlined in Section 3.0.

**Table 5. CSF Capital Items Funded In Study Area Catchments**

Category	CSF Code
Yard Works For Clean And Dirty Water Separation	CSF014
Livestock And Farm Machinery Tracks	CSF021
Watercourse Fencing	CSF003
Roofing Of Manures Storage And Livestock Gathering Areas	CSF023
Livestock Troughs With Associated Pipework	CSF010
Hard Bases For Livestock Drinkers And Feeders	CSF007
Ram Pumps And Associated Pipework	CSF009
Pasture Pumps And Associated Pipework	CSF008
Cross Drains On Or In Farm Tracks	CSF011
Watercourse Crossings	CSF024
Relocation Of Gates	CSF001
Installation Of Piped Culverts In Ditches	CSF015
Resurfacing Of Gateways	CSF016

Source: CSF Capital Grants Scheme Funding Priority Statements 2011/12

However, whilst the measures eligible for grant appear well conceived, the evidence suggests the grant has not been targeted effectively so far. Feedback from CSFOs indicates they have limited time available to visit farms and identify optimal measures for funding, leading to sub-optimal grant allocation e.g manure stores receiving roofing grant in catchment locations where there is a low risk of nutrient run-off. This issue has been exacerbated by funding uncertainties. For example CSFOs in the Rea catchment reported they were not informed CSF grant would be available for 2010/11 until one month prior to the application window closing. This did not leave sufficient time for them to identify optimal measures and target the best spend profile for the grant. Contacting farmers during the application window (March/April) was also made difficult due to this being the prime lambing season for sheep farmers. On a positive note, it now appears that CSF programme money has been secured from RDP funds, at least until March 2013, which means CSFOs can plan ahead and have greater opportunities to identify best value grant funding opportunities prior to the grant application window in March/April 2012. Whilst compressing all

applications within a short application window requires co-ordinated preparation by both CSFOs and farmers, this approach allows applications to be processed extremely cost effectively with only 5% of the total grant allocation of £10.5m pa being spent on administration costs.

CSFO's also expressed concerns that the scoring of CSF applications has historically been undertaken by a centralised administrative team in Nottingham who are not necessarily best placed to judge optimal grant allocation. This concern was substantiated by feedback from the farmer interviews which highlighted several examples of inappropriate measures being funded. For example, one farmer cited an example where a neighbouring farm had received CSF grant to cover a manure store where this farm is almost entirely focussed on arable production. However, it appears CSF managers have recognised this shortfall in the current system because from 2012, CSFOs will be given much greater opportunity to score applications. In addition, they will be given discretion to award grant assistance to 'special cases' where a farmer fails to meet the grant criteria but where the allocation of grant has the opportunity to achieve considerable environmental outcomes.

Care will also be needed to ensure CSFOs have sufficient time to ensure contracted works under the grant programme have been undertaken. Feedback from CSFOs highlights they have not always had the resource to ensure farmers have undertaken work contracted under the scheme. Observations made by local farm advisors suggest contracted works have not always been carried out which has implications for the credibility of the CSF grant allocation process.

#### **5.4 Developing On-Going Working Relationships With Farmers**

The availability of grant assistance from the CSF programme has undoubtedly helped to act as a hook to engage with farmers. However, evidence from farmer interviews and feedback from CSFOs suggests the CSF programme has not always been able to use this initial 'way in' to develop on-going working relationships capable of dealing with fundamental problems. One farm advisor likened the CSFO/farmer relationship as being characterised by 'payment for services rendered without the development of any love'. It appears lack of time available to CSFOs is a major reason why the establishment of continued working relationships have not been established. It is also likely that the use of private contractors in some areas to deliver CSF outputs has reduced the level of direct contact between CSFOs and the farming community. CSFOs also commented that the quality of advice delivered by private contractors and, therefore, the value of the CSF brand may have been compromised due to private contractors often being selected on price due to limited CSF budgets.

One further barrier to building strong relationships with farmers appears to be due to poor timing of service delivery. For example in the Rea catchment, some farmers receiving CSF grant had subsequently signed up for CSF delivered manure tests to be undertaken, designed to promote the optimal use of nutrients and reduce run-off. Unfortunately, it appears these tests were undertaken in the winter when nutrient levels in stored manures are different than in the spring when the farmers concerned planned to spread the majority of the tested material. Consequently, these tests were not well received by those farmers involved.

#### **5.5 Integration Of CSF And The Environmental Stewardship Programme**

It is uncertain at the current time how well integrated the CSF programme and its staff are with the Natural England Environmental Stewardship initiative. It is the perception of CSFOs that Natural England Managers are not particularly interested in the CSF initiative which

results in a lack of co-ordination between the two grant pools. For example, CSFOs cited examples where farmers have received grant under both CSF and HLS for fencing where CSF money might have been better spent on additional farm infrastructure such as slurry store roofing or alternative drinking points. Rather than having separate staff delivering CSF, ELS and HLS schemes, some CSFOs questioned whether it would make more sense to merge the various schemes under a single delivery team to promote internal co-ordination and allow a single point of contact with farmers to facilitate relationship building. To encourage better programme co-ordination, it appears since April 2011 that some CSFOs have begun occupying office space within Natural England's Land Management Teams where ELS/HLS officers reside. It is not clear whether this happens across all regions but would appear to be a positive move to foster collaboration.

## 6.0 Overarching Observations

The fieldwork for this project enabled extensive interaction with a broad range of individuals either directly involved in the delivery of regulation, advice and financial incentives or those directly involved with managing the land on a day-to-day basis i.e the recipients of regulation, advice and financial incentives. From this exercise, it has been possible to make a number of overarching observations which have direct relevance to the policy debate surrounding WFD implementation. This section of the report provides a synthesis of these observations, providing context for the suggested policy instrument changes which follow in Section 7.0.

### 6.1 Lack Of Consensus Of The Problem

A reoccurring theme that emerged across all three study areas was a clear lack of consensus regarding the nature and extent of local water quality problems. In particular, farmers have an interest in understanding the relative contribution agriculture is making to the problem as a whole, for example in relation to phosphate loads. The evidence suggests this source apportionment data has not been made available thus far across the study areas.

Feedback from farmers strongly suggests they have received little if any information explaining the current state of waterbodies in their area and they remain sceptical about the information they have received. As outlined in Section 6.1, a lack of agreement within the EA and the scientific community more widely over 'the problem' has prevented clarity of message which has prevented a common understanding amongst stakeholders on the ground of what the water quality concerns are in their area and what to do about them. The impacts of soil erosion in particular are hard for farmers to grasp as soil entering a river is often 'washed away' without causing obvious damage. As one conservation minded farmer put it, 'if there was a road at the bottom of every farm which became blocked by soil, farmers would very quickly acknowledge there is a problem'.

Almost without exception, the farmers engaging with this project were of the view the farming community must be presented with evidence that a problem exists before they will be willing to take action. Interviews with farmers uncovered numerous examples of situations where they had identified for themselves that a problem exists and had subsequently taken appropriate action:

*'I began noticing that my cows wouldn't drink from a particular stretch of the stream and felt there had to be something nasty going into the water there. Then I twigged our farmhouse septic tank is situated in the field near to that spot so I put two and two together. We've put some buffers in there now and that seems to have done the trick'*

The difficulty thus far is that farmers do not appear to have been adequately involved by the catchment management community in jointly understand the problems. Consequently, this has led to many farmers remaining disengaged from the subject and, in some cases, becoming overtly hostile to the agencies involved.

The need to present the problems in a clearer manner and develop methods for determining appropriate solutions has been recognised by the scientific community in recent years which has responded through the production of a plethora of computer models designed to model effects of land use change and farm management practices on pollutant loads<sup>18</sup>. Based on

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<sup>18</sup> Inman, A. and Cook, H. Reviewing Vulnerability Assessment And Modelling Tools For Pollutant Source Identification. SAIN Working Paper 4, April 2011

evidence derived from extensive academic research and farmer feedback within this project, it will be crucial to ensure farmers are involved in the choice, on-going development and scrutiny of these models to ensure they become a trusted decision support tool going forward. Simply presenting farmers with a 'black box' and expecting them to believe the results is unlikely to generate this outcome.

The need to involve farmers in defining problems and solutions has been formally recognised within the Catchment Approach formally launched in March 2011. The CSF programme is already piloting a participatory method for jointly working with farmers to collect and monitor water quality in local water courses and has allocated a budget (£85,000 in 2011) for local groups to carry out bespoke research designed to collect evidence and assess appropriate mitigation strategies. Farmers contacted within the DSEPP project welcome these developments but several were sceptical how seriously farmer input will be taken.

## **6.2 Land Ownership Dynamics**

It became apparent during the project that many land parcels in the study areas are increasingly not being farmed by owner occupiers. Numerous farmers and farm advisors interviewed were of the strongly held view that farmers renting ground, particularly on short term Farm Business Tenancy agreements, do not have a sufficient incentive to make infrastructure investments on items such as watercourse fencing, farm tracks and slurry stores which are the route cause of many of the water quality problems cited in the study catchments. In addition, short term tenancies do not encourage the development of a long-term farm plan, a necessary prerequisite for embedding environmental protection measures within the farming system, particularly where fundamental land use or land management changes may need to be made which cannot be delivered overnight. The corollary of this observation is that land owners need to be engaged on the water quality agenda in addition to their tenants to determine whether more satisfactory resource protection outcomes can be achieved to the mutual benefit of both tenant and landlord. It is likely this requires a third party capable of brokering such an arrangement, a theme that will be further expanded on in Section 10.0.

## **6.3 Enforcement Of GAEC1 Within Cross Compliance**

At the current time, the Rural Payments Agency (RPA) is responsible for the enforcement of GAEC1 which includes issues pertaining to the Soil Protection Review. The EA's remit is restricted to auditing farmer compliance with the Groundwater Regulations, The Sewage Sludge Regulations, the Nitrates Directive and water abstraction rules. Feedback from EA Enforcement staff reveals that when making cross compliance inspections, they are under instructions not to investigate soil related issues and do not have sufficient time within their cross compliance visit schedule to perform this activity anyway. Given the EA is responsible for WFD delivery, it would appear more efficient if EA Officers could check compliance with GAEC 1 when they are already on farm checking Groundwater, Sludge and Nitrates SMRs. Given detection of SPR non-compliances requires specialist skills, there is also an argument that these skills should be developed within the agency with a specific remit for catchment management more widely (i.e the EA) rather than within the RPA which has a different focus. This does not, however, appear to be current government policy as it is understood the RPA is currently in the process of taking over all cross compliance regulatory visits. Irrespective of which Agency monitors GAEC1, it will be important that inspections are mainly carried out during the autumn and winter months when detection of soil and nutrient run-off related problems can be achieved accurately. Evidence from EA

Enforcement staff suggests cross compliance inspections by both the RPA and EA are often carried out in dry weather when identification of soil pollution problems is difficult.

#### **6.4 Farmers Attitudes Towards Regulation**

Farmer attitudes towards regulation were explored in detail during interviews and workshops across the three study areas. There was universal agreement amongst the farmers that regulation to protect water quality is needed and justified. In some cases, farmers felt regulations did not currently go far enough particularly in relation to run off from crops such as potatoes and maize where mandatory buffer strips were called for by some respondents.

Farmers were quick to point out, however, that it is vital they understand what constitutes an offence. At the current time, farmers appear confused and uncertain about exactly where the boundary is which has led to a continuation of bad practice in the absence of a clearer regulatory framework. In order for regulations to be accepted by the farming community, feedback from respondents also underlines a need for the regulatory process to be perceived as fair. In particular, for soil pollution and cases of nutrient run-off from fields, farmers do not perceive immediate prosecution for a first offence to be appropriate, arguing lack of awareness or lack of control over events due to bad weather are often at play. Rather, a warning or series of warnings followed by prosecution through failure to act on these warnings is deemed a balanced way forward. During the fieldwork, cases were encountered of farmers who had been prosecuted for run-off offences, in their view unfairly as they did not perceive they had been causing a problem. It is testimony to the professionalism of the EA personnel involved that the farmers harboured no bad feeling to these Officers personally, simply the system under which they were operating.

Linked to the issue of fairness is the need for farmers to understand and recognise the impact of bad practice on the water environment. It follows that regulations to prevent an environmental harm will be more likely to be accepted and adhered to if that harm is perceived as real. In the case of cross compliance, several farm advisors interviewed were of the opinion many farmers perceive the SPR to be 'unnecessary bureaucracy' because they do not recognise the harm that can be caused by soil pollution.

#### **6.5 Roles And Responsibilities**

A clear finding of this project generated from stakeholder feedback is a need for clear demarcations between the roles, responsibilities and operating practices of the statutory agencies and advice providers (public, private, NGO) operating within the catchment management space. Each organisation involved in the mix should have clearly defined and well communicated terms of reference and be experts in their respective fields of operation to generate trust amongst themselves and wider stakeholders. It is understood Defra has recently initiated a joint working group project to directly address this issue, a timely and needed initiative based on the findings from this project.

Evidence from a plethora of research studies (strongly reaffirmed by farmer opinion expressed in this project) highlights the need for farmers to develop an on-going confidential relationship with a trusted farm advisor before they are willing to voluntarily discuss pollution problems on their landholdings and be receptive to new ideas and working practices. For this reason, it seems the EA is not well placed to act as a first port of call for farmers seeking advice on pollution issues. Not surprisingly, farmers have an inherent fear of the EA due to its regulatory and enforcement function which is why nearly all farmers interviewed stated they would be nervous to invite EA staff onto their farms to discuss a

pollution matter openly. Only one farmer interviewed had ever voluntarily contacted the EA over a pollution issue, having prevaricated over this decision for several days:

*'I was worried if they came out to discuss one matter they may see two or three other things and pick me up on those as well'*

This fear of the EA is recognised by the majority of CSF advisors interviewed who purposefully distance themselves from close association with the EA in order to facilitate the building of trust with farmers:

*'The last thing I want to do is begin working with a farmer, maybe successfully obtain some CSF grant for him and then find the EA have prosecuted him the day after I've been there.'*

The wish by CSF Officers to build a confidential working relationship with farmers is the reason why information exchange on farm specific pollution issues is very much one sided between the EA and the CSF Programme (information flows from the EA to CSF but not the other way round), much to the frustration of some EA Enforcement staff. Westcountry Rivers Trust has worked with farmers in the South West of England for 15 years and adopts the same confidential policy for the purposes of building trust with, and access to, the farming community.

Whilst it is unlikely farmers will approach the EA for advice on a voluntary basis, it is possible that the EA can provide an advisory function where they have encountered a pollution event on a farmers land i.e it is no longer voluntary for the farmer to seek advice. Indeed, the EA already performs this role in some cases where EA staff have sufficient agricultural expertise. The difficulty here, based on farmer feedback, is that they find it very difficult to be receptive to advice from an organisation which also has the potential to prosecute them. Aside from the issue of farmer perception, dealing with pollution mitigation will increasingly require integrated agronomic and farm business advice and it is questionable whether this can best be provided by a regulatory agency such as the EA.

Whilst the EA should not necessarily be precluded from maintaining an advisory capacity, there is a clear need for a confidential arms length highly skilled extension advice service capable of helping farmers tackle water pollution issues within the context of running profitable farm businesses. Given the CSF programme is already established, it would make sense to develop the skills base and capacity of this initiative, complimented where available by independent organisations such as ADAS, The Rivers Trusts etc. Given the CSF programme is currently a joint initiative between NE and EA, it is questionable whether this is the best arrangement based on the observations made above. Indeed, the evidence would suggest that CSF extension provision should remain entirely separate from the EA and should aim to build links with other independent advice providers. There is already close collaboration between the CSF Programme and the Westcountry Rivers Trust (WRT) in the Tamar catchment where WRT is co-ordinating CSF grant applications. This is effectively a pilot exercise in CSF/Third Party partnership delivery which, if successful, could be rolled out elsewhere where suitable external technical capacity exists.

With an effective and trusted extension service in place, this would leave the EA with a clear regulatory focus. Evidence from interviews with EA operational staff strongly indicates there is no clear consensus amongst senior management regarding how consistently regulations should be enforced and how much presence the EA should have on-the-ground. This lack of clarity is resulting in confusion amongst staff at the coal face. One example was given where local Enforcement Officers have recently been instructed to step back from operating in a particular catchment to make way for CSFOs to begin working with farmers there. This points to a situation where there appears to be a blurred picture regarding how regulation

should be used, where the level of baseline environmental performance of farmers should be, and where advice and financial support should be applied.

Aside from the public sector agencies, there are a number of third sector organisations involved with catchment management delivery in England and Wales, most noticeably the Rivers Trusts, FWAG, the Wildlife Trusts, the AONB network and other NGOs such as the RSPB. Interviews with respondents from both statutory agencies and third sector organisations revealed an element of confusion over respective roles and responsibilities, with different working practices, cultures and pressures appearing to threaten optimal partnership working in some cases. International experience has demonstrated that partnership working between public and third sector organisations is not always easy, but if marshalled correctly, can yield powerful results. Establishment of roles and responsibilities, and formal recognition of these by all concerned, appears to be a key prerequisite for success. Providing sufficient financial resources to the third sector to leverage delivery potential is also regarded as crucial given these organisations often suffer from precarious funding streams, holding back the building of capacity.

#### **6.6 Skills Need Within The Environment Agency**

Based on feedback from EA local managers, there appears to be a skills shortage within the Agency regarding knowledge of farming systems and the farming sector in general. In contrast to previous policy, Enforcement Officers are no longer recruited by regional offices for specific skill sets but are recruited through a national pool – the ‘*boot camp*’ - which tends to yield candidates with very little if any understanding of farming systems. EA managers believe this is a major problem regarding the ability of Enforcement Officers to correctly identify pollution issues, understand the causes of these problems, and command the respect of farmers when engaging with them on these matters. It appears the EA is planning to address this issue by developing a training system designed to produce Enforcement Officers who are specialists in agricultural systems although it seems this is currently planned to happen in the Midlands region only. Views were mixed as to whether the training will be suitably in-depth to equip recipients with sufficient knowledge.

In addition to the perceived need to recruit and train Enforcement Officers with agricultural knowledge, EA managers are also of the opinion the status, pay structure and career progression of these officers will need to be enhanced in order to attract sufficient numbers of high calibre individuals. Working with the farming sector is regarded by local EA managers as a complex job requiring highly skilled people who need to be suitably incentivised. When asked to express their views on the EA staff they have dealt with, farmers were impressed with their professionalism but, with one exception, were of the opinion they lacked sufficient knowledge of the industry over which they were regulating.

#### **6.7 Working Practices OF Environment Agency Enforcement Officers**

As outlined above, enforcement of regulations in the agricultural sector requires people with technical specialist skills to be on-the-ground interacting with the farming community on a daily basis. Long serving EA staff referred back to the days of the National Rivers Authority when it was felt more time was available for face-to-face contact with farmers. It was perceived Key Performance Indicators (KPI) have worked against EA officers ‘getting to know their patch’ as the time involved in doing this is not necessarily attributable to direct KPI outputs.

Feedback from EA Local Managers suggests Enforcement Officers spend considerable amounts of time ‘processing paperwork rather than undertaking on-farm visits’. The view from managers is that a considerable volume of paperwork could be dealt with by



administrative staff, freeing up Enforcement Officers to work on-the-ground. In one of the study catchments, the local office has managed to secure funding to recruit two administrators to support the Enforcement Officers to achieve this outcome. Whilst this situation is improving the ability of EOs to step up enforcement visits, it has only been possible to employ the administrators on two-year short term contracts so longer term support is not guaranteed.

#### **6.8 Reform Of Anti Pollution Works Notices**

As referred to in Section 4.2.1, The EA has traditionally been resistant to using APWNs because of the resource intensive nature of these regulatory instruments. However, new guidance information provided to Enforcement Officers and acquired during the fieldwork for this project outlines that the process of issuing APWNs has recently been streamlined. In particular, there has been a reduction in necessary supporting documents from eleven to one and the removal of a need for a formal risk assessment and cost benefit analysis. EA staff believe these reforms will make the use of APWNs far more practical for tackling soil and nutrient run-off problems, albeit APWNs should only be used as a last resort where a farmer refuses to take appropriate action.

#### **6.9 Need For Different Incentive Packages**

As outlined in Section 4.2.1, evidence from both farm advisors and farmers strongly indicates the current suite of agri-environmental schemes do not provide sufficient incentives to encourage many of the land use changes needed to solve water quality problems.

Feedback from farmers within this project has reaffirmed a commonly held view within the farming community that ELS payments are effectively a way of recouping modulated funds to top up the Single Farm Payment. In other words, ELS is seen as an entitlement payment for delivering basic environmental standards under cross compliance, not a payment which is sufficient to warrant adopting additional activities which involve taking land out of production. To do this, farmer respondents were adamant that payments rates will need to be considerably higher than current levels which are, firstly, not considered to accurately reflect income forgone; and, secondly, are not considered high enough to take into account - as one farmer put it - the 'additional inconvenience and hassle of managing buffer strips and messing about putting awkward bits of ground into grass and weeds'. Furthermore, several respondents mentioned current payments do not warrant 'the risk of taking land out of production for the five year duration of these schemes' i.e a reduction in production potential might significantly compromise farm profitability if commodity prices significantly rise during the term of an ES agreement. The following response from a farmer in the Lugg catchment neatly summarises how many farmers feel about current payments:

*'In relation to the Entry Level Scheme criteria we have adopted the options which have had the least impact on our productive farming system ie. we don't want to be taking land out of production by having buffer strips when we can adopt options which are more easily achievable, in our case mixed stocking and low input fertiliser. Virtually all of our points are achieved in these options without any real disruption to our systems, even if we weren't in ELS we would be doing this anyway.....with regard to HLS, if they want farmers to take up options which takes land out of production they need to offer a premium over and above achievable margins. I realise you are asking me to put a figure on this but it is really a 'how long is a piece of string' question, and I am only a simple farmer'*

For farmers with relatively small field sizes, incorporating buffer strips (particularly 6m-12m) is perceived as giving up too much field area to make management of the remaining plot practical. In addition, farmers with relatively small farms (typifying the Caudworthy and Rea

catchments) believe buffering watercourses on their farms will involve giving up too much land relative to the total size of their landholdings, rendering their farming systems (e.g crop rotations, stocking rates etc) unviable. The crucial point here is that the majority of farmers interviewed did not perceive a different vision for their farm, involving specific locations taken out of production, as being financially viable based on current ES payment rates. As an aside, it is also important to remember that the majority of farmers see their primary role as - and derive their self-respect from - being producers of food produce. Becoming suppliers of a wider range of ecosystem services remained an esoteric concept for many members of the farming community interviewed.

In reality, it is likely that in some cases, the current buffer strip/arable reversion payments offered under both ELS and HLS do adequately reflect income forgone (plus a 'hassle/profit/risk' margin) whilst in other cases they do not. Academic research has produced mixed conclusions in the past on this subject. Studies based on farmer opinion (e.g Moss, 1994; Falconer, 2000; ADAS, 2002) have suggested that agri-environment payments do not fully compensate the income foregone whilst empirical studies that have attempted to assess the direct financial implications (e.g Jones, 2006; Wallis and Jones 2007) suggest income foregone is more than covered and that farmers are able to profit from these schemes.

Whatever the reality of the situation, observations from the research undertaken for the DSEPP project suggest it is what the farmer thinks that is the all important factor as this determines his Willingness To Accept (WTA) payment threshold. Estimates from respondents suggest an average farmer WTA is two to three times the payment rates currently on offer under the ES programme which, therefore, presents a significant policy challenge. Two potential responses are possible. Firstly, policy makers could choose not to increase payments but to go for a '*voluntary coercion*' approach. As one farmer himself pointed out, 'the only way Defra will get us farmers to take up these actions without paying us more is to tie these undertakings to the Single Farm Payment'. The other potential option is to significantly increase the payment rates under the agri-environmental measure but this is unlikely to be feasible given the income foregone rules imposed by Europe. Also, as one of the policy experts interviewed for this project put it, there is also a question regarding '*why should a farmer be paid more than the opportunity cost of his land and efforts for diverting land from a market good to a public environmental good?*'

To answer this last question, it is possible to construct a strong argument that a farmer should be paid more than the opportunity cost of converting land out of production if the alternative public goods he is producing have a value which is worth more than the value that can be derived from the same land for producing food. In short, under agri-environmental payments, farmers are currently paid for the opportunity costs of diverting land out of production. They are not paid for the value of the ecosystem services they produce. This leads into the realms of the need to develop effective valuation methods for ecosystem goods and services which will always generate levels of uncertainty. However, if a pragmatic evaluation can be arrived at which is acceptable to a group of willing providers (farmers) and payers (public, private or third sector), it is feasible to conceive a market could be developed which would generate payments commensurate to farmers' WTA, thereby delivering the resource protection goals society needs. It is possible to envisage a mechanism where CAP funds could be used to deliver payments for ecosystem services provided rather than payments for income foregone; but this will take time to broker at a European level. In the short to medium term, more localised schemes between farmers and private sector payers operating independently - yet complementary to - existing state run

agri-environmental schemes, might offer a more pragmatic way forward. This topic is further explored in Section 10.0.

## 7.0 Required Policy Changes

The analysis and observations outlined in Sections 4.0, 5.0 and 6.0 indicate there are already a number of mechanisms in place that are helping to restore water quality across the study catchments. The evidence suggests, however, that there are several gaps or dislocations within current policy design that need to be addressed in order to improve water quality standards further and meet WFD requirements.

This section of the report synthesises some of the key learning points from previous sections which have relevance to policy makers tasked with WFD implementation at a national scale i.e at a scale beyond the three case studies selected for this project. An assumption is made here that the issues encountered in the case study catchments are common to many other catchments in England<sup>19</sup>. Firstly, an assessment of necessary governance or catchment management institutional changes is provided, followed by a summary of specific instrument changes required to address the types of water quality problems outlined in Section 3.0. Estimates for delivery costs over a notional five year planning period (case study level) are also provided to offer an indication of the financial implications inherent within the suggested delivery framework.

### 7.1 Better Governance Arrangements Needed

Feedback from respondents across a variety of different interest groups strongly indicates there is a need for clarity regarding the nature and scale of water quality problems at a catchment scale and how best to address this problem. As pointed out in Section 6.1, there is confusion and lack of consensus both between and within the governmental agencies and within the farming community on these crucial issues which is making joined up planning and delivery of actions on-the-ground very difficult. Current initiatives underway to address these factors are encouraging. In particular, The EA is addressing information gaps in many failing waterbodies (those failing WFD Good Ecological Status GES) by undertaking catchment investigations which are due to be completed during the second half of 2012. It will be crucial, however, to ensure EA led investigations are transparent about uncertainties and benefit from the knowledge of national and local EA staff in addition to outside delivery partners. It will also be vital to ensure the farming community is fully involved in the interpretation of results to build trust in the data collection, monitoring and analysis methodologies used. There remains a distinct problem with regard to waterbodies classified as currently meeting WFD GES (not currently earmarked for investigations) where classifications are disputed by local stakeholders on the ground including local EA and Natural England staff and third sector environmental groups. This is leading to confusion and lack of trust, particularly, amongst the farming community. For example, both the Caudworthy catchment and most of the River Rea is currently classified as GES yet these catchments are the focus of advice and grant activities by the Westcountry Rivers Trust and Catchment Sensitive Farming respectively. Not surprisingly, this disjuncture does not breed faith in the current WFD classification system and delivery mechanism amongst the farming community.

The case is clear, therefore, for the need for a single catchment scale data portal which is open to all stakeholders involved with the delivery of WFD objectives; government agencies, non governmental delivery partners, water companies, farmers etc. Access by non delivery entities (including members of the public) should also be enabled, although these users will be likely to require less detailed information. This portal should include clear

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<sup>19</sup> To build on the findings from this project, Defra should consider undertaking a similar study across a sample of catchments with different geo-physical characteristics and farming systems

communication of water quality problems, levels of uncertainty, WFD classifications and supporting data and should form a central data repository for use by all parties involved with, or interested in, catchment management delivery. Where current WFD classifications are disputed or under review and may require re-classification, this requires clear communication. A further discussion on data sharing can be found in the report outputs from Component A of the project.

It is suggested that each catchment data portal should be managed by the proposed host organisations envisaged under the Catchment Approach, albeit in partnership and with technical support from the EA. The current Catchment Approach pilot approach scheduled for 2012 is a very welcome initiative which should help to galvanise and build consensus on problem identification and required solutions. As a policy development to facilitate WFD implementation, the Catchment Approach appears particularly well conceived and timely. The need for improving participatory catchment planning design, consensus (trust) building and knowledge transfer, as envisaged within the Catchment Approach, has been overtly highlighted by the findings of this report.

## **7.2 Clearer Regulation And Enforcement Needed**

As pointed out in Section 6.0, it appears current baseline requirements for the management of soil erosion and nutrients are often poorly understood by farmers and are not being adequately enforced by regulatory authorities. The evidence suggests there is a clear need for land management failures to be identified and logged across a catchment and for the legal responsibilities and consequences for non-compliance to be clearly communicated to farmers. Ultimately, regulations need to be both enforceable and enforced, but with sanctions only used as a last resort following a sequence of awareness raising and warning steps, complimented with advice and financial assistance where possible. The evidence from farmer interviews during this project is that farmers will regard this process as equitable and they welcome clarity on what is required from them regarding the environmental protection agenda.

At the current time, it appears the SPR element within Cross compliance is not accompanied by an effective enforcement process. Firstly, it is unclear whether RPA inspectors possess sufficient experience to identify whether risk management measures entered into farmer SPR booklets have been appropriately selected and implemented. Secondly, where farmers are deemed by the RPA to be either non-compliant under the SPR or compliant but still causing pollution problems, there is no systematic procedure to ensure farmers take subsequent action to rectify a problem. Such farmers may be written to by the RPA with guidance on what to put right, and may be more likely to receive a future inspection under cross compliance, but there is no guarantee of repeat inspection to insure action has been taken. Of vital importance, there is no guarantee currently that such farmers will be given access to sufficient advice and/or financial support to help them rectify the problem.

Under the current cross compliance enforcement regime, whilst the EA has no responsibility to enforce the SPR, the EA does have the latitude to refer farms to the RPA where the EA suspects an SPR breach has taken place. These farms will be subject to an increased probability of a cross compliance inspection but there is no guarantee a farm identified by the EA will be inspected. Feedback from EA staff suggests they are referring very few cases to the RPA at the current time due to a lack of confidence amongst EA staff that referrals to the RPA will lead to 'environmental outcomes being delivered' i.e that action will be taken by the RPA.

Given only 1% of farms are inspected annually under cross compliance, some stakeholders within the case study areas look to a need for greater usage of regulatory measures by the EA. However, as pointed out in Section 4.1.2, the EA has thus far been extremely reluctant to use its powers to enforce action, for example through the use of APWNs. There appears to have been no systematic on-the-ground identification of site-specific issues at a catchment scale by the EA in recent years; partly due to resource limitations and partly due to a lack of consensus within the Agency over how rigorously enforcement of the legislation should be applied.

In the round, it appears for soil and nutrient management practices to be effectively regulated in a given catchment, a systematic process of identification and enforcement of management failures is required ensuring a balanced and equitable system prevails at all times. As outlined in Section 3.0, respondents across the case study catchments were largely of the view soil erosion is a *'diffuse point source'* issue, with a significant proportion of the problem emanating from a relatively small area of land. To deal with this issue, therefore, identification of problem fields can be achieved through a combination of modelling tools and walkover surveys<sup>20</sup>. By targeting walkovers and subsequent farm visits at specific high risk catchment zones determined initially from desk studies and local knowledge, costs of enforcement can be minimised.

During the fieldwork for this project, it appears that the EA has begun to undertake a series of walkovers across specific catchments with the aim of identifying pollution problems<sup>21</sup>. It would seem appropriate that this process should be rolled out as a matter of course within all catchments to form the basis of an on-going enforcement policy. Specifically, walkovers could be used to determine problem sites (focused on Category 1, 2 and 3 issues) which could stimulate subsequent visits to farms associated with specific problems identified. It is envisaged EA staff could explain the problem to the farmer, agree action is required but leave the precise nature of the action up to the farmer. A return visit and timetable would be agreed. Upon a revisit, if the problem has not been rectified, a formal warning could be issued requiring further action to be taken together with another return visit timetable. If the problem was found to be persistent at the next visit a formal 'code B' could be issued and proceedings initiated to serve an APWN. It is understood the EA is currently developing a 'walkover handbook' to help staff identify and deal with point source runoff problems from agricultural land causing pollution. The guidance outlined in the handbook envisages a process similar to that described above but it is uncertain whether this process has been officially adopted thus far. As an addendum, for this system to work on a practical level, it will be necessary for the EA to have access to the Rural Land Registry (RLR) mapping system which provides field scale land ownership data (currently only available to NE and the RPA). At the moment, EA officers have to 'knock on doors' to identify owners of a particular land parcel which they regard as an extremely inefficient and time consuming process.

In order to provide the cross compliance process with a level of enforceability, a similar stepped process of revisits could be implemented to ensure appropriate mitigation procedures are adopted by farms either with technical breaches of SPR compliance or identified problems.

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<sup>20</sup> Walkover is defined here as an 'on foot' visual survey undertaken by Environment Agency staff for the purposes of identifying pollution problems and should be distinguished from bespoke chemical or biological monitoring surveys

<sup>21</sup> Private sector surveyors are often used under contract to the EA

As pointed out in Section 6.3, the RPA currently inspects the SPR and according to RPA staff consulted as part of this project, it is likely the RPA will take over the inspection of all GAECs and SMRs from 2012 leaving the EA with no cross compliance inspection responsibilities at all. However, based on observations accrued during project fieldwork, it is questionable whether the RPA is necessarily the most appropriate entity to be carrying out the SPR inspections, particularly if the EA were to begin carrying out extensive walkover surveys. Identifying run-off problems requires skills and experience and it would seem to make sense to house and develop these skills in the Agency directly responsible for WFD implementation i.e The EA. Additionally, if the EA were to begin a process of identifying problem sites from walkovers and then monitoring actions taken by farmers through a process of revisits, it would be efficient to add cross compliance visits and subsequent revisits within one overall monitoring and surveillance process.

With reference to the pollution issues identified within the three study catchments for the project (Section 3.0), the walkover and subsequent follow up visit approach outlined above would be capable of identifying and taking action on all these issues. Whilst problems associated with insufficient slurry and manure storage may not necessarily be identifiable at the walkover stage, the follow up farm visits stemming from this exercise would be able to cover this base<sup>22</sup>. Indicative estimates for the resources required by the EA to undertake a comprehensive walkover and enforcement programme as outlined above in each of the three study catchments over a 5 year period are presented in Table 6<sup>23</sup>.

**Table 6. Indicative Enforcement Resources And Costs (5 Years)**

Catchment	Days (1)	Cost (2)	FTE(per year)
Caudworthy	40	23,000	0.05
Rea	140	47,000	0.1
Lugg	560	161,000	0.5

1. Number of days based on walkover of entire catchment (5km/day) and follow up visit to 30% of farms in catchment
2. Costs based on salary and overhead figures provided by EA Finance Business Partner and EA Team Leader

For details of the assumptions and calculations behind the above estimates please see Annex A.

The current combined annual resource expended on farm visits in the Rea and Lugg, for example, is estimated at between 0.5 and 1.5 FTE per year which covers a myriad of activities including cross-compliance inspections, GW authorisation compliance visits, PPC poultry site compliance, abstraction licence compliance, pollution response, pre-application visits for PPC, SSAFO compliance and occasional miscellaneous activities including planning consultations. The resource needed for walkovers and repeat visits outlined in Table 6 would be additional to that which exists already. However, whilst obviously an extra cost, the additional resources required do not seem orders of magnitude greater than that which is already in place.

<sup>22</sup> It is assumed many of the farms with manure and slurry storage problems will be included in the 30% of farms identified for follow up visits from the walkovers

<sup>23</sup> Please note these estimates are designed to provide a ballpark indication of costs and have not been verified by EA financial managers

### 7.3 More Advice Provision Needed

A distinct advantage of a proactive walkover approach undertaken by the EA is that those farmers which the CSF programme has struggled to engage with thus far will very likely be identified by the EA. These farmers could then be referred to the CSF programme by the EA for help and assistance to rectify the on-farm problems encountered.

Ultimate sanctions on farmers (i.e Single Farm Payment reduction or issue of a Works Notice) should be used as a last resort and should be seen as a failure to engage farmers effectively on the water quality improvement agenda. As pointed out earlier, it is essential the enhanced enforcement process outlined above is complemented by both an enhanced system of farm advice and greater access to targeted agri-environmental payments to address specific requirements.

Farmers identified as having a pollution problem by The EA and RPA should have access to a confidential advisory service with sufficient resources and expertise to provide on-farm guidance relevant to the needs of the individual. As pointed out by EA and Natural England staff in the study catchments, it is important farmers are provided with appropriate risk management tools to enable them to understand how to ‘carry on farming but without losing soil and nutrients into the river’. One such risk management tool is currently being developed through a collaborative project between the EA, Natural England, Cranfield University and a farmer in the Lugg catchment, the plan being to roll this tool out to other farmers in the area once it is completed.

Very importantly, farmer feedback suggests extension advisors must have expertise in farm business economics. This will be necessary to help farmers adopt practical solutions which make sense from a business perspective whilst at the same time deliver environmental protection. Advisors should also have the ability to influence where and how grant money is spent within a given catchment to achieve best value for money. To a certain extent, this autonomy is beginning to happen within the CSF programme which the evidence suggests is the correct direction of travel. As pointed out in Section 6.5, it is important advisors remain one-step-removed from the regulatory bodies to develop a trusted working relationship with farmers. It is also crucial CSF advisors are appropriately resourced to be able to spend sufficient time with farmers who may require significant ‘hand-holding’.

An estimation of the advisory resource and costs necessary to deliver appropriate levels of service for the three study catchments over a 5 year period is provided in Table 7<sup>24</sup>.

**Table 7. Indicative Advisory Resources And Costs (5 Years)**

Catchment	Days (1)	Cost (2)	FTE(per year) Needed	FTE(per year) Existing (3)
Caudworthy	65	12,000	0.06	0.1
Rea	700	133,000	0.64	0.33
Lugg	2620	497,000	2.38	0.5

1. Number of days based on NE focussing effort on 30% of farmers identified through EA walkover surveys
2. Costs based on salary and overhead figures provided by NE CSF Project Manager
3. Existing FTE figures provided by NE CSF Project Manager

<sup>24</sup> Please note these estimates are designed to provide a ballpark indication of costs and have not been verified by CSF financial managers



For details of the assumptions and calculations behind the above estimates please see Annex B.

This analysis suggests that with the exception of the Caudworthy catchment, current CSFO capacity would need to be increased; from 0.3 to 0.6 FTE in the Rea and from 0.5 to 2.4 FTE in the Lugg. Whilst representing increased costs, numerous research projects focusing on farmer behavioural change have identified a central role for one-to-one advice delivered by a trusted and skilled advisor, often over an extended period of time. The importance of this issue has been formally recognised by the EU Commission in relation to forthcoming reforms of the Common Agricultural Policy which is stressing the need for member states to put in place well resourced advice systems to help farmers adopt more sustainable farm business practices. All four policy advisors consulted for this project were also universally in agreement that a highly professional well funded extension system is a fundamental building block for successfully delivering the agri-environmental agenda in the UK. This point of view has not always been shared by public authorities who have tended to view the provision of advice as an administrative cost rather than a long-term investment in the sustainability of the agricultural sector<sup>25</sup>. Long-term investment in expert agricultural advisors is, however, exactly what many observers have been calling for to help farmers meet the growing challenges of producing more food within a more sustainable production system<sup>26</sup>.

In terms of external delivery entities, it would appear to make sense to continue to outsource some CSF functions to third party partners where appropriate resources exist. However, to avoid delivery fragmentation, to facilitate consistency of message and to ensure a sufficient advisory skills base is available in all areas, there is a strong argument in favour of ensuring greater resources are channelled to developing the current CSFO human resource base. If external contractors are to be recruited, steps must be taken to ensure highly skilled individuals are used and that contract management does not divert CSF Officer time away from on-the-ground delivery. It is understood CSF is already beginning to explore a 'partnership delivery' model although the details of this are unclear. In any event, care must be taken to ensure the transaction costs of managing external delivery partners do not outweigh the potential value external partners might bring.

The evidence also suggests it takes time for farm advisors to develop the necessary 'local knowledge' (technical and cultural) to perform their role effectively and for trust to develop between an individual advisor and the local farming community. Steps should, therefore, be taken to ensure advisor continuity is maintained which is another argument in favour of a well resourced core CSF delivery team, complemented by local external providers where these demonstrate strong social capital and credibility within the local farming community.

The issue of a fragmented advice network in England leading to mix messages to farmers and inefficient extension delivery is not new (e.g Winter, 1995). Since the break up of ADAS in the late 1980's, many observers have called for the need for a co-ordinated extension effort, delivered through expert farm advisors capable of delivering financially viable environmental advice to farmers. The variety of advisory organisations developing over the last three decades can be seen as a valuable development in as much as farmers have a choice over who they use and new approaches to advice, most noticeably pioneered by the

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<sup>25</sup> Hart, K. and Baldock, D. Greening The CAP: Delivering Environmental Outcomes Through Pillar One. Institute for European Environmental Policy, July 2011

<sup>26</sup> See for example *Improving agricultural extension: A reference manual*, FAO, 1997

Westcountry Rivers Trust, have lead to notable innovations being made<sup>27</sup>. There is, however, a need to make sure all advisory organisations are sending the same message to the farming community which will require collaboration and may require formal agreement. As pointed out in Section 6.4, confusion amongst farmers over what is expected from them appears to be an underlying cause for inaction in many cases.

#### 7.4 Better Strategic Design Of Agri-Environmental Payments System Needed

The evidence accrued during this project suggests the current structure of agri-environmental payments is not appropriate for solving the resource protection problems identified by stakeholders within the three study catchments and summarised in Section 3.0.

##### 7.4.1 Targeting Area Payments

Protection of water resources will sometimes require specific areas of high risk land to be taken out of production, either in the form of robust buffer strips or infield reversion of arable land. As they stand at the moment, both the ELS and HLS schemes do not offer sufficient payment levels to incentivise the majority of farmers to take up appropriate resource protection measures. If mandatory buffering and reversion is not introduced (see Section 8.0 on greening of the CAP), higher per hectare payment levels will need to be offered to farmers. Simply re-weighting the ELS points system away from hedgerow options towards resource protection measures will not work as many farmers may choose to withdraw from the scheme. The need to significantly increase payment rates presents a significant problem, however, due to EU income forgone rules which place a cap on payment rates below the level which most farmers will find attractive. Without income forgone restrictions being reformed which is very unlikely, it will be necessary to identify additional private sources of funding, a subject which is explored further in Section 9.0.

To gain maximum cost:benefit from such payments it will be vital to ensure they are focussed where they can make most impact. An estimate of the financial resources required to achieve appropriate targeted arable reversion in the study catchments for a 5 year period is presented in Table 8.

**Table 8. Cost Estimates To Achieve Necessary Arable Reversion/Buffer Strips**

Catchment	Hectares Required <sup>(1)</sup>	Payment/ha <sup>(2)</sup>	Cost/Year	Cost Over 5 Years
Caudworthy	10	£900	£9,000	£45,000
Rea	200	£900	£180,000	£900,000
Lugg	1000	£900	£900,000	£4,500,000

1. Estimates provided by farm advisors
2. Payment rates derived from interviews with farmers

A total cost of £5.5m in payments appears a high figure. However, if the total current ELS budget for the three catchments is taken into account, estimated at £13m<sup>28</sup> over the same timeframe, it is possible to suggest these more targeted arable reversion payments could achieve greater gain at less cost than ‘broad and shallow’ ELS payments which appear to be delivering marginal additionality at the current time.

<sup>27</sup> Integrated Whole Farm Plans (promoting ‘win-win’ solutions) incorporating 130 best farm practice advice sheets developed by Westcountry Rivers Trust are one such example

<sup>28</sup> Estimate based on £30/hectare x eligible ELS area across the study areas

Irrespective of funding streams and payment levels, there seems little argument that resource protection payments should be targeted at those farms where most protection is likely to be delivered. This in turn requires the involvement of local scheme administrators with on-the-ground knowledge (e.g CSF Officers) of where best to allocate funds. To facilitate the optimal allocation of agri-environment spend it is also likely that better co-ordination between CSF, ELS and HLS staff within Natural England is required. As pointed out in Section 5.5, it appears actions are being taken to address this issue although it is uncertain how much integration will result from the current changes. One CSF Officer interviewed suggested that CSF, ELS and HLS programmes and operational staff should be fully integrated into one operational unit, an idea which may well warrant further consideration within Natural England management circles.

#### 7.4.2 Targeting Capital Payments

Many of the pollution problems identified in Section 3.0 are caused by underlying deficiencies in farm infrastructure. Table 9 outlines estimates for the level of capital investment required by farmers to solve these infrastructure related issues.

**Table 9. Estimated Capital Investment Required In Study Catchments**

Fencing	Fencing required (m) <sup>(1)</sup>	Cost/m <sup>(2)</sup>	Total Cost
Caudworthy	7,000	£4	£28,000
Rea	32,000	£4	£128,000
Lugg	92,000	£4	£368,000

Farm Tracks	Number of farms requiring track management <sup>(1)</sup>	Cost/farm <sup>(2)</sup>	Total Cost
Caudworthy	22	£1000	£22,000
Rea	235	£1000	£235,000
Lugg	879	£1000	£879,000

Winter Housing	Number of farms requiring extra capacity <sup>(1)</sup>	Cost/farm <sup>(2)</sup>	Total Cost
Caudworthy	5	£30,000	£150,000
Rea	10	£30,000	£300,000
Lugg	20	£30,000	£600,000

Storage/Yard Cover	Number of farms requiring new roofs/new stores <sup>(1)</sup>	Cost/farm <sup>(2)</sup>	Total Cost
Caudworthy	20	£50,000	£1,000,000
Rea	15	£50,000	£750,000
Lugg	40	£50,000	£2,000,000

1. Estimates provided by farm advisors

2. Cost estimates derived from farm advisors and interviews with farmers

Clearly, investment in infrastructure represents a major financial challenge for the farming industry going forward and it will be vital to ensure grant funding is targeted where it can best make an impact. The current grant pool available does appear to be able to make a significant contribution to the necessary investments in the study catchments. For example, funding the required fencing works for the Lugg as outlined in Table 9 at a rate of 50% could have been achieved by dedicating approximately 40% of the CSF grant available in the Lugg for the 2011/12 period to that purpose<sup>29</sup>. As with area payments discussed in the previous section, it will be crucial to ensure individual CSFOs are able to identify where best the money should be spent. This in turn will necessitate the development of a well informed targeting plan informed by best available data backed up by local knowledge.

## **7.5 Clarity Needed Regarding The Management Of Phosphorus**

Applying excessive levels of phosphorus to land, particularly at times where risk of run-off is high, represents a significant pressure on the health of freshwater ecosystems. As pointed out in Section 4.3, outside NVZs, there is currently no restriction on the application rates and timing schedules for manures and slurries and even within NVZs, application limits are specified for nitrogen not phosphorus levels.

If it is assumed, however, that the current NVZ restrictions represent de facto a restriction on phosphorus applications as well as nitrogen, there remains a question over whether the remaining 40% of farmland lying outside NVZ designations should be subject to some form of phosphorus application restrictions. With regard to the three study areas for this project, most of the Lugg catchment is within an NVZ whilst neither the Caudworthy nor the Rea contain any NVZ designated land. This is a very complex policy question and one which raised significant debate with stakeholders throughout this project.

There seems little doubt from an ecological perspective that raising bioavailable phosphorus levels in watercourses is a major cause of eutrophication which in turn can have serious negative consequences on a range of organisms including macrophytes, invertebrates and fish. Bioavailable phosphorus becomes more plentiful when excessive amounts of manure and slurry are applied to a given area of land. Phosphorus is especially likely to become available when manures and slurries remain near the soil surface where connectivity with run off is greatest.

A strong argument exists, therefore, to restrict both the total volume of phosphorus applied and also when it is applied to increase the chance of crop nutrient take up and reduce the risk of run off from rainfall events. The ability of a farmer to spread manures and slurries at an appropriate time window depends on him having sufficient slurry storage capacity. The ability of a farmer to not overload a given land holding with phosphorus also depends on him having access to sufficient land. The difficulty this presents is that many farmers outside NVZs do not have sufficient storage and/or land to accommodate the volume of phosphorus generated by their livestock. This has major financial viability implications for these farms should restrictions on application rates and storage capacity be introduced.

Should phosphorus restrictions be implemented, it will be crucial to ensure a very long lead time is given (at least 5 years) for farmers to be able to make appropriate financial plans surrounding their businesses, which, in many cases may require significant structural adjustments. It will also be crucial to ensure that phosphorus restrictions on agriculture are not introduced without assessing alternative options which may place disproportionately less costs on society e.g phosphate stripping at water treatment works, reducing phosphorus

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<sup>29</sup> £462,000 grant allocation made for the Lugg Catchment 2011/12

loads in detergents etc. Financial assistance to farmers to put in place storage capacity should also be given serious consideration. Whilst it is probably not possible for public money to be made available in England - due to a combination of state aid rules and a precedent of no financial assistance being offered with NVZs - this should not preclude assistance being made available from the private sector through Paid Ecosystem Service markets where feasible to establish (see Section 9.0).

## 8.0 Current Common Agricultural Policy Reform Proposals

Since its inception, the European Common Agricultural Policy (CAP) has exerted a huge influence on the way the natural environment is managed across the UK and Europe more widely. Dating back to the MacSharry reforms of 1992, there has been a slow but gradual increase in European funds dedicated to the delivery of specific environmental outcomes under Pillar II of the CAP although Pillar I (direct farm support subsidy) has continued to maintain the lions share of the total CAP budget.

It is clear, however, from the EU Commissions 'CAP towards 2020' communication that the share of the CAP budget allocated to Pillar II is not envisaged to expand further which has disappointed many environmental groups who see Pillar II as an efficient mechanism of targeting payments to farmers to deliver specific environmental outcomes. Rather the Commission's proposal is to introduce a 'greening' element to Pillar I involving 30% of Pillar I funds being ring fenced to fund a range of green measures. In summary, it is proposed farmers must perform three greening measures in addition to adhering to cross-compliance regulations to receive an additional annual payment on top of a basic annual entitlement, all funded from Pillar I. At the moment, farmers receive the equivalent of the additional annual payment and the basic annual direct payment without having to undertake these greening options.

The three greening measures currently proposed are:

- Crop diversification: arable farms must grow at least three different types of crop each covering at least 5% and no more than 70% of the farm area. This would prevent, for example, 50% wheat 50% oil seed rape rotations practiced on some farms
- Maintaining permanent grassland: Grassland over 5 years old must be retained
- Ecological Focus Areas: at least 7% of the farm (excluding permanent pasture) must be left fallow or put into extensive management for the purposes of enhanced environmental protection

There is currently significant debate as to whether the proposed greening measures will yield any genuine environmental outcomes or whether they represent 'greenwash' with little likelihood of delivering any meaningful ecological benefits. In terms of helping to mitigate the types of soil and nutrient run-off issues highlighted within the study areas for this project, it would appear the Ecological Focus Areas (EFA) offer the best opportunity. Given details from the Commission have been rather vague thus far, it is difficult to gain much clarity at the moment regarding the scope of this particular measure. However at this stage, it is understood farmers would be required to allocate 7% of their 'non permanent pasture land' to an extensive management regime which might involve the creation of fallow land (land with no productive purpose) buffer strips, flower strips, beetle banks, skylark plots or grass margins.

Given a need for the strategic arable reversion of land identified in Section 7.4, the EFA measure potentially offers a valuable tool to protect water resources and deliver WFD outcomes. Importantly, it has the potential within a given catchment to protect specific land areas at risk of soil erosion and run-off and, importantly, reduce the budget needed to fund the uptake of these measures from the agri-environmental pot (Pillar II or private funds) which can, therefore, be diverted to delivering other environmental outcomes. In fact, if 7% EFA was focussed on arable land in the three study catchments for this project, this would

more than cover the estimated arable reversion area needed to protect the catchments and would, therefore, save considerable agri-environment budget which would otherwise be required to incentivise farmers to take this land out of production.

However, the success of this measure will entirely depend on the detail of how it is implemented. In particular, it will be vital to ensure farmers position their EFAs on areas of their farm which are likely to produce greatest resource protection outcomes. For this reason, farmers should not be left to their own devices when selecting this land but should be required to refer to some form of catchment risk map which stipulates areas where EFAs should be selected. This map would need to be constructed through a catchment management planning exercise, such as the Catchment Approach initiative envisaged by Defra. Provision needs to be made, therefore, at an EU Commission level, to ensure local priorities can be incorporated within the greening legislation.

It will also be important to ensure EFAs are robust enough (e.g dimensions, width) to deliver sufficient protection of watercourses and that the farmer is given enough flexibility to design, if necessary, a matrix of EFA land capable of delivering a specific purpose. For example, managing asparagus or other high erosion risk land is likely to require infield grass strips positioned in a variety of configurations to prevent overland flow. Both in-field and field margin options should, therefore, be made available to the farmer.

To provide farmers with assistance in selecting and implementing their EFA requirements, it will also be important they have access to appropriate advice, reaffirming the need for a skilled extension service outlined in Section 7.3.

Aside from the need to target the proposed EFA measure, some more overarching principles need to be put in place regarding the greening of Pillar I. In particular, to ensure wide-scale adoption of the proposed greening measures, it will be important to make access to the entire direct payment entitlement dependent on delivery of these measures not just the 30% additional payment. It is not clear yet within the Commissions proposals whether farmers will have to adopt the greening measures to obtain their 'core' entitlement payments. Secondly, there is a significant need to put in place effective monitoring and evaluation methods to assess the on-going effectiveness of both the green payments scheme and the cross-compliance mechanism under Pillar I. There is currently an absence of any requirement to monitor the impacts of these policy instruments which presents a major barrier to assessing their effectiveness<sup>30</sup>. Lack of monitoring may well be a reason why the apparent shortcomings of the cross-compliance process outlined in Section 4.0 have not been formally identified and evaluated thus far.

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<sup>30</sup> See Hart, K. and Baldock, D. Greening The CAP: Delivering Environmental Outcomes Through Pillar One. Institute for European Environmental Policy, July 2011

## **9.0 Potential For Private Sector Investment In Catchment Management**

The final section of this report provides an assessment of the potential for private sector money to contribute towards water quality protection outcomes through investment in catchment management. As outlined in earlier sections, delivering WFD obligations will require significant investment, primarily to achieve a combination of targeted land use changes and farm infrastructure improvements. As has been demonstrated, an effective combination of regulation, advice and CAP derived funds (both Pillar I and II) should be able to bring about many of the necessary changes but it is likely that more money will be required, particularly for capital infrastructure payments and land retirement in specific areas of ecological and/or drinking water importance.

### **9.1 Paid Ecosystem Services Markets**

In recent years, a growing interest has developed in what have generically become known as Paid Ecosystem Services (PES) models for environmental protection. Wunder (2008) defines PES as involving a voluntary transaction where a well-defined environmental service (or a land use likely to secure that service) is 'bought' by a (minimum one) service buyer from a (minimum one) service provider if, and only if, the service provider delivers appropriate levels of service provision.

A review of the literature has identified a small but growing number of instances where private (non-government) entities have funded payments direct to landowners to deliver specific environmental outcomes. These payments form part of the development of private markets characterised by 'individual buyer, individual seller transactions' (Brown et al, 2006). In some cases, these markets have been initiated and managed completely independently of the state whilst in most cases, the state – usually in the form of a natural resources management agency – has played a major role in their development and on-going administration.

Indeed, the literature reveals a majority of PES schemes are not self-organised between buyers and sellers but managed by a government agency. Notably, the government in Costa Rica has pioneered the use of formal PES mechanisms by establishing the Pago por Servicios Ambientales (PSA) in 1997 (Brown et al, 2006). This is a nationwide scheme which targets a number of services including carbon sequestration, water quality and quantity (for drinking, irrigation supply and hydropower), biodiversity conservation and scenic beauty (Turner and Daily, 2008). Since 2000, a growing number of PES mechanisms have emerged throughout other Meso-American and South American countries and also in North America.

As demonstrated in Costa Rica, a closer examination of many of the state led PES schemes reveals that payments made by ecosystem service recipients often form only a part of the total payments received by providers; the balance being made up from a variety of other sources (Porras et al, 2008). These include the re-allocation of (national and local) government general budgets, the reallocation of water revenues or surcharges on domestic or agricultural user fees and donor funds in the form of international grants and loans ( e.g from the World Bank).

There is insufficient evidence across the board to assess the relative contribution of the various funding sources. However, in cases where information does exist, private contributions are relatively small compared to the other sources of funding such as donors or public resources. This raises questions about the financial sustainability of these initiatives over the long-term (Porras et al, 2008). In several cases, it has been necessary for the state to intervene by enacting the enforcement of payments, the Philippines government, for



example, introducing a mandatory requirement for water users to finance watershed management activities. Such interventions involve significant up-front and on-going transaction costs paid for from the public purse.

In addition to the state led PES schemes outlined above, a smaller number of privately led or 'user' schemes have also started developing, usually on a reduced scale when compared to the state led schemes and usually concerned with the provision of a small number of ecosystem services (normally one in particular). For example, 'scenic landscape' markets involving self-organised private transactions can be found in the USA. These have involved the purchase of conservation easements from private landowners by private land trusts keen to protect scenic landscapes from development. Prices of conservation easements are negotiated directly between the trust and the landowner. Other examples from the USA include Trout Unlimited financing private landowners to improve fish habitat (Brown et al, 1993).

In the Philippines, the Kanla-on Spring Water Plant (KSWP) company depends on the maintenance of high water quality within the watershed it is operating in, which is being negatively impacted by unsustainable forestry operations. Consequently, the company is funding a reforestation and training programme to protect its assets (Porras et al, 2008).

There are also increasing examples in Europe of water companies paying farmers to undertake management practices that protect raw water quality at source. In the Weser-Ems Administrative District of Lower Saxony in Germany, voluntary land management contracts have been established between land managers and the water supply companies whereby farmers are paid compensation for economic loss which may arise. In the UK, private water companies (see below) have also started incentivising landowners to bring about changes in land management practices. Perhaps the most widely cited European example of a private entity paying landowners to protect water quality at source relates to Perrier-Vittel, the bottled water company. Whilst the exact payment levels are not known, this business has spent several million dollars on incentive payments in the catchments where it abstracts its water (Daily and Ellison, 2002).

In terms of evaluating the overall efficiency of privately funded payment schemes, this is very difficult at the current time given a lack of quantifiable data on environmental improvements and only a few ex-ante studies of costs (Porras et al, 2008). Based on developing country Payments for Watershed Services (PWS) schemes which represent the majority of PES schemes currently in existence, there is still a lack of evidence that investing in PES land-management measures upstream has advantages over other measures to address downstream water-related problems and effectively change farmer behaviour.

A fundamental difficulty with ecosystem services when considering market mechanisms is that they are largely non-excludable services i.e it is difficult to exclude those who don't pay for these services from benefiting from them (known as the free-rider problem). Potential purchasers of these services are also deterred from paying if they know other people will not pay. Free riding is particularly likely where multiple water users share the same catchment. It is noteworthy that most payment agreements with water users have been established in watersheds where there is a single dominant user (Pagiola, 2002). Because of the free-rider problem, it may become necessary for the state to step in to enforce payments otherwise the market will fail<sup>31</sup>. For example, the state in Costa Rica has had to introduce mandatory

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<sup>31</sup> PES market establishment may not be compatible with 'slim government' or lack of state intervention. See Defra Evidence and Analysis Series Paper 4 *Payments for Ecosystem Services*, 2011

water payments to finance PES activity. In Bolivia, it has been difficult to get individual users to pay for ecosystem provision with an NGO supplying nearly all the money so far (Asquith et al 2008). The difficulty with state intervention is that high transaction costs are likely to result, leading to the scheme becoming inefficient.

A key theme emerging from the literature maintains that high transaction costs can cancel out any of the theoretical efficiencies proposed by PES advocates. This has led several observers to conclude that the key to successful PES schemes is having good intermediaries who can reduce transactions costs to an economically efficient level. To date, a wide range of entities, governmental and non-governmental, academic and financial, have been involved in facilitating the development and operation of schemes, performing a broad range of roles. In relation to PWS schemes, Porrás et al (2008) classifies intermediary activities under the following headings:

- Communication between farmers and downstream users. Their participation could be transitory. The dialogue will help to identify the environmental services expected by downstream users
- Programme design. Feasibility studies, designing the payment mechanism, developing management plans and establishing monitoring systems to ensure the delivery of watershed services
- Support to suppliers. This helps create the technical, social and institutional capacities to implement the land-management practices required by buyers
- Administration of the scheme. Draw up contracts, collect and manage funds, transfer payments to suppliers, coordinate overall monitoring and technical capacity
- “Wholesale” managers. In these cases, a facilitator will take the risk of the intermediation process by buying the environmental services (usually bundled) from landowners. They try to sell these services to different users by pooling demand from local and international sources. This type of intermediary in practice becomes a “first-stage” demand for environmental services. Because of the risk involved, the role of “wholesale” manager is usually taken by a government agency, particularly for national-level schemes

Landell- Mills and Porrás (2002) argue that the successful development of markets depends on their ‘counterpart’; meaning strong cooperative arrangements capable of facilitating trading relationships. Intermediaries have often been criticised in the past for taking too much cash out of the schemes for themselves – leading to distrust and conflict between providers and intermediaries. Intermediaries need to be trusted and provide transparency over their role and the benefits the scheme is providing for providers and payers (Vatn, 2010). PES Schemes will only work where trust can be generated.

Transaction costs are also dependent on the complexity of the scheme in question including the number of ecosystem services being traded and the volume of entities involved. Wunder et al (2008) have reviewed various PES schemes and make a distinction between ‘user’ and ‘government’ funded schemes. User schemes are characterised by small numbers of entities focussing on one ecosystem service only; whereas government schemes involve many entities and multiple services. Because of their smaller and simple structure, user schemes generate far lower transaction costs. As the number of agents involved grows,

markets become costly due to the increased number of deals to manage (Vatn, 2010). At a certain point, it becomes cheaper and easier to deliver the ecosystem services in question through taxes or some other charge which involve simplified interaction with providers.

When examining ways of minimising transaction costs within PES schemes, some authors have emphasised a need to generate a reciprocal relationship between provider and society. Central to this relationship is the need for farmers to perceive the payments they receive as a reward for providing a good service rather than an incentive to behave well. This sense of worth leads to a lower likelihood of farmers failing to adhere to contractual obligations, necessitating less monitoring and enforcement and resulting in correspondingly lower transaction costs (Gintis et al, 2003).

The existing evidence also suggests that, as with government incentive schemes, PES schemes need to involve better targeting so that payments reach those providers of ecosystem services most capable of delivering maximum outputs. When considering PWS schemes for example, Porrás et al (2008) suggest differential payments are required that reflect (1) the risk of loss of watershed services (2) the geographical location of the provider and (3) the opportunity cost involved with the provider taking action. Porrás et al suggest grading systems can be used to identify areas capable of delivering most environmental benefits; involving the use of hydrological and risk mapping together with socio-economic analysis of farmers by location, willingness to engage and required compensation levels.

## 9.2 Investment From The Water Industry

Water companies in the UK are increasingly being seen as a potential source of private sector investment for catchment management initiatives. During the fieldwork for this project it has been possible to identify different trajectories within the water industry regarding water company involvement.

- **Actively involved:** A small number of water companies are already working with landowners to deliver improved water quality at the farm level. For example, within the Caudworthy catchment and the Tamar catchment more widely, South West Water (SWW) is funding farm infrastructure improvements such as increased slurry store capacity and farm track improvement. During the PR09 funding round, SWW is spending £9m on moorland and farmland projects and £1m on catchment investigation projects which totals 1% of total CAPEX between 2010-2015. In PR14, SWW plans to spend between £30-£50m on catchment management projects, split approximately 66% on moorland rehabilitation projects and 33% on wider farmland. Costs to the customer appear very small, totalling £0.60/year/household during PR09 and an estimated £2.00/year/household for PR14.
- **Undertaking investigations:** The majority of water companies have not invested in catchment management thus far, but are currently investigating the likely efficacy of on-farm measures to mitigate water quality pollution issues and the likely propensity of farmers to take up the requisite measures on a voluntary basis. At the current time, it appears these companies may choose a number of routes in the future ranging from farm interventions (i.e financial payments to farmers and provision of advice) to a continuation of end-of-pipe treatment. Where water companies feel pollution levels have reached a plateau in a given catchment, it is likely they will be able to continue blending poorer quality sources with high quality resources, reducing the pressure to invest in a catchment management approach.

It is interesting to note that both South West Water and Severn Trent Water whose operational regions overlap with the DSEPP project study areas have chosen to work with local Rivers Trusts who act as neutral brokers between the water company and local stakeholders particularly farmers. This arrangement closely resembles the 'trusted intermediary' model referred to in section 9.1 as being a prerequisite for successful PES market formulation and delivery.

Ultimately, the key issue that will determine the geographical scale of water company investment in catchment management is commercial self-interest. Based on discussions with water company representatives, it is clear that water companies will only invest in catchment management where this approach will provide value to their customers and shareholders. South West Water, for example, wishes to invest significant resources in Bodmin Moor and Dartmoor as these areas are strategically vital to SWW's business, supplying nine reservoirs, three river abstractions and two hydro electric installations which are becoming increasingly important to SWW's energy supply. The company believes retaining water on the moors and reducing nutrient pollution from wider farm land will help to improve water quantity in times of low flow, reduce water quality problems during drought conditions, reduce pump storage in reservoirs during dry periods and delay the investment in water treatment works which represent huge CAPEX and OPEX commitments.

The role of OFWAT, the Water Industry Regulator, is also vitally important regarding water industry investment in catchment management as it is ultimately OFWAT which sanctions this investment through the Periodic Review process. Discussions with OFWAT representatives for this project suggest OFWAT is broadly very supportive of catchment management as an approach but is cautious regarding whether catchment initiatives will work and, therefore, whether water customer money can be spent in this way. Where a specific water pollution problem can be attributed to a specific farm activity, a case for sanctioning remedial payments was regarded by the OFWAT representatives as relatively straightforward. However, where the cause/effect relationship is less clear cut, the case for funding becomes more difficult. For this reason, OFWAT appears to be concerned about funding land use change payments where these may not result in reduced pollution and has asked water companies to identify the risk associated with various land use change options not working. During PR09, OFWAT has only been prepared to sanction capital works (where a cause/effect relationship is easier to prove) but the view from SWW is that OFWAT will approve land management expenditure for the PR14 period provided sufficient outcomes and cost/benefit ratios can be demonstrated. It will also be vital from the point of view of both OFWAT and the individual water companies, that a clear regulatory baseline is established for farm environmental compliance standards, underpinned by effective enforcement. This will give the water industry confidence that investment made in farm level activities will not be delivering outcomes which should already be being delivered to comply with legal requirements. And importantly, this appears to be a necessary prerequisite before water customers can be asked to pay land managers for the delivery of additional ecosystem services.

In short, the overarching issue focussing OFWAT's position on catchment management is that of customer benefit. On this subject, OFWAT representatives were of the view water company customers must be further engaged regarding their willingness to pay for ecosystem services through their water bills when agri-environmental payments through Defra managed schemes are already in existence. This raises a much greater need for a societal debate regarding ecosystem provision from the landscape; who should pay for this, who should be paid to provide these services, and how much? Orchestrating this debate is

possibly beyond the remit of the water companies but is a task which could be taken up by the host organisations facilitating the Catchment Approach initiative going forward. Importantly, Defra policy and technical teams (e.g water, biodiversity, air quality and soils) should also aim to closely collaborate on this initiative to ensure a common vision is developed across the Department.

### 9.3 Investment From Other Sectors

As part of the DSEPP project, interviews were conducted with a small number of companies from outside the water industry in each of the three study catchments to determine their attitudes towards a conceptual PES model for catchment management and whether they could foresee their respective company's funding catchment management initiatives in the future. The model presented included the following features:

- Land managers would receive payments from local businesses for putting in place long-term land management changes and/or infrastructure improvements which would deliver multiple ecosystem benefits including carbon sequestration, improved water quality, flood mitigation and biodiversity gains<sup>32</sup>
- The scheme would be established and managed by a local not-for-profit entity
- Local businesses would contribute funds to a catchment funding pool which would be managed and distributed by the not-for-profit entity

Across the companies interviewed, there was a very positive response to the principle of investing in a locally based catchment management scheme. All companies interviewed bar one were involved in the Carbon Reduction Commitment programme and one was large enough to be part of the ETS trading scheme. Respondents were of a view that if they are required by government to pay what they see as an environmental tax on carbon emissions (e.g CRC), they would rather a proportion of this money be spent on a local environmental initiative which would be of benefit to their staff and the local community rather than channelled into 'general Treasury coffers'. Alternatively, they proposed that their CRC payments could be reduced subject to them investing resources in a local catchment scheme.

With one exception, respondents interviewed also felt investment in local catchment management would be a positive Corporate Social Responsibility outcome. Others felt a distinct marketing advantage could be derived from such an investment, with one company already donating proceeds from one of its product lines to the Wildfowl and Wetlands Trust for this reason. Companies within the food and drink sector appeared to envisage a particularly strong marketing advantage from being associated with such a scheme, due to the wish to link their brand identities to a sustainable 'countryside' supply chain delivering positive environment outcomes. One company interviewed currently supplies Marks & Spencers with food items and explained M&S is increasingly examining the sustainability of its own food and drink supply chain. If the company could demonstrate to M&S it was investing in a food supplier network which was delivering multiple environmental benefits, it was felt this might well provide a competitive advantage over other food processing businesses.

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<sup>32</sup> For example creation of wetlands can lock up carbon from the atmosphere, remove nitrogen from run-off through denitrification and reduce flooding by slowing down the process by which overland flow reaches river channels

Three of the companies interviewed had explored carbon-offsetting schemes (all outside the UK) but had been unconvinced of the legitimacy of these schemes and ‘whether they actually lock up carbon’. The idea of being able to invest in a local scheme ‘which you can actually see’ and which can be constantly monitored and scrutinised was appealing to respondents. They also liked the idea of a not-for-profit scheme administrator, given a perception that existing schemes are presided over by ‘profiteering middlemen’. A potential limitation of a local catchment management scheme was perceived to be a likely low threshold for carbon sequestration capacity. In particular, one respondent interviewed explained his business produces 40,000 tonnes of carbon each year and questioned how much of this could realistically be absorbed through a local catchment management programme. Local schemes would also need to achieve recognised accreditation standards for companies to be able to invest in them.

In summary, attitudes were very positive towards a catchment based PES model. However, respondents were quick to point out that unless existing tax systems are modified to allow these schemes to be funded or unless businesses are required by law to invest in them, the funding for these schemes generated organically is likely to remain very low. As demonstrated by international experience (see Section 9.1), it seems fiscal and regulatory intervention will be required by government if localised PES schemes capable of delivering water resources protection are to become a widespread reality.

#### **9.4 Paid Ecosystem Services Mapping**

The previous sections have outlined multiple sources of funding which could potentially be raised to fund catchment management delivery. The scope of this report precludes a full discussion on the potential for embedding an ecosystem services approach into a catchment management framework. However, a brief example of practical application is given here.

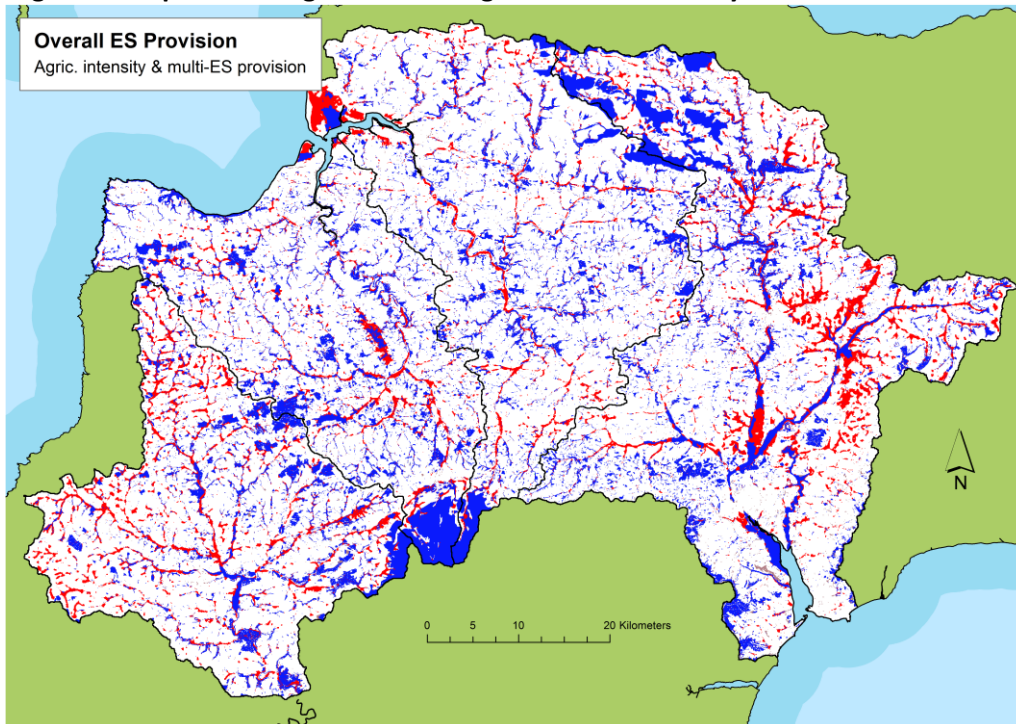
To deliver both food and multiple other ecosystem services within a catchment, there is a need for a variety of land uses capable of delivering these outputs. Some areas will be more suitable for growing food and some more suitable for providing other services including water quality, flood alleviation, recreation and biodiversity. Where a farmer is producing food from a unit of land likely to cause soil erosion but where this unit of land is crucial for the provision of multiple other ecosystem services, an argument exists to divert land use away from food production toward the provision of these other services. If a market can be developed where beneficiaries of multiple ecosystem services derived from the land unit are prepared to pay the farmer more for these services than he is currently deriving from using that land for food production, it is possible to envisage an optimal societal outcome. The farmer generates a better return from the unit of land and society benefits from the production of beneficial ecosystem services from the land which is now no longer likely to produce negative environmental externalities.

To illustrate this point, Figure 3 outlines a map of four catchments in SW England (Tamar, Torridge, Taw and Exe) highlighting areas of land in red which provide multiple regulating and supporting ecosystem services but are also used for intensive food production (approximately 7% of the land area)<sup>33</sup>. Such land represents zones where beneficiaries of these non-food provisioning services might choose to offer payments to farmers to take these land parcels out of agricultural production.

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<sup>33</sup> For further information see Palin, N., Walker, M. and Couldrick, L. Mapping Multifunctional Land Important For The Provision Of Ecosystem Services At A Catchment Level. Westcountry Rivers Trust, September 2011

**Figure 3. Map Illustrating Potential Target Areas For PES Payments**



Source: Westcountry Rivers Trust

If suitable market mechanisms could be established, it is possible that funds from beneficiaries could be targeted at land parcels causing water quality pollution problems (see Section 7.4.1) where these parcels have a high multiple ecosystem service value. These private markets could be used to supplement payments made from Common Agricultural Policy or other public funds thereby producing a significant incentive for landowners to divert land away from agricultural production activities with a high probability of causing pollution problems. The governance and management of these funds would need to be co-ordinated to deliver maximum benefit, with international experience suggesting the 'neutral broker model' is likely to be the best institutional arrangement for achieving this outcome (see Section 9.1).

## 10.0 Conclusions And Recommendations

Based on the evidence and analysis set out in the previous sections of this report, it is possible to draw the following overarching conclusions and recommendations.

### **Improved Governance Of The Catchment Management Planning Process Is Required**

Based on the case study catchment areas selected for this project, it appears significant confusion and disagreement regarding the nature and scale of water quality problems can exist at the catchment level; with current WFD delivery plans demonstrating insufficient detail to enable focussed effort. There is a need to co-ordinate understanding surrounding the state of waterbodies, for uncertainties to be clearly communicated and agreed on, and for solutions and delivery plans to be developed which have a mandate from the farming community, delivery agencies, the water industry and other catchment stakeholders. Clear problem definition will allow development of targeted mitigation solutions. Of utmost importance, **trust in the process and in those involved with delivery** must be established.

To facilitate the development of a co-ordinated catchment plan, information flow between stakeholders must be transparent and accessible, within limits laid out in the Data Protection Act. This requires the development of open access catchment scale data repositories which become the one-stop-shop for all parties involved in the delivery of WFD objectives. Management, co-ordination and ownership of this facility requires careful consideration by Defra; at this stage it would appear the host organisation model envisaged within the Catchment Approach will be the correct vehicle to deliver such an undertaking.

Leading on from this, it is recommended there is a need to clarify the roles and responsibilities of the various parties involved in the delivery of WFD objectives to avoid institutional conflict, encourage efficiency, and ensure the whole is greater than the sum of the individual parts. Given the emergence of an active third sector within the sphere of water resources management in recent years, it is suggested the relationship and dynamics between the third sector and the statutory agencies is reviewed and formalised to ensure all parties are able to realise their full potential.

### **Transparent, Equitable And Enforceable Regulation Of An Environmental Baseline Is Needed**

Farmers are currently confused, both about their legal responsibilities and about the enforcement process that accompanies the regulation of environmental compliance matters. Conversely, there also appears to be confusion amongst the regulatory authorities regarding process and application of regulation relevant to the agricultural sector. This is particularly true of the Rural Payments Agency and The Environment Agency over the issue of enforcing the Soil Protection Review within Cross Compliance. The result is a situation where all parties – farmers, regulatory personnel, conservation groups - appear demoralised and often frustrated with the current regulatory process.

There is a clear need for this situation to change. The evidence suggests that an unambiguous enforcement process needs to be established and, most importantly, clearly communicated to the agricultural sector. Cross compliance measures should not be increased in number as there are already a myriad of obligations within the GAEC and SMR requirements. What is needed is for the existing requirements to be adhered to and for a process of stepped enforcement (repeat visits) to be implemented to ensure pollution problems are successfully mitigated once identified.



Similarly, outside the cross compliance process, EA enforcement procedures also need to be capable of identifying (and mapping) problems on a catchment scale and able to follow through a problem from identification to successful mitigation. Walkover surveys<sup>34</sup> and follow up farm visits offer a route to achieve this. Identification of problems and subsequent constructive liaison with farmers is a highly skilled job which requires technical expertise and practical on-the-ground experience. It is suggested that walkovers are, therefore, undertaken by EA enforcement staff who are able to develop in-depth knowledge of their local area and refine the skills necessary to interact with the farming community in a knowledgeable, equitable and informed manner. Given the need for developing clear roles and responsibilities within the catchment management space and given the need to develop specialist skills within EA Enforcement Officer personnel (see Section 6.6), the use of private sector consultants to undertake walkover surveys for the purposes of identifying pollution problems should be reviewed.

Increased resource will be required for the EA to implement walkover and follow up visits but the evidence suggests the costs of doing this will not be orders of magnitude greater than existing resource availability. Focusing attention on particular high risk sections of a given catchment, through the use of modelling tools and local EA knowledge, is an obvious way of reducing the resource load required.

Cost efficient enforcement also depends on the development of an appropriate monitoring system capable of pinpointing problems, enabling source apportionment and tracking the efficacy of mitigation measures over time. It is hoped the Defra Test Catchment programme will provide suitable guidance on the best monitoring protocols to meet these objectives.

### **Investment In Agricultural Extension Is Required**

The need to apply regulatory enforcement action on a farm business should be regarded as a policy failure. As highlighted in Section 5.0, there is an urgent need to invest in the expansion and skills base of extension providers in England, capable of helping farmers with the technical, business and, in some cases, emotional support they will need to deliver the multifunctional farmed landscape society is increasingly demanding from them. As pointed out in Section 6.2, land is increasingly farmed on a rented basis which has complicated the picture with regard to long-term husbandry of, and investment in, issues such as soil health and farm infrastructure relevant to sustainable land management. Brokers will increasingly be needed to help both landlords and tenants understand their responsibilities pertaining to the resource protection agenda, and develop appropriate solutions whereby both parties share the costs and the benefits of enhanced environmental measures undertaken.

There are a large number of extension providers operating at various levels across the farming sector, seemingly with different remits and modes of operation. Not surprisingly, the end customer i.e the farmer, is often receiving different messages regarding what is expected from them; which is leading to confusion and often disillusionment with the environmental agenda. It is crucial, therefore, that all deliverers sing from the same hymn sheet. This will require leadership from Defra to bring the various providers together to agree a common objective and working practices. It is suggested that the Catchment Sensitive Farming initiative should be invested in by government, to provide a highly skilled and credible hub for future extension provision, working with other delivery partners (including the third sector) where these are available, locally accepted and have the

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<sup>34</sup> Walkover is defined here as an 'on foot' visual survey undertaken by Environment Agency staff for the purposes of identifying pollution problems and should be distinguished from bespoke chemical or biological monitoring surveys

requisite skill sets. Farmers must play a central role in the design and constitution of locally delivered advice to ensure provision is tailored to need. It is recommended the Affiliated Regional Advisory Training Service model (Winter, 1996) originally proposed in the 1990's is reviewed by Defra as a possible framework for delivery of integrated advice and training of advisors and is considered within the context of the Defra Integrated Advice Pilot work currently being undertaken. Consideration should also be given to fully integrate CSF, ELS and HLS advice provision within Natural England to avoid the dangers of fragmented advice delivery and encourage a common vision for the delivery of support to the rural landscape. On a broader level, a review of Natural England's remit may be required to ensure natural resource protection is fully incorporated within its statutory responsibilities alongside habitat and species (biodiversity) protection.

### **Financial Support To Deliver Water Resource Protection Needs Reform**

The evidence from this project suggests the current Environmental Stewardship package of Entry Level and Higher Level schemes is unlikely to deliver WFD objectives unless fundamental reforms are made. Neither scheme is resulting in the sufficient take up of selective buffering, arable reversion and capital investment measures needed to adequately protect watercourses from soil and nutrient run off problems and prevent underlying ecosystem functions from continued degradation.

As pointed out in section 8.0, it is possible that targeted Ecological Focus Areas (EFAs) under the proposed greening of the Common Agricultural Policy could deliver the desired outcomes from Pillar I (Single Farm Payment) without the provision of Pillar II agri-environment payments. However, should targeted EFAs not be possible, or where these would not be sufficient within a given catchment, additional payments to farmers will be needed. In this case, it is recommended that the current ELS scheme is fundamentally reshaped to focus payments on targeted resource protection measures. The analysis derived from the case studies for this project suggest an ELS scheme focussed purely on targeted resource protection measures (land use change measures) could deliver required resource protection goals using a proportion of the current ELS budget, releasing the remaining ELS budget to enhance current HLS funds available for focussed delivery of biodiversity, heritage and broader landscape objectives. Where income forgone rules limit the payment levels that can be offered to farmers to adopt bespoke land use change options, additional financial resources should be sought from the private sector through the development of PES markets.

As pointed out in Section 7.4, capital investment will be required to solve many of the problems associated with phosphorus and soil run off stemming from compaction of soils, poaching by livestock, river bank degradation etc. Based on an analysis within the three case study catchments for this project, the capital works budget under the CSF programme, if targeted and if continued at current levels, appears to have the potential to deliver many of the needed changes by the end of the second WFD cycle. However, it is very unlikely significant infrastructure improvements such as new slurry stores of cattle housing either can be, or will be, funded under RDP funding streams. As with selective land use change above, it appears, therefore, that private sector money – either as lump sum grants or in the form of low/no interest loans – will be needed to deliver the necessary scale of change required.

It is recommended that very careful consideration is given to planning how multiple sources of finance, both public and private, might best be managed to deliver optimal land use change and farm capital works investment at the catchment scale. Without effective co-

ordination between funding streams, there is a very real danger that resources will not be targeted effectively to deliver optimal outcomes. Worse still, fragmented funding streams might deliver counter productive results. Within the Catchment Approach framework currently being piloted by Defra, it is recommended there is a need to explore the development of a 'catchment delivery funding mechanism' capable of pooling multiple funding sources within the context of delivering a single integrated catchment plan. It is understood that the current Catchment Restoration Fund recently established by Defra exists in parallel to the CSF grant pool, the Environmental Stewardship pool, The Nature Improvement Area pool and emerging private sector funding streams developing via the water companies. It is also worth noting that the phasing of the Common Agricultural Policy budget, the Water Framework Directive delivery cycle and the Water Industry Periodic Review process is not synchronised which makes co-ordinated budgeting of catchment planning particularly difficult. All of this points towards a need for the co-ordination of different funding streams to deliver one set of targeted objectives at a catchment scale, set out in a single integrated management plan agreed by all parties.

### **Need For A Participatory Phosphorus Management Strategy**

As highlighted in Section 3.0, excessive phosphorus loads were regarded as a problem in all three study areas selected for this project and are considered a problem in nearly 50% of all surface waters in England and Wales. Changes with regard to the volume and/or timing of phosphorus applications were considered needed if phosphorus levels in soils are to be reduced to a level that poses low risk to the health of aquatic ecosystems.

Water Protection Zone (WPZ) legislation has been put in place (amended in 2009) which has the power to place mandatory restrictions on the volume and timing of phosphorus applications. Findings from the fieldwork for this project suggest, not unsurprisingly, that farmers are hostile to the idea of WPZs, questioning whether they are necessary and whether mandatory measures will work. These are fair enough questions. It is understood that Defra has agreed not to propose the implementation of new measures within WPZs before first a) developing a catchment approach that targets the use of existing regulatory, advice and incentive mechanisms b) determining the efficacy of this approach; and c) assessing whether additional measures are required. This would appear to be a balanced approach in line with the government's better regulation agenda. However, there has been no clear roadmap and timetable presented to farmers setting out an overarching process for addressing agricultural impact on the water environment; a much needed set of milestones which should be communicated to all stakeholders. A clear plan is required setting out basic compliance measures together with additional incentivised measures that will be available in certain areas – while making it clear that if farmers do not engage with the process, additional regulation will become a necessity. This certainty is needed for farmers to understand what is required of them and to plan effectively for the future.

For a process leading up to WPZ designation to have legitimacy, it would need to be underpinned by sound transparent science. Care must be taken to ensure phosphorus monitoring is sufficiently robust to detect changes in phosphorus levels in both soils and watercourses in response to farm management and land use changes. It will also be vital to make sure source apportionment analysis (proportion of P coming from agriculture, septic tanks, sewage treatment works etc) is sufficiently accurate to determine how much agriculture in a given catchment is contributing to total phosphorus loads.

It is understood that various monitoring and modelling methods (e.g ADAS) are currently being constructed to provide sufficient data to answer these important questions. It is

recommended that the final development and use of these tools is undertaken with full involvement and scrutiny from the agricultural community at a national, regional and local scale to facilitate trust in the methods used. Engagement with farmers at a catchment scale must be undertaken on an on-going-basis to design monitoring approaches, analyse data results, assess potential mitigation solutions and evaluate results. This process should be fully embedded within the Catchment Approach envisaged by Defra.

There remains the outstanding question of how farmers needing to invest in farm infrastructure to improve phosphorus management should fund this investment when they may not have adequate financial resources available. As pointed out in Section 7.4, in the absence of sufficient RDP funding, this is a need which could be met from private sector contributions. Failing this, it is likely that farm businesses without sufficient access to investment funds would be forced to leave the industry should mandatory phosphorus limits be applied, a situation which has social and indeed economic consequences for both the farming families themselves and also the rural communities in which they reside.

## Annex A Enforcement Cost Estimates And Assumptions (5 Year Period)

Note: Cost estimates designed to provide indicative guidance only. They do not take into account wage inflation and have not been verified by EA Financial Managers

### Caudworthy Catchment

EA Enforcement (£)	Year 1	Year 2	Year 3	Year 4	Year 5
Walkovers	480	480	480		
Initial visit (third of farms)	240	240	240		
1st Repeat Visit		240	240	240	
2nd Repeat Visit			120	120	120
Warning letter (Issue Code B, Evidence Gather)			1,460	1,460	1,460
Issue APWN			5,160	5,160	5,160
<b>Total</b>	<b>720</b>	<b>960</b>	<b>7700</b>	<b>6980</b>	<b>6740</b>

### Enforcement Officer Time (days)

Walkovers	2	2	2		
Initial Visit	1	1	1		
1st Repeat Visit		1	1	1	
2nd Repeat Visit			0.5	0.5	0.5
Warning Letter			2	2	2
Issue APWN			7	7	7
<b>Total</b>	<b>3</b>	<b>4</b>	<b>13.5</b>	<b>10.5</b>	<b>9.5</b>

### Rea Catchment

EA Enforcement (£)	Year 1	Year 2	Year 3	Year 4	Year 5
Walkovers	2,160	2,160	2,160		
Initial visit (third of farms)	3,120	3,120	3,120		
1st Repeat Visit		3,120	3,120	3,120	
2nd Repeat Visit			720	720	720
Warning letter (Issue Code B, Evidence Gather)			1,460	1,460	1,460
Issue APWN			5,160	5,160	5,160
<b>Total</b>	<b>5280</b>	<b>8400</b>	<b>15740</b>	<b>10460</b>	<b>7340</b>

### Enforcement Officer Time (days)

Walkovers	9	9	9		
Initial Visit	13	13	13		
1st Repeat Visit		13	13	13	
2nd Repeat Visit			3	3	3
Warning Letter			2	2	2
Issue APWN			7	7	7
<b>Total</b>	<b>22</b>	<b>35</b>	<b>47</b>	<b>25</b>	<b>12</b>

## Lugg Catchment

### EA Enforcement (£)

	Year 1	Year 2	Year 3	Year 4	Year 5
Walkovers	14,400	14,400	14,400		
Initial visit (third of farms)	11,760	11,760	11,760		
1st Repeat Visit		11,760	11,760	11,760	
2nd Repeat Visit			2,400	2,400	2,400
Warning letter (Issue Code B, Evidence Gather)			2,920	2,920	2,920
Issue APWN			10,320	10,320	10,320
<b>Total</b>	<b>26160</b>	<b>37920</b>	<b>53560</b>	<b>27400</b>	<b>15640</b>

### Enforcement Officer Time (days)

Walkovers	60	60	60		
Initial Visit	49	49	49		
1st Repeat Visit		49	49	49	
2nd Repeat Visit			10	10	10
Warning Letter			4	4	4
Issue APWN			14	14	14
<b>Total</b>	<b>109</b>	<b>158</b>	<b>186</b>	<b>77</b>	<b>28</b>

### Notes On Assumptions:

Number of farms in catchment: Caudworthy = 22, Rea = 235, Lugg = 879

Length of WFD waterbodies: Caudworthy = 14km, Rea = 67km, Lugg = 452 km

Costs (inc 50% overhead) of employing EO = £52,000 (£240/day) Costs of employing support staff (inc 50% overhead) = £31,104 (£140/day)

Walkovers wet weather and dry weather (assume 5km/day and 33% of waterbodies covered p.a): Caudworthy = 6 (2) days, Rea = 27 (9) days Lugg = 180 (60) days

Initial visit (1st Repeat Visit): assume 33% of farms require visit: Caudworthy = 2 farms/year, Rea = 26 farms/year, Lugg = 97 farms/year

Initial visit (1st Repeat Visit): assume each initial visit takes 0.5 days/farm

2nd visit: assume 20% of farms initially visited require revisit: Caudworthy = 1 farm/year, Rea = 5 farms/year, Lugg = 19 farms/year

2nd visit: assume each visit takes 0.5 days/farm

Warning letter (Issue Code B. Evidence Gather): assume 10% of farms receiving second visit: Caudworthy = 1 farm/year, Rea = 1 farm/year, Lugg = 2 farms/year

Warning letter (Issue Code B. Evidence Gather): assume 2 days for EO and 7 days for support staff per farm

Issue APWN: assume 7 days for EO, 7 days for support staff and 5 days Legal Support per farm

## Annex B Advice Provision Cost Estimates And Assumptions (5 Year Period)

**Note: Cost estimates designed to provide indicative guidance only. They do not take into account wage inflation and have not been verified by NE Financial Managers**

### Caudworthy Catchment

CSF Farmer Support (£)	Year 1	Year 2	Year 3	Year 4	Year 5
Advice to EA referred farms	1,900	1,900	1,900	1,900	1,900
Advice to Other farms	570	570	570	570	570
<b>Total</b>	<b>2,470</b>	<b>2,470</b>	<b>2,470</b>	<b>2,470</b>	<b>2,470</b>
<b>Advisor Time (days)</b>					
Advice to EA referred farms	10	10	10	10	10
Advice to Other farms	3	3	3	3	3
Total	13	13	13	13	13
FTE (needed)	0.06	0.06	0.06	0.06	0.06
FTE (existing)	0.1	0.1	0.1	0.1	0.1

### Rea Catchment

CSF Farmer Support (£)	Year 1	Year 2	Year 3	Year 4	Year 5
Advice to EA referred farms	20,700	20,700	20,700	20,700	20,700
Advice to Other farms	5,900	5,900	5,900	5,900	5,900
<b>Total</b>	<b>26,600</b>	<b>26,600</b>	<b>26,600</b>	<b>26,600</b>	<b>26,600</b>
<b>Advisor Time (days)</b>					
Advice to EA referred farms	109	109	109	109	109
Advice to Other farms	31	31	31	31	31
Total	140	140	140	140	140
FTE (needed)	0.64	0.64	0.64	0.64	0.64
FTE (existing)	0.33	0.33	0.33	0.33	0.33

### Lugg Catchment

CSF Farmer Support (£)	Year 1	Year 2	Year 3	Year 4	Year 5
Advice to EA referred farms	77,100	77,100	77,100	77,100	77,100
Advice to Other farms	22,420	22,420	22,420	22,420	22,420
<b>Total</b>	<b>99,520</b>	<b>99,520</b>	<b>99,520</b>	<b>99,520</b>	<b>99,520</b>
<b>Advisor Time (days)</b>					
Advice to EA referred farms	406	406	406	406	406
Advice to Other farms	118	118	118	118	118
Total	524	524	524	524	524
FTE (needed)	2.38	2.38	2.38	2.38	2.38
FTE (existing)	0.5	0.5	0.5	0.5	0.5

### Notes On Assumptions:

Costs (inc overhead) of employing a CSFO = £42,000 (£190/day)

Farms to be engaged from EA walkovers across 5 years (Caudworthy = 7 farms, Rea = 78 farms, Lugg = 290)

Assume 7 days needed with each EA referred farm engaged (inc developing a whole farm plan)

Engagement with other farms (non-EA referred) in catchment across 5 years e.g telephone advice

(Caudworthy = 15 farms, Rea = 157, Lugg = 589)

Assume 1 day needed with each non-EA referred farm

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