Fine Sediment Pressure Narrative

Published October 2019

Contents

1. Background

This summary document is one of a series of pressure focused evidence narratives. A pressure is defined as a factor affecting the water environment. These narratives, or stories, have been produced to support the 2019 challenges and choices consultation as these pressures affect, or are affected by, the challenges described in the consultation. These pressure narratives cover chemicals, phosphorus, nitrates, fine sediment, physical modification, abstraction and flow, faecal contamination, invasive non-native species and drinking water protected areas.

The pressure narratives support engagement at national level and help build a common understanding of the issues. They also provide the national context for discussions at the local level during the consultation period from October 2019 for six months.

1.1 Relevance and accuracy of data

This document has been produced by bringing together the readily available information on the topic. Quality assurance of the information included so far is not complete. As a result the document may contain some errors or inaccuracies. Please let us know of any other relevant evidence or if you are aware of any issues with the information. This will help us to build a comprehensive and robust evidence base to underpin decision-making in river basin management planning. Contact details are given in Section 4 of the document.

2. The problem

2.1 Evidence for the problem

Sediment is an important part of a healthy functioning aquatic environment. However, excess sediment generated by human pressures can cause problems, ranging from damage to the health of aquatic ecosystems, to poor quality water for abstraction in drinking water protected areas.

Sediment can also act as a source and ‘transport’ contaminants via fine grained particles such as chemicals, nutrients and faecal indicator organisms. The amount of sediment delivered from the catchment to the water body, and the ability of the water body to move sediment along are crucial factors in determining how sediment is retained (bed siltation), and how much is carried in suspension and for how long. The sensitivity of the receiving water to excessively high sediment delivery, impacts is also important for biological or ecological effects. The effects of siltation can impact rivers by clogging up the spaces between gravels in river beds. This prevents or reduces fish spawning and egg survival especially for sensitive species such as salmon, trout and shad. There are also critical impacts on freshwater pearl mussels where the juvenile stage of the lifecycle is smothered and white clawed crayfish where their habitat becomes unviable. Fine sediment that is not transported during high flows may also have a significant effect on room for water in the channel and consequently flood risk.

Case study: Sediment source tracing in the River Win, Dorset Frome CSF catchment

Sediment source tracing uses the link between the properties of sediment and those of its sources. Assuming different sources can be distinguished on the basis of their individual properties or “fingerprints”, the source of sediment can be established using a comparison of its properties with those of the individual potential sources. By comparing sources before and after mitigation, it is possible to identify changes in the importance of different sediment sources resulting from DWPA control measures.

Repeat sediment fingerprinting within the River Win Target Area detected a statistically significant shift in the source of in-river sediments resulting from control measures targeting agricultural top-soils at two large farm holdings. These changes in the relative importance of different sediment sources were associated with a 60 per cent reduction in the typical magnitude of sediment pressure, as represented by channel bed storage. In combination, the results indicate a significant response from the uptake of DWPA control measures in the River Win Target Area.

About 80 drinking water protected areas are at risk from colour problems, mainly caused by loss of dissolved organic carbon from peat uplands, which may be exacerbated by erosion[i]. It is not clear how sediment may be impacting Natura 2000 (N2k) sites, because sediment-related problems cannot be readily drawn out of the data collected[ii]. The Environment Agency and Natural England are currently developing diffuse water pollution plans for those water dependent N2k sites not achieving favourable condition due to diffuse water pollution[iii]. Evidence in Environment Agency salmon action plans show that N2k sites designated because they contain atlantic salmon (e.g. Test, Itchen, Hants Avon and Wye) are failing to meet favourable condition due, in part, to impacts of fine sediment on spawning success[iv],[v].

Sediment is one of the less well defined pressures. There is no in-river sediment standard; sediment pressures are assessed by a link to biological element failures, and we do not routinely monitor sediment run-off or in-river siltation, so there is limited collation of regional-to-national data available. Sediment is also primarily a diffuse pressure, and both reasons for failure investigations and catchment walkover evidence have highlighted that this can make sources more difficult to identify[vi]. But we also know from geomorphological assessments, local investigations, sediment audit tools like Sediment Matters[vii], and sediment fingerprinting studies[viii],[ix], the typical sources and activities that give rise to excess sediment in rivers. We also have information at local levels on soil compaction which influences runoff and erosion and is one of the key drivers of sedimentation[x].

Fine sediment pressure in England is responsible for around 5 per cent of the counts of reasons for not achieving good status (RNAG)[xi]. Agriculture and rural land management was the most common responsible sector, followed by the urban and transport sector (see Figure 1). In England the most commonly cited reasons for sediment from agricultural and rural land management sources were: Poor soil management (323 of 810 counts, 40%); riparian/in-river activities, includes bankside erosion (116 of 810 counts, 14%) and livestock (106 of 810 counts,13%). The way the data is categorised means that bankside erosion is grouped under Agriculture and rural land management, however a large proportion of bankside erosion will be due to natural fluvial erosion rather than impact from bank erosion through, for example, livestock poaching. Grassland compaction is endemic in the UK in association with intense livestock rearing, whilst this is more subtle it is a significant source as shown by local sediment fingerprinting studies[xii]. Connectivity between the field and the river such as via roads and tracks is an important pathway for fine sediment delivery.

The land management practices leading to soil erosion and sedimentation are many, and the risks increase with some soil types, degree of slope and pathways to surface waters. All result in damage to soil structure. For example:

- compacted seedbeds
- excessive travelling of headlands and between rows and beds that causes compaction
- allowing livestock to have unrestricted access to watercourses
- overstocking of fields, especially in periods of rainfall
- cultivating up and down slopes
- late harvesting operations that cause soil compaction

Soil compaction (urban and rural) is a frequent cause of many erosion-related sediment problems including siltation impacts and colour problems. This can be addressed by adoption of specific land management practices which can make a big difference to the overall sediment impact[xiii]. Other common causes are over-grazing in upland areas, livestock movement between fields, abrasion of roadside verges by traffic on highways and through groundwork as part of construction.

The range and uptake of appropriate land management practices to address this will vary across the country to reflect the regional variation in agriculture, from predominantly arable in the east to more livestock based systems in the west.

Other industries may cause associated problems such as contamination of sediment (and transport of such contaminants) or colour problems, through mining activities, industrial discharges (e.g. suspended solids from sewage treatment works), or atmospheric deposition of industrial pollution.

Figure 1: Counts of numbers of reasons for not achieving good status (RNAG), due to fine sediment in England, by sector responsible (Environment Agency Catchment Planning System 21st March 2019)[xiv]

2.2 Risk of deterioration

The September 2014 national risk assessment showed that the numbers of water bodies at risk of failing to reach good status by 2015 due to sediment pressure has in increased from 13 per cent to 23 per cent. The risk assessment results for England can be found at. https://s3-eu-west-1.amazonaws.com/data.defra.gov.uk/WaterQuality/wfd/Risk_Assessment_Results.zip

The WFD Cycle 1 river basin characterisation risk assessment[xv] and sediment relative risk model work[xvi] looked at risk factors such as the vulnerability of the land to erosion, land use and management and the sensitivity of the receiving water bodies.

For the Cycle 2 risk assessment review, the use of modelled sediment loads and expansion of the updated risk assessment to include non-agricultural sources, such as sewage works and sewerage systems, highways, road verges and construction sites, resulted in the increased number of catchments considered ‘at risk’.

The difference between sediment-related failures identified by reasons for not achieving good (RNAG), compared to the number of water bodies identified as ‘at risk’ indicates that these water bodies are not showing an impact through the WFD classification results and that some of the biological element failures currently assigned as ‘unknown’ reasons for failure could turn out to be due, in part to sediment. This highlights the potential for deterioration from current status in the future.

Future risks to predicted outcomes and ‘no deterioration’ objectives include population change, drive for greater energy and food security, and climate change. The supply and demand link to agricultural intensification through demand for greater food and energy security could lead to potentially detrimental changes in farming practice, including more risky land uses that could exacerbate erosion and sediment problems. For example the land area for maize has increased to feed livestock and anaerobic digesters. Maize harvesting is often the cause of soil compaction and increases sediment run-off since it coincides with autumnal rainfall. Household and industry choices such as more impermeable paving and increased construction (which increases run-off) could increase the amount of sediment in our rivers. Population growth will also increase the density of road and drainage networks leading to more pathways for sediment to reach the water environment. Climate change is already affecting sediment pressures through increased rainfall intensity. Intense localised storms frequently cause the greatest impacts in headwater streams at the end of a dry period when low flows give rise to increased in-stream siltation. After prolonged rainfall the streams have enough power to transport sediment further downstream and to flush the stream bed so siltation occurs closer to the sea. Droughts and periods of dry weather will affect the dynamics of how sediment travels through the system, possibly causing flushing and deposition, this has the potential to affect our water natural capital such as navigation, biodiversity and angling.

2.3 Evidence gaps

Our main evidence gaps regarding the problem are:

Sediment pressures are assessed by a link to biological element failures, we do not routinely monitor sediment run-off or in-river siltation, so there is limited collation of regional-to-national data available.

As we don't have a standard for sediment we don't have quantifiable evidence into the scale of the issue.

There is a lack of knowledge about the interaction of fine sediment with other pressures on the water environment. There are a significant number of case studies and extensive data but these have not been collated into a useable format.[xvii]

3. Current control measures

3.1 Evidence for control measures

There are a number of appropriate measures available for tackling the problem at source such as changing land management, interrupting run-off/drainage pathways, and reducing/mitigating impacts at the receptor[xviii]. A summary of measures and options for agricultural and non-agricultural sediment impacts can be found in sections 3.2 and 3.3.

The case study shows results from evaluating sediment sources contributing to freshwater pearl mussel bed siltation in the River Clun in Shropshire[xix].

Case Study: An evaluation of sediment sources contributing to freshwater pearl mussel bed siltation in the River Clun

In April 2015 a study was carried out to evaluate the sediment sources contributing to freshwater pearl mussel (FWPM) bed siltation in the River Clun. The River Clun is a tributary of the River Teme in Shropshire. The principal land use within the catchment is sheep and cattle grazing although there are notable areas of cultivated land. In the lower reaches, the river is protected as a Special Area of Conservation (SAC) and Site of Special Scientific Interest (SSSI) due to the presence of one of the few lowland populations of Margaritifera margaritifera, the freshwater pearl mussel.

Freshwater pearl mussels are one of the most critically threatened freshwater bivalves in the world, siltation is a major contributory factor to their decline. The evaluation included sediment fingerprinting, monitoring and walkovers to determine the main sources of fine sediment impacting their habitats.

Sediment fingerprinting was carried out at two levels:

1. to find the sources of fine sediment present in the FWPM's beds in the main channel
2. to look at sediment collected from tributary outlets and tracing them to sources within the catchment including cultivated soil, uncultivated soil, channel bank erosion, farm tracks, road verges and road transported materials

Results showed that key sediment sources included channel banks and agricultural land; and that sediment supply varied between sub catchments and seasons. In the main channel of the Clun, channel bank erosion makes an important sediment contribution to the freshwater pearl mussel beds. This contribution was particularly high in autumn and winter. Localised bank slumping was a likely source of sediment to mussel beds in addition to sediment supplied from runoff and bank erosion upstream. In the tributaries, agricultural land was an important sediment source, with supply from a range of land uses. For example, in the upper Clun, cultivated land was key whilst in the Redlake sub catchment, pasture-dominated sources were higher. Roads provided connectivity between sites and appeared to be an important conveyance route for eroded topsoil, especially in autumn and winter.

This approach now allows targeted measures to be taken forward on a tributary scale, tackling the issues most relevant to each tributary.

Measures also exist for tackling the potential impact of sediment problems once the sediment has been delivered to the watercourse. Measures such as river restoration that restore geomorphological process and form in river channels can reduce additional pressures and increase resilience and can therefore help to mitigate the sediment-associated impacts.

Increased uptake by 95% of all appropriate on-farm source control mitigation measures has been forecast by modelling work in conjunction with the Defra funded Demonstration Test Catchment (DTC) programme to have the potential to rapidly reduce current sediment delivery from agricultural land to rivers and streams by between 12-21%[xx]. By comparison, increased uptake of farmer-preferred mitigation measures for diffuse pollution control, was forecast by modelling work in the same project to have the potential to reduce current sediment delivery by a national median of 20%, showing the benefits of building mitigation strategies bottom-upwards with stakeholders.[xxi]

In 2015, Defra introduced the new Soil Standards (GAECs 4, 5 & 6) as part of Cross Compliance. Land managers must meet these standards to receive Common Agricultural Policy Basic Payment Scheme (BPS). GAEC 5 ‘Minimising soil erosion’ will form the baseline of practice by farmers to protect soil from soil erosion over 1 hectare and continuous bankside erosion over 20m in length and 2 metres in depth. Where these cross compliance parameters are breached, the BPS claimant runs the risk of receiving a financial penalty as a reduction of their BPS funding.

The Reduction and Prevention of Agricultural Diffuse Pollution (England) Regulations were launched in 2018. Commonly known as the Farming Rules for Water, and embedded in law, the regulations cover nutrient planning, manure management, soil protection from arable and livestock, the positioning of livestock feeders and the prevention of bankside erosion caused by agricultural activity.

These rules will help to safeguard water quality by requiring farmers to judge when it is best to apply fertilisers, to take more awareness to avoid soil compaction and soil erosion over 1 hectare and to prevent bankside erosion within 5 metres of a watercourses that exceeds 20 metres x 2 metres wide. These rules are inspected and enforced by the Environment Agency and will hopefully create a clear baseline for preventing agricultural diffuse pollution. Whilst some of these rules are similar to that of Cross Compliance (as above), the clear difference is that these rules are inspected by the Environment Agency and can be enforced through Civil Sanctions if advice is not followed.

The PSI tool[xxii] has shown siltation trends over time are variable, site specific and can be difficult to link to causal factors or the success of interventions. This is due to changes in factors (such as flow), and time lag between sediment pressure changes and the biological response. Where we have identified contributions from different sources using sediment fingerprinting, this evidence has been successfully used to bring about management changes on farm.

Figure 2 shows results from SEPARATE (SEctor Pollutant AppoRtionment for the AquaTic Environment), a national water pollution screening framework identifying the relative contributions from agriculture and additional sources. The agricultural contribution takes account of the impact of the current uptake of best management practices due to the current policy mix of regulation, incentives and advice. The channel bank contribution does not factor in any impacts of river bank protection works. The urban diffuse losses combine residential and industrial areas. The sewage treatment source contributions combine the losses from large and small consented effluent discharges. All source apportionment estimates are based on the delivery of sediment from the individual sources to river channels and do not take account of any instream processing thereafter[xxiii].

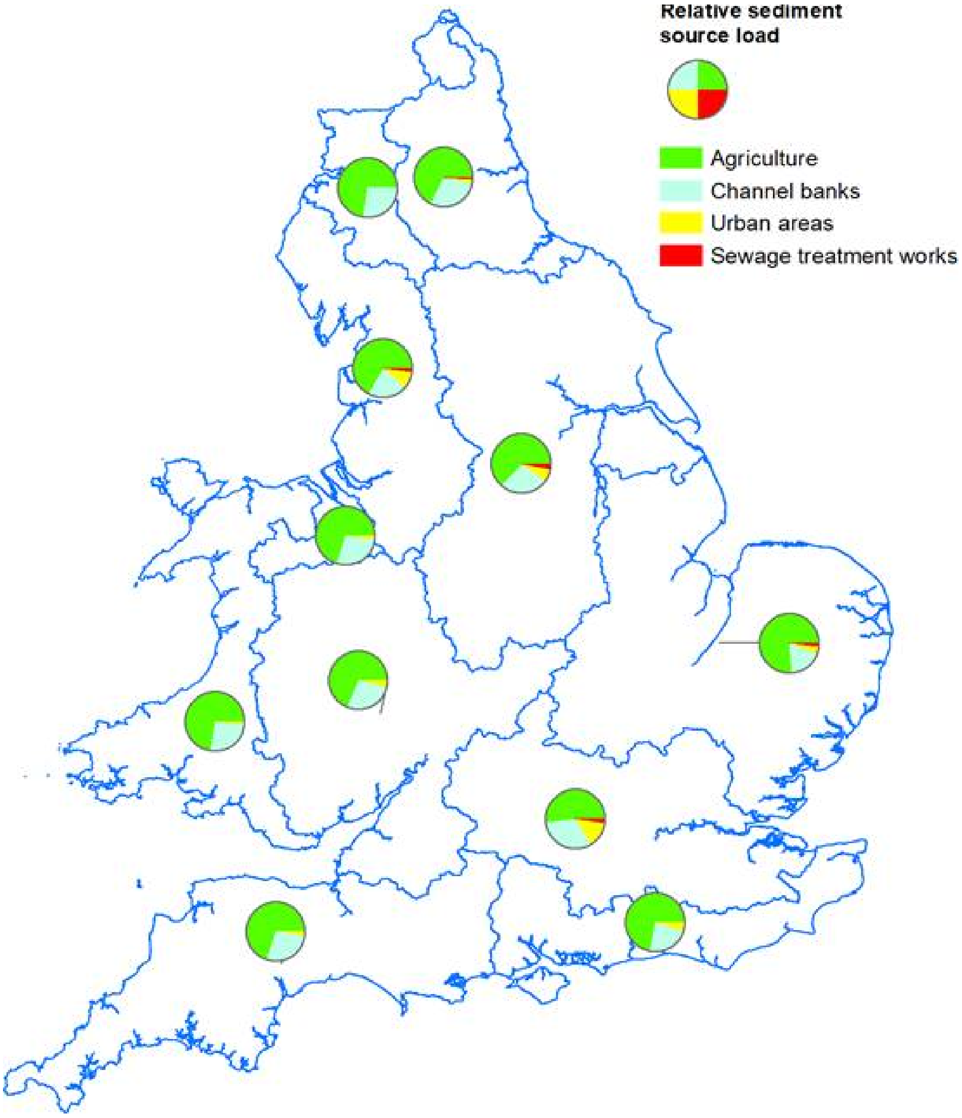

Figure 2: Relative sediment source load by river basin district from SEPARATE (Sector Pollutant AppoRtionment for the AquaTic Environment)[xxiv].

3.2 Mitigating agricultural sediment impacts

3.2.1 Measures

Reducing diffuse sediment pollution at source:

- change land use to less intensives uses (e.g. woodland or unimproved grassland) to manage risk
- restrict certain cultivation operations at high risk times and/or locations (e.g. to avoid compaction and exposure to high rainfall)

- restrict use of feeding stations at high risk times/locations
- improve farm yard drainage infrastructure
- soil management planning
- leaving a rough seedbed post-harvest
- encourage the use of low ground pressure tyres on machinery and trailers
- encourage the use of GPS and controlled trafficking
- restricting livestock access to river banks and channels

Reducing diffuse pollution pathways for sediment:

- restore the riparian zone, for example establish/improve riparian woodland and buffer strips
- fit/improve existing urban/rural SuDS
- create/improve wetlands
- new or improved farm infrastructure (e.g. tracks, gateways, drainage)
- improve field drain management
- break compaction on tram lines and in grass fields
- fit interceptor traps/gully pots to capture sediments (and contaminants) in drainage water; improve maintenance of interceptor traps/gully pots
- reduce slope length, consider planting hedges and woodland buffer cross slope strips and beetle banks

Mitigating sediment diffuse pollution impacts on receptor:

- work with natural processes to undertake sediment management appropriate to location, for example use of large woody material, to increase flow and transport sediment
- fit/improve in-stream sediment traps
- seal/cap contaminated sediments
- consider using rural SUDS and wetlands

3.2.2 Options for mechanisms for delivery

Non-government led advice/incentive:

- make funding mechanisms for water industry price review process more flexible so water industry can support catchment schemes
- seek funding from retail, food and drink sector as well as insurance sectors and/or link to assurance schemes
- utilise to greater effect, industry led initiatives such as the Championing the Farmed Environment and the Voluntary Initiative to spread advice

Government led Advice/Incentive:

- Farm Advisory Service

- wider use of government sponsored advice within catchments that are at risk of failing supported by capital grants and measures from the Countryside Stewardship Scheme/ the new ELM scheme when implemented
- Catchment Sensitive Farming (CSF) targeted free advice within catchments that are at risk of failing objectives, helps ensure effective deployment of capital grants and measures from the Countryside Stewardship Scheme and catalysis adoption of best practice
- provide government grant (or cheap loan) systems to help farming community improve critical infrastructure

Regulation

- embed Farming Rules for Water through an educational and advisory approach, applying enforcement when necessary
- enhance the regulatory baseline through cross compliance and other regulatory frameworks
- the burden of proof required to use legislation is often very resource intensive for diffuse sources of sediment, and usually retrospective (after damage has occurred)

3.3 Mitigating non-agricultural sediment impacts

3.3.1 Measures

- reducing sediment pollution at source
- improve management of small package treatment plants (including septic tanks)
- more effective controls for emergency sewer overflows (including CSO); 195 storm overflows have been identified for improvements between 2020-2025
- reduce accidental releases
- reduce numbers of leaking sewers
- improved management of road verges
- construction site pollution management plans
- reducing diffuse sediment pathways
- improve use of SuDs (including constructed wetlands)
- improve trunk roads, minor roads and track drainage management
- mitigate sediment diffuse pollution impacts on receptor
- dredge sediment (including gravel cleaning) or modify/cease dredging regime
- improve in-stream sediment traps

3.3.2 Options for mechanisms for delivery

Non Government led advice/incentive:

- develop an urban ‘Catchment Officer’ scheme in high risk areas similar to CSF to give advice to LAs, Developers, Housing Associations, retail park managers as well as the public and SMEs
- influence urban maintenance schemes, for example regeneration and road to maximise the use of SuDS

Government led advice/incentive:

- implement SuDS policy

Regulation

- increase enforcement activity (e.g. EPR)
- target misconnection through Water Company asset maintenance with assistance from the environment agency where necessary
- consider GBRs for high risk activities e.g. construction
- use civil sanctions to deal with abuse of surface water drainage network
- point source discharge regulation

Implementation issues may include:

- uptake, funding, political will

3.4 Control measures acting in combination with other pressures

Tackling sediment as a primary objective could lead to reductions in pressures for pollutants carried by fine sediment (e.g. nutrients, faecal organisms, metals, chemicals or pesticides). Physical modification pressures, additionally involving sediments in rivers and reservoirs (e.g. damage to bed habitat), will also be improved. Other pressures will need to be tackled before sediment. For example when flow is a recognised pressure and reduced flows are contributing to siltation impacts, or where physical modifications of rivers (such as channel restriction or over-widening) are contributing to siltation through changed flow regimes.

Chemicals can become attached to sediments over many years and re-released when overlying conditions change. There will be a direct impact of contamination but even by shutting-off the source (e.g. mine-waters and erosion of metal rich mining wastes) might still face a chronic problem caused by ongoing release of such chemicals (e.g. metals) that have built up in the sediment over time.

Targeting certain activities could offer multiple benefits across a range of pressures, for example where livestock poaching of river banks is contributing to siltation over-widening of the river bed and organic pollutants to the water course.(linking sediment, flow and physical modification pressures).

3.5 Evidence gaps

We have little field data to verify the effectiveness of measures across wide scales such as catchments, and the contributions of different pathways can make a significant difference to load reductions[xxv].

We do not know how to assess the effectiveness of measures that will act in combination for sediment and other pressures such as physical modification, chemicals and nutrients.

We need to understand how much general action/intervention on diffuse pollution reduces sediment pressures, and anecdotal evidence on delivery mechanisms (incentive and regulation) suggests issues with getting appropriate sediment-specific measures in places could compromise desired outcomes within required timescales.

4. Other considerations – opportunities and risks

4.1 Actions to close the evidence gaps

Annex 1 shows a table of Environment Agency completed or ongoing projects addressing the evidence gaps in the management of sediment. A second table shows ongoing Environment Agency and Joint Water Evidence Programme (JWEP) projects that address the evidence gaps across a broad range of, or all, pressures.

4.2 Actions for updated river basin management plans and expected outcomes

Measures to control point source discharges of sediment including e.g. grit removal as well as primary and secondary settlement at sewage treatment works are regulated through discharge consenting regime with established funding mechanisms.

Most other sediment measures (particularly for diffuse pollution and small point sources) are currently part of voluntary initiatives, often in relation to wider diffuse pollution pressures. This can make it difficult to identify specific sediment pressure benefits from diffuse pollution interventions.

The measures and mechanisms for second cycle planning are part of the updates to the river basin management plan consultation.

Lessons learned and experience from the following mechanisms, are helping to inform the debate.

Case Study: Catchment Sensitive Farming (CSF)

As of January 2018, Catchment Sensitive Farming (CSF) advice had been provided to 19,776 farm holdings covering 3.3 million hectares. This represents 34 per cent of the total farmed area in England. 29 per cent of farm holdings have been engaged once through CSF, 18 per cent twice and 53 per cent on three or more occasions. This illustrates the importance placed on building effective working relationships across the farming community in order to deliver CSF objectives.

As of January 2018, a total of 128,691 individual farm-specific mitigation measures had been advised through CSF, with the main focus being soil management, fertiliser management, manure management and farm infrastructure. Overall, 55 per cent of recommended mitigation measures have been implemented and 59 per cent of farm holdings have implemented at least 50 per cent of recommended measures. The majority of implementation occurs within the first year following a recommendation and 87 per cent of implemented measures were judged to be “mostly effective”.

Mitigation measures advised through one-to-one CSF advice are estimated to have reduced agricultural loadings of nutrients, suspended sediment, pesticides and FIOs by between 4 and 12 per cent, on average, across CSF Phase 1 Target Areas.

CSF requires time in a catchment to achieve widespread farmer engagement; establish effective farmer relationships; and achieve significant uptake of mitigation measures. There is a lag of around three years before we see benefits through surface water quality monitoring programmes. A combination of extended timescales (both to allow for lags in the system and build more comprehensive datasets) and refined evaluation methods will be needed to determine the ecological and groundwater benefits from CSF.

Initiatives such as catchment sensitive farming[xxvi] have helped to improve water and diffuse pollution: a survey found that 80 per cent of farmers receiving advice (2006-2011) said their knowledge of water pollution had increased and 65 per cent receiving specific advice had taken action to reduce diffuse pollution Catchment Sensitive Farming Officers[xxvii] have worked with the industry to deliver practical workshops and generate discussion. The case study captures the results achieved through effective working relationships across the farming community in order to deliver CSF objectives.[xxviii]Initiatives such as the sustainable catchment management programme (SCaMP[xxix]), which is largely water industry funded, has led to some significant improvements. But this is often seen mainly where Water Companies own the land and are able to assist tenant farmers in applying for agri-environment payments.

Lack of uptake of sediment measures on a voluntary basis, and lack of enforcement and/or funding mechanisms to deploy them is a barrier to remediating sediment issues. Anecdotal evidence, supported by evidence coming from catchment walk-overs indicates there is non-compliance with basic good practice and regulation (e.g., unrestricted access of livestock to river banks, or ploughing close to river banks). Issues with getting measures implemented can include land tenure, costs, who pays, limitations on mechanisms, and land use/management conflicts[xxx].

Article 7 of the WFD does not allow installation of new treatments for colour problems so other interventions are needed.

Incentives play a large part in agricultural environmental improvements. They are currently provided by various organisations in many forms such as Catchment Sensitive Farming (Natural England) the Basic Payment Scheme (Rural Payments Agency) and water company grants. However post EU Exit, direct payments to farmers will be phased out over a 7 year period and will be replaced with the proposed Environmental Land Management scheme (ELM). This will bring in a new era for farming based on the ‘public money for public goods’ principle. The government aims to work with farmers and land managers who wish to improve the environment by entering into multi-year contracts in which land managers commit to take certain actions to deliver public goods and services in return for financial rewards. This will contribute to the government’s ambition for a green EU exit and help to deliver some of the commitments in its 25 Year Environment Plan.

These incentives will encourage beneficial practices through voluntary action, such as managing fields in an environmentally sensitive way or targeted land use change. Incentives will be prioritised where the greatest environmental benefits can be achieved. Examples include creating sediment traps and wetlands, and using some land for the many benefits of woodland creation.

These measures will benefit water quality, improve biodiversity and ensure the landscape is more resilient to flooding. In the future, ELM could potentially replace activities currently carried out under the Water and Environment Grant (WEG) and CS both on land and in water.

The ELM scheme is in the early stages of development and definitive details are not yet available.

4.3 The benefits of action on sediment pressure

As well as helping to meet WFD targets for good status, the benefits of action for sediment pressures could include:

- reduced costs of dredging, and its damaging effects on the environment; reduced flood risk from the effects of siltation
- benefits to Natura 2000 protected areas, particularly in relation to fish stocks and the resultant benefits to angling/recreation
- public appreciation of a good quality environment: reducing ‘muddy flooding’ from farms, and turbidity in watercourses
- reduced erosion in peat uplands will improve recreational benefits, benefiting local economies as well as habitats, and will help store carbon
- reduction in water treatment requirements; reduced energy demand and carbon emissions
- maintained ecosystem services: poor quality or eroded soils will have impaired fertility and productivity; they are also not as able to break pollutants down or cycle water effectively
- synergistic benefits of tackling sediment on other pressures, for example for phosphorus, chemicals, faecal indicator organisms, and physical modification
- increased resilience of our catchments to climate change

5. Contacts and supporting information

If you have any feedback or comments on the evidence contained in the summary then please contact:

enquiries@environment-agency.gov.uk

Annex 1 - evidence gap projects

The table below summarises projects that are planned or ongoing in the Environment Agency, in order to address the evidence gaps in relation to pressures from sediment.

Organ-isation	Ref.	Summary
EA/JWEP	SC180002	Impact of sediment disturbance on chemical status. To understand the potential for sediment bound contaminants to be released into the water column when disturbed and how the impact of this can be measured and reported and to provide guidance to staff to enable robust decisions to be made regarding activities that could lead to sediment disturbance.

JWEP – Joint Water Evidence Programme

The table below summarises projects that are planned or ongoing in the Environment Agency or for Defra, in order to address evidence gaps that are relevant across a broad range of, or all, pressures.

Organ-isation	Ref.	Summary
EA	SC160001	UKCP18 Project. To shape the next set of UK Climate Change projections (UKCP18) to ensure they meet user needs.
EA	SC160020	Assessing the Statistical Significance of Changes: OOG Monitoring. The overall aim is that we should have a proportionate approach to environmental monitoring requirements for OOG. The project aims to identify techniques for statistical analysis for the design of monitoring programmes and the assessment of data. It should give early information on changes and their causes, in order to discriminate local environmental or seasonal conditions so that OOG impacts can be addressed.
EA	SC170019	Mapping residence time in English rivers for water quality risk screening. The aim of this project is to produce a map of 'at risk' river locations using a modification of an approach developed and used by CEH in previous investigations of climate change impacts. This will consist of two primary tasks: 1. Adapt, test and automate the existing approach to deriving residence time 2. Apply this to the river network of England to identify areas of potential risk to water quality.

Organ-isation	Ref.	Summary
EA/JWEP	SC180006	Future resilience (SRoC funded) Peer review. To explore how catchment resilience can be measured and managed for the benefit of communities, business and wildlife, given pressures including climate change, population growth and changing landuse. Catchment resilience has many definitions and concepts, including resisting change, recovering after change, and recovering to perform a similar function after change. We will commission approximately 13 small expert reviews on catchment resilience to understand the current state of knowledge and perspectives from different disciplines.

JWEP – Joint Water Evidence Programme

References

[i] Environment Agency, Drinking Water Database (Extract 11 Jan 2019).

ii Steve Peters, pers comm., Environment Agency

iii Diffuse Water Pollution Action Plans – Natural England

iv River Wye Salmon Action Plan, 2003. www.environment-agency.gov.uk/static/documents/Research/wyesap_e_603710.pdf

v Managing river flows for salmonids: Evidence-based practice. Edited by N.J. Milner et al, 2010.

vi England catchment walkovers, National Sediment project 2010.

vii Sediment Matters: A practical guide to sediment and its impacts in UK rivers. Environment Agency 2011. Publication code: SCHO0411BTWE-E-E.

viii Collins, A.L.; Walling, D.E.; Webb, L.; King, P. (2010) Apportioning catchment scale sediment sources using a modified composite fingerprinting technique incorporating property weightings and prior information. Geoderma 155 249-261

ix Provenance of interstitial sediment retrieved from salmonid spawning gravels in England and Wales: A Reconnaissance Survey Based on the Fingerprinting Approach. (2002) Environment Agency R&D Technical Report W2-046/TR3 D.E. Walling, A.L. Collins & G.K. McMellin

x Contact EA Regional agricultural leads for information

xi Environment Agency Catchment Planning System 21st March 2019 Source Data: Analysed Pressure and Business_Probable_Confirmed 21-03-2019 (Selection 1 Base Data)

xii ECSFDI Phase 1 & 2 Evaluation Report. Environment Agency. Contact: enquiries@environment-agency.gov.uk

xiii Sediment Matters: A practical guide to sediment and its impacts in UK rivers. Environment Agency 2011. Publication code: SCHO0411BTWE-E-E.

xiv Environment Agency Catchment Planning System 21st March 2019 (Counts of numbers of Reasons for not achieving good status and not numbers of water bodies in England) Source Data: Analysed Pressure and Business_Probable_Confirmed 21-03-2019 (Selection 1 Base Data)

xv http://www.environment-agency.gov.uk/static/documents/Research/Sediment_Rivers.pdf, 2007

xvi A simple relative assessment of risk to watercourses from sediment for targeting agri-environment measures in England and Wales, Antony Williamson, Risk and Forecasting, Environment Agency.

xvii Sediment issues in aquatic ecosystems. James O'Callaghan EA Intern October 2017.

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