

Activity Evaluation for workshop on 3rd December 2013



BACKGROUND

The forthcoming Broadland Catchment Partnership workshop aims to:

- Share knowledge around current activity and working practices including priorities and target areas.
- Discuss how and where this activity can be improved and integrated at a local level to provide multiple benefits and better value for money.
- Determine priority locations for action and commitment to working together to deliver *or facilitate delivery of* improvements to the water environment.

I have undertaken an evaluation of key current activity areas on behalf of the Steering Group.

Key 'management' activity	Detail
Waste water	Public and private sewage treatment works
Land	Environmental stewardship, woodland creation, farm advice and grants
River and floodplain	River and floodplain habitat improvement and restoration, invasive species
Holistic water	Flood prevention, drainage, highways, water capture/storage, water efficiency
Recreational access and community engagement	Community action, improved and integrated recreational access

This is based on information gathered to date from conversations with stakeholders, literature reviews and personal experience. It is hope that this will encourage discussion at the event. The conclusions and suggested actions are somewhat subjective and I welcome any feedback before, during or after our workshop.

Neil Punchard

Broadland Catchment Partnership Officer

20th November 2013

EVALUATION OF KEY CURRENT ACTIVITY AREAS

1. Waste water management

Public sewage treatment

Background

Anglian Water public sewage treatment works, now known as water recycling centres, treat human and industrial waste. They are regulated by the Environment Agency and have strict consent limits and regular compliance monitoring for a range of substances that could cause pollution.

The water recycling centres are responsible for the input of more phosphorus to watercourses than any other sector within the Broadland catchment. However, the amount has decreased considerably following phosphorus reduction at all large (>10,000 population) sewage treatment works as a mandatory requirement under the Urban Wastewater Treatment Directive with further reductions occurring under the Habitats Directive.

Pros

- Conventional phosphorus reduction treatment ('iron dosing' or 'ferric stripping') is a well understood, effective measure for reducing phosphorus in waste water.

Cons

- Conventional phosphorus reduction ('iron dosing' or 'ferric stripping') is expensive and not particularly sustainable given the mining, transportation and processing of the raw metal and the electricity required to run the plant and consequent carbon dioxide emissions.
- It does not provide any additional wider catchment benefits and does very little to reduce other chemicals and hazardous compounds present in the waste water
- Regular chemical deliveries can have a disturbance and disruption impact on local communities, especially in rural areas with narrow roads

Barriers

- It is not sustainable or cost-effective for conventional phosphorus removal at small water recycling centres

Opportunities

- A national water industry research project is looking at more sustainable means of reducing phosphorus at sewage treatment works.
- More sustainable methods, such as reed-beds have benefits for wildlife and landscape but can require relatively large areas of land. They may be appropriate for small water recycling centres if land is available and this could be explored with local trials if suitable sites can be found.

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Private sewage treatment

Background

Private sewage treatment works and septic tanks, misconnections and discharge from boats have a relatively small impact at a catchment scale but can cause localised water quality problems. The Environment Agency and Broads Authority have had campaigns using local press, parish councils and door knocking to improve awareness, maintenance and discharge of waste and encourage use of environmentally friendly washing products, including on boats.

Advice: <http://www.environment-agency.gov.uk/homeandleisure/118753.aspx>

Information on septic tanks: http://www.broads-authority.gov.uk/broads/live/managing/rivers-and-broads/water-quality/Septic_Tanks_A5_8pp_leaflet.pdf

Phosphate and boating: http://www.broads-authority.gov.uk/broads/live/boating/facilities-and-access/boating-in-sensitive-areas/Phosphate_leaflet.pdf

Information on misconnections: <http://www.connectright.org.uk/>

Pros

- Historic activity has largely been targeted around high risk and priority areas where there a relatively high proportion of properties are on private sewage treatment works.

Cons

- There is currently limited legal requirement to register private sewage treatment works.

Barriers

- It is uncertain and difficult to determine if previous measures have been productive and not certain if this is a cost-effective use of resources given a relatively small potential benefit.

Opportunities

- Further targeted public campaigns to high risk areas, leaflet dropping and/or door knocking could raise awareness further and could potentially lead to a reduction in phosphorus and other chemical pollutants.
- Local action groups and trusts could make use of existing material developed by the Environment Agency and Broads Authority to further raise awareness of misconnections, environmentally friendly products and septic tank maintenance to their membership.
- European legislation from 2015 will phase out or reduce the use of phosphorus in detergents.

2. Land management

The Good Agricultural and Environmental Condition (GAEC) standards are baseline requirements under Cross Compliance for farmers to safeguard soil and water, habitats and wildlife, and landscape features. They apply to anyone who receives payments from the European Union (EU) Common Agricultural Policy (CAP) under the Single Payment Scheme (SPS) and certain Rural Development schemes in addition to obligations under European and UK legislation. They either reinforce existing law, or were already existing good practice:

<https://www.gov.uk/standards-of-good-agricultural-and-environmental-condition>

The majority of the catchment is also a Nitrate Vulnerable Zone (NVZ). This designation applies to all land contributing to nitrate entering 'polluted waters' including ground or surface water containing at least 50mg/l nitrate, or likely to contain this if no action is taken and waters which are eutrophic (i.e. The Broads), or are likely to become eutrophic if no action is taken. The mandatory requirements control the quantity, timing and type of nitrogen products applied to land:

<https://www.gov.uk/nitrate-vulnerable-zones>

Many farmers also voluntarily protect the environment by signing up to environmental stewardship agreements where they receive payments for applying measures that go beyond GAEC to provide further benefits for wildlife, landscape and resource protection:

<https://www.gov.uk/environmental-stewardship>

Catchment Sensitive Farming (CSF) is a partnership initiative between Natural England and the Environment Agency, funded by Defra and the Rural Development Programme for England, working in priority catchments within England. It delivers practical solutions and targeted support to enable farmers and land managers to take voluntary action to reduce diffuse water pollution from agriculture to protect water bodies and the environment.

<https://www.gov.uk/catchment-sensitive-farming>

Essex and Suffolk Water company works in partnership with organisations and land owners to influence land management practices to prevent deterioration and improve the quality of water in the rivers and lakes that they abstract from for drinking water supply.

<http://www.eswater.co.uk/your-home/environment/catchment-management.aspx>

The Campaign for the Farmed Environment (CFE) encourages farmers across England to protect and enhance the environment, through measures that sit alongside productive agriculture. It offers assistance to farmers in choosing, locating and managing suitable measures to protect soil and water, and benefit wildlife. It works in partnership with voluntary industry-led initiatives (Greenhouse Gas Action Plan, Tried & Tested and The Voluntary Initiative):

<http://www.cfeonline.org.uk/home/>

The Voluntary Initiative (VI) is a programme to minimise the environmental impacts from pesticides. It was put forward by the farming and crop protection industry as an alternative to a pesticide tax:

http://www.voluntaryinitiative.org.uk/Attachments/resources/1194_S4.pdf

The Rivers Trust through its national strategic partnership project with CSF (PINPOINT) provides training to farm advisors on working with farmers to reduce Diffuse Water Pollution from Agriculture. They also provide direct farm advice and plans, on-line best practice information sheets for different farming practices and a template for jointly developing whole farm plans.

<http://www.theriverstrust.org/pinpoint/index.html>

Despite this activity, agriculture still continues to contribute to some issues with the extent varying in different areas of the catchment dependent on land use, slope and soil type and condition. Agriculture is responsible for some phosphorus and sediment and the majority of nitrate and pesticide input to water courses mostly on a sporadic basis linked to rainfall events.

As well as potentially impacting the environment this can also mean a loss of resource and productivity for farmers. Some loss is inevitable, often linked to adverse weather conditions, but in some cases this can be prevented or reduced. Benefiting the environment can be good for business sustainability and Catchment Sensitive Farming and the Campaign for the Farmed Environment focus on this approach.

Permanent land use change

Background

Relatively small areas of arable and grazing pasture, mainly on marginal land, have been subject to permanent land use change including wetland restoration around broads or in the river valleys.

Pros

- This land provides excellent wildlife habitat when well managed and can act as a buffer against pollution
- Acquisition by, or a legacy gift to, a charity such as the county Wildlife Trust, National Trust, or RSPB can occasionally be used to obtain land especially if adjacent to high quality habitat.

Cons

- Permanent land use change can result in less land available for food production (although marginal land is usually the most suitable)
- Some reedbed and fen creation has historically involved removal of wet woodland, such as alder carr, that may have been more appropriate habitat in some locations

Barriers

- Additional land purchase is expensive and unrealistic as the majority of land in the catchment is high grade (1, 2 or 3) and used mostly for arable agriculture.
- The majority of farmers want to grow food and population increases mean there is strong worldwide, national (self-sufficiency) and local demand and a good export market.
- Profit is currently relatively high for arable crops, especially wheat, and there is increasing demand for maize as a result of the development of bio-digesters.
- European and government generic conservation subsidies are reducing but there are signs that funding for worthwhile, targeted payment schemes could increase.

Opportunities

- Currently, the only real opportunities exist for changing the use of relatively small areas of marginal agricultural land. However, it is possible that improved targeting of funds to deliver multiple ecosystem benefits could lead to increased financial incentives for protecting strategically located areas of land. This includes land next to and/or linking areas of high conservation priority and/or along high erosion risk run-off 'pathways'.
- Development of payment schemes such as in the adjacent River Nar Norfolk Rivers Trust/WWF/ Coca Cola project and other national Water Industry programmes can deliver land use change.

Environmental stewardship and woodland creation

Background

Larger areas of arable land or intensive grazing have been temporarily changed to low input pasture or water meadows with the landowner receiving payment from the government through Higher Level Stewardship (HLS) or the expiring Countryside Stewardship (CS) and Environmentally Sensitive Area (ESA) payments, which ran for a 10 year period and will expire in 2014.

Relatively small areas of arable fields (collectively quite large) have been subject to temporary land use change through measure such as the establishment of field corners and margins often acting as buffer strips with payments through the basic Entry Level Stewardship (ELS) scheme.

<http://www.naturalengland.org.uk/ourwork/farming/default.aspx>

Small areas, usually of marginal land, have been established as woodland by landowners, often receiving payments for planting from the government England Woodland Grant Scheme or support from Woodland Trust charity that also promotes hedgerow establishment:

<http://www.forestry.gov.uk/ewgs> and www.woodlandtrust.org.uk/planttrees

As part of the 2010 Government Spending Review and in response to various monitoring reports, Defra Ministers undertook to make Environmental Stewardship (ES) more effective and better targeted. The Making Environmental Stewardship More Effective (MESME) project was established in the autumn of 2010 with a range of stakeholders involved. The project adapted to include trialling and testing a range of improvements to both HLS and ELS, aimed at more effective delivery of options on the ground. It was formally closed at the end of February 2013.

In line with a new Rural Development Programme for 2015-2020 a New Environmental Land Management Scheme (NELMS) is being developed to incorporate the best elements of Environmental Stewardship, Catchment Sensitive Farming and the England Woodland Grants Scheme: <http://www.naturalengland.org.uk/ourwork/farming/funding/developments.aspx>

Pros

- Environmental stewardship schemes have protected the water environment in many cases, provide other benefits and financially reward farmers
- ELS and HLS schemes now have provision for resource protection and climate change resilience including restoration of hedgerows and recent changes have incentivised these measures i.e. points/payments for field margins are greatest if located adjacent to watercourses
- Effective measures for resource protection, such as cover crops, are being promoted and becoming attractive to farmers (although applicability dependent on rotation and farm type).

Cons

- The ELS and HLS schemes and measures are not permanent.
- HLS schemes were historically mainly aimed at wildlife habitat (although they had provision for recreational access) and not necessarily targeted at resource protection or for multiple benefits and thus are not always cost-effective.
- In some cases the easiest to implement ELS measures have been adopted and these have not necessarily been the most appropriate or effective option(s) for resource protection and not always targeted at high risk or priority locations or for delivering multiple benefits.

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- Some of the lower catchment is unsuitable for substantial woodland planting schemes due to the landscape type ('openness') although small scale woodland and hedgerow creation has also not previously been strategic from a resource protection or multiple benefit perspective.
- Land use change such as woodland creation is also not always appropriate given food production, wildlife (e.g. chalk grassland, fen habitat), historic, geologic, and game bird requirements (predator risk).

Barriers

- Funding available for these measures is reducing with no new entrants for ELS until agreements are reached under CAP reform.

Opportunities

- All of the measures could be more appropriately located and better targeted at a landscape scale for multiple benefits at high risk and priority areas.
- Better combinations of measures and schemes could be applied for more effective resource protection (given individual farm circumstances) and funding streams integrated.
- Additional 'Farmer Attitude' surveys on a sub-catchment basis could be used to determine which measures are likely to be adopted, and for measures deemed effective but not favoured, further discussion can be used to explore the barriers and potentially find a resolution.
- The measures employed through environmental stewardship often work best when the advisers have worked closely with Catchment Sensitive Farming officers and/or agronomists together with the farmer - this working practice could become standard
- Whole Farm Plan/Farm Environment Plan with field level maps could be offered not just through HLS agreements but to all holdings in agreed high risk/priority areas.
- Local fuel or building material opportunities from wood or reed and available grants for planting could better publicised with markets further encouraged and supported through 'Wild Anglia'
- Support and free trees available from the Woodland Trust for woodland and hedgerow creation for communities, schools and landowners could be better publicised and planting better located.
- Rural Sustainable Drainage Systems, such as bunds, gravel traps, swales or settlement ponds could be funded through ELS for smaller schemes but larger schemes may require alternative investment with possible collaboration between the County Council Flood Risk and Highways departments, Environment Agency, Drainage Boards and farmers.
- Although there are more limited budgets there is a demand for delivery of better integrated advice for farmers and the New Environmental Land Management Scheme (NELMS) should encourage better targeting for multiple benefits including water resource protection, wildlife, water regulation (reduced downstream flood risk and increased aquifer recharge), recreational access and carbon storage.
- Landscapes East <http://landscape-east.org.uk/map.html> are considering a woodland opportunity mapping exercise for the East of England to be informed by National Character Assessments and Landscape Typology. Any larger scale woodland planting would be best located in 'Wooded plateau Claylands' parts of the Wensum, Yare and Waveney catchment, near existing woodland. A similar mapping exercise could be carried out for renewable energy generation.
- The importance of a good adviser, who is capable of taking a complicated scheme and making it simple for the farmer to deliver, cannot be over-rated, especially at the farm and field scale.

Farming advice and grants

Catchment Sensitive Farming officers act as a local facilitator in each sub-catchment working through farmer led Steering Groups to provide advice within priority areas and administer grants within high risk target areas to help farmers to implement measures appropriate to the farm aimed at reducing the source of pollution, slowing the pathway and/or protecting the receptor. An adviser also works in Essex & Suffolk Water target areas of the Bure and Waveney sub-catchments mainly assisting farmers in reducing pesticide and nutrient losses.

Pros

- Farmers have engaged with the Catchment Sensitive Farming (CSF) initiative to a relatively high degree across the catchment although the level varies between sub-catchments
- CSF has proved effective at reducing pollution and run-off from agriculture based on actual (monitored) and modelled improvements to the water environment
- Farm advice helps target and accelerate changes expected through general trends towards improved farm practice
- Farmers' enthusiasm for the CSF scheme and a willingness to commit their own money have been reflected in the grant schemes being significantly oversubscribed
- The Capital Grant Scheme delivers improvements to farm business and the environment and also acts as an incentive for farmers to initially engage with the initiative
- It is based around 'win-wins' with financial savings (time and money) "securing opportunities to improve business efficiency and to protect the water environment"
- Priority catchments have been determined from a conservation perspective
- Target areas have been determined from a water quality perspective with the assistance of risk based models and maps from national experts (ADAS) that take account of land use, slope and soil type to provide quantitative predictions of sediment and phosphorus losses. Sediment fingerprinting results have also been used to refine target areas.
- Essex and Suffolk Water have used pesticide monitoring and modelling to determine high risk areas and engage with local farmers.

Cons

- Some high risk farms have not engaged at all, others have not engaged in depth or taken up advised measures
- The risk based models and maps used to determine CSF target areas have inevitably been at too large a scale (1km²) using *general historic* (2010) land use data rather than *current actual*.
- The models used so far take no account of *soil condition*, and *soil nutrient levels*, which are also of relevance along with *soil type* in determining erosion and/or leaching risk.
- Within the Yare valley only the lower Yare and some of the Tas are in the CSF target area (much of upper Yare and some of the Tiffey are not in the HLS target area).
- The sediment fingerprinting investigations do not determine actual source location and are very expensive.

Barriers

- Some catchments have had a number of staff changes/advisers which may affect familiarity and the working relationship with farmers and lead to farmer disillusionment with CSF.

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- With a range of organisations offering advice at a local regional and national level, there is a risk of mixed messages and a risk of perception of interference by landowners
- Based on the experiences of The Rivers Trust many farmers fail to access the information and may not have the necessary skills required to respond to the causes and effects of agricultural emissions to water and to develop and implement solutions. However once the guidance, information and skills are delivered on a “face to face” basis farmers respond remarkably well.

Opportunities

- Engaging the farmer is the key, not the amount of information that is freely available nor its quality, which is generally excellent. Farmers greatly value ‘Whole Farm Plans’ and advice which is bespoke and relevant to them with commitment to on-going “aftercare”
- Implementation increases with time and further engagement, which underlines the importance of the farm adviser role and the need to develop a working relationship with farmers through repeat farm visits in order to deliver behavioural change.
- More independent (partnership branded rather than government/industry branded) integrated advice initially from just one representative could result in more uptake with the adviser calling on partnership contacts for specialist agronomic, forestry and river advice where applicable.
- The best outcomes result from well-targeted action. The provision of high quality on-farm advice is essential to achieve this and advisers with excellent interpersonal skills are most effective and are often favoured where they have a specialist background.
- Decision support tools and models can be improved if they incorporate farmer knowledge

A recent survey of farmers in the Wensum catchment revealed that:

- Measures requiring land use change are less likely to be adopted than measures improving farm infrastructure.
- Measures which decrease the use of fertiliser and fuel, therefore reducing costs are most likely to be adopted in the future
- Adoption of soil and fertiliser management measures (related to correct timing and application efficiency, as well as storage covers) were favoured above of livestock and manure management measures
- Nearly two-thirds of the priorities involve changing farm infrastructure, particularly additional concrete areas. A variety of uses were identified, including concrete for manure heaps, diverting dirty water and track repair. Farmers suggested these are inexpensive options if grants are provided to assist with payment.
- Location of priorities had a significant bias towards measures occurring in farmyards, whilst in-field and field boundary measures received less attention
- Several measures with relatively low current uptake but positive attitudes regarding future adoption, such as reduced cultivation systems could merit inclusion in future agri-environment programmes
- Radical changes in activities will not occur without substantial financial incentives or regulatory requirements.

Wensum Demonstration Test Catchment: <http://www.wensumalliance.org.uk/>

3. Holistic Water Management

Flood risk reduction

Background

The catchment has a history of flooding, generally due to high rainfall that can lead to extensive flooding of the river valleys, tidal surges that raise inland water levels and the overtopping of flood defences. Urbanisation, with an increase in impervious surfaces, has occurred in specific locations throughout the catchment and led to increased run-off. Compaction of agricultural land due to heavy machinery; and land management methods e.g. rolling and tramlines, sub-surface drainage, pumps and ditches have increased the speed and quantity of run-off.

Over time engineering schemes have been implemented to reduce flood risk to housing, farmland and sensitive wildlife habitats (saline incursion) in the catchment, including:

- the embanking of rivers and the strengthening, raising and protection of embankments as part of the Broadland Flood Alleviation Project (BFAP) and constructing flood walls
<http://www.bfap.org/index.html> and <http://tinyurl.com/BFAP-biodiversity>

Banks are being strengthened and raised to the standard of protection that existed in 1995, taking into account the effects of climate change. Erosion protection is being installed where necessary.

These measures have all reduced flood risk in the catchment and around 4 % of the total catchment population currently live in areas that benefit from flood risk management schemes. In addition to these engineering schemes, other flood risk management activities are carried out in the catchment with Norfolk County Council now the lead local flood authority. These include activities which help to reduce the probability of flooding and those that address the consequences of flooding.

Activities that reduce the probability of flooding include:

- maintaining and improving existing flood defences and structures;
- maintaining river channels;
- maintenance of drainage networks by Internal Drainage Boards (IDB).

Activities that reduce the consequences of flooding include:

- working with local authorities to influence the location, layout and design of new and redeveloped property and ensuring that only appropriate development is allowed on the floodplain through the application of Planning Policy Statement 25 (PPS25);
 - understanding where flooding is likely by using flood risk mapping;
 - providing flood forecasting and warning services;
 - promoting awareness of flooding so that organisations, communities and individuals are aware of the risk and are prepared in case they need to take action in time of flood;
 - promoting resilience and resistance measures for those properties already in the floodplain.

Pros

- Embanked rivers provide protection between the 20% annual probability and 4% annual probability tidal flood with Breydon Water up to the 5% annual probability tidal flood.
- Flood walls in Norwich provide protection up to the 1% annual probability river flood and are in good condition.
- Flood walls in Great Yarmouth provide protection up to the 0.5% annual probability tidal flood and are being repaired and upgraded.

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- The Broadland Flood Alleviation Project (BFAP) has resulted in some excellent habitat improvement with provision for recreational access where applicable:
 - [Habitat Work: Dunburgh Hill to Boathouse Hill floodbank - Broadland Flood Alleviation Project](#)
 - [Habitat Work: Geldeston Dyke to Dunburgh floodbank - Broadland Flood Alleviation Project](#)
 - [Habitat Work: Horning Hall \(River Bure\) to Browns Hill \(River Ant\) flood defences - Broadland Flood Alleviation Project](#)
 - [Habitat Work: Thurne Dyke to Somerton Dyke floodbank - Broadland Flood Alleviation Project](#)
 - [Habitat Work: Upper Thurne valley flood defences - Broadland Flood Alleviation Project](#)

Embankments have been set back where possible, sometimes by up to 100m, with provision for wildlife habitat and recreational access and scrapes to receive dredging spoil to improve navigation.

Cons

- The rivers in the lower catchment are (necessarily) heavily modified and the flood defence works do little to improve this although they have added new areas of open water and reedbed within the immediate river corridor and new reedbeds in the Upper Thurne.
- Without significant investment and creative thinking there is little opportunity for water regulation (holding back flood water in the floodplain) in lower catchment (The Broads area) given that much of the land protected is at or below sea level, includes property and valuable agricultural land and salt sensitive wildlife habitat.
- The deepening, straightening, widening and embanking of the river channels and disconnection from the floodplain in the upper sub-catchments has reduced flood storage capacity and aquifer recharge and increased downstream flood risk by transferring the problem downstream.

Opportunities

- For much of the upper catchment, locally, the floodplain storage areas can reduce flood risk to downstream settlements and may provide long-term benefits for the river environment, wetland habitats and aquifer recharge. Reducing bank and channel maintenance could increase the ability of the floodplain to store water by improving the flow between the river and its floodplain. However, where flood risk may be more concentrated, such as in towns and villages, existing actions to manage flooding may be continued.
- For urban areas, promoting sustainable drainage and soak-away's in new development or improvement works could assist district councils.

Barriers

- In the lower, tidal, parts of the catchment, particularly around The Broads, dis-connection of the river from the floodplain is essential for current flood alleviation purposes.
- In the upper catchment to be able to use the floodplain for flood risk management, planners must prevent development that affects the ability of the floodplain to retain water.
- The majority of the suitable floodplain land is in private ownership and used for agriculture. Much is improved pasture with some provision in place for expected winter flooding and higher water levels but additional, particularly summer, flooding is unlikely to be welcomed particularly if additional payment is unavailable.

Dredging and drainage

Background

Maintenance and clearance of natural in-channel, bankside and riparian vegetation occurs by landowners (consented), drainage boards and the Environment Agency for drainage and flood relief

Pros

- The Internal Drainage Boards have amended their standard maintenance operations for more sympathetic management of land drains to improve wildlife habitat and reduce disturbance sediment without compromising drainage capacity
- Natural England and Association of Drainage Authorities have published The Drainage Channel Biodiversity Manual (NE121) for integrating wildlife and flood risk management
<http://publications.naturalengland.org.uk/publication/50004>
- The Environment Agency also has produced a comprehensive guides to the Good practice management of in channel vegetation and also improved its internal operations:

<http://evidence.environment-agency.gov.uk/FCERM/en/SC060065/MeasuresList/M2/M2T2.aspx>

<http://evidence.environment-agency.gov.uk/FCERM/en/SC060065/MeasuresList/M2/M2T3.aspx>

Cons

- The practice has historically failed to take account the needs of wildlife and retain habitat features although management is improving.
- Good practice guides and manuals although very comprehensive and clearly illustrated are often very long and detailed

Opportunities

- Reducing bank and channel maintenance will help naturalise rivers and improve the flow between the river and its floodplain
- Drainage boards are required to comply with legal standards (WFD) relating to watercourses
- Maintenance work on rivers could actually be used to increase the capacity of the floodplain to retain water
- There may be further opportunities to use dredged sediment in flood banks and incorporate wildlife and recreational access features
- Clearer summary guides for drainage and water course management for easy use by plant operators are being produced by the drainage boards.

Barriers

- In many cases maintenance will always be required to keep flood risk obstructions, such as bridges and culverts, clear of debris.
- In many case drainage is to meet the needs of arable agriculture with pumped drainage occurring to low lying land in the Broads area and under-drainage in the heavy clay soils in much of the Waveney catchment, some of the Yare and parts of the Wensum
- Additional flooding or higher water levels may not be favoured by many landowners without adequate financial reward

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Highways

Background

Roads and tracks act as 'pathways' transferring run-off including sediment and pollutants from fields to water bodies. They can also act as a source of sediment from their verges.

Pros

- Natural England has funded a recent assessment of road crossing points that included the Wensum catchment. This was reported in 2013 and on the basis of this the Wendling Beck and River Tud sub-catchments have been prioritised and problem areas are then being addressed
- A 'Mud on the Road' Campaign has been previously run by the Environment Agency.
- Monitoring by the Environment Agency at Lyng has revealed impacts and provided evidence for a rural Sustainable Drainage Scheme.

Cons

- Sediment traps and drains can block and require regular maintenance

Opportunities

- This is an area where collaboration between Catchment Sensitive Farming officers, the Environment Agency, Norfolk County Council Highways and Flood risk and community-led action groups could be beneficial.
- Low cost and low technology schemes could potentially be delivered in association with farmers and the drainage boards

Barriers

- In some locations rural roads act as a receptor to alleviate flooding from downstream settlement
- Retrofitting Sustainable Drainage Schemes (SuDS) can be very expensive - schemes that involve road closures and resurfacing result in higher costs and inconvenience
- There is a lack of funding to deliver improvements such as rural SuDS and questions around responsibility for on-going maintenance.

Water demand and supply

Background

There is lack of availability of water in the catchment mainly during summer following a dry year(s). The majority of water used in the catchment on an annual basis is for public water supply although on a peak summers day more water is abstracted for agricultural irrigation than for public water supply with demand concentrated in the driest years although 'Hands-off' river levels/flows apply to protect the water environment.

Recent droughts have resulted in water restrictions for agriculture, gardens and public use and threatened wildlife due to low river flows and lack of dilution of pollutants and nutrients.

The Catchment Abstraction Management Strategy (CAMS) process is used by the Environment Agency to try to ensure sufficient water is available for all users including the environment. Abstraction licences limit the daily and/or annual volumes of water that can be abstracted. The CAMS process has identified that most sub-catchments are over abstracted or have no more water available. The Restoring Sustainable Abstraction (RSA) programme by the Environment Agency provides more detailed low flow investigations and ensures mitigation measures are applied where required within the catchment.

Anglian Water and Essex & Suffolk Water run water efficiency campaigns and also have to control leakage: <http://www.anglianwater.co.uk/environment/using-water-wisely/waterwise/> and <http://www.eswater.co.uk/your-home/using-water-wisely.aspx>

The Broads Agricultural Water Advisory Group (BAWAG) is an association of 170 agricultural and horticultural abstractors based around the Norfolk Broads in East Anglia. It was formed in 1997 in response to the 1994 Habitat Directive. BAWAG represents abstractors' interests in North Norfolk CAMS and Broadland CAMS. It acts as a forum for discussion of sustainable agricultural water management; it encourages its members to both have a greater involvement in water policy and to strive for wise and sustainable use of water resources.

http://www.norfolkfarm.co.uk/default.asp?page_id=34&pg

Pros

- Water efficiency programmes have been effective at reducing peak and average demand for public water supply
- Anglian Water have a target of 80% of domestic customers on a water meter by 2015.
- Anglian Water fix between 25,000 and 30,000 leaks a year and aim to fix all major leaks within 48 hours and all other leaks within three days, with many being repaired in less than 24 hours
- BAWAG encourages members to conduct water audits to show efficiency. Courses are run regularly to ensure managers and staff remain efficient water users.

Cons

- Low summer flows are still a threat to river wildlife and to crop yields
- Fixing leaks in the domestic water supply network is expensive with the majority of the cost born by the customer. Anglian Water saved 30 million more litres per day in 2012 (compared to 2011)

through leakage reduction alone. This cost £14m - almost double the cost of previous years with a similar level of investment planned for 2013.

- No seasonal charging is in place for public water supply
- New development is planned within the catchment with around 20,000 new homes allocated through local development plans that will put additional strain on summer water resources.

Opportunities

- Of all voluntary measures, water capture and retention offers potential shared benefits for people, agriculture, and wildlife within the catchment.
- Changes in agricultural abstractor licences are linking abstraction to actual flow rather than seasonal constraints
- Re-naturalising and narrowing previously widened rivers can mitigate low flows impacts on river wildlife
- Retaining water in the floodplain of the upper catchment can improve aquifer recharge and base flows
- The Rural Economy Grant scheme has previously been available to aid reservoir construction for water capture and is likely to be available under the new Rural Development Programme 2015-2020. Schemes that have associated benefits are likely to be favoured.
- The Local Environment and Economic Development (LEED) toolkit is available to assist Local Authorities (LAs) and Local Economic Partnerships (LEPs) to plan growth and development: <http://www.naturalengland.org.uk/ourwork/planningdevelopment/LEP-citydeals/leedtoolkit.aspx>
- Innovations in irrigation can be further promoted locally: http://www.farmingfutures.org.uk/sites/default/files/casestudy/pdf/Case%20Study%2035%20-%20Langmeads_Sept%202011.pdf
- The public can play a huge part with water efficiency the measures that Anglian and Essex & Suffolk Water companies are delivering including free and reduced price fittings for the home and garden could be further promoted at a local level

Barriers

- The price of water remains relatively low in relation to its value. Seasonal pricing (to lower peak summer demand) is unlikely and the Consumer Council for Water will understandably want to keep bills as low as possible to protect customers.

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4. River and floodplain habitat management

River and floodplain habitat improvement, creation and restoration

Background

Over half of the rivers in the catchment remain physically modified with many sections straightened and/or deepened, widened, impounded, embanked and disconnected from their floodplain mainly as a result of historic flood defence, land drainage and milling activities. Habitats have become more fragmented and impoundments such as weirs, sluices and mills affect the up and downstream migration of some wildlife species and fish although this is most pronounced at low flows.

Angling organisations and the Wild Trout Trust have delivered habitat improvement schemes in the upper catchment and the Environment Agency led River Wensum Restoration Strategy has worked to improve this conservation priority chalk river: <http://www.environment-agency.gov.uk/homeandleisure/wildlife/114676.aspx> and [Habitat Work: River Wensum Restoration Strategy](#).

Other examples reported specifically for river and floodplain habitat include:

[Habitat Work: Reepham Stream Enhancement Project](#) and [Habitat Work: Waveney tributaries habitat enhancement project](#) and http://therrc.co.uk/Bulletin/Oct2013/Homersfield_FINAL.pdf

The National Trust have been involved in river and floodplain restoration on stretches of river within their estates in the upper Bure and Scarrow Beck.

RSPB Futurescapes is working in partnership to make The Broads landscape more wildlife-friendly: http://www.rspb.org.uk/Images/futurescapes_thebroads_tcm9-304497.pdf

Living Landscapes are the areas where The Wildlife Trusts are targeting landscape-scale conservation efforts to halt the decline of wildlife and restore the natural environment:

<http://www.wildlifetrusts.org/living-landscape/schemes/bure-valley-living-landscape>

<http://www.wildlifetrusts.org/living-landscape/schemes/hickling-living-landscape>

<http://www.wildlifetrusts.org/living-landscape/schemes/suffolk-broads>

<http://www.wildlifetrusts.org/living-landscape/schemes/north-norfolk-woods>

<http://www.wildlifetrusts.org/living-landscape/schemes/claylands>

Specific floodplain habitat (reed bed) restoration by Natural England through Higher Level Stewardship includes:

[2608940 - HQ4 - Restoration of reedbeds](#)

[5466286 - HQ4 - Restoration of reedbeds](#)

[5649083 - HQ4 - Restoration of reedbeds](#)

[5928420 - HQ4 - Restoration of reedbeds](#)

There has been much more habitat improvement and restoration through mixed agreements including management of fen habitats.

Pros

- Fish and invertebrate habitat has been improved in relatively small sections of all rivers throughout the catchment, and to a greater degree, on the River Wensum.

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- The removal of Homersfield sluice, on the River Waveney, by the Environment Agency is an example of good practice. The redundant operational structure acted as a barrier to fish migration where the construction of a sequence of gravel riffles maintains the upstream water level, with no impact on flood risk. It provides habitat for invertebrates and spawning fish and incorporates provision for canoe access.

Cons

- Historic habitat improvement and restoration work has (necessarily) been largely piecemeal to individual sections and not strategic on a catchment scale
- Where historical habitat improvement (including barrier removal or by-pass) has occurred it has, in some circumstances, failed to provide additional benefits for other interest groups, such as canoeists, despite opportunities existing.

Barriers

- River habitat improvement schemes can be relatively expensive to install and often require subsequent management
- The majority of suitable locations are on private land although improved angling as a result of habitat improvement may generate further landowner support.

Opportunities

- River habitat improvement schemes that restore natural functioning such as re-meandering and re-connection with the floodplain (where there is no flood risk to property) can reduce downstream flood risk, increase aquifer recharge, lead to improvements in water quality and link disconnected habitats.
- River habitat improvement schemes can include provision for recreational access including angling and sometimes canoeing and walking where landowners and fishing clubs are in agreement.
- By removing redundant operational structures on main rivers that act as a barrier to fish migration the costs associated with maintaining these are eliminated and, as such, can possibly be funded as capital works under the Environment Agency flood risk budget
- Soft bio-engineering techniques are applicable to sections of river in the upper catchment and are low cost but can be highly effective if well designed:
http://www.therrc.co.uk/rrc_manual_pdf.php
<http://evidence.environment-agency.gov.uk/FCERM/en/FluvialDesignGuide/Chapter3.aspx?pagenum=7>
- Carrying out river and floodplain restoration work in partnership with landowners and local action groups and volunteers (where suitable), is more likely to create a sense of ownership and pride, which may in turn contribute to further improvements and ultimately to regeneration.

Invasive species removal or control

Background

Invasive species are present within the catchment. Himalayan balsam and Japanese knotweed are present in all sub-catchments and invasive shrimp is now recorded in Barton Broad and the River Ant. Chinese mitten crabs are present in the lower reaches of all the river systems. Signal crayfish are present throughout the Broads, in the middle and lower Wensum, and in the middle Yare posing a serious threat to populations of native crayfish on the River Wensum, Wendling Beck, and in particular the lower Waveney, where resident species are recovering from crayfish plague. Asiatic clam and zebra mussel are ubiquitous throughout the Bure and Broads system.

Reducing the Impacts of Non-native Species in Europe (RINSE) is new European Project which will look at ways of managing invasive non-native species. The Norfolk Biodiversity Information Service (NBIS) collate records of invasive species within Norfolk and also initiates action to record, control and/or remove species that are a threat to natural species. It also runs campaigns to raise awareness at garden centres and amongst the general public.

A Broads Authority, Defra, Natural England and Environment Agency partnership employed a bio-security officer and developed a range of material for increasing awareness in the boating and angling community of invasive shrimp along with other invasive species. Local action groups and conservation volunteers, including Broads Authority volunteers have been involved in the removal of invasive species especially Himalayan balsam.

Pros

- Invasive species removal/containment can result in improved wildlife
- In the case of Himalayan balsam, removal can result in less bank erosion and thus improved water quality.

Cons

- 'Seeding' from upstream areas can result in wasted effort of any downstream removal

Barriers

- Lack of awareness by the public and lack of access by landowners can lead to non-reporting and/or non-removal/containment of invasive species.

Opportunities

- A new free to download Smartphone 'App' 'That's Invasive!' has been developed by the RINSE project to allow anyone to identify and report sightings of over 35 invasive non-native plant and animal species. www.rinse-europe.eu
- The hydraulic model developed from recent SCIMAP modelling can be used to work out those locations most at risk of seeding and spreading along watercourses
- Improved co-ordinated effort could see volunteers from different sub-catchments work from the top of the catchment downstream.

5. Recreational access and community engagement

Community engagement

Many local communities and recreational interest groups feel that their views and knowledge have previously been ignored in the planning process whilst others believe there is a lack of opportunity to experience or learn about the water environment. Some individuals report a lack of guidance or too much bureaucracy despite being keen to deliver voluntary action to improve their local water ways. This is based on findings in the Bure catchment following MSc research in 2007.

Similar experiences were reported in the Waveney catchment and were a driver for the establishment of the River Waveney Trust. It is likely that similar sentiments apply to recreational users and communities in all sub-catchments. The Bure Navigation and Conservation Trust is newly formed and there is also a South Yare Wildlife Group and a Friends of the Tud group. The Wensum Valley Trust was established in 2007 but is in hibernation due to a lack of public funding although the Norfolk Rivers Trust covers the whole of the Broadland Catchment in its operational area.

RiverCare is a partnership project (2010-2015) between Anglian Water, Keep Britain Tidy and the Environment Agency, whereby local communities adopt a stretch of their local river and undertake litter picks, biodiversity surveys and receive information around water efficiency and unflushables.

<http://www2.keepbritaintidy.org/Programmes/RiversAndCanals/RiverCare/About/Default.aspx>

The aim of the project is to engage local communities with their watercourse and to get people to make the connection between the way they behave in their homes and the impact that this can have on the natural environment.

The Norfolk Wildlife Trust is running the 'Bringing Landscapes to Life' Heritage Lottery Fund project (2013- 2016) that will work in the Bure Valley Living Landscape area and encourage local communities to take part in positive conservation projects and wildlife recording.

Access provision and integration

Norfolk County Council is responsible for the maintenance of rights of way signage with farmers responsible for maintenance on their land under cross compliance. The Broads and Norfolk River Valleys is a recognised target area for access provision under environmental stewardship. There are significant opportunities to provide additional permissive routes that link and extend the existing Public Rights of Way network, link with coastal /open access areas and the provision of educational access.

Farmers have been previously eligible for Higher Level Stewardship (HLS) applications if they provided permissive access where there is identified demand or need in order to link people with places, enhanced existing networks, particularly where providing circular access routes and/or providing links to Coastal Access routes and open access areas and/or provided opportunity to improve people's understanding of the farmed environment through educational access.

The Broads Authority provides promotional material, signage and information boards, parking and disabled facilities in its Executive area. Its Integrated Access Strategy is improving recreational access by working with landowners for the establishment of permissive paths to link existing routes and canoeists to improve access arrangements and produce trails and information guides for users. It also includes mooring provision in areas of greatest need.

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The Environment Agency in association with the Broads Angling Strategy Group and local angling organisations seeks to improve angling access provision including for anglers with disabilities.

Friends of the Tud: <http://www.friendsofthetud.co.uk/>

South Yare Wildlife Group: <http://southyarewildlife.wordpress.com/>

Bure Navigation and Conservation Trust: <http://aylsham-navigation.norfolkparishes.gov.uk/>

River Waveney Trust: <http://groupspaces.com/riverwaveneytrust>

Community biodiversity projects and groups in Norfolk:

<http://www.norfolkbiodiversity.org/communityprojects/Default.aspx>

Pros

- There is already considerable public access to watercourses within the catchment with Wherryman's, Weavers and Angles Way public footpaths running along long lengths
- The BA integrated access strategy and HLS agreements link routes by working with landowners to create permissive paths
- River Waveney Trust and Wensum Alliance are working on citizen science projects that involve local communities and landowners in monitoring the biological health of their local rivers through the Riverfly partnership.
- Canoe access has been incorporated into a recent river restoration scheme at Homersfield on the River Waveney
- Public mooring platforms are shared with anglers in the Broads Authority area.
- Outdoor access and green space has proven health benefits for local communities

Cons

- River crossings and ferries are limited and cycle and horse riding access is not particularly well integrated
- Provision for canoe access has not always been considered in river restoration schemes
- Increased and integrated access has the potential to cause disturbance to rare wildlife and breeding birds in certain locations.

Barriers

- Many landowners do not want to provide additional access to their land
- Areas of high conservation priority with sensitive species are unlikely to be suitable for access at least at certain critical times of year.

Opportunities

- By mapping existing access at a catchment scale, new opportunities to integrate this may become apparent
- Much existing literature, maps and trails are available that can be better promoted
- Consideration of recreational use and incorporation into new schemes where applicable can be promoted locally
- Local Trusts have networks of volunteers keen to get involved in on the ground action including habitat improvement and invasive species removal
- Local groups are already involved with maintaining key local rights of way, particularly around river corridors and this could be further supported.

Conclusion

Many of the measures and changes in practice required to deliver improvements to and enjoyment of the water environment need to occur on land. The majority of land in the catchment is privately owned so landowner input and buy-in is essential.

Making the economic case is the best way to achieve large scale behaviour change. It is important to provide appropriate incentives that maximise current payment opportunities and if this is insufficient highlight where and suggest how this can be improved.

Targeting is an overarching theme. The evidence points to targeting at a *landscape*, farm and field scale as key to success. Facilitation involving co-ordinated action of a group of farmers in a targeted area may provide the greatest efficiency gains for the funders and agreement holders through economies of scale.

'No regret' actions based around low cost solutions and 'win-wins' such as rural sustainable drainage or targeted small scale woodland/wetland creation should be encouraged and promoted.

Accessible computer models and mapping techniques can assist in determining and presenting pollution and flood risk areas and the best potential locations for integrated action to provide multiple benefits given limited budgets and availability of land.

Maps are very effective visualisation tools that can demonstrate risk, target and priority areas to funders and the key audiences (communities, farmers, investor organisations, planners). The ability to use local stakeholder knowledge within models is essential for effective planning and decision making.

Potential action areas relating to all activity areas:

- Refine computer models and mapping to determine pollution and run-off risk areas by using farmer, local community, Wildlife Trust surveyor and CSF officer and specialist knowledge
 - On an individual holding basis, determining land use, nutrient management, soil condition, run-off and leaching in potential high risk areas would be beneficial in model ground-truthing and assisting specific farm action through advice and support.
 - Further walkover surveys in small tributaries, drains and feeder streams trial the potential use of drones for post-rainfall/storm event monitoring
- Arrange sub-catchment partnerships to deliver integrated advice and grants and try to engage any high risk farms that have not previously engaged
- Arrange partnership river/broad walks for farmers within high risk areas of each sub-catchment to discuss links not just to water quality but also ecology, flood risk and aquifer recharge
- Arrange farmer led water testing schemes, community Riverfly monitoring and UEA student research could be used to help monitor effectiveness of implemented measures in pilot locations in each sub-catchment
- Explore the possibility of working with groups of neighbouring landowners to trial more ambitious measures with shared efficiencies and rewards.
- Further promote water efficiency to all
- Make all information readily available to local authorities and communities with clear summary guidance making use of diagrams, illustrations and animation.