

BROADLAND FLOOD ALLEVIATION PROJECT

Impacts on the Biodiversity and Agricultural Use of Grazing Marsh

**Broads Authority
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Introduction

The Broadland Flood Alleviation Project (BFAP) is a 20-year programme of flood defence improvements, maintenance and emergency response services covering parts of the rivers Yare, Bure, Waveney and their tributaries. Broadland Environmental Services Limited (BESL) is undertaking the BFAP on behalf of the Environment Agency (EA).

The Project area includes 270km of floodbanks that protect over 23,000ha of land and 1,700 properties. The low-lying land behind the defences, often referred to as the 'drained marshes', has high environmental value and is important to the local economy for farming and tourism.

The purpose of this report is to examine the issues relating to the impact that the works have in terms of changes in habitat and land management; specifically the encroachment onto, and consequent reduction in area of, grazing marsh due to the need to source material locally. These impacts are considered in relation to policy, legislation and land use planning.

The issue of grazing marsh loss is not a new one. One of the remits of the BFAP Wetland Task Group¹ in 2005 was to identify the changes in habitat occurring as a result of the works and to consider the implications in relation to Biodiversity Action Plan and other targets.

Improvement works

The improvement works involve a combination of strengthening banks on their existing alignment and the construction of completely new "setback" banks. Both solutions require material to be excavated from the adjoining marshes, either through widening the existing soke dyke or digging a new one.

Material sourcing and relocation of floodbanks is resulting in a reduction in area of some habitats, most notably coastal and floodplain grazing marsh. This habitat is classified by the UK Biodiversity Action Plan (BAP) as a priority; consequently plans to identify measures required to protect and enhance it have been produced at both the national and local (Norfolk and Suffolk) level.

What is grazing marsh?

The BAP definition is:

Periodically inundated pasture or meadow, with ditches that maintain the water level containing brackish or fresh water.

In terms of biodiversity value grazing marshes can provide important habitat for wintering and breeding bird populations whilst the dyke network often supports a wide range of plants and invertebrates. In Broadland the dykes also support water voles, one of the most threatened mammal species in the UK. The botanical value of the grassland is generally poor as most fields have been re-seeded and improved for grazing.

The Broadland grazing marshes can also be classified by the type of management that they are subject to under the Environmentally Sensitive Area (ESA) scheme i.e. there are different prescriptions according to what tier a landowner has entered particular fields into.

¹ BESL, Broads Authority, Environment Agency, Natural England, Norfolk Wildlife Trust and RSPB

There are three tiers for grazing marsh with 1 being the 'basic' level that secures the habitat as a landscape feature (i.e. it cannot be ploughed), whilst tier 3 is the most prescriptive and generally has the greatest biodiversity benefit.

All of the marshes entered into ESA have to receive some form of grazing each year, typically by cattle, in order to meet the requirements of the scheme. The fields can also be cut for silage (tiers 1 and 2) or hay (all tiers). The ESA has halted the arable reversion and intensification of farming that was happening up until the 1980's. However, the biodiversity value of grazing marsh is variable and dependant upon a number of factors including location, soil type, water supply, water quality, water management and grassland management. This is why the BAP (see below) includes targets to *rehabilitate* 'poor' sites and to maintain the *quality* of 'good' ones.

Biodiversity Objectives

Biodiversity Action Plan

The BAP process has produced a series of national, regional and local (usually county) plans covering habitats as well as individual species. Each plan sets objectives and quantifiable targets, together with the actions that are necessary to achieve them. In terms of coastal and floodplain grazing marsh the national and local (Norfolk and Suffolk) BAP objectives are to:

- Maintain the existing extent and quality;
- Rehabilitate habitat that has become too dry or is intensively managed; and
- Create new areas of grazing marsh from arable in targeted areas.

Broads Drained Marsh Strategy

Another key document that sets biodiversity objectives, targets and actions for grazing marsh is *The Broads Drained Marsh Strategy*, prepared by the Broads Authority, English Nature, Norfolk Wildlife Trust and RSPB in 2001. The Strategy sets objectives, targets and actions necessary to benefit the key nature conservation features of the drained marshes (excluding fen areas that have a separate Strategy). It seeks to provide a means of co-ordinating the projects required to deliver UK and local BAPs; The Broads Natural Area Profile; and The Broads Plan.

Broads Plan

The Broads Plan (2004) sets out a vision and long-term (20-year) aims for the future of The Broads. It also specifies priority objectives and actions to be delivered over a 5-year period through a supporting Action Plan. The Plan supports the implementation of the BFAP as a 5-year priority objective and states that the majority of the drained marshes will continue to be defended through the 20-year period. It also states that the long-term vision has to include provision for a more naturally functioning wetland taking into account the impacts of climate change over the next 100 years. This vision is reflected in the objectives and policies that are contained in the emerging Local Development Framework.

High Level Targets and Outcome Measures

Up until 1st April 2008 DEFRA had a series of High Level Targets (HLT) that operating authorities were required to have regard to when undertaking flood risk management schemes. With respect to biodiversity the HLT was to "*ensure no net loss to habitats covered by Biodiversity Action Plans and seek opportunities for environmental enhancements*".

The HLT have now been replaced by *Outcome Measures*. These have been developed to provide greater clarity on what policies and funding for flood risk management are intended to achieve. With respect to biodiversity the outcome measure is:

Flood and coastal erosion risk should improve the natural environment as well as reducing the risks to people and property. This measure will record the overall increase in BAP habitat achieved through flood and coastal erosion risk management activities.

Despite this change the emphasis remains on ensuring that flood risk management schemes do not result in a loss in area of BAP habitat. Whilst this meets the BAP objective of maintaining the extent of BAP habitat there is no specific reference to the issue of quality or rehabilitation. This is an important consideration for schemes such as the BFAP where one of the principal reasons for undertaking the works is to protect the biodiversity interest of grazing marsh.

Planning policy & legislation

The current Development Plan contains a number of policies relevant to the protection and enhancement of biodiversity (nature conservation), including a number that specifically refer to the drained marshes e.g. C14 Development on drained marshland; INF5 (d) consideration of BFAP works in relation to protection of grazing marshes. Both these policies from the Broads Local Plan 1997 have been 'saved' as part of the transition process to adopting a Local Development Framework (LDF) which, together with the Regional Spatial Strategy, will form the new Development Plan for the Broads Executive Area. Some of the emerging objectives and policies from the LDF acknowledge that it will not be feasible or desirable to keep all of the drained marshes defended. The sites identified by the Wetland Task Group as offering the highest biodiversity benefits if returned to the floodplain are shown on the draft proposals maps for the LDF.

With respect to European designated sites (SAC and SPA) the Habitat Regulations require that all plans and projects likely to have a significant effect should be subject to an 'appropriate assessment' i.e. assess the implications of the plan or project in respect of the site's conservation objectives. All BFAP works have to be considered under the Habitat Regulations and, where an appropriate assessment has been necessary, the impact of loss of grazing marsh has been evaluated. In each case to date the assessment has concluded that there would be no adverse affect on the integrity of the site. In some cases it may be necessary to return some areas of grazing marsh to the floodplain in order to alleviate flooding on designated fen sites. No decisions have been made on this yet but an evaluation of the potential effectiveness of washlands in the mid-Yare is currently underway in relation to the proposed flood defence works at Postwick Marshes.

The Natural Environment and Rural Communities Act 2006 states that every public body must, in exercising its functions, have regard, so far as is consistent with exercising its functions to the purpose of conserving biodiversity. Conserving biodiversity includes restoring or enhancing a population or habitat. The species and habitats of principal importance in this respect are those published under section 74 of the CROW Act, including coastal and floodplain grazing marsh.

The Countryside and Rights of Way Act 2000, places a duty on the Environment Agency, when carrying out its functions in the Broads, to 'have regard' to the purposes for which the Broads was designated as a special statutory authority. It also requires them to take 'reasonable steps', when exercising their functions, to further the conservation and

enhancement of Sites of Special Scientific Interest. The Project works closely with Natural England and landowners to ensure that proposals within designated sites take account of the recognised interest features and the need to provide enhancements.

Planning Policy Statement 9: Biodiversity and Geological Conservation lists a number of key principles that planning bodies should adhere to when considering the impact of development. These include:

- Development proposals where the principal objective is to conserve or enhance biodiversity and geological conservation interests should be permitted; and
- The aim of planning decisions should be to prevent harm to biodiversity and geological conservation interests. Where planning permission would result in significant harm, planning authorities should be satisfied that the development cannot be reasonably located elsewhere and that adequate mitigation measures are put in place. Where a permitted scheme cannot deliver adequate mitigation then appropriate compensation measures should be sought. If significant harm cannot be prevented, adequately mitigated, or compensated for, then planning permission should be refused.

The BFAP objectives and approach to scheme delivery are consistent with these principles. Individual schemes are subject to scrutiny as part of the planning process and, to date, the reduction in grazing marsh has not been considered a significant impact that justifies either refusal or scheme modification.

Habitat Change

BESL have always quantified the net change in habitat area resulting from its works and reported the figures in the Environmental Statements. The information is used to maintain a profit and loss account for wildlife habitats as well as for calculating compensation due to landowners. A summary of the changes to date are shown in Table 1. The breakdown for each compartment, including estimated figures for those that have not yet progressed through detailed design, are tabulated in Appendix 1.

The figures show a net loss of grazing marsh and its replacement by a variety of other habitats including grassland associated with floodbank and folding (area between the bank and soke dyke), as well as reedbed and open water associated with ronds and soke dykes.

Table 1. Habitat change due to BFAP improvement works

Habitat	Change (ha)		
	All comps#	Completed schemes^	SSSI (completed schemes only)
Grazing marsh	-281.52	-166.79	-36.64
Marsh dykes	*	-13.56	-1.55
Arable	-84.61	-47.64	-1.40
Soke dyke	149.64	93.64	14.95
Folding	80.28	40.48	3.41
Floodbank	64.22	45.72	8.10
Rond	106.56	63.56	9.82

excluding compartment 22 Chet u/s of Nogdam Wall (potential for approx. 100ha of grazing marsh to be converted to open water and reedbed if the flood defences are not maintained)

* not calculated separately at the strategic level but will be included in the total estimate of grazing marsh loss (i.e. 281.52ha). Completed schemes do include a net change for area of marsh dyke change

^ compartments that have been completed or for which detailed designs have been produced: 1, 2, 5, 7, 10, 11 (Bure), 11 (Yare), 12, 14, 15, 16, 17, 18, 21, 22 (phase 1, 2 & 3), 23, 24, 26, 27, 28 (1), 31, 32 (phase 1 & 2), 35 (phase 1, 2 & 3) & 37.

Benefits

The flood defence works are providing improved protection to a wide range of freshwater plants and animals that are dependant upon good water quality. Frequent flooding by river water high in nutrients and/or saline in nature damages these communities. A good illustration of this is the effect that flooding had at Cantley Marshes following a breach in 1991. The freshwater dyke communities had still not recovered at the time of the 1997 Grazing Marsh Dyke Survey but had done so by the time BESL surveyed the site in 2005.

In addition to the direct benefit of preventing serious flooding the works are also providing and facilitating the delivery of improvements in water level management within the marshes. This is of benefit to grazing management as well as wildlife. At Cantley and Upton, for example, additional large capacity dykes have been excavated in order to switch the route of the main drain away from the centre of the marshes.

The habitats that are increasing as a result of scheme implementation are providing significant biodiversity benefit. In particular the creation of more open water and reeded margin in new soke dykes and the promotion of reedswamp on new areas of rond are delivering habitat for a wide-range of species in a relatively short period of time (see photos).

BFAP Actions

Notwithstanding the large benefits that the BFAP is delivering to the protection of grazing marsh biodiversity and its agricultural use, it is acknowledged that the net reduction in area and other construction impacts need to be addressed. The actions that BESL and the EA are taking are outlined below:

BFAP Actions to minimise impacts on biodiversity and agricultural use

Biodiversity

- Replacing the area of grazing marsh and other important habitats lost due to encroachment within designated sites through creation, in partnership with local landowners, of new habitat within the Broads e.g. 42.6ha of grazing marsh has been created from former arable land at two sites within Halvergate Marshes.
- The EA has funding through its Regional Habitat Creation Programme to create new grazing marsh and/or rehabilitate poor quality sites. Officers are working with BESL and local stakeholders to identify and target the most appropriate sites in the Broads. If it is not possible to provide all replacement habitat in the Broads then schemes will be delivered elsewhere in the Anglian region. There is a clear commitment to offset the loss of ~300ha of grazing marsh.
- The construction works have the potential to kill, injure or disturb animals and destroy notable plant and invertebrate species. Surveys and assessments are undertaken as part of the design and planning process. On-site mitigation measures to avoid or minimise these impacts are implemented for all schemes (see **Appendix 2** for examples)

Agricultural use

- BESL discuss the implications with landowners at an early stage in scheme design. For those who have a small landholding and would suffer a disproportionate loss then the design can be modified to take more material from neighbouring areas or to use crest piling.
- Where the landtake will reduce the area of a field to an uneconomic size then lengths of dyke can be filled to incorporate into an adjoining field.
- The design and access can be modified to make grazing the new folding and/or floodbank feasible. Although this will not be a direct replacement for the area lost in terms of quality or suitability it will offset some of the loss. Many areas of folding and floodbank are already grazed under ESA.
- The Project is able to pay financial compensation to landowners where land is being used (changed) in order to improve the flood defences.
- Exceptionally the Project will buy a piece of land, or facilitate its purchase by a third party, where there is a good flood defence and/or other beneficial reason to do so.

Exceptions

Although the majority of the drained marshes will continue to be protected through improvement and maintenance of the floodbanks there may be opportunities during the lifespan of the Project to return some areas back into the flood plain. A number of plans and strategies, including the Broads Plan, identify such an approach as a valid objective in order to accommodate the longer-term impacts of climate change. The Wetland Task Group has identified potential sites that would deliver the greatest biodiversity benefits or may be required to alleviate water levels on undefended designated sites. A consultation leaflet was circulated in 2006 and BESL are looking at the feasibility of individual sites in consultation with landowners. Although many of the areas identified are currently cultivated some sites are grazing marsh so there is the possibility of losing habitat through this means.

Conclusion

The BFAP is delivering biodiversity and agricultural benefits to substantial areas of grazing marsh within Broadland. The improvement works unavoidably lead to a loss in area of grazing marsh due to material sourcing requirements. This reduction conflicts with some of the objectives and targets set in the BAP plans as well as DEFRA targets for flood risk management schemes. Conversely, the works are contributing to the delivery of other targets through providing ongoing, improved protection against the damaging effects of flooding with water that has high nutrient and/or salinity levels. By definition, the 'drained marshes' are dependant upon maintaining flood embankments and undertaking appropriate water level management.

The Project has developed a range of mitigation techniques to minimise impacts during construction as well as incorporating habitat enhancements. Significant amounts of staff time and resources are put into designing, implementing and monitoring environmental measures. Notwithstanding this replacement grazing marsh is being provided by the Project (for SSSIs) and the Environment Agency (non-SSSI areas) so there will be no overall loss of habitat.

These combined actions are providing benefits and 'compensatory' measures that far outweigh the temporary disruption and small-scale changes in habitat that occur as a result of the flood defence improvement works.

Photographs



Setback bank & piling removal providing sustainable defences to protect the designated site and farming value at Halvergate (Photo: Mike Page)



Cattle grazing provides landscape and biodiversity benefits to freshwater marshes at Halvergate



Newly established reed rond behind fence post piling, Strumpshaw



Species-rich soke dyke 1-year after excavation, Carlton Marshes

Comp. No. (Phase)	River	Compartment Name	Length of flood bank (km)	Comp. Area (ha)	Rond (ha)	Flood bank (ha)	Folding (ha)	Soke Dyke (ha)	Marsh dyke (ha)	Grazing marsh (ha)	Arable (ha)	Woodland (ha)	Trees/ scrub (ha)	Trees/ scrub on folding (ha)	Within SSSI (ha)*
22 (III)	Yare	Norton Marshes	0.8		0.10	0.50	1.50	3.80	-0.20	-5.80	0	0	0	0	0
22 (III)	Waveney	Wheatacre & Burgh Marshes	5.2								0	0	0	0	0
23	Waveney	Short Dam Level	3.1	100.3	2.00	1.02	0.25	1.47	0	-2.24	0	0	0	0	
24	Waveney	Long Dam Level	5.3	250.6	0	1.72	1.62	2.45	0	-5.63	0	0	0	-4.26	
25	Waveney	Gillingham Marshes	4.8	213.6	4.00	1.00	1.00	3.00		-8.55	0	0	0	-3.86	
25A	Waveney	Geldeston Marshes	3.1	306.8	0.50	1.00	2.00	4.00		-7.84	0	0	0	-2.51	-1
25B	Waveney	Barsham Marshes	4.9	268.1	0.43	0.09	1.73	2.00	-0.09	-2.09	-1.57	-0.39	0	0	
26	Waveney	Beccles Marshes	4.2	399.4	0	1.08	1.04	0.91	-0.06	-3	0	0	0	0	
27	Waveney	Barnby Broad & Marshes	4.9	459.0	0	1.00	0.53	3.04	-0.25	-5.75	0	0	0	-3.94	-2
28 (1)	Waveney	Sprats Water & Marshes	8.3	565.1	0.00	0.57	-0.32	1.66	-0.09	-1.82	0	0	0	-6.64	-0.69
28 (2)	Waveney	Peto's Marsh			3.00	1.00	3.00	4.00		0	-11.62	0	0	0	
29	Waveney	Oulton Marshes	2.5	164.6	3.00	1.00	1.00	2.00		-5.54	0	0	0	0	
30	Waveney	Blundeston Marshes	1.2	102.0	0.00	0.50	1.00	1.00		-1.95	0	0	0	0	
31	Waveney	Somerleyton Marshes	3.0	133.3	0	2.42	0.82	0.38	0.10	-2.23	-1.40	0	0	0	0
32	Waveney	Herringfleet Marshes	3.0	81.2	0	1.00	1.85	0.49	-0.25	-5.75	0	0	0	0	0
33	Waveney	Fritton Marshes	3.9	180.4	0	1.00	2.00	2.00		-1.87	-2.81	0	0	0	
34	Waveney	Belton Marshes	3.5	299.0	1.00	1.00	3.00	3.00		-7.16	0	0	0	0	
35 (1)	Yare	Haddiscoe Island	18.3	899.7	6.50	3.30	1.20	3.40	-0.10	-14.50	0	0	0	0	0
35 (1)	Waveney	Haddiscoe Island			-0.10	1.20	0.10	1.90	-0.60	-2.40	0	0	0	0	0
35 (3)	Yare/ Waveney	Haddiscoe Island			1.00	2.79	-0.45	3.50	-0.12	-5.70	0	0	0	0	0
22/35 (2)	Cut	Haddiscoe Island			0	1.85	2.62	2.33	-0.25	-7.65	0	0	0	0	0
36	Yare (Breydon)	Burgh Castle & Fisher's Marshes	6.7	887.3	0.00	0.50	1.00	1.00		-0.99	-0.15	0	0	0	
37	Bure	Fishley Marshes	4.5	175.1	3.31	0.60	2.88	1.68	2.33	-7.53	-3.32	0	0	0	
TOTAL			275.85	23301.58	106.56	64.22	80.28	149.64	-13.56	-281.52	-84.61	-1.39	-0.03	-21.22	-44.09

* Habitat on the landward side of the soke dyke

**No solution determined yet but could involve retreat to higher ground. This would result in a loss of approximately 100 ha of grazing marsh

*** Comprises of established grazing marsh (-5.61) and recent arable reversion (-6.77)

APPENDIX 2

Mitigation and enhancement for wildlife associated with grazing marsh

All of the sites that the Project works within have some wildlife interest so it is important that the design and implementation of schemes take account of the need to minimise, and where possible avoid, damage to plants and animals.

Some examples of mitigation for species that are dependant upon grazing marsh habitat:

- **Water voles** are present in most of the soke dykes so advanced vegetation clearance and sustained draw-down of water levels is implemented in order to displace them to nearby habitat. BESL has funded a student research project to investigate the fate of displaced voles and the effectiveness of the mitigation.
- **Grass snakes** are regularly found in marsh dykes. Surveys are undertaken of all sites to determine the presence and distribution of reptiles so that mitigation can be targeted at particular locations. Vegetation cuts, installation of reptile fencing, observation and capture during ground-breaking and provision of breeding sites (vegetation piles) and hibernacula are all used.
- Turions (winter buds) of the rare aquatic plant **grass-wrack pondweed** have been collected and grown in containers for re-introduction to sites where soke dykes containing the plant have had to be in-filled.
- Seeds of rare plants such as **greater water-parsnip** have been collected and plants grown for re-introduction into suitable habitat once the earthworks are complete.
- Sections of soke dyke supporting breeding **scarce chaser** dragonflies have been left undisturbed, to fill in naturally.
- New soke dykes incorporate berms (ledges) that provide a substrate for reed, sedges and other plants to colonise. Silts and water from the old soke dyke are transferred into the new one, encouraging rapid colonisation by **aquatic plants** and **invertebrates**. These measures also benefit **breeding birds**, **winter waterfowl** (through the creation of larger areas of open water) and **water voles**.
- Vegetation clearance is undertaken in advance of the breeding season to discourage **nesting birds** from occupying the works corridor. If birds are present, especially Schedule 1 species that are protected against disturbance, then the works programme will be re-scheduled and/or a buffer zone created.