

Report 6. Natural England comments on recent information provide by Mr Harris to the Environment Agency
Date: October 3 rd 2013

Introduction

The Environment Agency requested on 24.9.13 that Natural England confirms whether recent information provided as a series of reports materially affect any of the advice provided to date or whether NE's advice has already had regard to these reports.

This report is structured as follows:

1. Overall comments.
2. Summary view on each report.

Overall comments

1. Information contained in Mr Harris's reports plus further comments provided by the authors by way of rebuttal to NE responses have been taken into consideration in advice provided to the EA to date.

Key points in Natural England's advice to the EA to date relevant to information presented in Mr Harris' s reports are worth summarising here:

Change

- (i) There is evidence of vegetation change largely in Middle Marsh: an increase in frequency and abundance of *Sphagna*; there are some slight changes in M24 vegetation showing a tendency towards development of M25; there are some small changes in a limited number of species limited number of rich fen species associated with wetter conditions (however given the limited number of species and small change in cover / abundance the significance of this is not known).
- (ii) The change in *Sphagnum* has become apparent since mid- late 1980s.
- (iii) NE considers it reasonable to judge that the expansion of *Sphagnum* is a trend.
- (iv) To date changes have not compromised the SAC conservation objectives. NE is unable to predict if and when conservation objectives may be compromised.
- (v) Making such a judgement will not only be informed by condition assessment, but also by local discussions and validation especially where change contrary to conservation objectives could partly or wholly be influenced by anthropogenic factors.
- (vi) NE has identified that condition of Catfield Fen is currently favourable but is categorised as at "hydrological risk". This risk category is applied because of: the nature of changes in vegetation, location of Catfield at the fen-highland edge, and ground water abstractions which have been shown by EA in their Review of Consents to cause drawdown of the water table at Catfield.

Possible causes of change

- (vii) The vegetation changes recorded indicate a change in the hydrological balance between water which is more base-poor (acid) and that which is base-rich.
- (viii) Natural England does not consider that the evidence to date, based on changes in vegetation, indicates drying.
- (ix) The change in balance between acid and more base-rich water may be due to a range of factors working alone or together:
 - Natural succession within former turf ponds whereby the semi-floating raft of vegetation develops above the influence of the more calcareous groundwater and becomes more reliant on rainfall.
 - Changes in vegetation management.
 - A decrease in frequency and magnitude of flooding water entering the site via ditches and dykes.
 - A decrease in groundwater input as a consequence of abstraction.

Role of abstraction

(x) In the context of the above, NE is reliant on EA groundwater modelling to provide information that can help establish how the characteristics of groundwater flow and levels (eg scale, magnitude, frequency and duration of change) may be affected by fully licensed abstractions in the area. NE understand that this modelling work has still to conclude.

(xi) The EA should use this model to assess groundwater abstraction and - in particular - the licenses under consideration, alone and in combination with other externally driven influences, to ascertain how significant these changes might be for the conservation objectives of the sites in the area. NE would expect information obtained from the groundwater model to form part of the Appropriate Assessment and so be available to NE for review.

2. A number of the findings from the reports concur with some of the key points of NE current advice to EA.

3. There are two key areas of difference between Natural England and findings from the reports provided by Mr Harris.

(i) Whether changes seen are adverse or not.

Mr Harris' advisors consider the site to be in adverse condition. NE's view is that the site is currently in favourable condition as assessed against the conservation objectives for the site. However, Natural England has recognised that the condition of the site is noted as being hydrologically at risk on the basis of:

- The nature of the recorded changes in vegetation which indicate amongst other factors a change in hydrological balance with a reduced influence of base-rich water. Given the potential impact of abstraction there is cause for concern.
- The possible trajectory of change such that communities may change (particularly, though not exclusively, in relation to M24 *Molinia caerulea-Cirsium dissectum* fen meadow community located at the fen-highland edge which is tending towards M25 *M.caerulea-Potentilla erecta* mire)
- the change seen may be explained by a number of factors including those influenced and / or exacerbated by non-natural influences

(ii) Changes indicate drying.

NE's view is that currently we do not have evidence that the recorded changes indicate drying and that these changes can be solely ascribed to water abstraction and the licenses under question alone or in combination. The changes in vegetation are indicative of a change in hydrological balance between more acid and more base rich water which may be influenced by groundwater abstraction amongst other potential hydrological influences.

Summary of Natural England views on Mr Harris's reports provided to EA

4. Stratigraphy

Dr Parmenter's report helps confirm some of the key points in our advice to date:

- There has been a notable increase in *Sphagnum*.
- The report states that such change is successional. It highlights that this successional process has been accelerated by drawdown of groundwater thereby increasing reliance on rainfall and leading to more acidic conditions at the fen surface. NE recognises that changes in vegetation observed may be explained by a range of factors working alone and in combination resulting in changes in the mineral water vs rainwater balance and these may include succession. NE are not clear that change has been accelerated by drawdown of groundwater.
- Peat spatial heterogeneity and discontinuous distribution of clay layers indicates the potential for lateral water movement and vertical inputs from (and to) Crag.

5 Vegetation

5.1 Dr Parmenter report

This work helpfully confirms some of the key points in our advice to date:

- There has been a notable increase in *Sphagnum* particularly since the 1980s and that the vegetation in parts of Middle Marsh is more strongly calcifugous (plants less associated with base-rich conditions) than in the past.
- This change has not yet resulted in a change in vegetation communities though the M24 community located at the fen-highland edge is borderline M24/M25.
- There has not been a change in species diversity at a site scale; though at a smaller scale there have been increases and decreases in particular species.
- Changes are concentrated in Middle Marsh with some small change in Mill Marsh.
- NE agrees that there is evidence of vegetation change, however, we are not persuaded that these changes may necessarily be extrapolated to all areas of solid peat as Dr Parmenter suggests.
- The report has suggested that change is due to an increase in reliance on rainfall as opposed to groundwater. NE agrees that changes may indicate an increased influence of rainfall as opposed to other forms of more base-rich water, i.e. groundwater and / surface water derived from the floodplain via the ditch and dyke system as opposed to just groundwater.
- Dr Parmenter's work usefully supports two lines of questioning which may be relevant:
 - a) Why changes in vegetation seem to be spatially restricted?
 - b) Why changes have become particularly apparent since the mid 1980s?

Natural England does not agree that the changes are necessarily adverse. Changes are assessed by NE against the conservation objectives for the site and Broadland Fen SAC as a whole. It is not clear on the basis Dr Parmenter has made her judgement.

5.2 Dr Barendregt report

NE concurs with Dr Barendregt's views that expansion of *Sphagnum* in Middle Marsh is relatively recent and is indicative of more acid conditions at the fen surface.

There are key points of difference between NE and statements by Dr Barendregt:

- (i) Changes indicate desiccation. NE is not persuaded that an expansion of *Sphagnum* indicates drying of the site. *Sphagnum* species which have expanded are not associated in England with a tendency to drier conditions.
- (ii) As a consequence of desiccation there is an increase in nutrients as indicated by the presence of a number of species in Rose Fen and Long Fen. NE's view is that the presence of these species may have other explanations, e.g. Rose Fen - disturbance of the peat surface as a consequence of past surface lowering may well favour *Juncus effusus* and *Calamagrostis canescens*. There is no evidence of expansion or colonisation of indicators of eutrophication in other areas of Catfield Fen, as might be expected if desiccation were widespread.
- (iii) Changes are not consistent with natural succession due to the absence of other species of *Sphagnum* (not stated) and certain liverworts. NE view is that the species which have expanded are those which a) have been present in the past b) are seen in other areas of Broadland where transition mire is succeeding base-rich fen c) these are characteristic of transition mire NVC communities M5 *Carex rostrata*-*Sphagnum squarrosum* mire and W2b, the *Sphagnum* spp. sub-community of *Salix cinerea*-*Betula pubescens*-*Phragmites australis* woodland, (Rodwell, 1991), and more specifically the Broad's 'speciality' mixed-mire community described by Wheeler (1978) as the *Betulo-Dryopteridetum cristatae* and by ELP (2010) as *Dryopteris cristata*-*Sphagnum* species fen.
- (iv) Changes are adverse. Changes are assessed by NE against the conservation objectives for the site and Broadland Fen SAC as a whole. It is not clear on the basis Dr Barendregt has made this assessment.

6. Letter Owen Mountford

This letter makes the point that the changes seen indicate an influence of more acid conditions as opposed to base rich conditions especially in Middle Marsh and that a change in the relative influence of rainfall vs groundwater may be an explanation. NE agrees with this view and would add

that changes may also be due to relative influence of rainfall vs mineral influenced water (groundwater and / or water via dykes and ditches) in addition to other possible causes.

Dr Mountford calls for a moratorium on abstraction whilst investigations are undertaken and this request presumably includes the AWS public water supply. Natural England is not persuaded that there is adequate clear evidence to date indicating risk to the site to confidently and robustly advise that EA should consider an immediate moratorium on all abstraction. However specifically, in relation to this case, and in wider discussions NE has expressed the opinion that EA's Restoring Sustainable Abstraction Programme should include a comprehensive review/analysis of total abstraction and all licenses which may have an impact on Catfield Fen. In addition, it would also make sense to include other potential external influences on hydrology such as the management of water levels in the ditches and dykes.

7. Mr Harris synthesis

Comments provided here will be confined to key additional points not referred to above.

7.1 Conceptual model

Natural England broadly agrees with the conceptual model presented in Figure 1 of the synthesis. The figure supports the discussions Natural England and EA have had regarding the hydrological functioning of Catfield Fen and other sites.

7.2 Vegetation surveys

Natural England recognises limitations associated with the vegetation data available for Catfield. That notwithstanding we have a useful series of quadrat data ¹ which provides a picture of vegetation change at Catfield over time. Whilst re-recording of accurately located quadrats is valuable, the picture we have provides a picture of wider change than at changes at a spot which is also valuable.

7.3 Discussion

The generic changes described by Mr Harris following a lowering of water levels in mires resulting in peat oxygenation-decomposition-potential release in nutrients-increased influence of rainfall - vegetation change not disputed.

NE consider that the changes in *Sphagnum* abundance and frequency described at Catfield may not reflect this sequence, or necessarily, be driven by a lowering of water levels for the following reasons:

1. The changes seen at Catfield may in part / wholly reflect successional change as noted by Wheeler and Parmenter
2. Changes may also reflect an alteration in the balance of the influence of rain water to mineral-derived water, for example, a decreasing influence of floodplain derived water as noted by Parmenter and/ or the interruption of groundwater inputs through the impact of abstraction.

- ¹ Wheeler's work comparing the situation in the 1970s with 2013;
- Jo Parmenter's work comparing the situation in 1991 with 2013;
- The condition assessment by NE comparing samples from 2009 with 2013.