

Report 4. (post Appropriate assessment) to the Environment Agency 20.6.14

This report is Natural England's response to two reports provided by RSPB to the EA (May 2014) relating to the distribution and extent of *Liparis loeselii* and *Sphagnum*.

These reports do not change Natural England's advice to the EA's Appropriate Assessment for the application to renew water abstraction licenses NPS/WR 007223, NPS/WR/007224. The new evidence presented highlights the degree of change and the potential for interactions and synergistic effects between all of these drivers of change.

Key points relating to both reports

1. Both reports represent new evidence and are helpful in demonstrating the dynamic nature of the fens
2. They have shown that noticeable change appears to be rapid and very marked (similar to that in Unit 11)
3. Both reports show changes in vegetation – a loss of S24e type vegetation and an increase in *Sphagnum* - indicative of an increase in acid conditions and loss of very wet base-rich conditions at the fen surface.
4. They highlight the loss of extent of the sub-community of S24 (i.e. S24e) that requires the wettest conditions, tends to support the highest number of rare species and is an important component of the priority Annex 1 feature Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae*.
5. It is relevant to recognise that:
 - a) these units of the SSSI are notable for their turf ponds. Turf ponds are susceptible to successional change.
 - b) the loose layer of surface peat of turf ponds is buoyant which enables them to become more reliant on rainfall at the surface as the mat thickens, consolidates and becomes less transmissive of water, hence the development of *Sphagnum* boils
 - c) there have been concerns over water management for these units, although the buoyancy of the fen mat should offer some damping to changes in water levels, whatever the reason for them (whether surface water management or groundwater changes)
 - d) previous information from RSPB which was presented in NE Report 7 highlighted some changes in vascular plants which when translated to Ellenberg indices suggest the development of a lower pH and drier conditions at the fen surface.

Liparis report

6. This report highlights the national and international importance of the Ant Broads and Marshes for the fen orchid *Liparis loeselii*. This unit is exceptionally important providing habitat for 40% of the national population of this species.
7. The report gives insight into the dynamism of fens and *Liparis* itself.

8. The report couples the changes in *Liparis* distribution with that of the decrease in extent of S24e and increase in extent of *Sphagnum*.
9. In fens, *Liparis* is associated with very wet, relatively base rich conditions with pH >6.3 as provided by S24e and M9 type habitat (*Acrocladio-Caricetum*),
10. Wider evidence indicates *Liparis* is likely to need a degree of disturbance, or at least an open, low-competition environment. This is not highlighted in the reports. Certainly in south Wales where it is found in dune slack habitat, it requires some disturbance and a return to early successional conditions or it is gradually lost.
11. It appears that *Liparis* within the RSPB/BC unit is associated with turf ponds. Therefore, it is likely to be associated with a particular stage in their vegetative succession characterised in the main by base rich, very wet, low nutrient status conditions and where there is low competition between plants. Changes in *Liparis* distribution indicate a move away from these conditions.
12. It is significant to note that if the *Sphagnum* area does continue to spread into the main *Liparis* colony then *Liparis* is likely to be lost if it is unable to colonise other areas of the site because conditions are not conducive. This will clearly have a major impact on the Catfield population, and hence its UK population.

***Sphagnum* report**

13. This report confirms that the increase in *Sphagnum* noted in Mr Harris land is also occurring here. The changes in extent are remarkable, e.g. 452% increase since 1986 in Mill Marsh West.
14. Some or all (?) of this change has been at the expense of S24e recorded by Jo Parmenter in 1995. However, it is important to recognise that there may well have been gradual change before 1995 but not sufficient to lead to a re-classification of these communities.
15. It is relevant that this expansion is associated with former turf ponds where buoyant vegetation rafts have formed. This habitat type is also the location of change in Unit 11. However here, there are also changes in *Sphagnum* extent on areas of more solid peat at the fen edge closer to mineral ground.
16. The speed of change is notable. This may be indicative of a tipping point / threshold being reached in *Sphagnum* colonisation. Previous more gradual change becomes relatively more rapid due the positive feedback *Sphagnum* exerts on its own environment through the action of cation exchange. The threshold may be due to succession (leading to elevation of the fen surface) as in the case of the colonisation of former turf ponds. It may be also caused or exacerbated by other changes in fen hydrology including a greater reliance on rainfall which may result from changes to fen ground water tables due to abstraction and / or changes in fen hydrological management. Included in the complicated overlay of drivers is the potential influence of both the management (or lack of it) of fen surface hydrology and changes to vegetation management (as described by Wheeler).