PERCEPTIONS OF CHANGE AND CAUSES OF CHANGE

In general terms it seems that a surprisingly large proportion of the valley fen sites that survived the improvements of the first part of the nineteenth century remained in a quite intact condition for a century or more, mostly until after the 2nd World War. With the benefits of hindsight it is particularly exasperating that the conservationists of the sixties were able to do so little to arrest damage to nationally-important sites. However, not only was the conservational voice weaker then, but it also suffered many of the uncertainties inherited by its successors: a lack of knowledge of what operations were in hand; a lack of a co-ordinated policy to ensure that especially valuable sites were especially safeguarded; and, particularly, the difficulty of predicting the impact of, say, certain drainage operations; and of separating their apparent effects from those of natural changes, or from the separate effects of unrelated environmental change.

Without the help of a crystal ball, it is difficult to predict the future, and the ease of misjudgement is nowhere more evident than in a singularly ill-judged foreboding of Swann (1943): "Derby Fen is particularly rich in uncommon species and now that Roydon Common is drying up and thereby losing many of its botanical treasures, it will be worth trying to schedule this small area as a nature reserve." This pronouncement is notable because events have turned out in almost exactly the opposite way: Roydon Common has not been badly affected by dehydration and has lost few of its "treasures" whereas Derby Fen has been almost completely destroyed (though, arguably, this may have been avoided had it been made a nature reserve). It is not known what precipitated Swann's concern for Roydon Common. Though, whatever, it should not be concluded that his judgement was particularly poor; rather that it is difficult to foretell the future.

Dehydration of valley fens

Perhaps the most salient feature of fen ecosystems is that they are wet, but there is an astonishing lack of knowledge about the precise relationships between vegetation and hydrology in East Anglian valley fens. This is paralleled by an equal lack of information on their hydrology, or even just on their typical ranges of water level flux. Faced with such a lack of factual information, conservationists often have to rely on an anecdotal and intuitive appraisal of changing water budgets in these sites. And whilst this is a far from satisfactory approach (not least because there is sometimes an almost axiomatic assumption that fen sites must be drying-out!), there are few alternatives. It may be possible to find biological evidence indicative of dehydration, but as Wheeler & Shaw (1992) have pointed-out, there are numerous problems and uncertainties associated with this. Even seemingly-useful experimental studies (e.g. growing plants in a water gradient) are often of extremely limited value as they fail to adequately account for the complexities of "real" ecosystems. This is because the performance and survival of wetland plants in "real" vegetation is not just a function of their individual response to water levels but an outcome of their interactions with other species, which may also respond in various ways to water regimes. Moreover, the observed response of individual species to soil hydration, and the species-interactions within communities, is itself critically dependent upon other variables that may be considerably independent of water availability *per se*. Such variables include nutrient availability, presence of soil toxins (especially Fe^{2+} and S^{-}) and reduction of dominance by vegetation management.

Another complication is that perceptions of dehydration may sometimes stem from ongoing peat accumulation rather than from actual water loss. This is likely to be particularly evident at sites rich in abandoned peat pits where ongoing terrestrialisation can quite rapidly stabilise swamp or hover to form ostensibly "dry" and firm fen surfaces. A good example of this is provided by a comment made by G.H. Rocke [*in litt.* to F. Rose, 1958]. This was with reference to a Broadland side-valley site, Shallam Dyke, Thurne (but a site which in many respects could probably qualify for inclusion as a valley fen): "*Carex limosa* seems to have forsaken Thurne ... I cannot see that they have drained the bogs; but the swamps seem of their own accord to have become drier." Shallam Dyke was a site of old peat pits. From such a viewpoint it is possible to speculate that, for example, Geldhart's (1901) comments on the dry state of the Waveney-head fens may perhaps partly stem from a comparable cause. Such considerations are of great importance because they point to the likelihood that, even without an actual reduction in water tables, a strategy of rotational turf removal would be needed to maintain the perceived conservation interest of many valley fens.

Droughts are, of course, an occasional natural feature of many wetland sites. Even before current concerns about climatic change and groundwater abstraction, dry episodes in wet fen sites were well known. Drought conditions in East Anglia in the early 1920s undoubtedly had a very considerable affect upon the water supply to some fen sites. For a time even the turf ponds in the normally-wet East Ruston Common were bereft both of water and *Utricularia* species (Gurney, 1922; and *Diaries*, 1922; 1923). Yet both water and, more slowly, *Utricularia* returned. Although there is a dearth of reliable data, there are other reasons too to suppose that the majority of wetland species can accommodate short-term drought. This may be because many wetland species do not have a critical *direct* dependence upon high water tables, but rather that high water conditions indirectly help ensure their survival by helping to regulate the balance of community-composition. Certainly many (but not all) wetland plants show a remarkable long-term tolerance of dry conditions in garden cultivation as long as potential dominants (weeds) are systematically removed - an adaptive attribute which materially enhances the difficulty of using such species as bio-indicators of water conditions in fens!

The capacity of certain wetland plants to survive periods of drought, or indeed to grow occasionally in situations that are drier than usual, should not be taken as reason to minimise concern about the potential impact of present-day dehydration upon fens. For whilst there is no doubt that the drought of the early 1920s was acute both in terms of water supply to domestic wells and to some spring-fed fens, it was of only relatively short duration. Moreover, its impact on many of those fens irrigated from the Chalk aquifer may not have been all that great, even for this short period. There is, unfortunately, rather little direct information of the overall effects of the 1920 drought on the East Anglian valley fens, but the following points, derived from information published at the time, are relevant: (i) its impact upon domestic wells was principally on those shallow examples (the majority) which tapped water holding strata in the drift; (ii) the yield from deeper wells that penetrated well into the chalk was mostly not seriously affected (Sutton, 1922); (iii) water levels in spring-fed meres remained more-or-less normal (Clarke, 1922); and (iv) the fen sites from which Gurney (1922) reported severe dehydration were principally poor-fen sites that were probably irrigated mainly from a superficial drift aquifer. Thus not only was the 1920s drought of short duration, it may also have had only a superficial impact on groundwater supply to fens irrigated from the Chalk. It is therefore not at

all comparable with the long-term and pervasive effects on water supply to spring-fed fens that exist, or are threatened in consequence of borehole abstractions and groundwater development schemes.

Other causes of vegetation change

The foregoing considerations indicate some of the difficulties inherent in attempts to assess the effects of, or even the occurrence of, water level change in valley-fen sites in circumstances when no other environmental variables are changing. However, in many valley-fen sites there have also been various other concurrent, but largely unrelated, changes, the most notable of which has been dereliction. The point has already been made that formerly many, if not all, of the valley-fen sites were extensively managed. Now many of them are not, and this has undoubtedly had a major impact upon their floristic character. In general, there are few factual data available about changing management practises in these sites through the twentieth century, but those which do exist paint a similar picture - that of abandonment. Thus in Poor's Fens the twentieth century has been marked by an increasing reluctance of eligible parishioners to exercise their various rights. Turf extraction was one of the first practises to cease on anything other than a very local scale (though in some instances this may have reflected lack of peat rather than lack of interest). Grazing and cutting of sedge or reed continued for longer, but also dwindled. Today, rather few contemporary rightholders have a lively interest in harvesting fen products; even less have a couple of cows they want to graze. In some cases, Poor's Land has been let to neighbouring farmers, who have been able to make some use of the land, but more often there is a reluctance to do anything with the land. The cost-effective option of grazing is often rejected as either inconvenient or dangerous to valuable stock. In consequence many fens have been completely abandoned or, at best, used only for shooting. In some sites occasional fires have helped check scrub invasion. In some of the most valued sites, conservationists have, in relatively recent years, been able to restore abandoned management regimes, usually with substantial success - but invariably also with considerable effort. This has meant that, except for the small number of sites for which adequate resources are available, the areas managed are rarely as extensive as they once more; nor can continuity of management always be guaranteed.

There is a link between the dehydration and dereliction of fens. It is not just that lower water levels may facilitate scrub invasion (which they will), but also that the botanical repercussions of both processes are rather similar, at least in terms of the loss of may of the "more interesting" fen species. Dehydration tends to cause the loss of low-growing, shallow-rooted fen herbs and bryophytes; so also does dereliction, though there may be different time-scales - in some suitably unproductive fen sites, especially those without *Cladium*, species-diversity can be retained for considerable periods of dereliction (Shaw & Wheeler, 1991). But even in this favourable circumstance it is likely that overgrowth will eventually occur and that species typical of the open fen will be lost. This, of course, means that evidence of loss of typical fen species from valley-fen sites does not provide an unambiguous indication of dehydration (Wheeler & Shaw, 1992) and that the knee-jerk tendency to attribute all deterioration in their vegetation to this may sometimes mean that the real causal factors of change are overlooked.

An informed perspective on the perception and causes of recent vegetation change in some East Anglian valley fens has been provided by the one individual who has long familiarity with them:

"Many of the sites have sadly deteriorated, especially the Waveney-Ouse fens, due to water abstraction. On my visits to Norfolk in 1991, however, when I revisited many of the sites, I was relieved to find that the main problem in many fens involve coarse sedge, scrub and woodland growth, rather than a catastrophic water table drop, and in these cases appropriate management could relieve the situation - in some cases the situation is already improving. Scarning Fen, for example, is now as quite good as at was when I first saw it in 1956; Mr Boosey, the warden, has done wonderful work there in keeping the place mown. The water table also seems to be fairly good so far at Buxton Heath[9], Holt Lowes and Roydon Common, all spring-fed mires." [F Rose, *in litt*, 1992]

As other examples of the affects of dereliction upon what was once clearly high quality fen vegetation is, citation may be made of of Rockland All Saints Fen (Norfolk), from which F. Rose recorded species of a *Schoeno-Juncetum* community in 1960 but which was dense alder carr by 1974 when B.D. Wheeler made an abortive visit; or of Booton Fen where perhaps only clearance of some of the scrub beneath the pylon line by electricity workers prevented complete overgrowth of the small patch of *Schoeno-Juncetum* in the early 1970s; or even of managed sites such as Thelnetham West Fen where ongoing terrestrialization of former peat pits threatens to gradually eradicate some of their more notable species, despite the programme of vegetation management. The case has already been made that the present biological value of valley fen sites is partly a product of human management and exploitation. There is equally little doubt that such operations will need to be continued if this value is to be retained.

CONCLUSIONS: ASSESSMENT OF CAUSES OF VEGETATION CHANGE

There are generally rather few hard data available upon the causes of vegetation change in East Anglian valley fens, and sometimes rather few even upon the occurrence of vegetation change. Evidence of changes in individual sites has been marshalled in the dossiers that accompany this report and is usually far from complete. It varies in character from factual observations (e.g. that a drain has been dug or deepened) to more casual perceptions (e.g. that a site is thought to be drying out, or the vegetation is thought to be gradually going down-hill). The value of the more casual perceptions depends very much on the personnel involved. Individuals who have an intimate knowledge of sites and who have visited them regularly and over a long period are generally likely to make more accurate assessments of changes within them than are those who have only casual and short-term acquaintance with the sites. And there is no doubt that different individuals can have strikingly different perceptions of the same site. This is, perhaps, nowhere better illustrated than in some of the English Nature "Site Integrity Monitoring Reports" when reports from the same site for successive years vacillate between (say) "site in quite good condition" to "site in urgent need of management", in circumstances which lead one to suspect that the only real change to have occurred is the identity of the observer! Given different backgrounds and different insights, such differences of viewpoint are only to be expected, but they scarcely assist in the development of a consistent perspective of change.

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9 Some other observers report evidence of dehydration at Buxton Heath

Although the data assembled for the site dossiers are invariably incomplete, and sometimes unreliable or contradictory, it has been felt worthwhile to try to marshal the information available for individual sites and to interpret it in terms of perceived changes and causes of change (Table 3). It must be emphasised that this attempted synthesis is offered as a tentative suggestion, not as a statement of fact. The compilers are all to well aware of the limitations of their database - that hard data are usually notable by their absence; that some observations have not always been made in a systematic or rigorous way; that many opinions are subjective and occasionally inaccurate or contradictory. In attempting to assess the changes that have taken place and their possible causes, the compilers have paid particular attention to (i) factual data, where available; (ii) consistent comments made by a variety of observers; (iii) the observations and opinions of individuals who have a particularly thorough knowledge of some of the sites; and (iv) observations the compilers have themselves made at individual sites. Nonetheless, Table 3 is ultimately based on the subjective judgement and interpretation of the compilers who, working with incomplete material, may sometimes have come to erroneous conclusions.

The information marshalled in Table 3 suggests that the vast majority of sites have shown a deterioration in floristic composition, as determined by the loss of the less common fen species, and particularly by the loss of those that are typically associated with consistently wet conditions (Wheeler & Shaw, 1992). A few sites are not marked as having evidence of appreciable floristic change - but even in these sites it is likely that there has been some reduction in at least the abundance of species, or of the diversity of the vegetation. [Or they are sites which, as far as is known, have long sustained an impoverished vegetation.]

Many of the sites which have shown a deteriorating flora show evidence of dehydration. In some, but by no means all cases, this may be related to groundwater abstraction; in others to deepening of adjoining drains and watercourses. In some cases, for example the Gaywood valley fens, the dehydration is of some long standing; in others, more recent. Note, however, that the incidence of very recent fen dehydration induced by either drainage or abstraction is possibly strongly underestimated. This is because any recent effects of an artificial lowering of the fen water-tables may not yet have been recorded and, moreover, are likely to be obscured by the effects of the concurrent drought.

Many of the sites also show evidence of dereliction, in some cases so deep-seated that former herbaceous communities have been almost entirely replaced by fen woodland. Indeed, Table 3 suggests that more sites may have suffered dereliction than dehydration - though this may simply be because in most fen sites it is much easier at the present time to see the obvious effects of dereliction than it is to know whether there has been a sensible change in the water regime.

In many sites there is evidence that both dereliction and dehydration have occurred. Given the present state of poor knowledge of the relative magnitude of these processes within the fens, or of their exact floristic repercussions, it is unrealistic to speculate on their relative importance. Perhaps it may just be remarked that there is evidence that severe floristic loss can be both a direct consequence of dehydration without a significant contribution from dereliction (as at Redgrave & Lopham Fens) and of dereliction in the absence of substantial dehydration (as appears to be found at Whitwell

Common, Norfolk). Acting in combination, one may expect the effects of both processes to be additive or perhaps even synergistic.

It is clear that it cannot be assumed that all valley fens in East Anglia are drying out. Nor is dehydration the only cause of deterioration of the vegetation. However, high water tables are undoubtedly associated with high vegetation quality in valley fens and it is notable that the fens which F Rose (quoted above) thought were not suffering from water loss are all examples which have shown relatively little floristic deterioration. It is likewise clear from data from East Anglia and from other parts of Britain, that where the water level is substantially or consistently lowered in valley fens it is likely to have a profound effect upon vegetation composition, and particularly upon the character of the community-type for which these sites are most prized, the *Schoeno-Juncetum subnodulosi* (Shaw & Wheeler, 1991). Thus although lack of water table data and lack of experimental evidence on vegetation-hydrological interactions may mean that there is little conclusive *proof* that valley fens in East Anglia have been adversely affected by dehydration, the *balance of probability of the evidence* is that, for some sites at least, and possibly for many, dehydration has been, or threatens to be, a major threat to their botanical value. And as good examples of wet, low productivity, base-rich valley fens are now rare not just in Britain but in most of the lowlands of Europe, this is a cause for very considerable concern. It is not difficult to identify an urgent need for more action, as well as more study, in this area.

Equally, however, there seems to be little point, and even less natural justice, in complaining about dehydration or even attempting to rectify its effects, if sites are also allowed to deteriorate for quite separate reasons, most notably through lack of management. The example of Thriplow Meadows (Cambridge) is salutary. These fen meadows provided the location for some formative field management experiments in the 1960s (Crompton & Hepburn, 1972). The experiments were important (a) because comparable examples were, at that time, very few and far between; and (b) because they demonstrated very clearly that on-going management (in this case, particularly grazing) was needed to maintain the character of the fen meadow vegetation, as well as the population-size of some target species (in this case *Dactylorhiza* spp.). Yet despite these clear results, effective management at the Thriplow site ceased from 1968 onwards, apparently because of practical constraints, and the vegetation quality deteriorated. To exacerbate these difficulties, there has also been concern for dehydration at this site, a process which may have added injury to insult. However, rather exceptionally, a sophisticated water sub-irrigation scheme was proposed to mitigate the affects of summer drought and this was installed in 1983. But despite this, the site remained unmanaged until 1989 - though as the subirrigation scheme seems to not to have been used until 1991 (or monitored) it may be the case that the continued lack of management has been of little consequence!

The necessity of vegetation management to maintain the character of seral communities, such the herbaceous vegetation of valley fens, is nowadays generally recognised by conservationists. Their dilemma is that it is often also expensive, or simply just difficult to arrange. In consequence vegetation management (or any other management) is often not carried either as widely or as frequently as might be desired.

The information collected for the valley-fen dossiers clearly demonstrates that whilst dehydration can cause, and has caused, damage to some valuable valley-fen sites, the lack of vegetation management in some situations has led to a comparable deterioration of flora. Both

problems need to be addressed, though, given the scale of the problem, any such proactive policy for effective conservation management of these sites is likely to have very considerable resource implications. But the evidence accumulated in the valley-fen dossiers is clear - without such intervention and support, the remains of an internationally-important series of valley fen ecosystems will have a most precarious future.

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TABLE 1: The occurrence of selected fen vegetation-types within different hydromorphological categories of fen.

Data are based on a survey of fens throughout lowland Britain (Shaw & Wheeler, 1991) but only community-types that occur in East Anglian valley fens are included. The entries for community-types which have exceptionally high conservational importance in valley fens are emboldened.

Hydromorphological categories are:

SF Spring fen
VF valley fen
BF basin fen
OWT open water transition
FPF flood plain fen

	SF/VF %	BF %	OWT %	FPF %
M13: *Schoenus nigricans* - *Juncus subnodulosus* mire	**95**	**4**	**0**	**0**
M22: *Juncus subnodulosus* - *Cirsium pal.* fen meadow	85	6	2	8
M21: *Narthecium ossifragum* - *Sphag. pap.* valley mire	**81**	**8**	**2**	**4**
M24: *Molinia caerulea* - *Cirs. diss.*fen meadow	**77**	**6**	**0**	**17**
M6: *Carex echinata* - *Sphag. recurvum/auric.* mire	**70**	**15**	**3**	**5**
M15: *Scirpus cespitosus* - *Erica tetralix* wet heath	50	10	5	5
M27: *Filipendula ulmaria* - *Angelica sylvestris* mire	50	0	13	38
S25: *Phragmites australis* - *Eupatorium cannab.* fen	35	9	9	47
Cladio - *Molinietum*	34	10	0	48
M9: *Carex rostrata* - *Calliergon cuspidatum* mire	**18**	**62**	**10**	**7**
S26: *Phragmites australis* - *Urtica dioica* fen	17	17	0	67
M4: *Carex rostrata* - *Sphagnum recurvum* mire	16	45	24	11
M5: *Carex rostrata* - *Sphagnum squarrosum* mire	12	45	25	14
S27: *Carex rostrata* - *Potentilla palustris* fen	11	29	16	35
S4: *Phragmites australis* swamp & reed-beds	8	31	23	39
S24: *Phragmites australis* - *Peucedanum pal.* fen	3	3	15	79

TABLE 2. **List of East Anglian valley fen sites for which vegetation dossiers have been prepared.**

The title name of sites for which dossiers have been prepared is indicated in bold type. This normally corresponds to the SSSI name, where applicable.

Some of the sites are known by more than one name, or contain more than one named fen area. This is particularly in the case of some of the larger or composite SSSIs which include several areas of fen. Similarly when information on fenny areas adjoining or close to a main site is available, this is usually encompassed in the dossier of the main site. [This is, for example, often the case when there are "Grassland Survey" data from fenny meadows peripheral to an SSSI.] This table indicates the additional names of sites that have been thus included in this survey, and the dossiers in which information about them is contained.

Suffolk **Vice-Counties 25 and 26**

Ashby Warren and Fritton Decoy
Belton Bog (Fen and Common)
Bixley Heath
Blo' Norton & Thelnetham Fens
Buggs Hole, Thelnetham
Cavenham - Icklingham Heaths (Including, Cavenham Poor's Fen, Icklingham Poor's Fen, Tuddenham Turf Fen and Tuddenham Heath)
Cavenham Poor's Fen (see Cavenham - Icklingham Heaths)
Confluence Meadow, Newbourn
Cornard Mere
Eriswell Lode Fen (see Hurst Fen and Howlett Hills)
Flempton Meadow
Fritton Decoy (Bogs) (see Ashby Warren & Fritton Decoy)
Gromford Meadow, Snape
Hill House Meadows, Flempton
Hinderclay Fen
Hopton Fen
Hurst Fen & Howlett Hills (Eriswell Lode Fen)
Icklingham Poor's Fen (see Cavenham - Icklingham Heaths)
Lound Bogs
Melton Meadow
Moorhouse Farm Meadow, Boxted
Newbourn Springs (Pit And Wood)
Pakenham Fen (Meadows)
Pashford Poor's Fen
Redgrave & Lopham Fens
Thelnetham Fens (see Blo' Norton and Thelnetham Fens)
Tuddenham Heath (see Cavenham - Icklingham Heaths)
Tuddenham Turf Fen (see Cavenham - Icklingham Heaths)
Wangford Fen (see Pashford Poor's Fen)
Weston Fen

Aslacton Parish Land (Bunwell Common)
Barnham Broom Fen (Runhall Common) (*see also Coston Fen*)
Beeston Bog (see Sheringham & Beeston Commons)
Beetley & Hoe Meadows
Booton Common
Bressingham Fen
Briston Common
Brock's Watering
Bryant's Heath
Bunwell Common (see Aslacton Parish Land)
Buxton Heath
Cawston & Marsham Heaths
Coston Fen (*see also Barnham Broom Fen*)
Coston Meadow (see Barnham Broon Fen)
Craymere Beck Meadow, Briston (see Briston Common)
Crostwick Marsh and Crostwick Common
Decoy Carr, Acle
Ducan's Marsh, Claxton
East Ruston Common
Ellingham Fen
Felthorpe Bogs
Felthorpe, Cushions Common
Flordon Common
Forncett Meadows (Forncett St Peter)
Forncett St Mary: Spring Lane Meadow
Guist Common
Hall Farm Fen (Hemsby Common)
Hapton Common
Hemsby Common (see Hall Farm Fen)
Holt Lowes
Hopes Farm Meadows
Houghen Plantation (see Felthorpe Bogs)
Kings Fen, East Ruston (see East Ruston Common)
Lopham Fens (see Redgrave & Lopham Fens, Suffolk)
Mautby
Mill Lane Meadow, Briston (see Briston Common)
Mown Fen, East Ruston (see East Ruston Common)
North Elmham Turf Common
Old Buckenham Fen
Old Carr Meadow (Holly Farm Meadow)
Ormesby Common
Roydon Fen (Diss)
Runhall Common (see Barnham Broom Fen)
Runton Common
Shelfanger Meadows
Sheringham & Beeston Regis Commons (Beeston Bog)
Shotesham Common
Smallburgh Fen
Southrepps Common
Spout Common, Holt
St Faiths Bogs
Swannington Upgate Common
Thwaite Common
White House Meadows (see Barnham Broon Fen)
Whitwell Common

All Saints Meadow (see Helhoughton Common)
Attleborough Poors' Fen (see Swangey Fen)
Badley Moor
Banham Great Fen (see Kenninghall & Banham Fens)
Binham
Binham Sewage Works Meadow (see Binham)
Blo' Norton Fen (See Blo' Norton & Thelnetham Fens, Suffolk)
Borough Fen, Foulden
Boughton Fen
Broomsthorpe Meadow (see Helhoughton Common)
Button Fen, Marham (see Marham Fens)
Caldecote Fen (Oxburgh Fuel Allotment)
Carbrooke Fen
Caudle Common (and Springs)
Castle Acre Common
Chalk Farm Meadows, Litcham
Cockley Cley Meadows
Cranberry Rough (Hockham Fen)
Dereham Rush Meadow
Derby Fen (see Leziate, Sugar & Derby Fens)
Dersingham Bog
Dersingham Meadows (see Dersingham Bog)
East Harling Common
East Walton Common
East Winch Common
Foulden Common (and Gooderstone Common)
Foulden: Beckett End Meadow
Garboldisham Old Fen
Gooderstone Common (see Foulden Common)
Great Cressingham Fen
Helhoughton Common
Hockham Fen (Mere) (see Cranberry Rough)
Holly Farm Meadows (see Wendling Poor's Land)
Hotherils Common (see Thompson Common)
Houghton Springs
Kenninghall & Banham Fens
Kettlestone Fen
Lamb's Common, East Walton
Leziate, Sugar & Derby Fens
Little Cressingham Fen
Little Ryburgh Common (see Kettlestone Fen)
Lopham Fens (see Redgrave & Lopham Fens, Suffolk)
Manor Farm Meadow, Binham (see Binham)
Marham East Fen (see Marham Fens)
Marham Fens
Middle Harling Fen
Oxborough Fen (Caldecot Valley)
Oxborough Fuel Allotment (see Caldecote Fen)
Pensthorpe Hall Meadow (see Kettlestone Fen)
Potters Fen, East Dereham (see Scarning & Potters Fen)
Pynkney Meadow (see Helhoughton Common)
Rockland All Saints Fen
Roydon Common
Saham Fen
Sandringham Warren (see Dersingham Bog)
Scarning & Potters Fen

Scoulton Mere (and "Heath")
Sculthorpe Moor
Sea Mere
Sugar Fen (see Leziate, Sugar & Derby Fens)
Swangey Fen (Attleborough Poor's Fen)
Tallant's Fen (or Common) (see Foulden Common)
Thompson Common
Thompson Carr, Thompson Meadow and Thompson Water (see Thompson Common)
Wendling Poor's Land (Holly Farm Meadows)
Whin Carr Meadow (see Helhoughton Common)
Woolferton Fen (Bog) (see Dersingham Bog)

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Chippenham Fen
Dernford Fen
Fowlmere Watercress Beds
Gamlingay Bogs
Gamlingay Meadow (see Gamlingay Bogs)
Meadow Banks, Gamlingay (see Gamlingay Bogs)
Sawston Hall Meadows
Shepreth Moor (L-Moor)
Snailwell Meadows
Snailwell Poor's Fen (see Chippenham Fen)
Thriplow Meadows
Thriplow Peat Holes

TABLE 3. **Summary table of apparent changes in floristic composition and other features in valley fen sites in East Anglia.**

Note that in most cases the evidence for change, and the magnitude of this, rests upon a subjective interpretation of an incomplete data set. This table must therefore be regarded as provisional. Some sites for which little information is available are not included.

Flora

This assesses the magnitude of change in *herbaceous fen vegetation* composition from a former state, *not the present condition.* [Thus some sites with no evidence of change may be species poor; consequently some sites that have shown a ### change may still be of greater value than such low-grade sites that have shown no change.] Unlike the other variable this is assessed on a 4-point scale: # some species loss; ## several species lost; ### very substantial loss of species; #### original vegetation largely or completely lost. Note that the assessment of change takes cognizance of (a) loss of species from site; (b) reduction in abundance of species at site; and (c) reduction in area of 'valued' vegetation-types.

Other variables

The magnitude of the apparent effects of other variables upon the sites has been estimated on a 3-point scale: # (minor) → ### (major)

Dehyd: This assesses evidence for site dehydration, in relation either to:

Drains: adjoining ditches and watercourses and to

Abstr: reduction of groundwater supply

Derel: This assesses evidence for dereliction of vegetation (lack of management) as expressed by:

Therb: expansion of tall, herbaceous fen vegetation and:

Scrub: encroachment of woody species

Note that entries are given for dereliction for some sites that are currently managed. This applies either when substantial areas of the site remain unmanaged or when substantial dereliction has occurred prior to recent management initiatives.

Turbry: This indicates the known occurrence of peat cutting at the site; it is recorded only in terms of occurrence with no attempt at semi-quantification. Its significance relates to the possibility of autogenic terrestrialization and concomitant species change of abandoned peat pits.

Reclam: This refers to partial or complete reclamation of the site. Note that it applies only to land within, or thought to have been within, the identifiable unit of the site from which species records have been made. It does not consider reclamation of land adjoining the site, but reclamation may not specifically refer to the fen area within complex sites. Reclamation includes:

Agric: agriculture (other than traditional management); or

Forest: afforestation of part or all of the site (usually with conifers or poplars). [It does not include the occurrence of long-standing osier beds within parts of the sites.]

Other This includes:

Tips: this relates to organised rubbish tips on part of the site. It does not include fly-tipping of rubbish

Flood: This refers to inundation of the site by deliberate flooding.

The magnitude of these effects are expressed on a 3-point scale by font modifications as: minor, <u>medium</u>, **major**.

? alone: uncertain but possible; ? preceded by #: uncertain but probable

EAST NORFOLK

Site	Flora	Dehyd	Drains	Abstr	Derel	Therb	Scrub	Turbry	Reclam	Other
Aslacton Parish Land	#(#?)	##	#	##?	#	#	#			
Barnham Broom Fen	###	##	#		###	###	#	√	agric	enriched?
Beeston Bog						#	#			
Beetley & Hoe Meadows							#			
Booton Common	#	#	#	#?	##	#	##	√?		
Bressingham Fen	####		###					√		
Briston Common	##	#?					##	√?		
Brock's Watering			#			#				
Bryant's Heath	###	#?			##	#	##	?		
Buxton Heath	##	#?		#?	#		##	√	fires / Sphag pulling	
Cawston & Marsham Heaths									agr/for	
Coston Fen	?									
Crostwick Marsh	##	##	#?	#?						
Decoy Carr	###	##?	##?		##	#	##	√		
Ducan's Marsh	#	#		#	##	##	#	√	agric	
East Ruston Common	####	###	#	###	###	##	##	√		tip
Felthorpe Bogs	####	###?	###?		###			√	forest	
Flordon Common	#	#	#					?	agric	
Forncett Meadows	?				##	##	#			
Guist Common	?				##	##	#	√		
Hall Farm Fen	?	#		#?	#					herbicides
Hapton Common	?	?			##	##				
Holt Lowes	#				##	##	##			
Lopham Fens	###	###	##	##	##	#	##	√		
Mautby	####	???			?				???	
Old Buckenham Fen	##	##	##		##	##	##	√	agric	
Ormesby Common	####									
Roydon Fen (Diss)	###	##	##?	##?	##	##	##	√	agric	
Runton Common	?									
Shotesham Common	?	##		##	#	#	#			
Smallburgh Fen	#	##?		##?	##	#	##			
Southrepps Common					##	#	#			
Spout Common					#	#				
St Faiths Bogs	####							√	forest?	
Swannington Upgate	###	#(#?)	#		###	##	##	√?		
Thwaite Common	?				#	#				
Whitwell Common	###		#		###	###	##	√?		

WEST NORFOLK

Site	Flora	Dehyd	Drains	Abstr	Derel	Therb	Scrub	Turbry	Reclam	Other
Badley Moor	?	?			#	#		?		
Binham					#	#				
Blo' Norton Fen	###	?	?	?	###	#	###	√		
Borough Fen	###?	##?						√		
Boughton Fen	?	#	#		###	###				
Caldecote Fen	####	##	##		###		###	√		
Carbrooke Fen	####	###?	###?		##?				agric?	
Caudle Common									agric	herbicide?
Castle Acre Common		#?	#?		#	#				
Cranberry Rough	#				###	#	###	√	forest	inundation
Derby Fen	####	##	#					√?	agric	
Dersingham Bog	#	#?	#		###		#	√	bypass	Sphag pulling
East Harling Common		?	#		##	#	##	√?		
East Walton Common	#	##		##?						
East Winch Common	##	#?	#?	#?	##	#	#			fires
Foulden Common	#	#		?	#		#			
Garboldisham Old	###	##	?		#	#		√		
Great Cressingham Fen		#		#?	#	#	#	√		
Helhoughton Common					#					
Houghton Springs					##	##				
Kenninghall Fen	##	#	#		#	#	#	√		
Kettlestone Fen	###	?			##	##		√		disturbed
Lamb's Common	###				###	#	#			
Leziate Fen	###	##	##		##		#	√	agric	
Little Cressingham	####	###?	###?		###	###				
Marham Fens	####	###	###		##		##	√	agric	
Middle Harling Fen	#	###		###?	#	#	#	?		
North Elmham Turf Comm								√		over -grazed?
Oxborough Fen	####	###	###						agric	
Rockland All Saints Fen	####	?			###		###	√		
Roydon Common					#	#	#	√	agric	
Saham Fen	####	###	###					?	agric	
Scarning Fen					#	#	#	√?	housing	by-pass
Scoulton Mere	##	##		##?	#	#			forest	
Sculthorpe Moor	###?				###	##	#		forest	
Sea Mere	?	#	#		##		#	√	agric	
Sugar Fen	###	##	##		###		###	√		
Swangey Fen	##	##	##	?	##	##	##	√	agric	
Thompson Common		#?	#		##		##			tip
Wendling Poors Land	?	##		?	#	#	#	√		

SUFFOLK

Site	Flora	Dehyd	Drains	Abstr	Derel	Therb	Scrub	Turbry	Reclam	Other
Ashby Warren	####	##?	##?		#		#		forest	
Belton Bog & Common	###	#?	#?		###		##	√?		
Bixley Heath	#				##?	##?	#?	?		pollution?
Buggs Hole	?		#					?	imprv	enriched?
Cavenham Poors Fen	###	##	##		###	##	##	√		
Cornard Mere	###?	###	#	##?	##	##	#	seral	ag/for	
Gromford Meadow	#	#?			##	##				
Hinderclay Fen	####	###	###	##?	###	##	###	√		
Hopton Fen	##	##	##	#?	##	##	##	√		
Hurst Fen	####	###	###	?	###	##	###	√		
Icklingham Poors Fen	###	##	##	?	###	###	##	√		
Lound Bogs	####							√?		Flooded
Newbourn Springs	#?	?	#		###	##	##			
Pakenham Fen	###	###	###						agric	
Pashford Poors Fen	####	###	###	##	##	##	##	√		
Redgrave & Lopham Fens	###	###	##	###	##	##	##	√		
Thelnetham Old Fen	####	##	##	#?	###	##	###	√?		
Thelnetham West Fen	#(#?)	#?	#?	#?	##	#	#	√		
Tuddenham Heath	##	?		?	##		##			
Tuddenham Turf Fen[1]	####	##	##	?	###	###	###	√		
Weston Fen	#				##			√		

CAMBRIDGE

Site	Flora	Dehyd	Drains	Abstr	Derel	Therb	Scrub	Turbry	Reclam	Other
Chippenham Fen	#	##		##	#	#	#	√	forest	
Dernford Fen	##?	#	?	?	##	##	##	√	indust	
Fowlmere	##	#		#?	##	##	#	√?		water-cress
Gamlingay Bogs	####	###			#			√	agr/for	pigs
Sawston Hall Meadows	#?	#	?	?	##	##	#			
Shepreth Moor	##	?			##	#	#			
Snailwell Meadows	?	?		?	#	#				
Thriplow Meadows	#	##		##	##	###	#		agric	
Thriplow Peat Holes	####	##	##		###		###	√	agr/for	

1 this assumes that Tuddenham Turf Fen is the location for numerous former records of fen species from "Tuddenham"