10.S24 (Phragmites australis-Peucedanum palustre) Tall-herb Fen

10.1 Context

Examples of the S24 community have been included within the 'Chalk-rich Fen Dominated by Saw Sedge' (Ref H6410) SAC feature (although note that not all stands of S24 necessarily support *Cladium mariscus*).

10.1.1 Floristic Composition

Tall herbaceous fen community with monocotyledons, notably *Phragmites australis* and *Cladium mariscus*, providing the major structural component. Variable in composition (NVC: range = 14–39 spp per sample (Rodwell, 1995)) with a wide range of associated tall forbs e.g. *Lysimachia vulgaris, Eupatorium cannabinum* and *Filipendula ulmaria*. The community is given cohesiveness by the recurrence of such species as *Calamagrostis canescens, Carex elata, Peucedanum palustre* and *Thelypteris palustris*. The community supports several rare species, and other infrequent fen species. It is the main community supporting *Peucedanum palustre*, the food plant of the rare swallow-tail butterfly.

Rodwell (1995) recognises six sub-communities of S24: *Carex paniculata* sub-community (S24a); *Glyceria maxima* sub-community (S24b); *Symphytum officinalis* (S24c); typical subcommunity (S24d); *Cicuta virosa* sub-community (S24e), *Schoenus nigricans* sub-community (S24f).

10.1.2 Distribution

The S24 community is very localised and primarily based in Broadland (where it is widespread and quite extensive), with outliers in a few other East Anglian sites (such as Cranberry Rough and Swangey Fen). It also occurs at Wicken Fen, though in a form which is close to M24, and impoverished examples can be found at Woodwalton Fen. The community occurs fragmentarily in the Somerset Levels and rather similar species assemblages occur in various other places (e.g. Crymlyn Bog, Wales) though their taxonomic relationship to S24 remains to be clarified.

The distribution of the community is shown in Figure 10.1.

10.1.3 Landscape Situation and Topography

The majority of examples occur in floodplain situations - they form the main herbaceous vegetation over much of the Broadland fens. Some variants occur in basin and valley head situations.

10.1.4 Substratum

S24 usually occurs on solid fen peat or else on a semi-floating turf pond infill over fen peat.

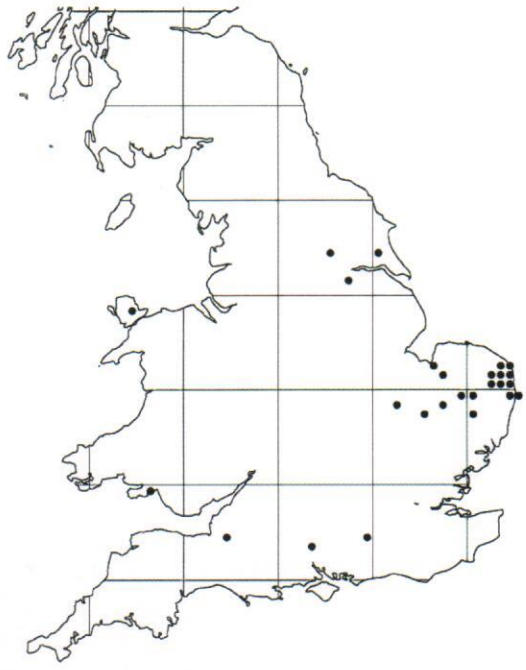

Figure 10.1 Distribution of S24 in England and Wales (from FenBASE database)

10.2 Supply Mechanism and Conceptual Model

The majority of stands of S24 appear to be surface-water fed, primarily through periodic river flooding. However, the community also occurs where similar conditions are created by groundwater inputs (e.g. East Ruston Common and Upton Fen). In some other cases (e.g. Sutton Broad, Swangey Fen) some groundwater contribution is suspected but is not known. In some sites (e.g. Wicken Fen) the surface of the peat appears now to be fed just by precipitation, creating the paradox of an 'ombrotrophic fen' in which the base-rich peat can be prone to surface acidification.

Wheeler & Shaw (2001) identified 'Wetmecs' 4, 5, 6 and 7 as supporting S24. The two main types are illustrated schematically in Figure 10.2: "Surface Water Percolation Floodplains" (Type 6, e.g. Sutton Broad (6a), Catfield Fen (6b), Cranberry Rough (6d)) and "Summer 'dry' Floodplains" (Type 7, e.g. Wheatfen, Strumpshaw, Catfield Fen).

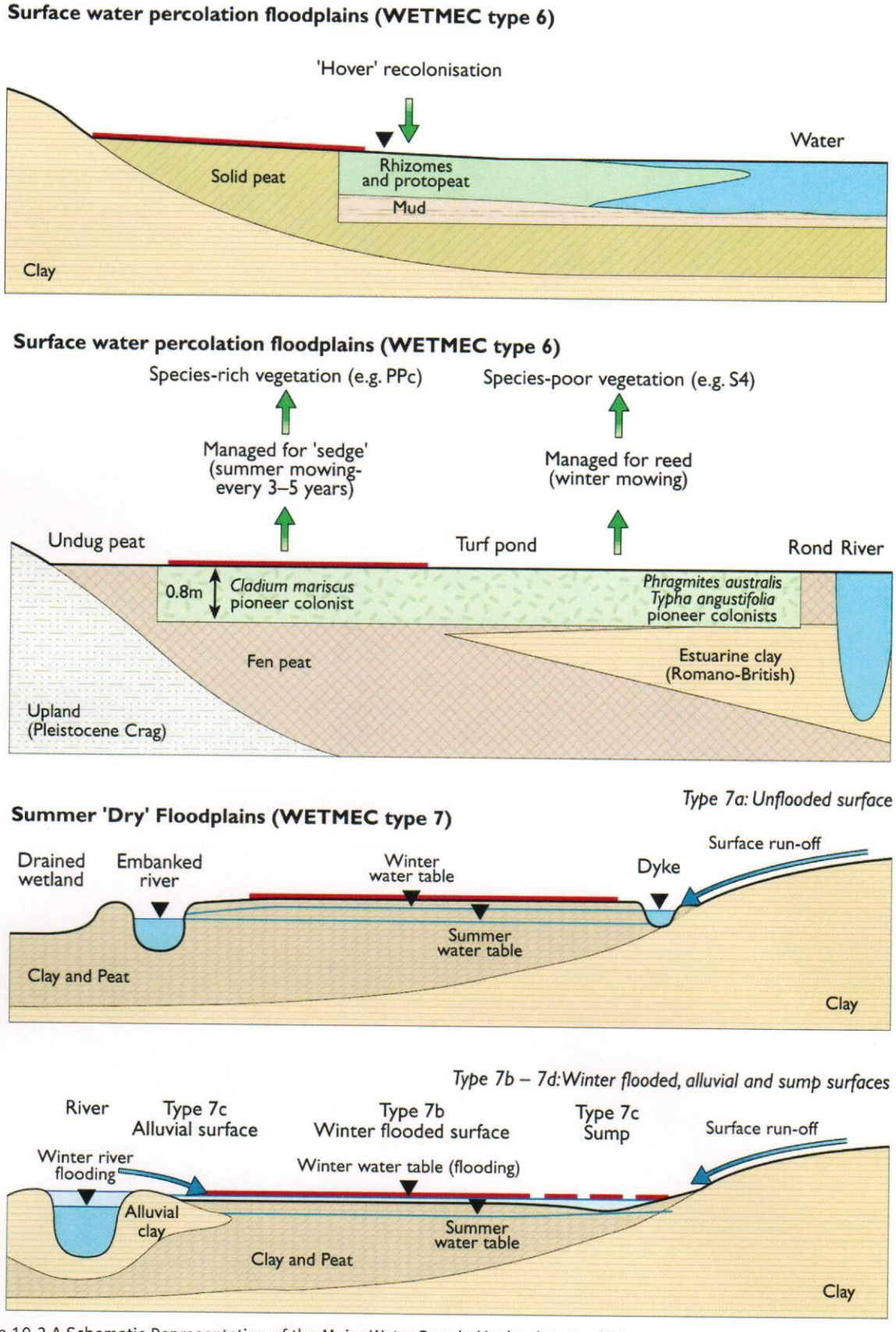

Figure 10.2 A Schematic Representation of the Major Water Supply Mechanisms to S24

10.3 Regimes

10.3.1 Water

S24 is a highly variable vegetation type and it can be difficult to untangle the significance of water regime to vegetation composition from the influence of other factors such as management and substratum fertility. Mean values for summer water table measured in stands of S24 in eastern England (Wheeler & Shaw, 2001) are given in Table 10.1.

Table 10.1 Mean Summer Water Table for S24 Stands in East Anglia

Variable	N	Mean	ŶSD	Min	Max
Mean Summer Water Table (cm)	30	-16.70	20.11	-78.40	+3.80

It is also clear that different sub-communities tend to be associated with rather different sets of conditions (See Table 10.2).

Those sub-communities particularly associated with 'solid' peat tend to have the lowest mean summer water tables. Considering all stands of S24, the mean summer water table associated with examples in reflooded peat workings was -9.1 cm, whilst that of examples on 'solid' peat was -23.3 cm. The low water tables associated with 'solid' peat may reflect constraints of recharge from surface water during the main growing period.

Specific time-series data for stands of S24 are not available. It is therefore not possible to specify precise water regimes, or tolerance to change, but the following comments can be made:

Optimal Water Levels

- The summer water level is typically around 15 cm bgl. However, relatively deep subsurface water table in the summer may be a perfectly natural feature of some sites. It is often difficult to know to what extent 'summer-dry' stands are natural or represent remnants of formerly wetter S24;
- The sub-community most often associated with a water table at or near the surface all year round (S24e) on average supports the greatest number of rare species (see table above). These tend to occur on semi-floating rafts on infilled turf pond. However, stands of the 'drier' sub-communities may still support a good number of rare species where soil fertility is relatively low and the vegetation is properly managed;
- Winter inundation is a natural feature of many S24 stands. The normal range of winter water tables is probably of little importance, except when associated with prolonged spring inundation, which may reduce species diversity.

Suboptimal or Damaging Water Levels

- Strongly subsurface winter and summer water tables are outside of the normal range of this community. It can be speculated that this will lead to a loss of wetland species and increased representation by 'dryland' species. Peat drying and degradation would lead to development of rank fen rapidly becoming wooded without management;
- Very wet sites with widespread summer inundation are likely to be less species rich than those where the summer water table is sub-surface;
- Winter inundation is a natural feature of many S24 stands. However, deep inundation in the spring or summer months is likely to kill some species and lead to development of less diverse swamp communities.

10.3.2 Nutrients/Hydrochemistry

Typically base rich and, particularly where subject to periodic river flooding, conditions are generally mesotrophic - eutrophic. In Broadland, more fertile

Table 10.2 Mean Summer Water Table for Sub-Communities of S24

Sub-Community of S24	n	Total spp (spp 4 m^{-2})	Rare spp (mean) (spp 4 m^{-2})	Rare spp (max) (spp 4 m^{-2})	Water Table (cm)	% in Wet Peat Cutting
S24b *Glyceria maxima*	14	26.2	3.1	6	-26.1	21%
S24c *Symphytum officinalis*	15	27.4	4	7	-47.5	0%
S24d Typical	34	21.3	3.9	6	-14.3	61%
S24e *Cicuta virosa*	24	25.1	5.4	10	-3.4	100%
S24f *Schoenus nigricans*	22	22.1	4.7	9	-14.5	45%

Table 10.3 pH, Conductivity and Substratum Fertility Measured in Stands of S24 in Eastern England

	n	Mean	ŶSD	Min	Max
Soil pH	15	7.17	0.40	6.20	7.52
Water pH	31	6.46	0.37	5.46	7.00
Water Conductivity (µS cm-1)	28	1896.39	1680.08	451.00	5354.00
Soil Fertility1 (mg phytometer)	30	16.63	9.07	5.00	37.00

examples tend to be found in the Yare valley, whilst less fertile examples occur in the northern valleys. Figures for pH, conductivity and substratum fertility measured in stands of S24 in eastern England are presented in Table 10.3, taken from Wheeler & Shaw (2001).

Wheeler & Shaw (1991) report a mean increment (April - September) in dry weight of above ground standing crop of 681 g dry wt m-2 (range: 381–1097 g. dry wt m-2).

Different sub-communities tend to be associated with rather different fertilities, which appears to have some relationship with species richness. Measurements in sub-communities of S24 in eastern England are presented in Table 10.4, taken from Wheeler & Shaw (2001).

10.3.3 Management

S24 appears to be a completely 'artificial' vegetation-type, derived either by the clearance of carr or the management of drained swamp. Where appropriate stratigraphical data are available, it is clear that the fens where it occurs have been occupied by fen woodland for much of the post-glacial period.

Management is essential to maintain species richness, and is principally by mowing for marsh 'litter', and harvesting reed and sedge for thatching. The timing and frequency of management can profoundly influence vegetation composition, for example, winter floods can significantly inhibit regrowth if *Cladium* is mown too late in the year and cut stems are submerged. Abandonment of traditional marsh crop harvesting has lead to problems of scrub encroachment across large areas of Broadland.

10.4 Implications for Decision Making

10.4.1 Vulnerability

The principal vulnerability is to scrub encroachment through dereliction of traditional vegetation management practices, although the degree to which this has a significant botanical effect depends upon the sub-community type. The wide range of habitat conditions associated with S24 makes it difficult to assess vulnerability to drying and eutrophication. Figure 10.3 outlines some of the possible impacts of changes to the stand environment.

Table 10.4 Species Rarity and Substratum Fertility Measured in Stands of S24 in Eastern England

Sub-Community of S24	n	Total spp (spp 4 m-2)	Rare spp (mean) (spp 4 m-2)	Rare spp (max) (spp 4 m-2)	Fertility (mg phyto-meter)[11]
S24b *Glyceria maxima*	14	26.2	3.1	6	23.7
S24c *Symphytum officinalis*	15	27.4	4	7	9.5
S24d Typical	34	21.3	3.9	6	20.6
S24e *Cicuta virosa*	24	25.1	5.4	10	13.5
S24f *Schoenus nigricans*	22	22.1	4.7	9	7

11 (Experience has shown that N and P data derived from soil analysis has only limited use in assessing fertility of wetlands. Consequently the technique of Phytometry (measuring the biomass of test species (Phytometers) grown on soil samples) was developed. Typical phytometer yields (dry wt.); Low fertility = ‹8 mg, High fertility›18mg.

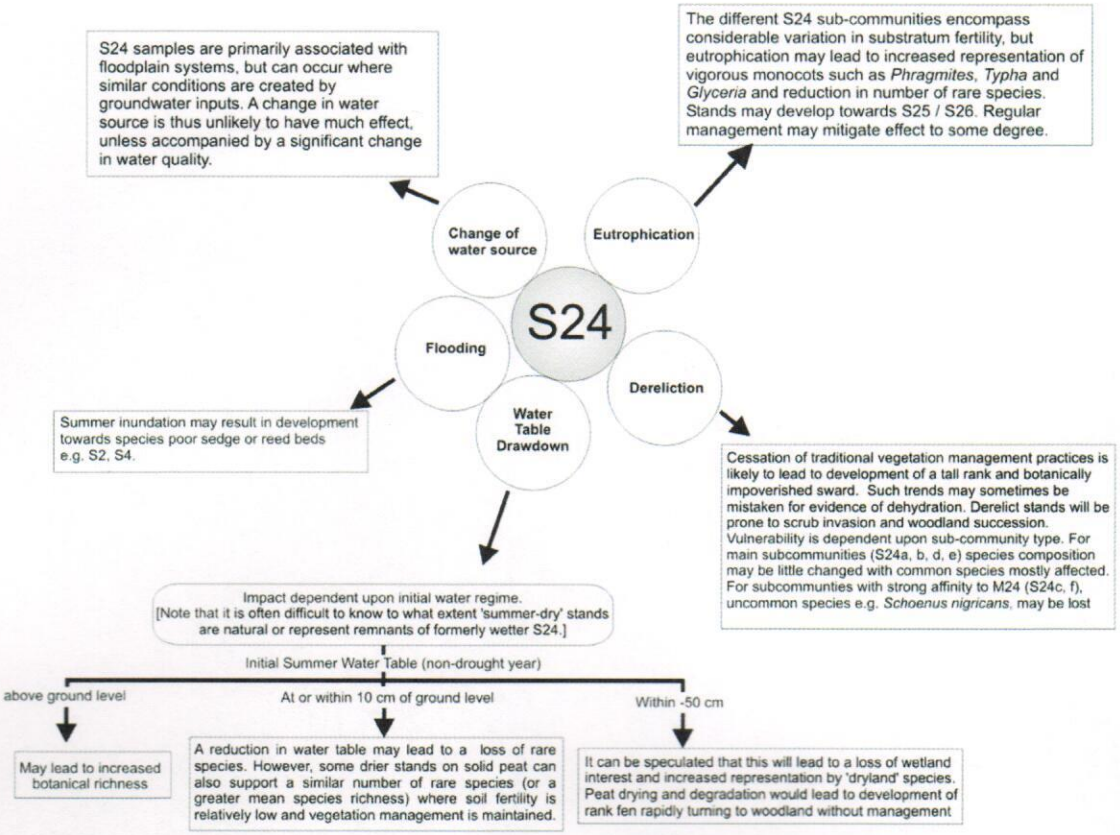

Figure 10.3 The Possible Effects of Environmental Change on Stands of S24

10.4.2 Restorability

As with all restoration measures, their likely success depends on the cause of the 'damage', and how far the starting conditions are from the objective, both in time and conditions (e.g. numbers of species lost, damage to substratum, degree of enrichment etc). There is limited information available that specifically relates to restoration of S24 stands, but the following observations can be made.

- Scrub removal and reinstatement of a regular vegetation management regime can be expected to improve stand quality;
- The potential for restoring high grade stands to dehydrated sites through re-wetting is largely untested (most pertinent fen restoration trials are at a relatively early phase).

10.4.3 Limitations of These Guidelines and Gaps in Knowledge

The limitations of the information presented here related to S24 include the following:

- The information presented here is largely based on that synthesised by Wheeler & Shaw (2001) - itself primarily based on knowledge of wetland sites supporting S24 in eastern England, and other information held within the FenBASE database. It is proposed that an updated account, including data from other parts of the UK, should be prepared in 2004;
- There are currently virtually no data to better inform the temporal water table characteristics of S24 stands. Time series of dipwell measurements are required to fill this gap;
- In order to make predictions with respect to the vulnerability of S24 stands to water levels, models are required that can connect hydrogeological processes with hydrological conditions at the fen surface. This may require detailed ecohydrological investigations at 'representative' sites;
- S24 is very localised in Britain, but the habitat that it typically occupies appears to be considerably wider than the distribution of the community. The reason why apparently suitable habitats do not support S24 is not known;
- Data on the areal extent of S24 are lacking;
- Possible differences in environmental conditions influencing the six sub-communities have not been explored in detail here.